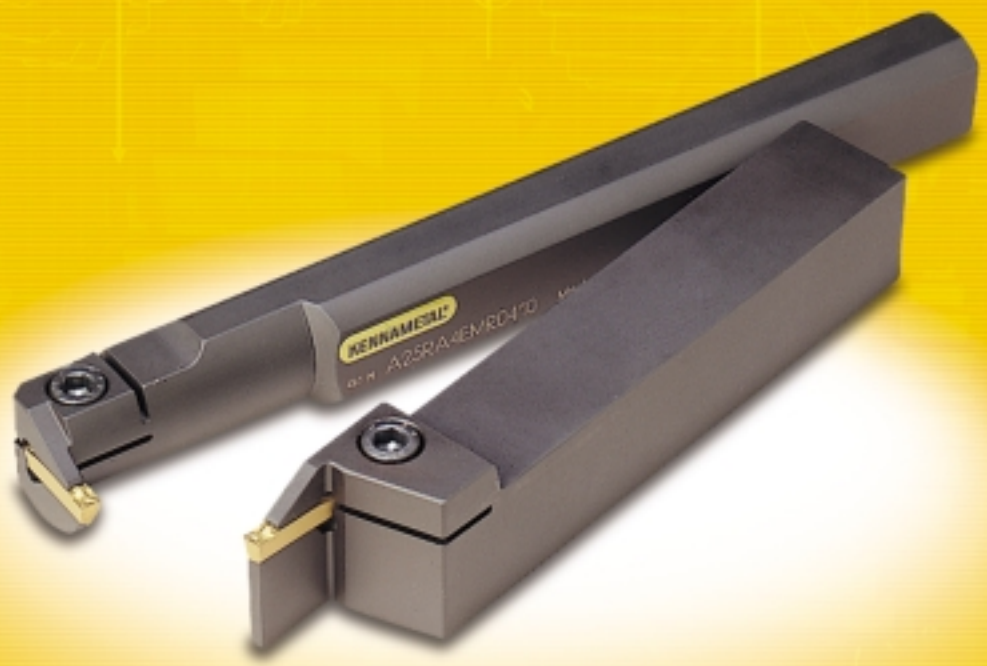
Engineering Your Competitive Edge

KENNAMETAL®

# A4™ Groove & Turn System




Catalog 4012

# Engineering Your Competitive Edge

## In Groove & Turn. In All Materials.

***No matter what type of workpiece you're turning and grooving,*** *Kennametal's new high-performance A4 Groove & Turn System* ***will boost your productivity and profitability — and your overall manufacturing competitiveness!***

### A4™ Groove & Turn System

- ***ONE TOOL*** for turning, facing, grooving, face-grooving, and cutoff...in OD and ID applications – that means exceptionally fast cycle times, no turret indexes!
- Extra-long clamping area, ground 120° bottom prism seating surface, and an exclusive top guide rail combine to deliver unsurpassed grooving and side-turning stability!
- Precise insert positioning is ensured – for accurate cuts!

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# Table of Contents




## *Metalcutting Safety*

(Please read this before using products listed in this catalog.)

Modern metalcutting operations involve high energy, high spindle or cutter speeds, and high temperatures and cutting forces. Hot, flying chips may be projected from the workpiece during metalcutting. Although advanced cutting tool materials are designed and manufactured to withstand the high cutting forces and temperatures that normally occur in these operations, they are susceptible to fragmentating in service, particularly if they are subjected to over-stress, severe impact or are otherwise abused. Therefore, precautions should be taken to adequately protect workers, observers and equipment against hot, flying chips, fragmented cutting tools, broken workpieces or other similar projectiles. Machines should be fully guarded and personal protective equipment should be used at all times.

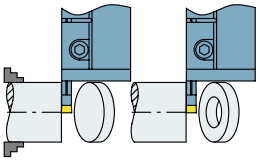
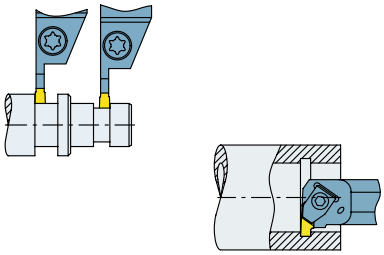
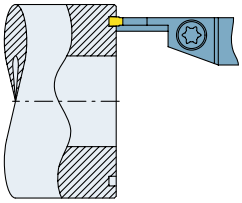
When grinding carbide or other advanced cutting tool materials, a suitable means for collection and disposal of dust, mist or sludge should be provided. Overexposure to dust or mist containing metallic particles can be hazardous to health, particularly if exposure continues over an extended period of time, and may cause eye, skin and mucous membrane irritation and temporary or permanent respiratory disease. Certain existing pulmonary and skin conditions may be aggravated by exposure to dust or mist. Adequate ventilation, respiratory protection and eye protection should be provided when grinding, and workers should avoid breathing of and prolonged skin contact with dust or mist. General Industry Safety and Health Regulations, Part 1910, U.S. Department of Labor, published in Title 29 of the Code of Federal Regulations should be consulted. Obtain from Kennametal and read the applicable Material Safety Data Sheet before grinding.

Cutting tools are only one part of the worker-machine tool system. Many variables exist in machining operations, including: metal removal rate; workpiece size, shape, strength and rigidity; chucking and fixturing; the load carrying capability of centers; cutter and spindle speed and torque limitations; the holder and boring bar overhang; available power, and the condition of the tooling and the machine.
A safe metalcutting operation must take all of these variables, and others, into consideration.

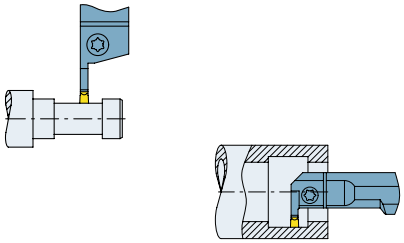
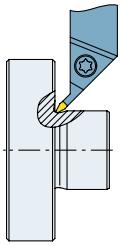
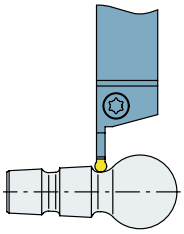
Kennametal has no control over the end use of its products or the environment into which those products are placed. Kennametal urges that its customers adhere to the recommended standards of use of their metalcutting machines and tools, and that they follow procedures that ensure safe metalcutting operations. The technical information included throughout this catalog, as well as recommendations on machining practices referred to herein are only advisory in nature and do not constitute representations or warranties and are not necessarily appropriate for any particular work environment or application.

For more information, we suggest you obtain Kennametal's Metalcutting Safety booklet, if you do not already have one. Quantities of safety booklets and Material Safety Data Sheets may be obtained free from the Kennametal Corporate Compliance Office at 724-539-5747, or fax 724-539-5439. For product safety and environmental inquiries, contact our Corporate Environmental Health and Safety Office at 724-539-5631 or fax 724-539-5372.

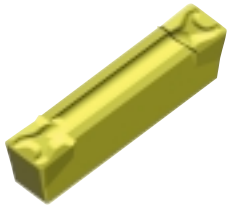
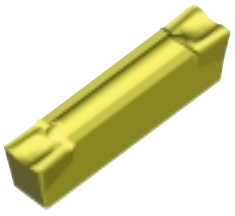
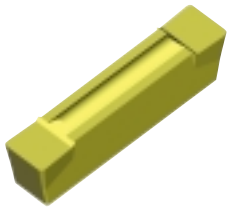
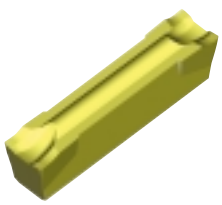
# Grooving Application Guide

| | Cutoff | Grooving | Face Grooving |
|---|---|---|---|
| **Application** |  |  |  |
| **A4™ Groove & Turn** | **A4 Cutoff Capabilities**<br>• .118 in. to .157 in. (3 mm to 4 mm) cutoff width<br>• satisfies extreme demands for rigidity and dimensional accuracy<br>• integral screw-clamping toolholders with .670 in. (17 mm) maximum cutting depth available<br>• economical double-edge inserts | **Inserts**<br>• cutting widths from .118 to .396 in. (3,0 to 10,05 mm)<br>• precision ground and molded inserts... all available with chip control<br>**OD Application**<br>• integral shank toolholders and modular KM heads are available<br>• cutting depths from .55 to 1.02 in. (14 to 26 mm)<br>**ID Application**<br>• boring bars with .984 in. (25 mm) minimum bore diameter<br>• cutting widths from .118 to .250 in. (3,0 to 6,35 mm) | **Minimum Face Groove Diameter Capability**<br>• 1.417 in. (36 mm) minimum diameter<br>• unlimited maximum diameter<br>**Cutting Width Range**<br>• cutting widths from .118 to .199 in. (3,0 to 5,05 mm)<br>**Cutting Depth Range**<br>• cutting depths of .276 to .748 in. (7 to 19 mm) |
| **Top Notch® Grooving**<br>*generally recommended for cutting depth/ width ratios of 1.5 or less (See Catalog 1010.)* | | **Inserts**<br>• cutting widths from .031 to .375 in. (0,8 to 9,5 mm)<br>• cutting depths from .050 to .375 in. (1,27 to 9,5 mm)<br>• chip control, positive rake, and neutral flat top inserts are available<br>**OD Application**<br>• integral shank toolholders and KM heads are available<br>**ID Application**<br>• boring bars with a .440 in. (11,2 mm) minimum bore diameter | **Minimum Face Groove Diameter Capability**<br>• standard inserts: 2.125 to 13 in. (54 to 330 mm) depending on size<br>• NF/NFD face grooving inserts: .940 to 2.25 in. (24 to 57 mm)<br>• all have unlimited maximum diameter<br>**Cutting Width Range**<br>• standard inserts: .031 to .375 in. (0,8 to 9,5 mm)<br>• NF/NFD face grooving inserts: .125 to .375 in. (3,2 to 9,5 mm)<br>**Cutting Depth Range**<br>• standard inserts: .050 to .375 in. (1,27 to 9,5 mm)<br>• NF/NFD face grooving inserts: .150 to .250 in. (3,8 to 6,35 mm) |
| **A3™ Deep Grooving**<br>*generally recommended for cutting depth/ width ratios of more than 1.5 (See Catalog 1010.)* | | **Inserts**<br>• cutting widths from .093 to .396 in. (2,36 to 10,05 mm)<br>• precision ground and molded inserts... all available with chip control<br>**OD Application**<br>• integral shank toolholders and modular KM heads are available<br>• cutting depths from .394 to 1.26 in. (10 to 32 mm)<br>**ID Application**<br>• boring bars with 1.26 in. (32 mm) minimum bore diameter | **Minimum Face Groove Diameter Capabilities**<br>• .984 in. ( 25 mm) minimum diameter<br>• unlimited maximum diameter<br>**Cutting Width Range**<br>• cutting widths from .157 to .250 in. (4 to 6,35 mm)<br>**Cutting Depth Range**<br>• cutting depths from .393 to 1.26 in. (10 to 32 mm) |
| **A2™ Cutoff**<br>*(See Catalog 1010.)* | **A2 Cutoff Capabilities**<br>• cutoff widths from .063 to .315 in. (1,6 to 8 mm)<br>• left- and right-hand styles with 6° to 16° lead angles<br>• self-clamping blades and screw-clamping integral shank toolholders are available<br>• single-edge inserts for maximum depth capability | | |

# Grooving Application Guide

| Groove & Turn | Undercutting | Profiling |
|---|---|---|
|  |  |  |
| **Recommended for Heavy Stock Removal, Particularly in Turning Applications**<br>**Inserts**<br>• cutting widths: .118 to .396 in., (3,0 to 10,05 mm)<br>• double-ended, precision ground, and molded inserts...all available with chip control<br>**OD Application**<br>• integral shank toolholders and modular KM heads are available<br>• cutting depths from .55 to 1.02 in. (14 to 26 mm)<br>**ID Application**<br>• boring bars with .984 in. (25 mm) minimum bore diameter<br>• cutting widths from .118 to .250 in.(3,0 to 6,35 mm) | | **Recommended for Heavy Stock Removal**<br>**Full Radius Inserts**<br>• cutting widths from .118 to .396 in. (3,0 to 10,05 mm)<br>**OD Application**<br>• integral shank toolholders and modular KM heads are available<br>• cutting depths from .55 to 1.02 in. (14 to 26 mm) |
| | **Top Notch Undercutting Capability**<br>• undercutting insert widths from .094 to .156 in. (2,4 - 4 mm)<br>• economical double-ended inserts | **Recommended for Moderate to Heavy Stock Removal at Shallow Profile Depths**<br>**Full Radius Inserts**<br>• cutting widths from .062 to .250 in. (1,57 to 6,35 mm)<br>• cutting depths of .094 to .250 in. (2,39 to 6,35 mm)<br>**OD Application**<br>• integral shank toolholders and KM heads are available |
| **Recommended for Light Cutting**<br>**Inserts**<br>• cutting widths from .093 to .396 in. (2,36 to 10 mm)<br>• precision ground and molded inserts, all available with chip control<br>**OD Application**<br>• integral shank toolholders and modular KM heads are available<br>• cutting depths from .394 to 1.26 in. (10 to 32 mm)<br>**ID Application**<br>• boring bars with 1.26 in. (32 mm) minimum bore diameter | **A3 Full Radius Undercutting**<br>• full radius inserts with cutting widths from .093 to .315 in. (2,4 to 8 mm) at 45° lead angle<br>**A3 35° Insert Undercutting**<br>• 35° V-form inserts for profiling undercuts<br>• toolholder lead angles of 93° and 117.5° | **Recommended for Light Cutting**<br>• full radius inserts with cutting widths from .118 to .315 in. (3 to 8 mm)<br>• 1.26 in (32 mm) maximum cutting depth<br>• integral shank toolholders and modular KM heads are available<br>• 35° V-form inserts are also available |

# A4 Insert Overview

| Insert Type & Chipbreaker Designation | | Application Range | Metric Widths (mm) | Inch Widths (in.) | steel | stainless steel | cast iron | non-ferrous | high-temp alloy | hardened materials |
|---|---|---|---|---|---|---|---|---|---|---|
| **A4G-U-GMN** |  | **Groove & Turn:**<br>• stable cutting edge for higher feed rates<br>• utility molded | 3,05-10,05 | – | ● | | ● | | | ● |
| **A4G-P-GMN**<br>(precision ground) | | **Groove & Turn:**<br>• stable, precision ground cutting edge<br>• general grooving for specific widths<br>• +/- .001 in. (0,025 mm) width tolerance | – | .125-.375 | ● | ○ | ● | ○ | ○ | ● |
| **A4G-U-GMP** |  | **Groove & Turn:**<br>• positive rake angle<br>• reduced cutting force<br>• small to medium feed rates<br>• utility molded | 3,05-10,05 | – | ○ | ● | | | | |
| **A4G-P-GMP**<br>(precision ground) | | **Groove & Turn:**<br>• positive rake angle<br>• precision ground cutting edge<br>• +/- .001 in. (0,025 mm) width tolerance | 3,0-10,00 | – | | ○ | | ● | ● | |
| **A4R-U-GMN** |  | **Groove & Turn:**<br>• stable cutting edge for higher feed rates<br>• utility molded | 3,05-10,05 | – | ● | | ● | | | ● |
| **A4R-P-GMN**<br>(precision ground) | | **Groove & Turn:**<br>• stable, precision ground cutting edge<br>• general grooving for specific widths<br>• +/- .001 in. (0,025 mm) width tolerance | – | .125-.375 | ● | ○ | ● | ○ | ○ | ● |
| **A4R-P-GMP**<br>(precision ground) |  | **Groove & Turn:**<br>• positive rake angle<br>• precision ground cutting edge<br>• +/- .001 in. (0,025 mm) width tolerance | 3,0-10,00 | – | | ● | | ● | ● | |
| **A4G-U-B** |  | **Groove & Turn:**<br>• for special profiles and for CBN tipped inserts (on request only)<br>• secondary choice for cast iron and high-temp alloys | 3,05-10,05 | – | | | ○ | | ○ | |
| **A4G-P-E**<br>(precision ground) | | **Groove & Turn:**<br>• diamond sheet tipped tool for high performance non-ferrous machining | 3,0-5,0 | – | | | | ● | | |
| **A4C-CF** |  | **Cutoff:**<br>• high positive rake angle<br>• sharp cutting edge<br>• available in neutral lead angle, or 6° and 10° right- and left-hand styles | 3,05-4,05 | – | ● | ● | ● | ● | ● | |

● - primary application

○ - secondary application

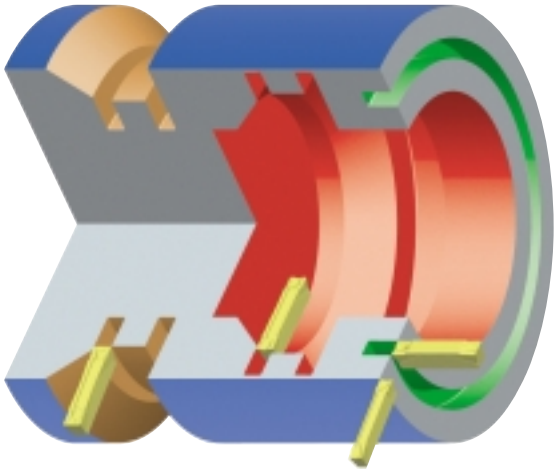
# KENNA PERFECT A4 Groove & Turn

## 5 Easy Steps to Greater Productivity in Grooving and Turning

***What you need to know:***

- groove depth, width, and profile
- material being machined
- application to be performed (OD, ID face grooving, or turning)

### 1st Step – Choose the A4 size for your grooving and turning application.

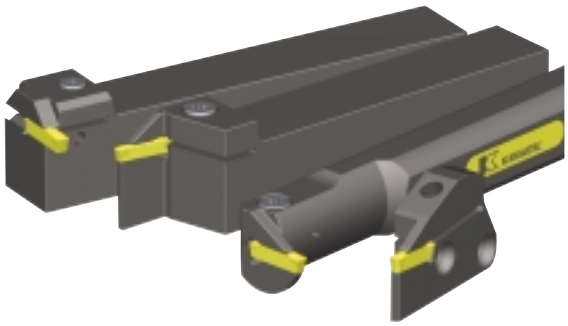


***General Recommendation to Select Insert Size***

| for workpiece diameters... | or groove widths down to... | insert seat size |
|---|---|---|
| up to 1 inch | .118 in. (3 mm) | 3 |
| from 1 to 2 inches | .157 in. (4 mm) | 4 |
| >2 inches | .197 in. (5 mm) | 5 |
| >2 inches | .236 in. (6 mm) | 6 |
| >2 inches | .312 in. (7,9 mm) | 8 |
| >2 inches | .375 in. (9,5 mm) | 10 |

*EXAMPLE: For a 1.5 inch diameter part with a .125 inch minimum groove width, select insert seat size 3 (size 3 is required to cut the .125 inch groove).*

### 2nd Step – Choose your toolholder based upon the application.



***Note that the insert seat size must match the seat size of the toolholder.***

| | conventional toolholders | modular blades |
|---|---|---|
| OD grooving and turning | page 18 | page 24 |
| ID grooving and turning | page 22 | — |
| face grooving | page 20 | page 24 |

# KENNA PERFECT A4 Groove & Turn

## 5 Easy Steps to Greater Productivity in Grooving and Turning

### 3rd Step – Select the best chipbreaker and feed rate for your application.

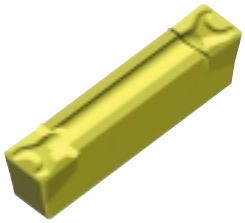
**Choose Chipbreaker Based on Material Type.**

| Steel | Stainless Steel | Cast Iron | Non-Ferrous | High-Temp Alloy | Hardened Material |
|---|---|---|---|---|---|
| GMN | GMP | GMN | GMP precision ground (-E for KD1405) | GMP precision ground | GMN * |

**Alternative PCBN tipped inserts are available upon request.*
*NOTE: Precision ground A4_-P-GMN inserts can be applied on all material groups for inch-width grooving.*

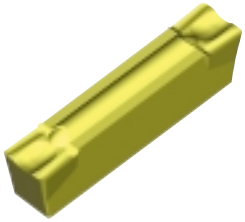
### *GMN Chipbreaker – Square Inserts (A4G...)*

- groove & turn molded inserts
- stable cutting edge
- available in metric and inch widths

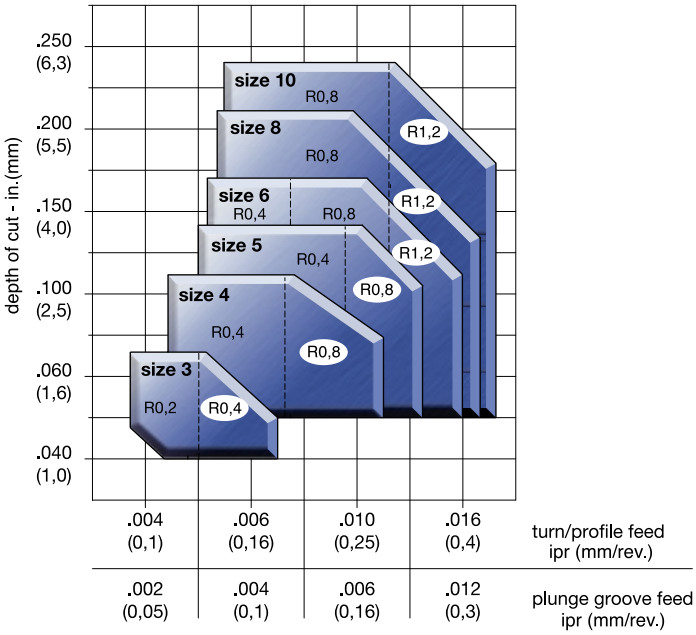


### *GMP Chipbreaker – Square Inserts (A4G...)*

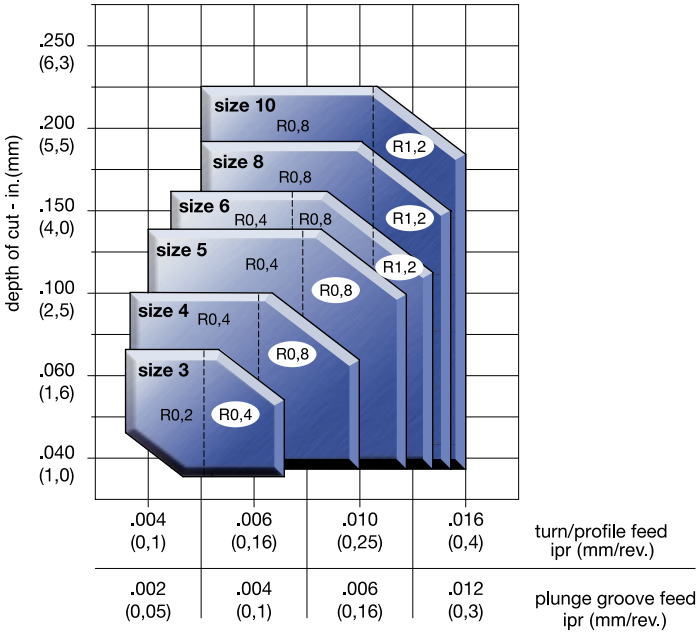
- groove & turn inserts
- available in molded and precision-ground styles
- positive rake angle
- available in metric widths only



**• Depth of Cut Guidelines for Turning and Profiling**
**• Feed Guidelines for Grooving, Turning, and Profiling**




**• Depth of Cut Guidelines for Turning and Profiling**
**• Feed Guidelines for Grooving, Turning, and Profiling**

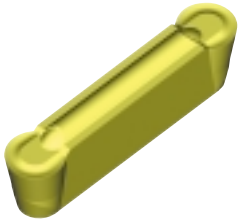



*NOTE: Select feed based on nose radius:* *R0,2 = .008 in. corner radius*
*R0,4 = .016 in. corner radius*
*R0,8 = .032 in. corner radius*
*R1,2 = .047 in. corner radius*

### *For Full Radius Inserts (A4R...)*

Maximum turning and profiling depth of cut equals 1/2 insert width.

The maximum turn and profile feed rate depends on the material to be machined and the depth of cut. For easy-to-machine materials, feed can be increased up to 1.5 times.



# KENNA PERFECT A4 Groove & Turn

## 5 Easy Steps to Greater Productivity in Grooving and Turning

**4th Step – Select the grade and speed based on material and cutting conditions.**

### GMN Chipbreaker – Carbon, Alloy, and Tool Steels (up to 40 HRC)

| Cutting Conditions | Grades |
|---|---|
| heavily interrupted cut | KC5025 |
| lightly interrupted cut | KC9125 / KC5025 |
| varying depth of cut, casting or forging skin | KC9110 |
| smooth cut, pre-turned surface | KT315* / KC9110 |

**Recommended Cutting Speeds**

| | | Speed - sfm (m/min) 200 (60) | 400 (120) | 600 (185) | 800 (245) | 1000 (300) | Starting Conditions sfm | Starting Conditions m/min |
|---|---|---|---|---|---|---|---|---|
| steel | KC5025 | | | | | | 400 | 120 |
| | KC9125 | | | | | | 650 | 200 |
| | KC9110 | | | | | | 800 | 250 |
| | KT315* | | | | | | 850 | 260 |

*NOTE: KT315 is an alternative choice for steel; available in the GMP chipbreaker only.*

### GMP Chipbreaker – Austenitic Stainless Steels (200 & 300 series, duplex)

*NOTE: Use P-GMN for inch-width inserts.*

| Cutting Conditions | Grades |
|---|---|
| heavily interrupted cut | KC5025 |
| lightly interrupted cut | KC5025 |
| varying depth of cut, casting or forging skin | KC5010 |
| smooth cut, pre-turned surface | KT315 |

**Recommended Cutting Speeds**

| | | Speed - sfm (m/min) 150 (45) | 300 (90) | 450 (140) | 600 (185) | 750 (230) | Starting Conditions sfm | Starting Conditions m/min |
|---|---|---|---|---|---|---|---|---|
| stainless steel | KC5025 | | | | | | 350 | 105 |
| | KC5010 | | | | | | 450 | 135 |
| | KT315 | | | | | | 550 | 170 |

### GMN Chipbreaker – Ductile and Gray Cast Irons

| Cutting Conditions | Grades |
|---|---|
| heavily interrupted cut | KC9125 |
| lightly interrupted cut | KC9125 |
| varying depth of cut, casting or forging skin | KC9110 |
| smooth cut, pre-turned surface | KC9110 |

**Recommended Cutting Speeds**

| | | Speed - sfm (m/min) 400 (120) | 550 (170) | 700 (215) | 850 (260) | 1000 (300) | Starting Conditions sfm | Starting Conditions m/min |
|---|---|---|---|---|---|---|---|---|
| cast iron | KC9125 | | | | | | 650 | 200 |
| | KC9110 | | | | | | 800 | 245 |

# KENNA PERFECT A4 Groove & Turn

## 5 Easy Steps to Greater Productivity in Grooving and Turning

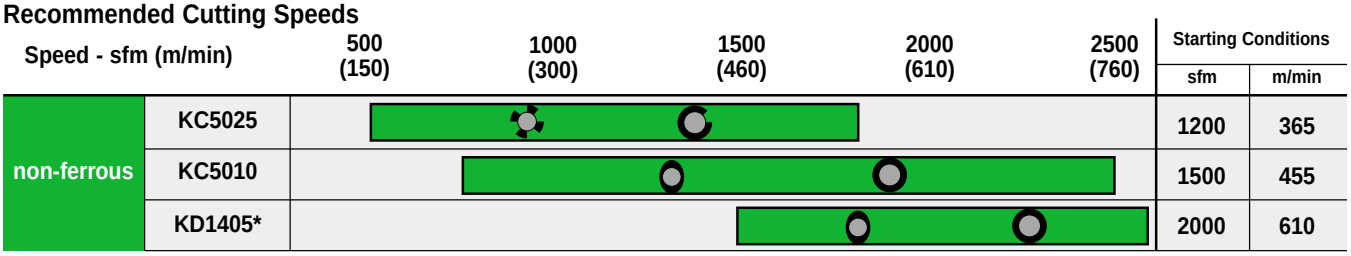
**4th Step – Select the grade and speed based on material and cutting conditions (cont'd.).**

### GMP Chipbreaker – Non-Ferrous Metals (P-GMP... precision-ground inserts recommended.)

*NOTE: Use P-GMN for inch-width inserts.*

| Cutting Conditions | Grades |
|---|---|
| heavily interrupted cut | KC5025 |
| lightly interrupted cut | KC5025 |
| varying depth of cut, casting or forging skin | KC5010 / KD1405 |
| smooth cut, pre-turned surface | KC5010 / KD1405 |

### Recommended Cutting Speeds



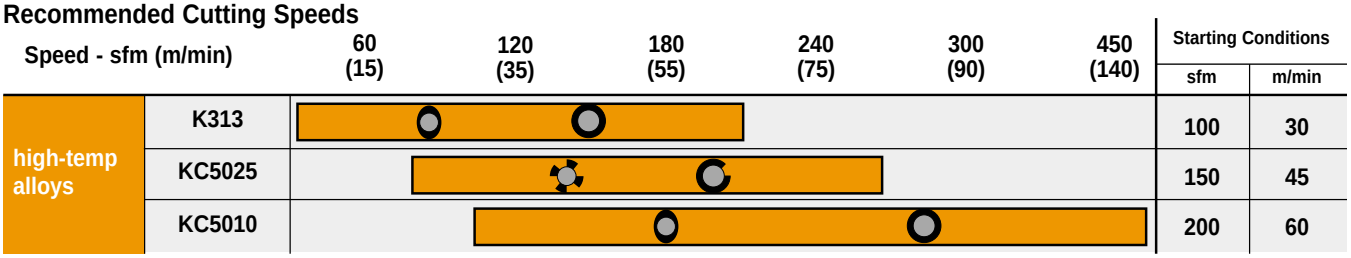

**Recommended for high-silicon aluminum alloys and abrasive non-metallics. Available in -E style.*

### GMP Chipbreaker – High-Temp Alloys (P-GMP... precision-ground inserts recommended.)

*NOTE: Use P-GMN for inch-width inserts.*

| Cutting Conditions | Grades |
|---|---|
| heavily interrupted cut | KC5025 |
| lightly interrupted cut | KC5025 |
| varying depth of cut, casting or forging skin | K313 / KC5010 |
| smooth cut, pre-turned surface | K313 / KC5010 |

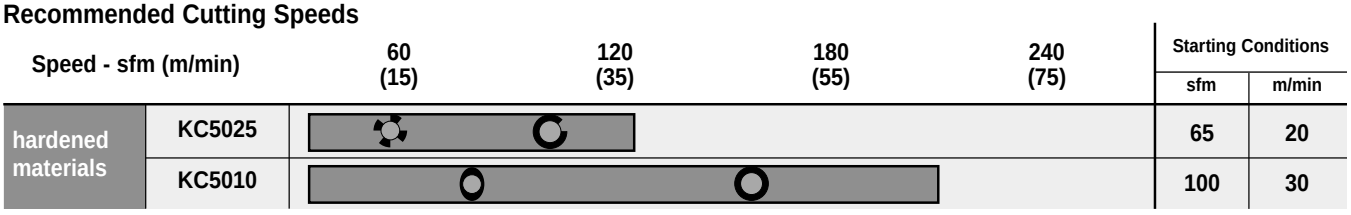
### Recommended Cutting Speeds




### GMN Chipbreaker – Hardened Steels and Irons (48-60 HRC)

| Cutting Conditions | Grades |
|---|---|
| heavily interrupted cut | KC5025 |
| lightly interrupted cut | KC5025 |
| varying depth of cut, casting or forging skin | KC5010 |
| smooth cut, pre-turned surface | KC5010 |

### Recommended Cutting Speeds

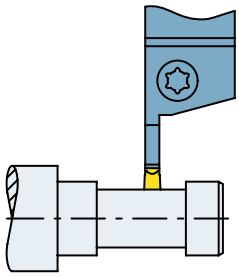


# KENNA PERFECT A4 Groove & Turn

## 5 Easy Steps to Greater Productivity in Grooving and Turning

### 5th Step – Select insert and holder.

Select insert and holder from catalog pages which meet the criteria in steps 1 thru 4.
Always make sure that the insert seat size matches that of the toolholder.



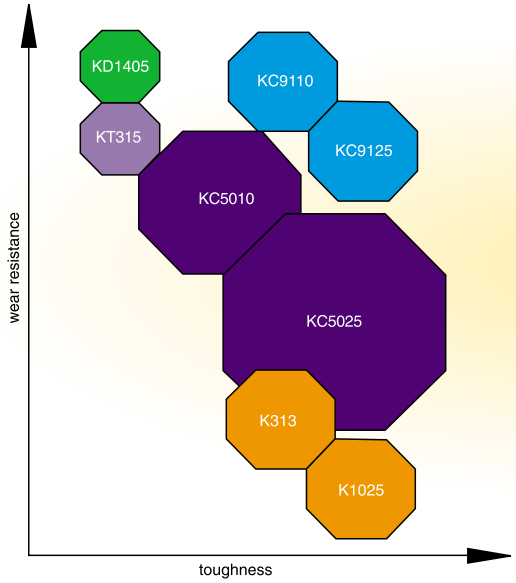
**Example for Grooving and Turning**

| | |
|---|---|
| material: | low-alloyed steel |
| workpiece OD: | 1.5 in. (38 mm) |
| groove depth: | .5 in. (12 mm) |
| groove width: | .850 in. (22 mm) |
| lightly interrupted cut | |

**Recommendation:**

| | |
|---|---|
| insert: | A4G 0405M 04U08 GMN |
| grade: | KC9125 |
| insert width: | 4,05 mm |
| insert seat size: | 4 |
| toolholder: | A4SMR-1604-17 |
| grooving depth: | .670 in. (17 mm) |
| insert seat size: | 4 |
| speed: | 650 sfm (200 m/min) |
| turn feed: | .010 ipr (0,25 mm) |
| plunge feed: | .006 ipr (0,16 mm) |

## Grades for Grooving and Turning Program




### *KT315...*

a multi-layered TiN/TiCN/TiN coated cermet grade for excellent surface finish and exceptional tool life.

### *KC5010 and KC5025...*

PVD TiAlN-coated, submicron carbides, for excellent toughness and wear resistance.

### *KC9110 and KC9125...*

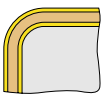
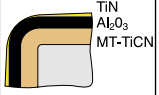
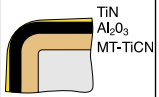
CVD coated grades for optimal performance at high speeds on steels and irons.

### *K313 and K1025*

uncoated, submicron carbides with excellent edge integrity for special applications when uncoated grades are preferred.

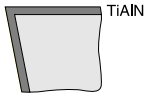
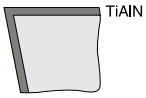
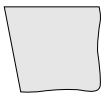
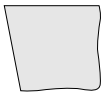
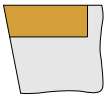
### *KD1405*

diamond sheet tipped cutting tool for maximum speed capability and abrasion resistance in non-ferrous applications

| grade | structure | composition and application | C class | ISO class |
|---|---|---|---|---|
| **KT315** |   | **composition:** A multi-layered, PVD TiN/TiCN/TiN, coated cermet turning grade. **application:** Ideal for high-speed finishing to medium machining of most carbon and alloy steels and stainless steels. Performs very well in cast and ductile iron applications too. Provides long and consistent tool life and will produce excellent workpiece finishes. | **C3 C7** | **K10 - K20 M10 - M20 P10 - P20** |
| **KC9110** |   | **composition:** A specially engineered, patented cobalt-enriched carbide grade with thick K-MTCVD-TiCN coating layer, an $Al_2O_3$ layer of controlled grain size, and outer layers of TiCN and TiN for maximum wear resistance. **application:** An excellent finishing/semi-finishing grade for a variety of workpiece materials including most steels, ferritic and martensitic stainless steels, and cast irons. The specially engineered, cobalt-enriched substrate offers a balanced combination of deformation resistance and edge toughness, while the thick coating layers offer outstanding abrasion resistance and crater wear resistance for high-speed machining. The smooth coating provides good resistance to edge build-up and microchipping and produces excellent surface finishes. For rougher cutting, use the KC9125 grade. | **C3 C7** | **M10 - M20 P05 - P20** |
| **KC9125** |   | **composition:** A tough cobalt-enriched carbide grade with a newly designed multi-layer K-MTCVD TiCN-$Al_2O_3$-TiCN-TiN coating with superior interlayer adhesion. **application:** This is the industry's best general-purpose turning grade for most steels, and ferritic and martensitic stainless steels. The substrate design, with cobalt-enrichment, assures adequate deformation resistance along with excellent bulk toughness and insert edge strength. The coating layers offer good wear resistance over a wide range of machining conditions. The smoothness of the coating leads to reduced frictional heat, minimizes microchipping, and improves workpiece surface finishes. The KC9125 grade performs well in moderately heavy roughing to semi-finishing cuts. Use the KC9110 grade forfinishing cuts. | **C2 - C3 C6 - C7** | **M15 - M25 P15 - P35** |

# KENNA PERFECT A4 Groove & Turn

## Grades for Grooving and Turning Program (cont'd.)

| grade | structure | composition and application | C class | ISO class |
|---|---|---|---|---|
| KC5010 |   | **composition:** A PVD TiAlN coating over a very deformation-resistant unalloyed, carbide substrate. **application:** Grade KC5010 is ideal for finishing to general machining of most workpiece materials at higher speeds. Excellent for machining most steels, stainless steels, cast irons, non-ferrous materials and super alloys under stable conditions. It also performs well machining hardened and short chipping materials. | C3 C4 | K10 - K20 M10 - M20 P10 - P20 |
| KC5025 |   | **composition:** A PVD TiAlN coated grade with a tough, submicron grain unalloyed substrate. **application:** For general purpose machining of most steels, stainless steels, high-temperature alloys, titanium, irons, and non-ferrous materials. Speeds may vary from low to medium, and will handle interruptions and high feed rates. | C2 C6 | K15 - K35 M15 - M30 P20 - P40 |
| K313 |  | **composition:** A hard, low binder content, unalloyed WC/Co submicron grade. **application:** Exceptional edge wear resistance combined with very high strength for machining titanium, cast irons, austenitic stainless steels, non-ferrous metals, non-metals, and most high-temperature alloys. Superior thermal deformation and depth of cut notch resistance. The grain structure is well controlled for minimal pits and flaws which contributes to long, reliable service. | C3-C4 | K05 - K20 M10 - M20 |
| K1025 |  | **composition:** A tough, high binder content, unalloyed WC/Co, submicron grade. **application:** Select this grade for machining aluminum, cast iron, high-temperature alloys, and titanium. Well suited for demanding operations involving aerospace materials. The high binder content enhances toughness, while the small grain structure provides wear resistance. | C2 | K20 - K35 M20 - M35 |
| KD1405 |  | **composition:** An extremely abrasion resistant, pure diamond material, vacuum brazed onto a carbide substrate. **application:** This grade is intended for fine finishing cuts with little or no interruptions. Recommended for finishing high-silicon content (hypereutectic) aluminum alloys, metal matrix composites, carbon and graphite composites, non-ferrous materials, and non-metallics. This grade operates at very high speeds. | C4 | K01 - K05 |

# A4 Groove & Turn Inserts

## Identification System for A4 Groove & Turn Inserts

**1.** Tooling System

A4 — groove & turn

**3.** Groove Width

expressed in 1/100 mm or .001 in.

**5.** Insert Seat Size

| | |
|---|---|
| 03 | 06 |
| 04 | 08 |
| 05 | 10 |

**7.** Corner Radius

| metric | inch |
|---|---|
| 01 = 0,1 | 0 = .004 |
| 02 = 0,2 | 05 = .008 |
| 04 = 0,4 | 1 = .016 |
| 08 = 0,8 | 2 = .032 |
| 12 = 1,2 | 3 = .047 |

**full radius = 00**

**A4 G 0405 M 04 U 02 GMN**

**2.** Insert Type

G — square
R — full radius
C — cutoff

**4.** Unit of Measurement for Grooving Width

M = metric
I = inch

**6.** Insert Tolerance

P = precision ground grooving width tolerance: ±.001 in. (0,025 mm)

U = utility molded grooving width tolerance:
3,05-4,05: $\frac{+.006}{-0}$ in. $\left(\frac{+0,15\ mm}{-0}\right)$
5,05-10,05: $\frac{+.010}{-0}$ in. $\left(\frac{+0,25\ mm}{-0}\right)$

**8.** Chipbreaker Type/Edge Prep

GMN = groove & turn medium machining stable cutting edge

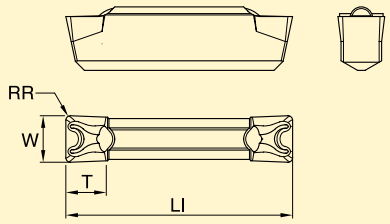
GMP = groove & turn medium machining positive rake angle

B = flat top for special forms and applications

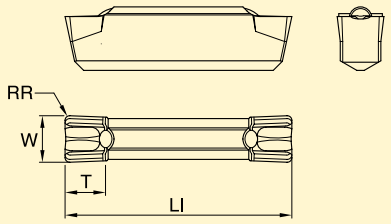
E = flat top, honed edge

# A4 Groove & Turn Inserts

GMN geometry

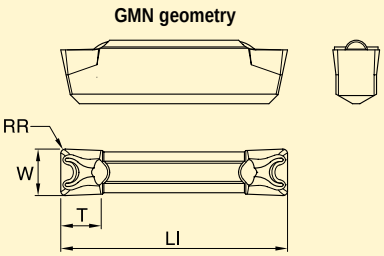


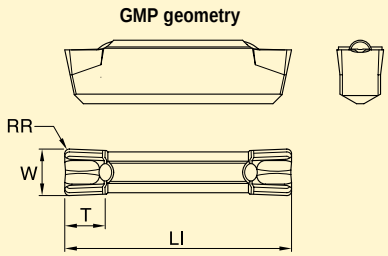

GMP geometry




| | catalog number | seat size | W | | RR | | LI | | T | | K313 | K1025 | KC5010 | KC5025 | KC9110 | KC9125 | KT315 | KD1405 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | inch | mm | inch | mm | inch | mm | inch | mm | | | | | | | | |
| **A4G-P-GMN** precision ground | **A4G125I03P05GMN** | 3 | .125 | 3,18 | .008 | 0,2 | .79 | 20 | .135 | 3,4 | ■ | | ■ | ■ | | | | |
| | **A4G125I03P1GMN** | 3 | .125 | 3,18 | .016 | 0,4 | .79 | 20 | .135 | 3,4 | | | ■ | ■ | | | | |
| | **A4G187I04P1GMN** | 4 | .187 | 4,75 | .016 | 0,4 | .79 | 20 | .139 | 3,5 | ■ | | ■ | ■ | | | | |
| | **A4G187I04P2GMN** | 4 | .187 | 4,75 | .032 | 0,8 | .79 | 20 | .139 | 3,5 | | | ■ | ■ | | | | |
| | **A4G250I06P1GMN** | 6 | .250 | 6,35 | .016 | 0,4 | 1.18 | 30 | .190 | 4,8 | ■ | | ■ | ■ | | | | |
| | **A4G250I06P2GMN** | 6 | .250 | 6,35 | .032 | 0,8 | 1.18 | 30 | .190 | 4,8 | | | ■ | ■ | | | | |
| | **A4G312I08P1GMN** | 8 | .312 | 7,93 | .016 | 0,4 | 1.18 | 30 | .249 | 6,3 | ■ | | ■ | ■ | | | | |
| | **A4G312I08P2GMN** | 8 | .312 | 7,93 | .032 | 0,8 | 1.18 | 30 | .249 | 6,3 | | | ■ | ■ | | | | |
| | **A4G375I10P1GMN** | 10 | .375 | 9,53 | .016 | 0,4 | 1.18 | 30 | .315 | 8,0 | ■ | | ■ | ■ | | | | |
| | **A4G375I10P2GMN** | 10 | .375 | 9,53 | .032 | 0,8 | 1.18 | 30 | .315 | 8,0 | | | ■ | ■ | | | | |
| **A4G-U-GMN** molded | **A4G0305M03U02GMN** | 3 | .120 | 3,05 | .008 | 0,2 | .79 | 20 | .138 | 3,5 | | | ■ | ■ | ■ | ■ | | |
| | **A4G0305M03U04GMN** | 3 | .120 | 3,05 | .016 | 0,4 | .79 | 20 | .138 | 3,5 | | | ■ | ■ | ■ | ■ | | |
| | **A4G0405M04U04GMN** | 4 | .159 | 4,05 | .016 | 0,4 | .79 | 20 | .138 | 3,5 | | | ■ | ■ | ■ | ■ | | |
| | **A4G0405M04U08GMN** | 4 | .159 | 4,05 | .031 | 0,8 | .79 | 20 | .138 | 3,5 | | | ■ | ■ | ■ | ■ | | |
| | **A4G0505M05U04GMN** | 5 | .199 | 5,05 | .016 | 0,4 | .98 | 25 | .165 | 4,2 | | | ■ | ■ | ■ | ■ | | |
| | **A4G0505M05U08GMN** | 5 | .199 | 5,05 | .031 | 0,8 | .98 | 25 | .165 | 4,2 | | | ■ | ■ | ■ | ■ | | |
| | **A4G0605M06U04GMN** | 6 | .238 | 6,05 | .016 | 0,4 | 1.18 | 30 | .193 | 4,9 | | | ■ | ■ | ■ | ■ | | |
| | **A4G0605M06U08GMN** | 6 | .238 | 6,05 | .031 | 0,8 | 1.18 | 30 | .193 | 4,9 | | | ■ | ■ | ■ | ■ | ■ | |
| | **A4G0605M06U12GMN** | 6 | .238 | 6,05 | .047 | 1,2 | 1.18 | 30 | .193 | 4,9 | | | ■ | ■ | ■ | ■ | | |
| | **A4G0805M08U08GMN** | 8 | .317 | 8,05 | .031 | 0,8 | 1.18 | 30 | .252 | 6,4 | | | ■ | ■ | ■ | ■ | | |
| | **A4G0805M08U12GMN** | 8 | .317 | 8,05 | .047 | 1,2 | 1.18 | 30 | .252 | 6,4 | | | ■ | ■ | ■ | ■ | | |
| | **A4G1005M10U08GMN** | 10 | .396 | 10,05 | .031 | 0,8 | 1.18 | 30 | .319 | 8,1 | | | ■ | ■ | ■ | ■ | | |
| | **A4G1005M10U12GMN** | 10 | .396 | 10,05 | .047 | 1,2 | 1.18 | 30 | .319 | 8,1 | | | ■ | ■ | ■ | ■ | | |
| **A4G-P-GMP** precision ground | **A4G0300M03P02GMP** | 3 | .118 | 3,00 | .008 | 0,2 | .79 | 20 | .138 | 3,5 | ■ | | ■ | ■ | | | | |
| | **A4G0300M03P04GMP** | 3 | .118 | 3,00 | .016 | 0,4 | .79 | 20 | .138 | 3,5 | ■ | | ■ | ■ | | | | |
| | **A4G0400M04P02GMP** | 4 | .157 | 4,00 | .008 | 0,2 | .79 | 20 | .138 | 3,5 | ■ | | ■ | ■ | | | | |
| | **A4G0400M04P04GMP** | 4 | .157 | 4,00 | .016 | 0,4 | .79 | 20 | .138 | 3,5 | ■ | | ■ | ■ | | | | |
| | **A4G0400M04P08GMP** | 4 | .157 | 4,00 | .031 | 0,8 | .79 | 20 | .138 | 3,5 | ■ | | ■ | ■ | | | | |
| | **A4G0500M05P04GMP** | 5 | .197 | 5,00 | .016 | 0,4 | .98 | 25 | .165 | 4,2 | ■ | | ■ | ■ | | | | |
| | **A4G0500M05P08GMP** | 5 | .197 | 5,00 | .031 | 0,8 | .98 | 25 | .165 | 4,2 | ■ | | ■ | ■ | | | | |
| | **A4G0600M06P04GMP** | 6 | .236 | 6,00 | .016 | 0,4 | 1.18 | 30 | .190 | 4,8 | ■ | | ■ | ■ | | | | |
| | **A4G0600M06P08GMP** | 6 | .236 | 6,00 | .031 | 0,8 | 1.18 | 30 | .190 | 4,8 | ■ | | ■ | ■ | | | | |
| | **A4G0800M08P08GMP** | 8 | .315 | 8,00 | .031 | 0,8 | 1.18 | 30 | .249 | 6,3 | ■ | | ■ | ■ | | | | |
| | **A4G0800M08P12GMP** | 8 | .315 | 8,00 | .047 | 1,2 | 1.18 | 30 | .249 | 6,3 | ■ | | ■ | ■ | | | | |
| | **A4G1000M10P08GMP** | 10 | .394 | 10,00 | .031 | 0,8 | 1.18 | 30 | .316 | 8,0 | ■ | | ■ | ■ | | | | |
| | **A4G1000M10P12GMP** | 10 | .394 | 10,00 | .047 | 1,2 | 1.18 | 30 | .316 | 8,0 | ■ | | ■ | ■ | | | | |

# A4 Groove & Turn Inserts



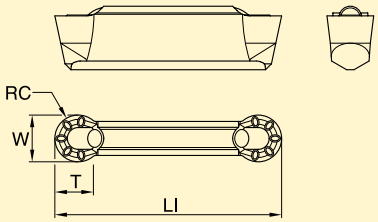




| | catalog number | seat size | W | | RR | | LI | | T | | K313 | K1025 | KC5010 | KC5025 | KC9110 | KC9125 | KT315 | KD1405 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | inch | mm | inch | mm | inch | mm | inch | mm | | | | | | | | |
| **A4G-U-GMP** molded | **A4G0305M03U02GMP** | 3 | .120 | 3,05 | .008 | 0,2 | .79 | 20 | .138 | 3,5 | | | ■ | ■ | ■ | ■ | ■ | |
| | **A4G0305M03U04GMP** | 3 | .120 | 3,05 | .016 | 0,4 | .79 | 20 | .138 | 3,5 | | | ■ | ■ | ■ | ■ | ■ | |
| | **A4G0405M04U04GMP** | 4 | .159 | 4,05 | .016 | 0,4 | .79 | 20 | .138 | 3,5 | | | ■ | ■ | ■ | ■ | ■ | |
| | **A4G0405M04U08GMP** | 4 | .159 | 4,05 | .031 | 0,8 | .79 | 20 | .138 | 3,5 | | | ■ | ■ | ■ | ■ | ■ | |
| | **A4G0505M05U04GMP** | 5 | .199 | 5,05 | .016 | 0,4 | .99 | 25 | .165 | 4,2 | | | ■ | ■ | ■ | ■ | ■ | |
| | **A4G0505M05U08GMP** | 5 | .199 | 5,05 | .031 | 0,8 | .99 | 25 | .165 | 4,2 | | | ■ | ■ | ■ | ■ | ■ | |
| | **A4G0605M06U04GMP** | 6 | .238 | 6,05 | .016 | 0,4 | 1.19 | 30 | .193 | 4,9 | | | ■ | ■ | ■ | ■ | | |
| | **A4G0605M06U08GMP** | 6 | .238 | 6,05 | .031 | 0,8 | 1.19 | 30 | .193 | 4,9 | | | ■ | ■ | ■ | ■ | ■ | |
| | **A4G0605M06U12GMP** | 6 | .238 | 6,05 | .047 | 1,2 | 1.19 | 30 | .193 | 4,9 | | | ■ | ■ | ■ | ■ | | |
| | **A4G0805M08U08GMP** | 8 | .317 | 8,05 | .031 | 0,8 | 1.19 | 30 | .252 | 6,4 | | | ■ | ■ | ■ | ■ | | |
| | **A4G0805M08U12GMP** | 8 | .317 | 8,05 | .047 | 1,2 | 1.19 | 30 | .252 | 6,4 | | | ■ | ■ | ■ | ■ | | |
| | **A4G1005M10U08GMP** | 10 | .396 | 10,05 | .031 | 0,8 | 1.19 | 30 | .319 | 8,1 | | | ■ | ■ | ■ | ■ | | |
| | **A4G1005M10U12GMP** | 10 | .396 | 10,05 | .047 | 1,2 | 1.19 | 30 | .319 | 8,1 | | | ■ | ■ | ■ | ■ | | |
| **A4G-P-E** precision ground | **A4G0300M03P04E** | 3 | .118 | 3,00 | .016 | 0,4 | .79 | 20 | .138 | 3,5 | | | | | | | | ■ |
| | **A4G0400M04P04E** | 4 | .157 | 4,00 | .016 | 0,4 | .79 | 20 | .138 | 3,5 | | | | | | | | ■ |
| | **A4G0500M05P08E** | 5 | .197 | 5,00 | .031 | 0,8 | .98 | 25 | .165 | 4,2 | | | | | | | | ■ |
| **A4G-U-B** molded | **A4G0305M03U02B** | 3 | .120 | 3,05 | .008 | 0,2 | .79 | 20 | .138 | 3,5 | | ■ | | ■ | | | | |
| | **A4G0405M04U04B** | 4 | .159 | 4,05 | .016 | 0,4 | .79 | 20 | .134 | 3,4 | | ■ | | ■ | | | | |
| | **A4G0505M05U04B** | 5 | .199 | 5,05 | .016 | 0,4 | .98 | 25 | .165 | 4,2 | | ■ | | ■ | | | | |
| | **A4G0605M06U04B** | 6 | .238 | 6,05 | .016 | 0,4 | 1.18 | 30 | .193 | 4,9 | | ■ | | ■ | | | | |
| | **A4G0805M08U08B** | 8 | .317 | 8,05 | .031 | 0,8 | 1.18 | 30 | .252 | 6,4 | | ■ | | ■ | | | | |
| | **A4G1005M10U08B** | 10 | .396 | 10,05 | .031 | 0,8 | 1.18 | 30 | .319 | 8,1 | | ■ | | ■ | | | | |

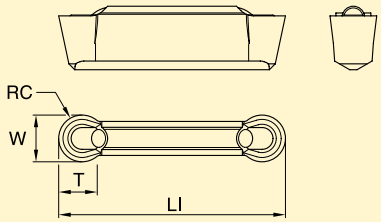
*NOTE: If inserts are ground to special end forms, please check toolholder support for the required clearance. If necessary, modify steel support.*

# A4 Groove & Turn Inserts – Full Radius

GMN geometry




GMP geometry




| | ANSI catalog number | seat size | W | | RC | | LI | | T | | K313 | K1025 | KC5010 | KC5025 | KC9110 | KC9125 | KT315 | KD1405 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | inch | mm | inch | mm | inch | mm | inch | mm | | | | | | | | |
| **A4R-P-GMN** | **A4R125I03P00GMN** | 3 | .125 | 3,18 | .063 | 1,6 | .79 | 20 | .111 | 2,8 | | | ■ | ■ | | | | |
| full radius precision ground | **A4R187I04P00GMN** | 4 | .187 | 4,75 | .094 | 2,4 | .79 | 20 | .159 | 4,0 | | | ■ | ■ | | | | |
| | **A4R250I06P00GMN** | 6 | .250 | 6,35 | .125 | 3,2 | 1.18 | 30 | .209 | 5,3 | | | ■ | ■ | | | | |
| | **A4R312I08P00GMN** | 8 | .312 | 7,94 | .156 | 4,0 | 1.18 | 30 | .256 | 6,5 | | | ■ | ■ | | | | |
| | **A4R375I10P00GMN** | 10 | .375 | 9,53 | .188 | 4,8 | 1.18 | 30 | .303 | 7,7 | | | ■ | ■ | | | | |
| **A4R-U-GMN** | **A4R0305M03U00GMN** | 3 | .120 | 3,05 | .060 | 1,5 | .79 | 20 | .101 | 2,6 | | | ■ | ■ | ■ | ■ | | |
| full radius molded | **A4R0405M04U00GMN** | 4 | .159 | 4,05 | .080 | 2,0 | .79 | 20 | .134 | 3,4 | | | ■ | ■ | ■ | ■ | | |
| | **A4R0505M05U00GMN** | 5 | .199 | 5,05 | .099 | 2,5 | .99 | 25 | .161 | 4,1 | | | ■ | ■ | ■ | ■ | | |
| | **A4R0605M06U00GMN** | 6 | .238 | 6,05 | .119 | 3,0 | 1.19 | 30 | .192 | 4,9 | | | ■ | ■ | ■ | ■ | | |
| | **A4R0805M08U00GMN** | 8 | .317 | 8,05 | .159 | 4,0 | 1.19 | 30 | .256 | 6,5 | | | ■ | ■ | ■ | ■ | | |
| | **A4R1005M10U00GMN** | 10 | .396 | 10,05 | .198 | 5,0 | 1.19 | 30 | .319 | 8,1 | | | ■ | ■ | ■ | ■ | | |
| **A4R-P-GMP** | **A4R0300M03P00GMP** | 3 | .118 | 3,00 | .059 | 1,5 | .79 | 20 | .099 | 2,5 | ■ | | ■ | ■ | | | | |
| full radius precision ground | **A4R0400M04P00GMP** | 4 | .157 | 4,00 | .079 | 2,0 | .79 | 20 | .134 | 3,4 | ■ | | ■ | ■ | | | | |
| | **A4R0500M05P00GMP** | 5 | .197 | 5,00 | .098 | 2,5 | .99 | 25 | .161 | 4,1 | ■ | | ■ | ■ | | | | |
| | **A4R0600M06P00GMP** | 6 | .236 | 6,00 | .118 | 3,0 | 1.18 | 30 | .192 | 4,9 | ■ | | ■ | ■ | | | | |
| | **A4R0800M08P00GMP** | 8 | .315 | 8,00 | .158 | 4,0 | 1.18 | 30 | .256 | 6,5 | ■ | | ■ | ■ | | | | |
| | **A4R1000M10P00GMP** | 10 | .394 | 10,00 | .197 | 5,0 | 1.18 | 30 | .319 | 8,1 | ■ | | ■ | ■ | | | | |
| **A4R-P-E** | **A4R0400M04P00E** | 4 | .157 | 4,00 | .079 | 2,0 | .79 | 20 | .134 | 3,4 | | | | | | | | ■ |
| full radius precision ground | **A4R0500M05P00E** | 5 | .197 | 5,00 | .099 | 2,5 | .98 | 25 | .161 | 4,1 | | | | | | | | ■ |

# A4 Cutoff Inserts

## Identification Code

**1.** Tooling System

A4 — groove & turn

**3.** Cutting Width

expressed in 1/100 mm

**5.** Main Cutting Edge Lead Angle

00 = neutral
06 = 6°
10 = 10°

**7.** Corner Radius

| metric | inch |
|---|---|
| 02 = 0,2 | .008 |

**A4 C 0305 N 00 CF 02**

**2.** Insert Type

G — square
R — full radius
C — cutoff

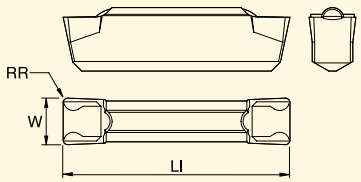
**4.** Hand of Insert

N = neutral
R = right hand
L = left hand

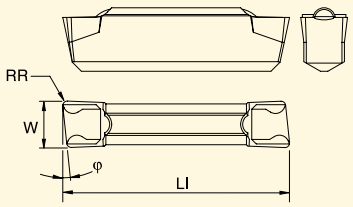
**6.** Chipbreaker Type

CF cutoff fine positive rake

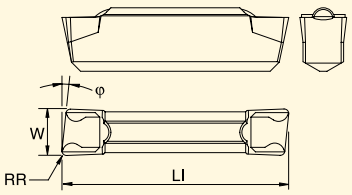
**neutral**



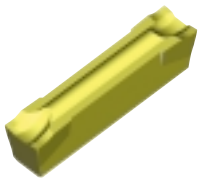

**right-hand**




**left-hand**

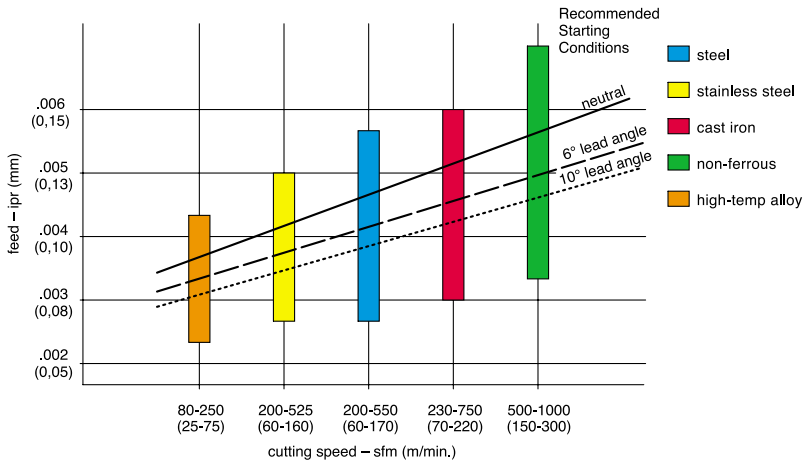



**A4C-CF**



| insert catalog number | seat size | W inch +.006 -0 | W mm +0,15 -0 | lead angle φ | RR inch | RR mm | LI inch | LI mm | grade KC5025 |
|---|---|---|---|---|---|---|---|---|---|
| **A4C-N-CF (neutral)** | | | | | | | | | |
| A4C0305N00CF02 | 3 | .120 | 3,05 | – | .008 | 0,2 | .79 | 20 | ■ |
| A4C0405N00CF02 | 4 | .159 | 4,05 | – | .008 | 0,2 | .79 | 20 | ■ |
| **A4C-R-CF (right-hand)** | | | | | | | | | |
| A4C0305R06CF02 | 3 | .120 | 3,05 | 6 | .008 | 0,2 | .79 | 20 | ■ |
| A4C0305R10CF02 | 3 | .120 | 3,05 | 10 | .008 | 0,2 | .79 | 20 | ■ |
| A4C0405R06CF02 | 4 | .159 | 4,05 | 6 | .008 | 0,2 | .79 | 20 | ■ |
| A4C0405R10CF02 | 4 | .159 | 4,05 | 10 | .008 | 0,2 | .79 | 20 | ■ |
| **A4C-L-CF (left-hand)** | | | | | | | | | |
| A4C0305L06CF02 | 3 | .120 | 3,05 | 6 | .008 | 0,2 | .79 | 20 | ■ |
| A4C0305L10CF02 | 3 | .120 | 3,05 | 10 | .008 | 0,2 | .79 | 20 | ■ |
| A4C0405L06CF02 | 4 | .159 | 4,05 | 6 | .008 | 0,2 | .79 | 20 | ■ |
| A4C0405L10CF02 | 4 | .159 | 4,05 | 10 | .008 | 0,2 | .79 | 20 | ■ |

## Feed and Speed Guidelines for Cutoff Applications with Chipbreaker -CF



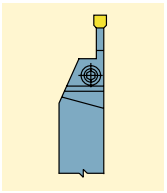
# A4 Toolholder Identification System

**1.**
Tooling System

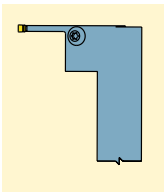
A4 — groove & turn

**2.**
Tool Style

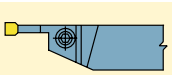
S — straight



E — end mounted 90°



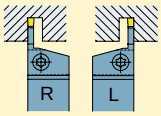
**3.**
Support Type



M = maximum support for specific groove widths and straight clearance for unlimited workpiece diameters

N = no steel support for face grooving

**4.**
Hand of Tool




R = right hand
L = left hand
N = neutral

**5.**
Shank Size

**inch sizes:** for square shanks, the number indicates the height and width in 1/16-inch increments (rectangular: 1st digit = width in 1/8-inch increments, 2nd digit = height in 1/4-inch increments)

**metric:** height x width in mm, letter indicates tool length according to ISO

| metric tool length (mm) | | |
|---|---|---|
| E = 70 | K = 125 | Q = 180 |
| F = 80 | L = 140 | R = 200 |
| G = 90 | M = 150 | S = 260 |
| H = 100 | N = 160 | X = other |
| J = 110 | P = 170 | length |

**6.**
Seat Size

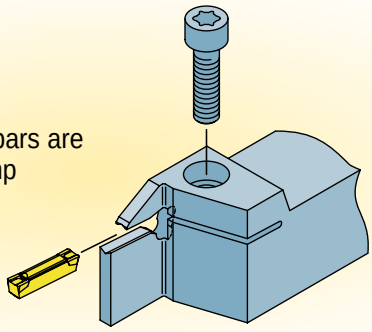
03, 04, 05, 06, 08, 10

**7.**
Max. Grooving Depth

in millimeters

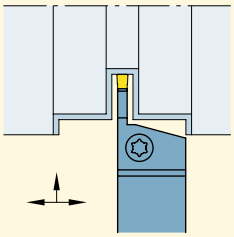
| A4 | S | M | R | - | metric 2525M / inch 16 | 03 | - | 17 |
|---|---|---|---|---|---|---|---|---|

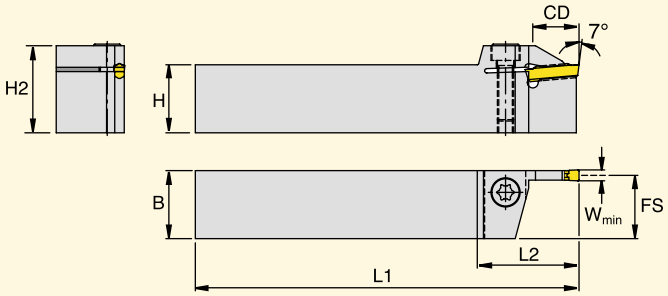
All A4 toolholders and boring bars are supplied with secure Torx clamp screws and L-style wrenches.



# A4 Groove & Turn Integral Shank OD Toolholders

## A4SM






## Inch Toolholders

| catalog number | | insert seat size | min. cutting width $W_{min}$ * | | max. cutting depth CD | | H | B | H2 | L1 | FS | L2 | Torx clamp screw | Torx wrench |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| right hand | left hand | | inch | mm | inch | mm | | | | | | | | |
| A4SMR100314 | A4SML100314 | 3 | .118 | 3,0 | .55 | 14 | 5/8 | 5/8 | .91 | 5 | .569 | 1.38 | MS2091 | KT25 |
| A4SMR120314 | A4SML120314 | 3 | .118 | 3,0 | .55 | 14 | 3/4 | 3/4 | 1.06 | 5 | .694 | 1.38 | MS1595 | KT30 |
| A4SMR160317 | A4SML160317 | 3 | .118 | 3,0 | .67 | 17 | 1 | 1 | 1.26 | 6 | .944 | 1.46 | MS1970 | KT30 |
| A4SMR100414 | A4SML100414 | 4 | .157 | 4,0 | .55 | 14 | 5/8 | 5/8 | .91 | 5 | .549 | 1.38 | MS2091 | KT25 |
| A4SMR120414 | A4SML120414 | 4 | .157 | 4,0 | .55 | 14 | 3/4 | 3/4 | 1.06 | 5 | .674 | 1.38 | MS1595 | KT30 |
| A4SMR160417 | A4SML160417 | 4 | .157 | 4,0 | .67 | 17 | 1 | 1 | 1.26 | 6 | .924 | 1.46 | MS1970 | KT30 |
| A4SMR200417 | A4SML200417 | 4 | .157 | 4,0 | .67 | 17 | 1 1/4 | 1 1/4 | 1.54 | 6 | 1.174 | 1.46 | MS1970 | KT30 |
| A4SMR120519 | A4SML120519 | 5 | .197 | 5,0 | .75 | 19 | 3/4 | 3/4 | 1.10 | 5 | .654 | 1.57 | MS1595 | KT30 |
| A4SMR160520 | A4SML160520 | 5 | .197 | 5,0 | .79 | 20 | 1 | 1 | 1.30 | 6 | .904 | 1.57 | MS1970 | KT30 |
| A4SMR200522 | A4SML200522 | 5 | .197 | 5,0 | .87 | 22 | 1 1/4 | 1 1/4 | 1.54 | 6 | 1.154 | 1.65 | MS1970 | KT30 |
| A4SMR120620 | A4SML120620 | 6 | .236 | 6,0 | .79 | 20 | 3/4 | 3/4 | 1.06 | 5 | .646 | 1.57 | MS1595 | KT30 |
| A4SMR160620 | A4SML160620 | 6 | .236 | 6,0 | .79 | 20 | 1 | 1 | 1.30 | 6 | .894 | 1.57 | MS1970 | KT30 |
| A4SMR160624 | A4SML160624 | 6 | .236 | 6,0 | .94 | 24 | 1 | 1 | 1.30 | 6 | .894 | 1.69 | MS1970 | KT30 |
| A4SMR200626 | A4SML200626 | 6 | .236 | 6,0 | 1.02 | 26 | 1 1/4 | 1 1/4 | 1.57 | 6 | 1.146 | 1.77 | MS1970 | KT30 |
| A4SMR240626 | A4SML240626 | 6 | .236 | 6,0 | 1.02 | 26 | 1 1/2 | 1 1/2 | 1.81 | 7 | 1.394 | 1.77 | MS1970 | KT30 |
| A4SMR160820 | A4SML160820 | 8 | .315 | 8,0 | .79 | 20 | 1 | 1 | 1.34 | 6 | .858 | 1.69 | MS1490 | KT45 |
| A4SMR160824 | A4SML160824 | 8 | .315 | 8,0 | .94 | 24 | 1 | 1 | 1.34 | 6 | .858 | 1.81 | MS1490 | KT45 |
| A4SMR200826 | A4SML200826 | 8 | .315 | 8,0 | 1.02 | 26 | 1 1/4 | 1 1/4 | 1.61 | 6 | 1.110 | 1.85 | MS1490 | KT45 |
| A4SMR240826 | A4SML240826 | 8 | .315 | 8,0 | 1.02 | 26 | 1 1/2 | 1 1/2 | 1.85 | 7 | 1.362 | 1.85 | MS1490 | KT45 |
| A4SMR201026 | A4SML201026 | 10 | .394 | 10,0 | 1.02 | 26 | 1 1/4 | 1 1/4 | 1.61 | 6 | 1.087 | 1.85 | MS1490 | KT45 |
| A4SMR241026 | A4SML241026 | 10 | .394 | 10,0 | 1.02 | 26 | 1 1/2 | 1 1/2 | 1.85 | 7 | 1.335 | 1.85 | MS1490 | KT45 |

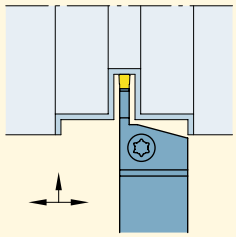
*Dimensions in inches except as noted.*

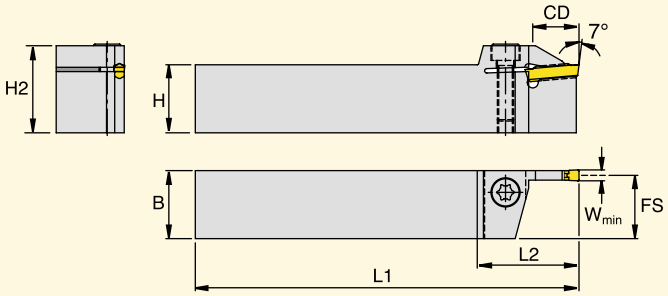
**NOTE: Minimum cutting width supplied for reference only; see insert listing for actual width. Always match seat size of insert to seat size of holder.*

| Recommended Clamp Screw Torque (based on Torx/wrench size) | | |
|---|---|---|
| KT25 | 50-70 in.-lbs. | 6-8 Nm |
| KT30 | 80-100 in.-lbs. | 10-12 Nm |
| KT45 | 100-130 in.-lbs. | 12-15 Nm |

# A4 Groove & Turn Integral Shank OD Toolholders

## A4SM






## Metric Toolholders

| catalog number | | insert seat size | min. cutting width $W_{min}$* | max. cutting depth CD | H | B | H2 | L1 | FS | L2 | Torx clamp screw | Torx wrench |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| right hand | left hand | | | | | | | | | | | |
| **A4SMR1616K0314** | **A4SML1616K0314** | 3 | 3,0 | 14 | 16 | 16 | 23 | 125 | 15 | 35 | MS2091 | KT25 |
| **A4SMR2020K0314** | **A4SML2020K0314** | 3 | 3,0 | 14 | 20 | 20 | 27 | 125 | 19 | 35 | MS1595 | KT30 |
| **A4SMR2525M0317** | **A4SML2525M0317** | 3 | 3,0 | 17 | 25 | 25 | 32 | 150 | 24 | 37 | MS1970 | KT30 |
| **A4SMR2020K0414** | **A4SML2020K0414** | 4 | 4,0 | 14 | 20 | 20 | 27 | 125 | 18 | 35 | MS1595 | KT30 |
| **A4SMR2525M0417** | **A4SML2525M0417** | 4 | 4,0 | 17 | 25 | 25 | 32 | 150 | 23 | 37 | MS1970 | KT30 |
| **A4SMR3225P0417** | **A4SML3225P0417** | 4 | 4,0 | 17 | 32 | 25 | 40 | 170 | 23 | 37 | MS1970 | KT30 |
| **A4SMR2020K0519** | **A4SML2020K0519** | 5 | 5,0 | 19 | 20 | 20 | 28 | 125 | 18 | 40 | MS1595 | KT30 |
| **A4SMR2525M0520** | **A4SML2525M0520** | 5 | 5,0 | 20 | 25 | 25 | 33 | 150 | 23 | 40 | MS1970 | KT30 |
| **A4SMR3225P0522** | **A4SML3225P0522** | 5 | 5,0 | 22 | 32 | 25 | 40 | 170 | 23 | 42 | MS1970 | KT30 |
| **A4SMR2525M0620** | **A4SML2525M0620** | 6 | 6,0 | 20 | 25 | 25 | 33 | 150 | 22 | 40 | MS1970 | KT30 |
| **A4SMR3225P0626** | **A4SML3225P0626** | 6 | 6,0 | 26 | 32 | 25 | 40 | 170 | 22 | 45 | MS1970 | KT30 |
| **A4SMR2525M0820** | **A4SML2525M0820** | 8 | 8,0 | 20 | 25 | 25 | 34 | 170 | 21 | 43 | MS1490 | KT45 |
| **A4SMR3225P0826** | **A4SML3225P0826** | 8 | 8,0 | 26 | 32 | 25 | 41 | 170 | 21 | 47 | MS1490 | KT45 |
| **A4SMR3225P1026** | **A4SML3225P1026** | 10 | 10,0 | 26 | 32 | 25 | 41 | 170 | 21 | 47 | MS1490 | KT45 |

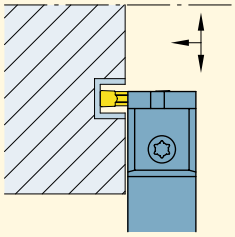
*Dimensions in mm.*

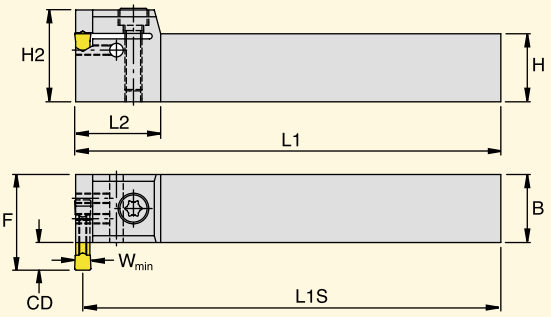
**NOTE: Minimum cutting width supplied for reference only; see insert listing for actual width.*
*Always match seat size of insert to seat size of holder.*

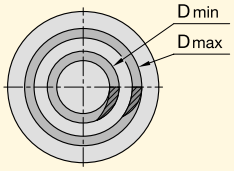
| Recommended Clamp Screw Torque (based on Torx/wrench size) | | |
|---|---|---|
| KT25 | 50-70 in.-lbs. | 6-8 Nm |
| KT30 | 80-100 in.-lbs. | 10-12 Nm |
| KT45 | 100-130 in.-lbs. | 12-15 Nm |

# A4 Face Grooving Integral Shank Toolholders

## A4EN






*Dmax is unlimited for A4EN holders.*

## Inch Toolholders

| catalog number | insert seat size | min. cutting width $W_{min}$ * | | max. cutting depth CD | | min. face groove dia. $D_{min}$ | | H | B | H2 | L1 | L1S | L2 | F | Torx clamp screw | Torx wrench | hex seating screw | metric hex wrench |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | inch | mm | inch | mm | inch | mm | | | | | | | | | | | |
| **A4ENN120305** | 3 | .118 | 3,0 | .20 | 5 | 2.76 | 70 | 3/4 | 3/4 | 1.06 | 5 | 4.95 | .98 | .965 | MS2091 | KT25 | MS2090 | 170.000 |
| **A4ENN160305** | 3 | .118 | 3,0 | .20 | 5 | 2.76 | 70 | 1 | 1 | 1.26 | 6 | 5.95 | .98 | 1.213 | MS2091 | KT25 | MS2090 | 170.000 |
| **A4ENN120407** | 4 | .157 | 4,0 | .28 | 7 | 3.54 | 90 | 3/4 | 3/4 | 1.06 | 5 | 4.93 | .98 | 1.061 | MS2091 | KT25 | MS2090 | 170.000 |
| **A4ENN160407** | 4 | .157 | 4,0 | .28 | 7 | 3.54 | 90 | 1 | 1 | 1.26 | 6 | 5.93 | .98 | 1.309 | MS2091 | KT25 | MS2090 | 170.000 |
| **A4ENN120509** | 5 | .197 | 5,0 | .35 | 9 | 4.72 | 120 | 3/4 | 3/4 | 1.06 | 5 | 4.91 | .98 | 1.148 | MS2091 | KT25 | MS2090 | 170.000 |
| **A4ENN160509** | 5 | .197 | 5,0 | .35 | 9 | 4.72 | 120 | 1 | 1 | 1.26 | 6 | 5.91 | .98 | 1.398 | MS2091 | KT25 | MS2090 | 170.000 |

*Dimensions in inches except as noted.*

## Metric Toolholders

| catalog number | insert seat size | min. cutting width $W_{min}$ * | max. cutting depth CD | min. face groove dia. $D_{min}$ | H | B | H2 | L1 | L1S | L2 | F | Torx clamp screw | Torx wrench | hex seating screw | metric hex wrench |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **A4ENN2020K0305** | 3 | 3,0 | 5 | 70 | 20 | 20 | 27 | 125 | 123,8 | 25 | 25,40 | MS2091 | KT25 | MS2090 | 170.000 |
| **A4ENN2525M0305** | 3 | 3,0 | 5 | 70 | 25 | 25 | 32 | 150 | 148,8 | 25 | 30,40 | MS2091 | KT25 | MS2090 | 170.000 |
| **A4ENN2020K0407** | 4 | 4,0 | 7 | 90 | 20 | 20 | 27 | 125 | 123,3 | 25 | 27,90 | MS2091 | KT25 | MS2090 | 170.000 |
| **A4ENN2525M0407** | 4 | 4,0 | 7 | 90 | 25 | 25 | 32 | 150 | 148,3 | 25 | 33,10 | MS2091 | KT25 | MS2090 | 170.000 |
| **A4ENN2020K0509** | 5 | 5,0 | 9 | 120 | 20 | 20 | 27 | 125 | 122,8 | 25 | 30,10 | MS2091 | KT25 | MS2090 | 170.000 |
| **A4ENN2525M0509** | 5 | 5,0 | 9 | 120 | 25 | 25 | 32 | 150 | 147,8 | 25 | 35,10 | MS2091 | KT25 | MS2090 | 170.000 |

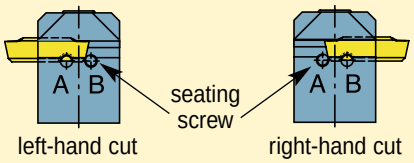
*Dimensions in mm.*

*A4EN-style toolholders are designed without steel support for face grooving capability.*
*Cutting feed recommendations should be reduced by 25 to 30%.*

*Recommended clamp screw torque = 50 - 70 in.-lbs. (6-8 Nm).*

**NOTE: Minimum cutting width supplied for reference only; see insert listing for actual width.*
*Always match seat size of insert to seat size of holder.*

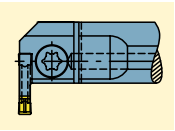
### A4EN Insert Mounting



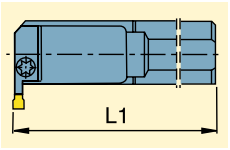

A4EN-style holders can be used for either left- or right-hand applications. The seating screw is to be used in position B for a left-hand cut, and in position A for a right-hand cut.

# Internal Groove & Turn Bar Identification System

**1.**
Steel Bar with Coolant

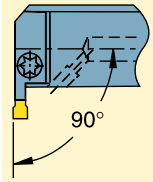


**3.**
Bar Length



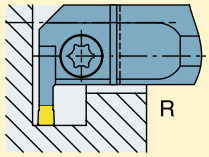

**inch bars:**
R = 8 inch
S = 10 inch
T = 12 inch
**metric bars:**
R = 200 mm
S = 250 mm
T = 300 mm

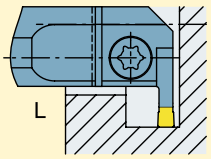
**5.**
Tool Style




E = end mounted (90 deg.)

**7.**
Hand of Tool



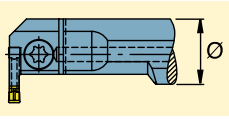




**10.**
Tool Units

M = metric
N = inches

| A | 16 | R | - | A4 | E | M | R | 03 | - | 10 | N |
|---|---|---|---|---|---|---|---|---|---|---|---|

**2.**
Bar Diameter




**inch bars:**
A two-digit number which indicates the bar diameter in 1/16-inch increments.
**metric bars:**
bar diameter in millimeters

**4.**
A4 Groove & Turn System

**6.**
Support Type

M = maximum support

**8.**
Insert Seat Size

3
4
5
6

**9.**
Max. Grooving Depth in mm

**conversions: inch**

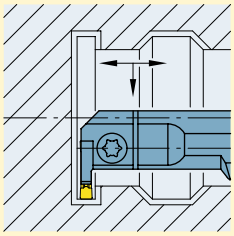
7 mm = .28
10 mm = .39
12 mm = .47
16 mm = .63

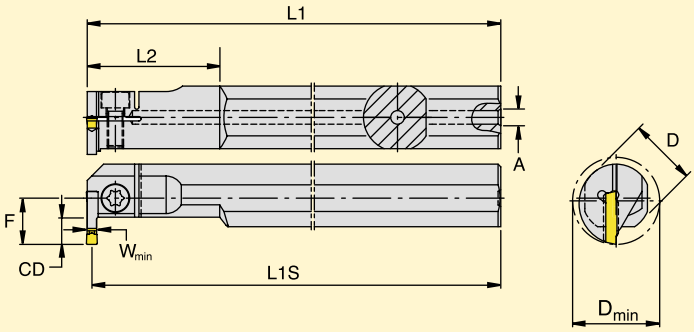
| system | groove & turn applications |
|---|---|
| A4 | • OD<br>• ID<br>• face<br>• cutoff |
| | deep grooving applications |
| A3 | • OD<br>• ID<br>• face |
| | cutoff applications |
| A2 | • OD cutoff |
| | grooving applications |
| Top Notch | • OD<br>• ID<br>• face |

***Kennametal... One Source, Optimum Solutions for ALL Your Grooving Needs!***

# A4 Internal Groove & Turn Boring Bars

## A-A4E Boring Bars with Coolant






## Inch Boring Bars

| catalog number | | insert seat size | min. cutting width $W_{min}$* | | max. cutting depth CD | | min. bore dia. $D_{min}$ | | D | L1 | L1S | F | L2 | A | Torx clamp screw | Torx wrench |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| right hand | left hand | | inch | mm | inch | mm | inch | mm | | | | | | | | |
| A12RA4EMR0307N | A12RA4EML0307N | 3 | .118 | 3,0 | .276 | 7 | .984 | 25 | .750 | 8 | 7.94 | .512 | 1.57 | .16 | MS2089 | KT25 |
| A16RA4EMR0310N | A16RA4EML0310N | 3 | .118 | 3,0 | .394 | 10 | 1.260 | 32 | 1.000 | 8 | 7.94 | .669 | 1.97 | .20 | MS1595 | KT30 |
| A20SA4EMR0312N | A20SA4EML0312N | 3 | .118 | 3,0 | .472 | 12 | 1.575 | 40 | 1.250 | 10 | 9.94 | .866 | 2.52 | .24 | MS1595 | KT30 |
| A12RA4EMR0407N | A12RA4EML0407N | 4 | .157 | 4,0 | .276 | 7 | .984 | 25 | .750 | 8 | 7.92 | .512 | 1.57 | .16 | MS2089 | KT25 |
| A16RA4EMR0410N | A16RA4EML0410N | 4 | .157 | 4,0 | .394 | 10 | 1.260 | 32 | 1.000 | 8 | 7.92 | .669 | 1.97 | .20 | MS1595 | KT30 |
| A20SA4EMR0412N | A20SA4EML0412N | 4 | .157 | 4,0 | .472 | 12 | 1.575 | 40 | 1.250 | 10 | 9.92 | .866 | 2.52 | .24 | MS1595 | KT30 |
| A24TA4EMR0416N | A24TA4EML0416N | 4 | .157 | 4,0 | .630 | 16 | 2.047 | 52 | 1.500 | 12 | 11.92 | 1.181 | 3.15 | .24 | MS1970 | KT30 |
| A20SA4EMR0516N | A20SA4EML0516N | 5 | .197 | 5,0 | .630 | 16 | 1.732 | 44 | 1.250 | 10 | 9.90 | 1.024 | 2.52 | .24 | MS1595 | KT30 |
| A24TA4EMR0516N | A24TA4EML0516N | 5 | .197 | 5,0 | .630 | 16 | 2.047 | 52 | 1.500 | 12 | 11.90 | 1.181 | 3.15 | .24 | MS1970 | KT30 |
| A20SA4EMR0616N | A20SA4EML0616N | 6 | .236 | 6,0 | .630 | 16 | 1.732 | 44 | 1.250 | 10 | 9.88 | 1.024 | 2.52 | .24 | MS1595 | KT30 |
| A24TA4EMR0616N | A24TA4EML0616N | 6 | .236 | 6,0 | .630 | 16 | 2.047 | 52 | 1.500 | 12 | 11.88 | 1.181 | 3.15 | .24 | MS1970 | KT30 |
| A32TA4EMR0616N | A32TA4EML0616N | 6 | .236 | 6,0 | .630 | 16 | 2.559 | 65 | 2.000 | 12 | 11.88 | 1.378 | 3.94 | .24 | MS1970 | KT30 |

*Dimensions in inches except as noted.*

## Metric Boring Bars

| catalog number | | insert seat size | min. cutting width $W_{min}$* | max. cutting depth CD | min. bore dia. $D_{min}$ | D | L1 | L1S | F | L2 | A | Torx clamp screw | Torx wrench |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| right hand | left hand | | | | | | | | | | | | |
| A20RA4EMR0307M | A20RA4EML0307M | 3 | 3,0 | 7 | 25 | 20,0 | 200 | 198,5 | 13 | 40 | 4 | MS2089 | KT25 |
| A25RA4EMR0310M | A25RA4EML0310M | 3 | 3,0 | 10 | 32 | 25,0 | 200 | 198,5 | 17 | 50 | 5 | MS1595 | KT30 |
| A32SA4EMR0312M | A32SA4EML0312M | 3 | 3,0 | 12 | 40 | 32,0 | 250 | 248,5 | 22 | 64 | 6 | MS1595 | KT30 |
| A20RA4EMR0407M | A20RA4EML0407M | 4 | 4,0 | 7 | 25 | 20,0 | 200 | 198,0 | 13 | 40 | 4 | MS2089 | KT25 |
| A25RA4EMR0410M | A25RA4EML0410M | 4 | 4,0 | 10 | 32 | 25,0 | 200 | 198,0 | 17 | 50 | 5 | MS1595 | KT30 |
| A32SA4EMR0412M | A32SA4EML0412M | 4 | 4,0 | 12 | 40 | 32,0 | 250 | 248,0 | 22 | 64 | 6 | MS1595 | KT30 |
| A40TA4EMR0416M | A40TA4EML0416M | 4 | 4,0 | 16 | 52 | 40,0 | 300 | 298,0 | 30 | 80 | 6 | MS1970 | KT30 |
| A32SA4EMR0516M | A32SA4EML0516M | 5 | 5,0 | 16 | 44 | 32,0 | 250 | 247,5 | 26 | 64 | 6 | MS1595 | KT30 |
| A40TA4EMR0516M | A40TA4EML0516M | 5 | 5,0 | 16 | 52 | 40,0 | 300 | 297,5 | 30 | 80 | 6 | MS1970 | KT30 |
| A40TA4EMR0616M | A40TA4EML0616M | 6 | 6,0 | 16 | 52 | 40,0 | 300 | 297,0 | 30 | 80 | 6 | MS1970 | KT30 |

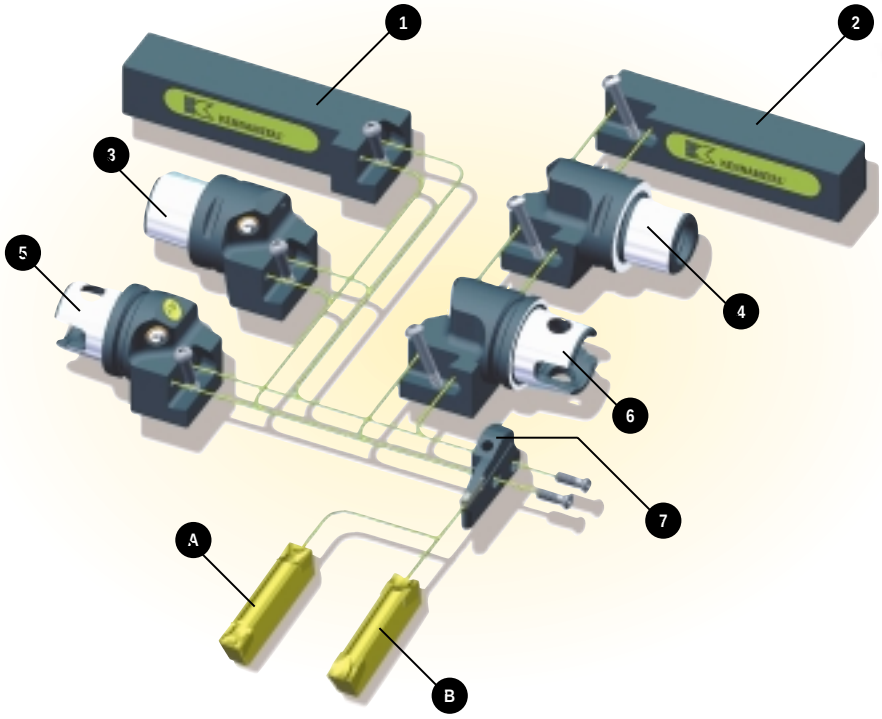
*Dimensions in mm.*

**NOTE: Minimum cutting width supplied for reference only; see insert listing for actual width.*
*Always match seat size of insert to seat size of holder.*

| Recommended Clamp Screw Torque (based on Torx/wrench size) | | |
|---|---|---|
| KT25 | 50-70 in.-lbs. | 6-8 Nm |
| KT30 | 80-100 in.-lbs. | 10-12 Nm |

# A4 Modular System

## Modular Grooving Shank Toolholder and Quick-Change Tooling




For a complete listing of modular holders, see our Lathe Catalog 1010 (pages shown below).

| Legend | | page |
|---|---|---|
| A | A4 Groove & Turn Inserts | 12-13 |
| B | A4 Cutoff Inserts | 14 |
| 7 | OD Grooving Blades | 21 |
| 1 | KGME Toolholder | Cat. 1010, pg. 391 |
| 2 | KGMS Toolholder | Cat. 1010, pg. 390 |
| 3 | Capto™ Cutting Unit | Cat. 1010, pg. 395 |
| 4 | Capto Cutting Unit | Cat. 1010, pg. 395 |
| 5 | KM Cutting Unit | Cat. 1010, pg. 393 |
| 6 | KM Cutting Unit | Cat. 1010, pg. 393 |

By customer demand, Kennametal Inc. and Sandvik Coromant have entered into an agreement that allows both companies to manufacture, market, and sell KM® and Coromant Capto® products worldwide. Using the trademark Kennametal Capto™, we make available a variety of leading and innovative Kennametal tooling designs utilizing the Coromant Capto coupling.

The manufacture and marketing of Kennametal Capto products and the use of the "Capto" trademark are in accordance with a license granted from Sandvik.

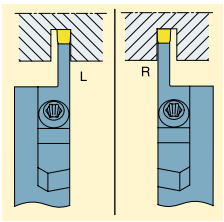
# A4 Identification Code for Modular Blades

**1.** A4 Tooling System

Modular blade assembly for A4 inserts

**2.** Modular System Size

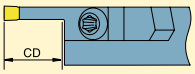
**3.** Hand of Tool




**4.** Seat Size

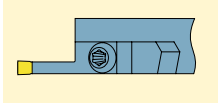
03
04
05

**5.** Maximum Groove Depth

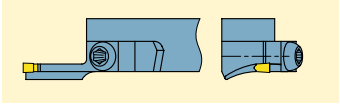



14 mm = .55 in.
19 mm = .75 in.

**6.** Tool Style

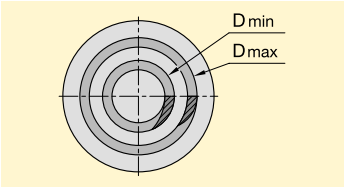


M = maximum support for specific groove widths and straight clearance for unlimited workpiece diameters



B = outboard sweep face grooving support

**7.** Face Grooving Diameter $D_{min}$-$D_{max}$ (mm)

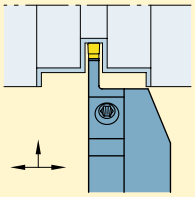


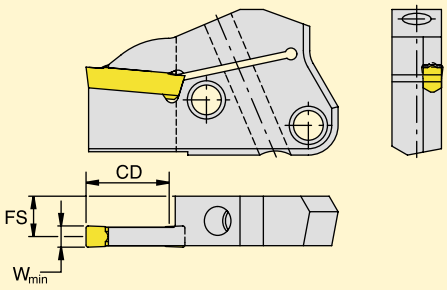

diameters are min and max for outer face groove dia. 999= unlimited $D_{max}$

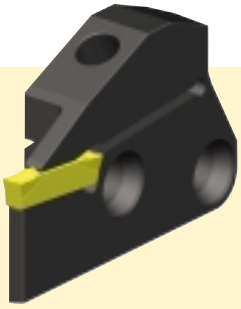
| A4M | 50 | R | 04 | 14 | B | 048-072 |
|---|---|---|---|---|---|---|

# A4 Modular Blades

## A4M-M Modular Blades



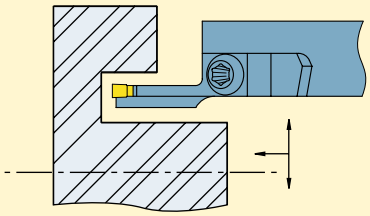


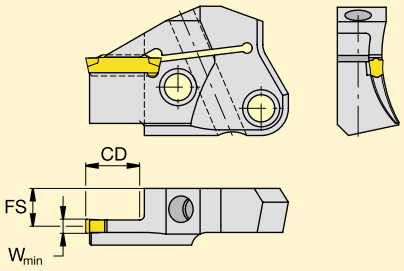



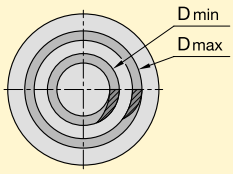
| catalog number | | insert seat size | min. cutting width $W_{min}$ * | | max. cutting depth CD | | FS | |
|---|---|---|---|---|---|---|---|---|
| right hand | left hand | | inch | mm | inch | mm | inch | mm |
| A4M50R0314M | A4M50L0314M | 3 | .118 | 3,0 | .55 | 14 | .413 | 10,5 |
| A4M50R0414M | A4M50L0414M | 4 | .157 | 4,0 | .55 | 14 | .394 | 10 |
| A4M50R0519M | A4M50L0519M | 5 | .197 | 5,0 | .75 | 19 | .374 | 9,5 |

**NOTE: Minimum cutting width supplied for reference only; see insert listing for actual width. Always match seat size of insert to seat size of holder.*

## A4M-B Modular Face Grooving Blades – Outboard Sweep Style





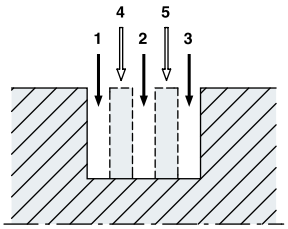

| catalog number | | insert seat size | min. cutting width $W_{min}$ * | | max. cutting depth CD | | $D_{min}$-$D_{max}$ | | $D_{min}$-$D_{max}$ | | FS | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| right hand | left hand | | inch | mm | inch | mm | inch | | mm | | inch | mm |
| A4M50-R0314B-036-048 | A4M50-L0314B-036-048 | 3 | .118 | 3,0 | .55 | 14 | 1.417 | 1.890 | 36 | 48 | .413 | 10,5 |
| A4M50-R0314B-042-058 | A4M50-L0314B-042-058 | 3 | .118 | 3,0 | .55 | 14 | 1.654 | 2.284 | 42 | 58 | .413 | 10,5 |
| A4M50-R0314B-052-074 | A4M50-L0314B-052-074 | 3 | .118 | 3,0 | .55 | 14 | 2.047 | 2.913 | 52 | 74 | .413 | 10,5 |
| A4M50-R0314B-068-100 | A4M50-L0314B-068-100 | 3 | .118 | 3,0 | .55 | 14 | 2.677 | 3.937 | 68 | 100 | .413 | 10,5 |
| A4M50-R0314B-090-160 | A4M50-L0314B-090-160 | 3 | .118 | 3,0 | .55 | 14 | 3.543 | 6.299 | 90 | 160 | .413 | 10,5 |
| A4M50-R0314B-130-300 | A4M50-L0314B-130-300 | 3 | .118 | 3,0 | .55 | 14 | 5.118 | 11.811 | 130 | 300 | .413 | 10,5 |
| A4M50-R0314B-290-999 | A4M50-L0314B-290-999 | 3 | .118 | 3,0 | .55 | 14 | 11.417 | – | 290 | – | .413 | 10,5 |
| A4M50-R0414B-048-072 | A4M50-L0414B-048-072 | 4 | .157 | 4,0 | .55 | 14 | 1.890 | 2.835 | 48 | 72 | .394 | 10,0 |
| A4M50-R0414B-064-100 | A4M50-L0414B-064-100 | 4 | .157 | 4,0 | .55 | 14 | 2.520 | 3.937 | 64 | 100 | .394 | 10,0 |
| A4M50-R0414B-092-150 | A4M50-L0414B-092-150 | 4 | .157 | 4,0 | .55 | 14 | 3.622 | 5.906 | 92 | 150 | .394 | 10,0 |
| A4M50-R0414B-132-300 | A4M50-L0414B-132-300 | 4 | .157 | 4,0 | .55 | 14 | 5.197 | 11.811 | 132 | 300 | .394 | 10,0 |
| A4M50-R0414B-290-999 | A4M50-L0414B-290-999 | 4 | .157 | 4,0 | .55 | 14 | 11.417 | – | 290 | – | .394 | 10,0 |
| A4M50-R0519B-058-094 | A4M50-L0519B-058-094 | 5 | .197 | 5,0 | .75 | 19 | 2.284 | 3.701 | 58 | 94 | .374 | 9,5 |
| A4M50-R0519B-080-136 | A4M50-L0519B-080-136 | 5 | .197 | 5,0 | .75 | 19 | 3.150 | 5.354 | 80 | 136 | .374 | 9,5 |
| A4M50-R0519B-120-300 | A4M50-L0519B-120-300 | 5 | .197 | 5,0 | .75 | 19 | 4.724 | 11.811 | 120 | 300 | .374 | 9,5 |
| A4M50-R0519B-250-999 | A4M50-L0519B-250-999 | 5 | .197 | 5,0 | .75 | 19 | 9.843 | – | 250 | – | .374 | 9,5 |

**NOTE: Minimum cutting width supplied for reference only; see insert listing for actual width. Always match seat size of insert to seat size of holder.*

## Application Guidelines

**When groove width is greater than insert width, two methods are possible:**

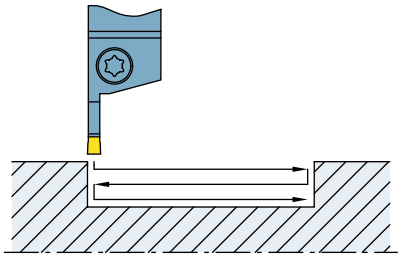
**1.**




### 1. Multiple Pass Grooving

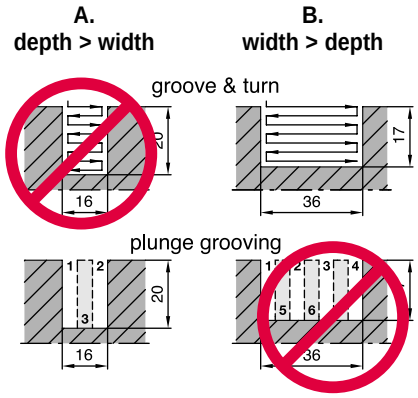
Use the widest possible insert width to achieve optimal chip control and tool life. Make grooves 1, 2, and 3 first...then connect with passes 4 and 5. For passes 4 and 5, the material removed should be no more than 0.8 times the insert width.

**2.**



### 2. Grooving and Turning

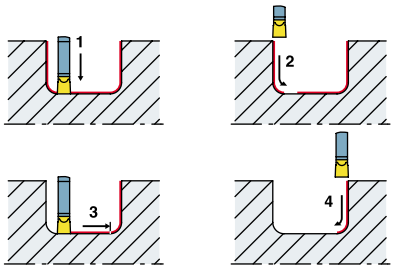
For small and unstable workpieces, this is the preferred method to reduce vibrations experienced when axial grooving. The depth of cut in longitudinal turning should generally be 60%-70% of the groove width. Turning in both directions improves tool life.




### Choosing the Best Method:

**A.** When the groove depth is greater than the groove width, multiple pass plunge grooving offers the best results.

**B.** When the groove width is greater than the groove depth, groove & turn (plunge/longitudinal turning) is easier and faster.




### Finish Profiling

When finish profile machining internal chamfers or radii, take into account that the effective feed rate and chip cross section are reduced (the tool is cutting in both radial and axial directions). The accompanying drawing (left) shows the suggested processing sequence for the final pass, to reduce vibrations.

## A4 Grooving Tool Application Guidelines

- Always use good general machining practices.
- Make the machine and workpiece setup as rigid as possible.
- Integral shank toolholders offer the best rigidity. They should be your first toolholder choice, when possible.
- When changing inserts, make sure the new insert locates securely against the toolholder's positive stop.
- Never tighten the clamping screw without an insert in the pocket.
- Toolholder extension out of the tool block should be as short as possible.
- Inserts should cut as close to center as possible or slightly above. They should never cut more than .010 above center, especially when machining small diameters.
- Dwell time in bottom of groove should be less than three revolutions.
- Recommended cutting speeds and feeds are a starting point. Adjust, as necessary, for optimum tool life and chip control.
- If you need technical assistance, ask your Kennametal Metalworking Systems Engineer, or call our Applications Support Group at 800-835-3668 (select option 2) or e-mail: kmtlhelp@kennametal.com.

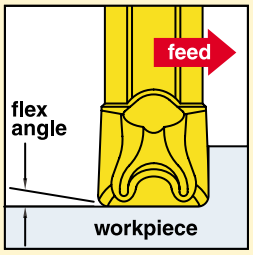
## A4 Additional Application Tips

### Wiper Effect

- Square-form groovers produce excellent finishes in side turning due to the wiper action of the flat.

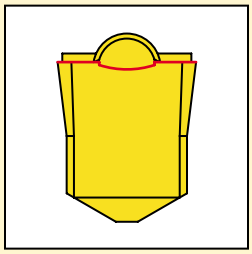
### Side Flex

- Under side turning load, the steel support flexes, creating a slight clearance that avoids excessive frontal contact.
- When chatter is an issue, increase feed to maximize clearance, or use a narrower width insert.



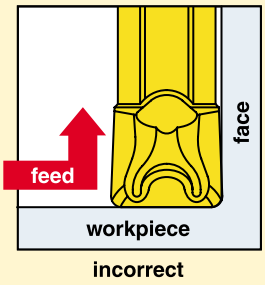

### A4 GMP Geometry

- GMP has a curved cutting edge to reduce chip width.
- After plunging, a noticeable bump may remain at the groove's base.
  This is more noticeable on small diameter applications.
- Solution:
  - use narrower width
  - take two or more passes to form groove
  - side turn to remove bump, or
  - use GMN-style insert

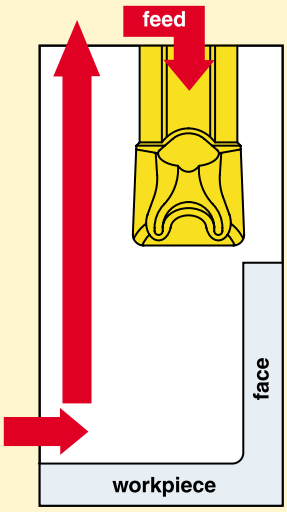


### Avoid Feed-Out

- Avoid feed-out on faces deeper than the cutting edge.
- Use plunge cuts to finish straight faces.




incorrect



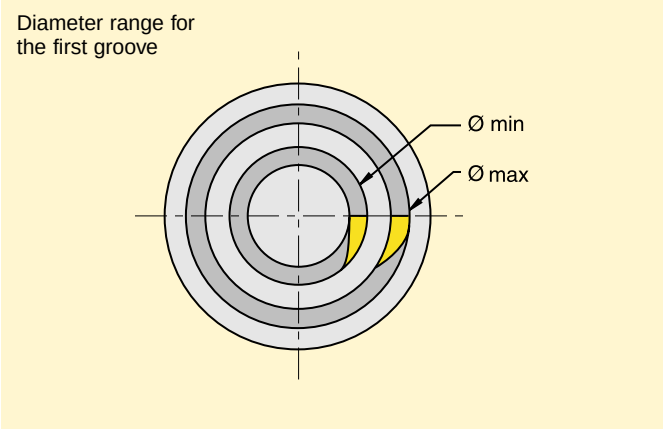

recommended

## Extended Speed Recommendations

| Workpiece Group | Recommended Surface Speed (sfm) m/min = sfm/3.28 | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | uncoated | | PVD coated | | cermet | | | |
| | K313 | K1025 | KC5010 | KC5025 | KT315 | KC9110 | KC9125 | KD1405 |
| free-machining carbon steel | — | — | 500-750 | 450-700 | 700-1400 | 700-1300 | 500-1200 | — |
| plain carbon steel | — | — | 450-700 | 400-650 | 550-1200 | 600-1100 | 500-1000 | — |
| alloy steels (190-330 HB) | — | — | 450-700 | 400-650 | 650-1400 | 600-1300 | 500-1000 | — |
| alloy steels (330-450 HB) | — | — | 400-600 | 350-550 | 300-750 | 300-650 | 250-600 | — |
| martensitic/ferritic/stainless/precipitation hardening | — | — | 300-650 | 250-550 | 450-1000 | 400-900 | 350-750 | — |
| austenitic stainless steel | 200-425 | 100-250 | 350-700 | 300-650 | 500-900 | 450-800 | 400-750 | — |
| gray cast iron (190-330 HB) | 100-400 | 100-250 | 350-700 | 350-650 | 400-1000 | 600-1100 | 450-900 | — |
| gray cast iron (330-450 HB) | 75-350 | 75-200 | 300-600 | 300-550 | 300-850 | 500-900 | 400-800 | — |
| alloy/ductile irons | 75-350 | 75-200 | 300-650 | 250-500 | 300-850 | 450-850 | 350-750 | — |
| free-machining aluminum alloys | 500-2000 | 250-800 | 600-2500 | 600-2500 | — | — | — | 1600-10000 |
| high-silicon aluminum alloys | — | — | — | — | — | — | — | 1200-3000 |
| copper/zinc/brass | 250-700 | 150-350 | 400-1000 | 300-900 | — | — | — | 900-2500 |
| non-metallics | 400-1500 | 200-800 | 400-1500 | 350-1200 | — | — | — | 500-3000 |
| high-temperature alloys (200-260 HB) | 80-150 | 40-75 | 110-300 | 80-225 | — | — | — | — |
| high-temperature alloys (260-450 HB) | 30-100 | 20-60 | 60-225 | 30-175 | — | — | — | — |
| titanium alloys (Ti 6Al-4V) | 90-200 | 50-120 | 120-300 | 90-250 | — | — | — | — |
| hardened materials (48-60 HRC) | — | — | 50-200 | 50-150 | — | — | — | — |

*NOTE: Reduce speed by 30 percent for internal and face grooving.*

## Face Grooving Application Guidelines




### Tool Selection

- When selecting the toolholder, always start at the largest diameter possible and work toward the smaller diameter. This will allow the strongest tool to be used.

### Cutting the First Groove

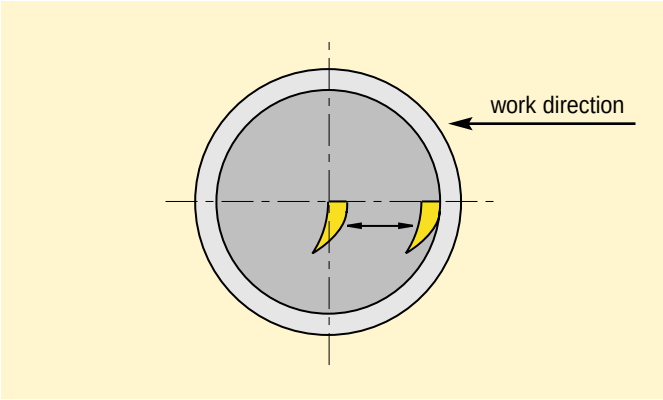
- The outside diameter of the first groove must be between the diameter minimum and diameter maximum capability of the face grooving tool (see illustration). This creates clearance for the toolholder.

### Chip Control

- Adjust speed and feed for good chip control and evacuation from the groove. Chip compaction can cause poor surface finish, tool breakage, and reduced tool life.
- On the first groove – a light feed will produce a continuous chip and ensures that the chip exits the groove.

### Tool Setting

- The tool should be set as close to the center as possible to avoid loss of support blade clearance.
- Align the cutting edge square to the workpiece.




### Widening a Face Groove

- After the first groove has been cut, the groove width can be widened in either direction using the same tool. The best practice is to work from the OD to the ID.

## Practical Solutions to Some Common Grooving Problems

| problem | remedy |
|---|---|
| burr | 1. Assure tool center height.<br>2. Use sharp tool (index more often).<br>3. Use precision ground PVD coated insert.<br>4. Use correct grade for workpiece material.<br>5. Use correct geometry (e.g.-positive rake for workhardening material).<br>6. Change tool path. |
| poor surface finish | 1. Increase speed.<br>2. Use sharper tool (index more often or use precision-ground insert).<br>3. Dwell tool in bottom 1-3 revolutions (max).<br>4. Use proper chip control geometry.<br>5. Increase coolant flow/concentration.<br>6. Assure proper setup (overhang, shank size).<br>7. Use correct geometry (e.g.-positive rake for workhardening material). |
| groove bottom isn't flat | 1. Use sharper tool (index more often or use precision-ground insert).<br>2. Dwell tool in bottom 1-3 revolutions (max).<br>3. Reduce tool overhang (increase rigidity).<br>4. Reduce feed rate at groove bottom.<br>5. Use a GMN vs. GMP geometry.<br>6. Assure tool center height. |
| poor chip control | 1. Use sharper tool (index more often or use precision-ground insert).<br>2. Increase coolant concentration.<br>3. Adjust feed rate (usually increase first). |
| chatter | 1. Reduce tool and workpiece overhang.<br>2. Adjust speed (usually increase first).<br>3. Adjust feed (usually increase first).<br>4. Assure center height. |
| insert chipping | 1. Use correct grade for workpiece material.<br>2. Increase speed.<br>3. Reduce feed.<br>4. Use a stronger grade.<br>5. Increase tool and setup rigidity. |
| built-up edge | 1. Use positive rake PVD coated insert.<br>2. Increase speed.<br>3. Reduce feed.<br>4. Increase coolant flow/concentration.<br>5. Use cermets. |
| side walls not straight | 1. Check tool alignment for square.<br>2. Reduce workpiece and tool overhang.<br>3. Use sharp insert (index more often). |

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