

Tooling Solutions for Aerospace

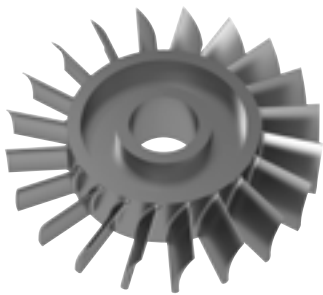


Providing optimal tooling solutions for the aerospace industry



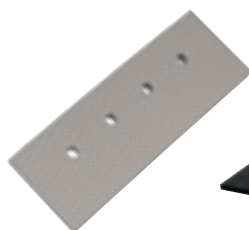
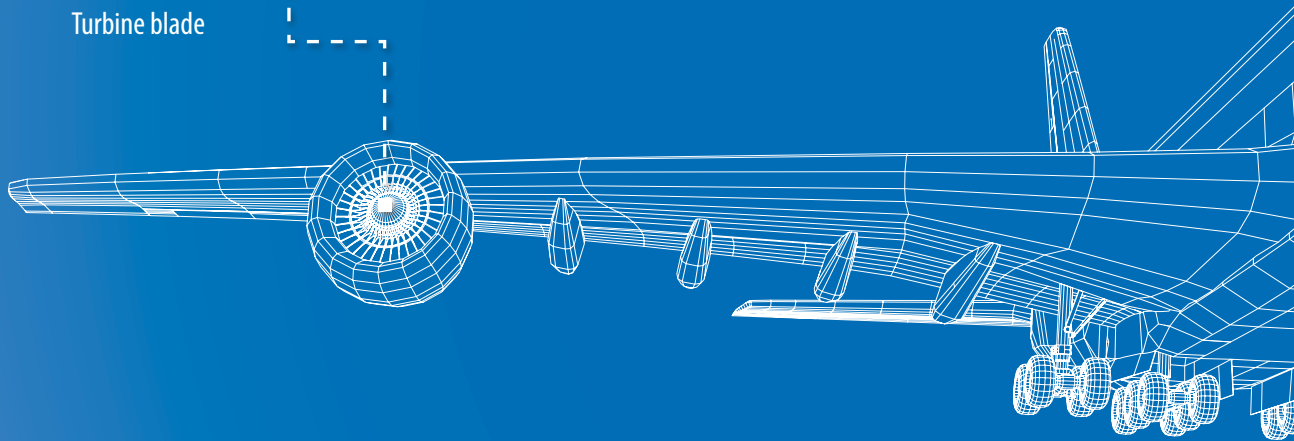
AEROSPACE

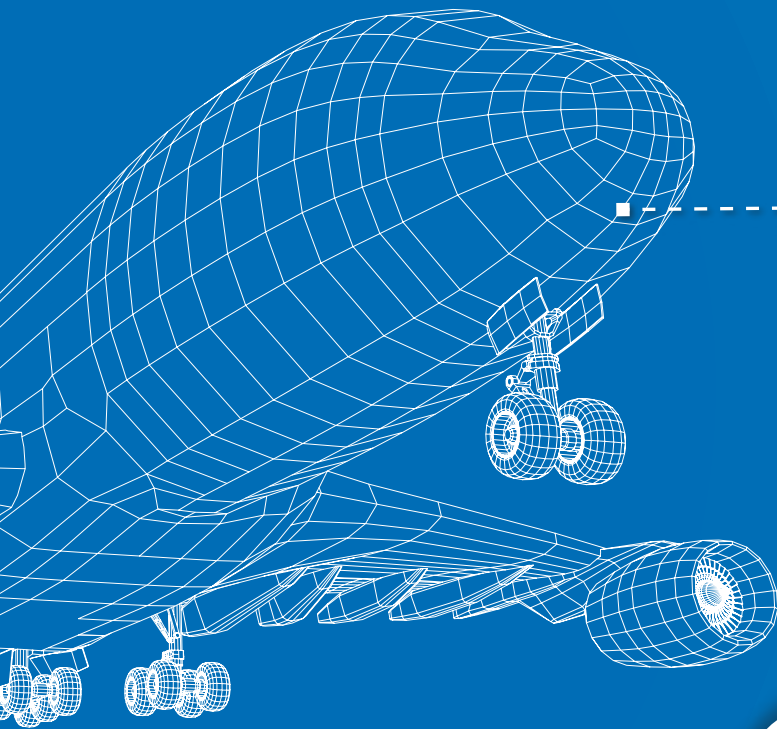
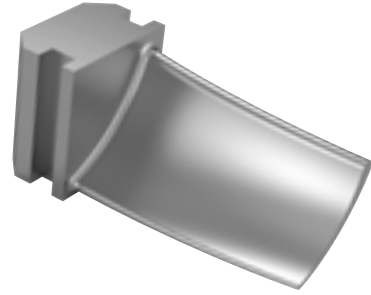
TOOLING SOLUTIONS



ENGINE

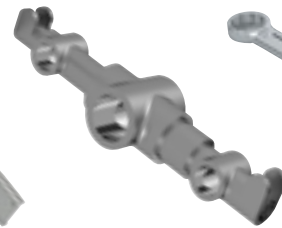
Blisk
Combustion casing
Turbine disc
Turbine blade





- Fuselage (CFRP)
- Composite (CFRP / AFRP)
- Stacked Applications
- Fitting, Rib, Support
- Wing (Rib, Beam, Spar)
- Tail
- Trailing edge
- Leading edge
- Landing gear
- Ceramic UHF RFID Tags

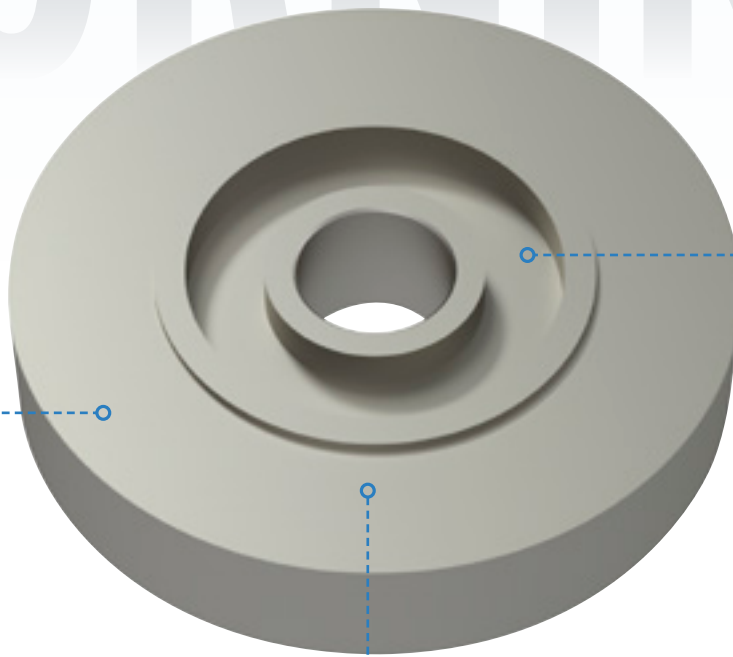
FRAME



BLISK

Titanium Ti-6Al-4V (Gr.5)

TURNING



SG, PG, MU Chipbreaker (PR1535, SW05)

Roughing (Internal and External, face)

SG:

- Stable chip control during heavy machining applications
- High-strength land and low cutting force design
- Double-sided 4-corner design

PG:

- Stable chip control
- Great cutting edge stability
- Suitable for medium roughing
- Prevents the formation of shavings and the possibility of chip biting

MU:

- From medium to roughing
- Large rake angle
- Low cutting resistance
- Reduces notching & burrs

MQ, SK Chipbreaker (PR1535, SW05)

Finishing (Internal and External, face)

MQ:

- From finishing to medium
- Large rake angle with circular edge line
- Low cutting force and good chip control
- Stable chip evacuation due to large slits and rake angle

SK:

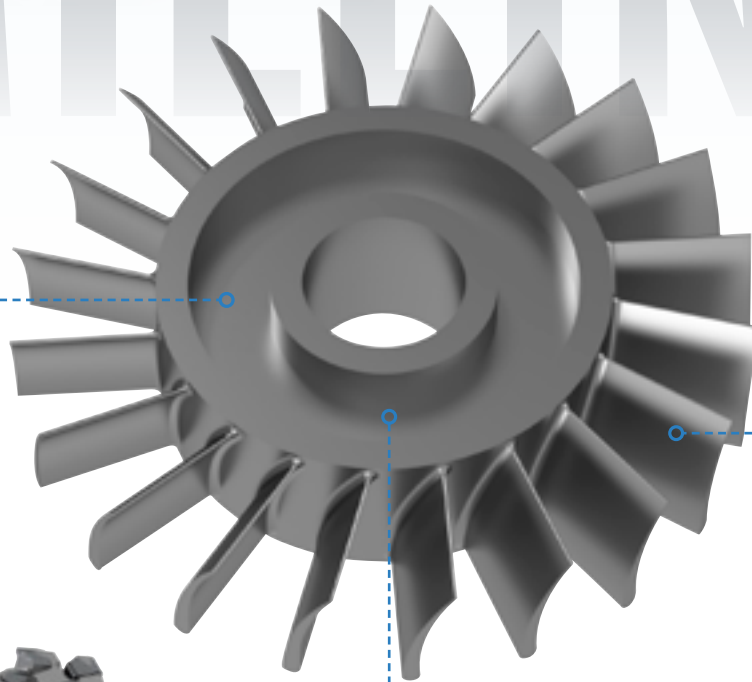
- Stable chip evacuation due to large slits and rake angle
- Increased chip control in small depth of cut due to new chipchipbreaker design
- Lower cutting force as the cutting blade is lowered towards the center of the workpiece
- Improved wear resistance with MEGACOAT NANO (PR1535) coating



GM, CM Chipbreaker Grooving

- For general purpose (GM)
- For copying (CM)
- Excellent chip control
- Improved wear resistance with MEGACOAT NANO (PR1535) coating

MILLING



1.MFH-Mini-GM, 2.MEV-SM (PR1535)

Slot roughing 1

- Cutter diameter: 16-32 mm
- Can be used for a wide range of applications
- Good chip evacuation prevents chip-biting
- Multi-edge design enables high efficiency machining
- Improved wear resistance with MEGACOAT NANO (PR1535) coating



4/5/6RFH - Roughing Endmill

Slot roughing 2 (Ø6 - 20)

- High efficiency machining with multi-edge design
- Good chip evacuation with serrated edge
- Stable machining with reduced cutting pressure



Barrel Tool

Semi-finish,finishing

- A type of a taper ball-nose tool, where the straight taper is replaced with a large tangential radius (Ø50mm to Ø1500mm)
- Diameter from Ø6mm – Ø16mm
- Variable flute pattern for chatter reduction
- 4, 6 & 8-flute design
- Regrinds available
- Reduced cycle times – Up to 90%
- Improved surface finishes
- Increased tool life

COMBUSTION CASING

Inconel®718 (AMS5663)

TUR

SG, SX Chipbreaker (PR005S/PR015S)

Roughing (Internal and External, face)

SG:

- Stable chip control during heavy machining applications
- High-strength land and low cutting force design
- Double-sided 4-corner design

SX:

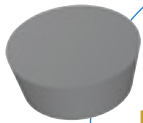
- Decreases cutting edge temperature
- Single-sided 2-corner design



Ceramic insert KS6030

For high efficiency

Superior balance between wear and fracture resistance when machining in heat resistant alloys.



SQ, MQ Chipbreaker

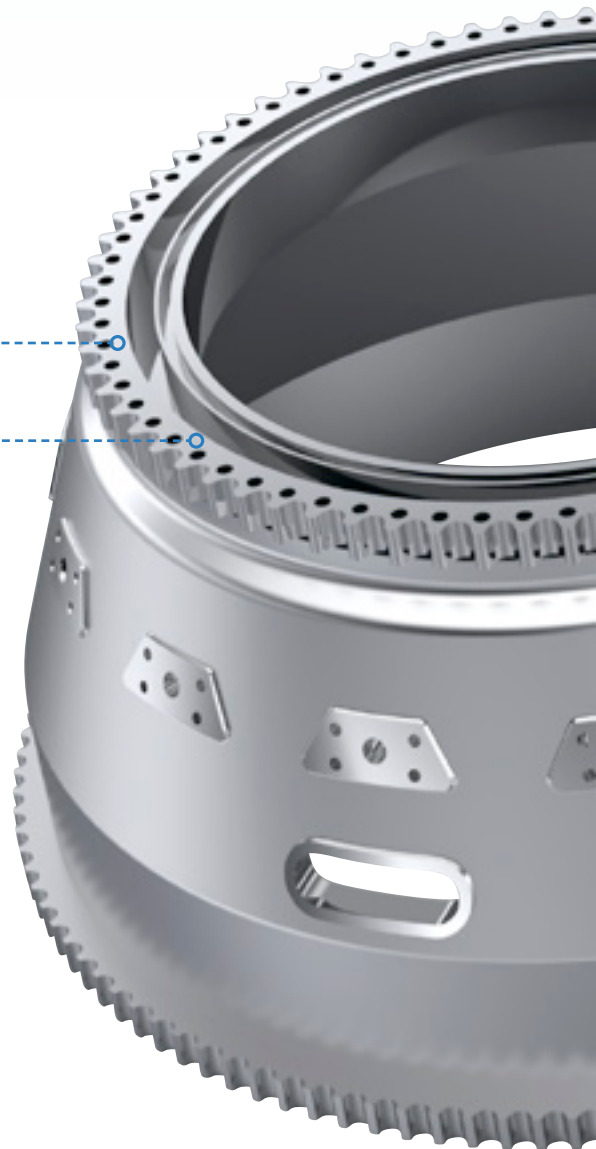
Finishing (Internal and External, face)

SQ:

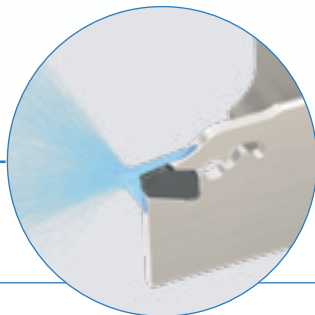
- From finishing to medium
- Improve wear resistance with MEGACOAT HARD coating
- High machining stability and low cutting force

MQ:

- From finishing to medium
- Large rake angle with circular edge line
- Low cutting force and good chip control
- Stable chip evacuation due to large slits and rake angle



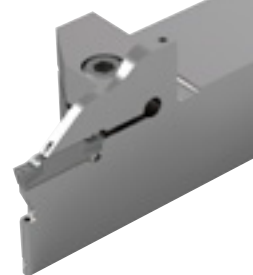
WINING



JCT Series

High pressure coolant

- More than 30 Mpa



GM, CM Chipbreaker

Grooving

- For general purpose (GM)
- For copying (CM)
- Excellent chip control
- Improved wear resistance with MEGACOAT NANO (PR1535) coating

COMBUSTION CASING

Inconel®718 (AMS5663)

MILLING

4JER

Profiling

- Improved chatter resistance
- Kyocera's original MEGACOAT HARD coating technology ensures long tool life and stable machining
- Variable helix design
- High sharpness with a large rake angle
- Unique four flutes design
- Diameter ranges from 6 mm – 20 mm



MFH-GM, MFH-FL

Facing (Roughing and finishing)

- Highly effective
- Long tool life due to the anti-vibration design
- Wide range of application
- Wiper profile for optimum surface quality (FL geometry)



DRILLING



DRA MagicDrill-GM, FTP (PR1535)

Drilling

- Low cutting force design improves hole accuracy
- Optimal web thickness limits deflection
- Fine chip breaking even in deep hole drilling applications
- Easy insert replacement



FTP Drill tip

- Pilot point geometry and double margin improved hole accuracy
- Reduce burr by large helix angle and corner chamfer
- Long tool life and stable machining of various workpieces



KDA 5xD

Drilling small diameters

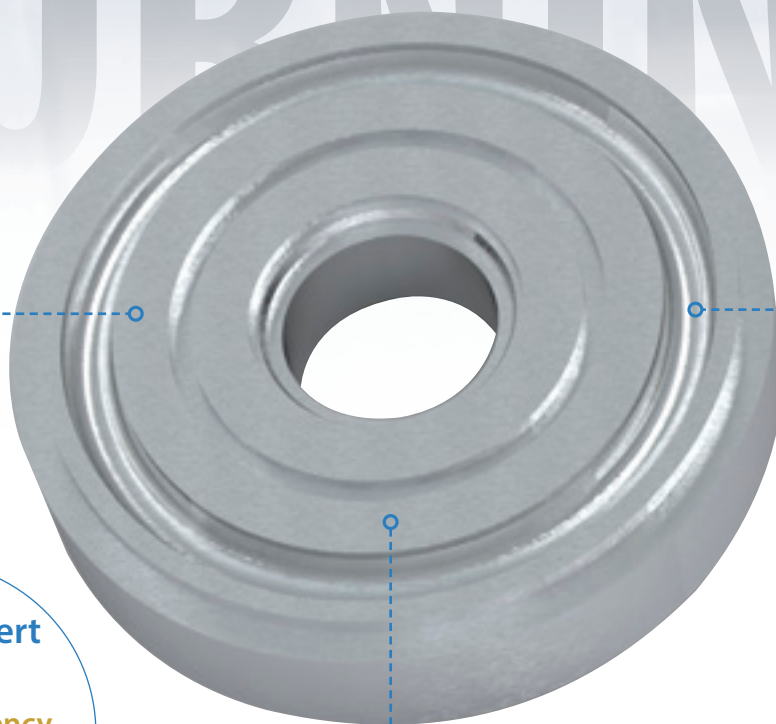
- Excellent all-round drill performance
- Large lineup to accommodate a wide variety of applications
- Stable machining with a unique cutting edge shape



TURBINE DISC

Inconel®718 (AMS5663)

TURNING



**Ceramic insert
KS6030**

For high efficiency

Superior balance between wear and fracture resistance when machining in heat resistant alloys.



**SG, SX Chipbreaker
(PR005S/PR015S)**

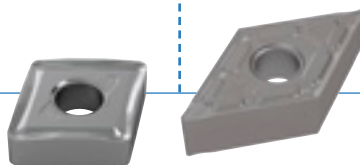
Roughing (Internal and External, facing)

SG:

- Stable chip control during heavy machining applications
- High-strength land and low cutting force design
- Double-sided 4-corner design

SX:

- For roughing applications
- Decreases cutting edge temperature
- Single-sided 2-corner design



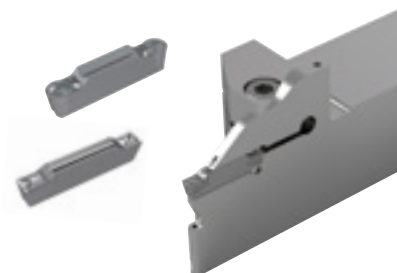
**SQ, MQ Chipbreaker
Finishing (Internal and External, face)**

SQ:

- From finishing to medium
- Improve wear resistance with MEGACOAT HARD coating
- High machining stability and low cutting force

MQ:

- From finishing to medium
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- Low cutting force and good chip control
- Stable chip evacuation due to large slits and rake angle



**GM, CM Chipbreaker
Grooving**

- For general purpose (GM)
- For copying (CM)
- Excellent chip control
- Improved wear resistance with

MILLING



1.MFH-Mini-GM

2.MEV-SM (PR1535)

Slot roughing (1)

- Cutter diameter: 16-32 mm
- Can be used for a wide range of applications
- Good chip evacuation prevents chip-biting
- Multi-edge design enables high efficiency machining
- Improved wear resistance with MEGACOAT NANO (PR1535) coating



4/5/6RFH Endmill

Slot roughing (2) (ø6-20)

- High efficiency machining with multi-edge design
- Good chip evacuation with serrated edge
- Stable machining with reduced cutting pressure



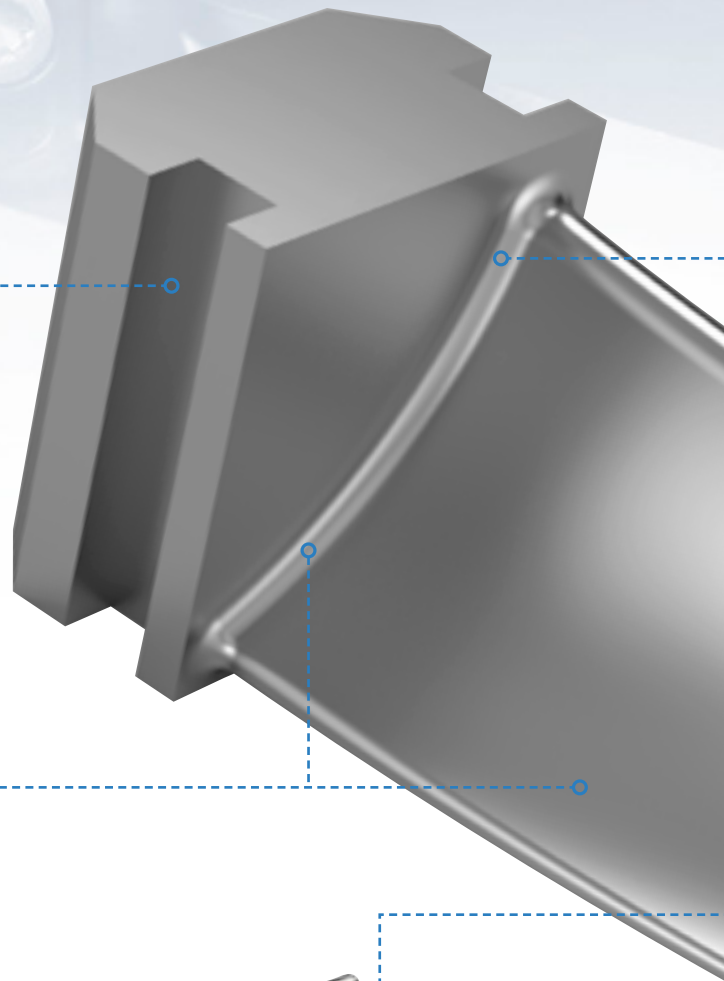
Root form cutter

Root form slot (semi-finish, finishing)

- Power Edge and NANO composite coating
- Newly developed geometry
- Superior tool life
- Progressive feed rate
- Minimised cost per cut

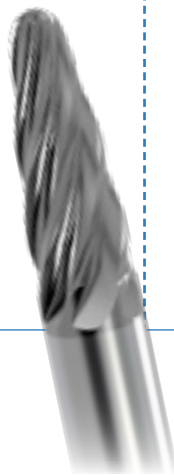
TURBINE BLADE

HRSA, TiAl Alloys



1.MFH-Mini-GM, 2.MEV-SM (PR1535) Slot roughing

- Cutter diameter: 16-32 mm
- Can be used for a wide range of applications
- Good chip evacuation prevents chip-biting
- Multi-edge design enables high efficiency machining
- Improved wear resistance with MEGACOAT NANO (PR1535) coating



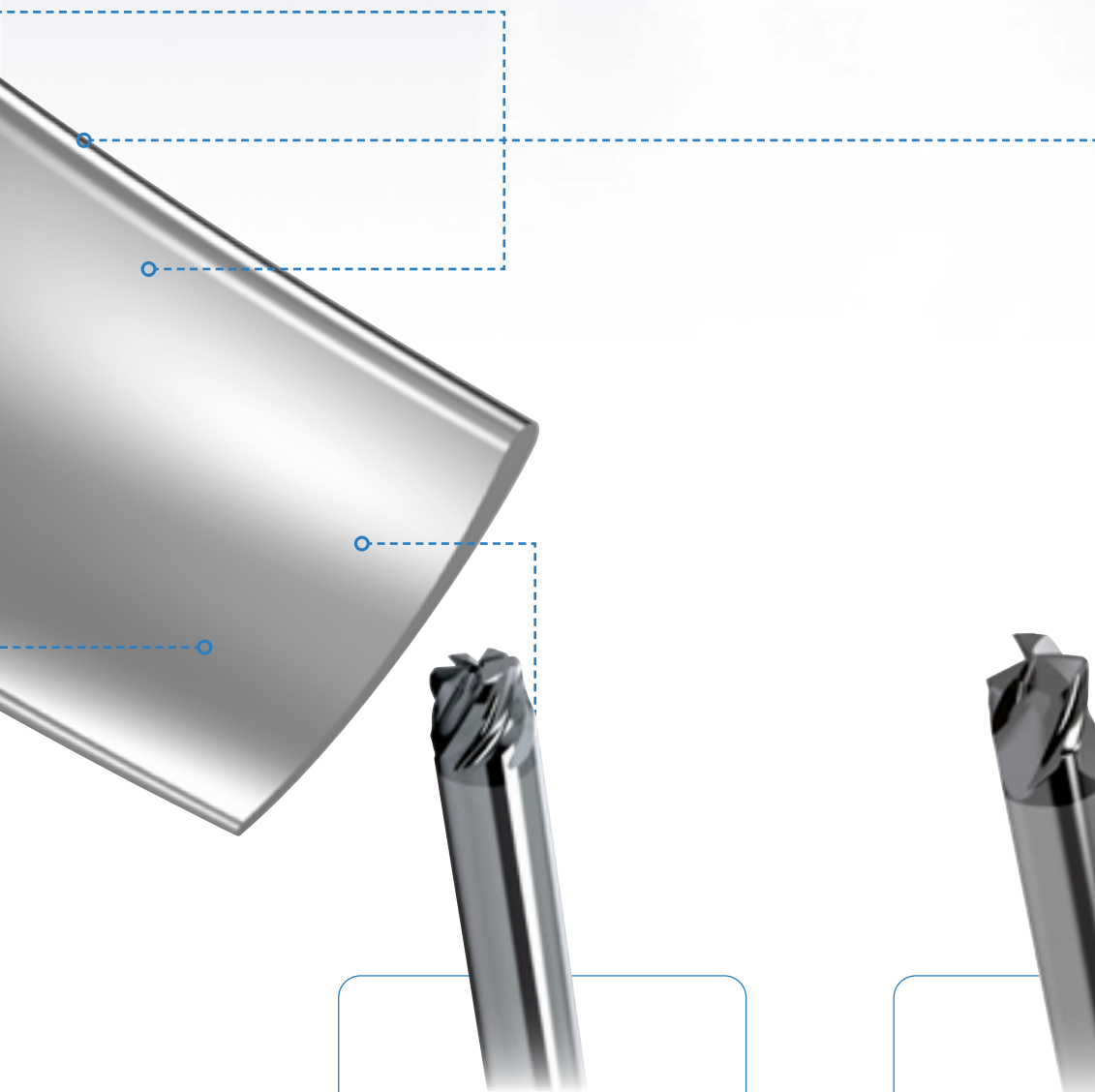
NTS-Radial - Barrel Tool Finishing (Blade, Fillet)

- A type of a taper ball-nose tool, where the straight taper is replaced with a large tangential radius (Ø50mm to Ø1500mm)
- Diameter from Ø6mm – Ø16mm
- Variable flute pattern for chatter reduction
- 4, 6 & 8-flute design
- Regrinds available
- Reduced cycle times – Up to 90%
- Improved surface finishes
- Increased tool life



4JER Semi-finish, finishing

- Improved chatter resistance
- Kyocera's original MEGACOAT HARD coating technology ensures long tool life and stable machining
- Variable helix design
- High sharpness with a large rake angle
- Unique four flutes design
- Diameter ranges from 6 mm – 20 mm



NTS Torus

Finishing curved surfaces

- $\pm 10 \mu\text{m}$ profile tolerance on effective radius
- Up to 12x more productive than point milling with same tool diameter on low curvature surfaces
- Uses full surface speed of the cutter
- Tough, sub- μm grain, chip resistant carbide with Kyocera PVD coating
- Customizable semi-standard range with diameters from $\varnothing 5$ to $\varnothing 32$ mm
- Easily reground – therefore very economical - no loss of diameter when reground.

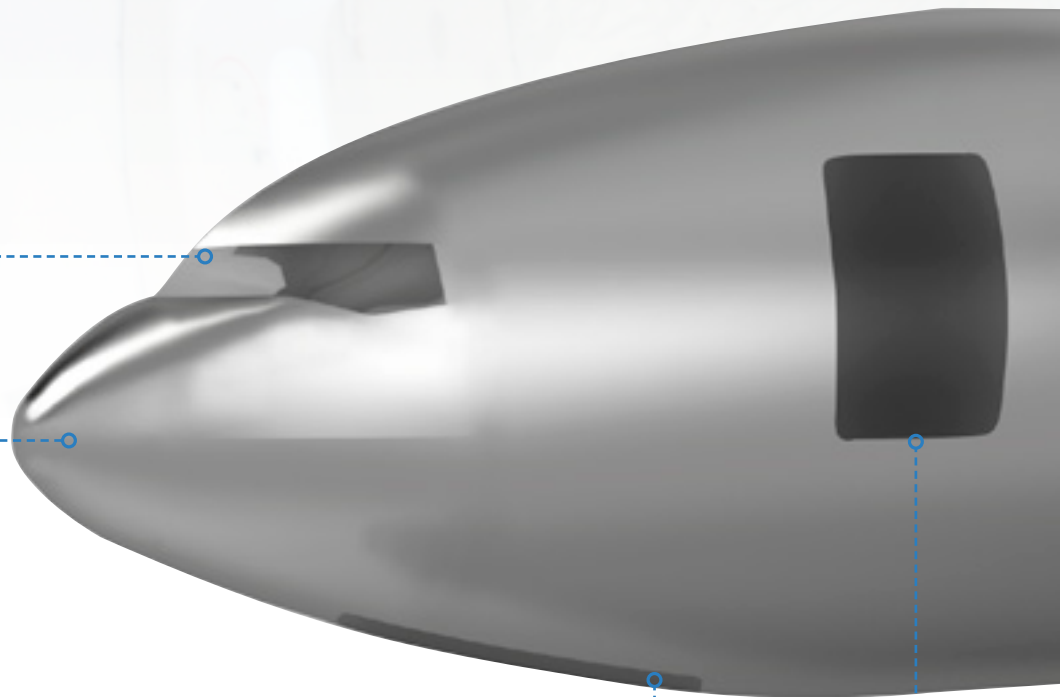
NTS Axial Arc

High-speed Finishing

- $\pm 5 \mu\text{m}$ profile tolerance on effective radius
- 1st for tangential finishing of hard to reach, surfaces.
- The faster alternative to ball-nose copy milling
- High Surface Generation Ratio, due to the arc-shaped end cuts combined with HSC (High Speed Cutting)
- Tough, Sub- μm grain, chip resistant carbide with Kyocera PVD coating
- Customizable to your needs - diameters between $\varnothing 5$ and $\varnothing 20$ mm.

FUSELAGE

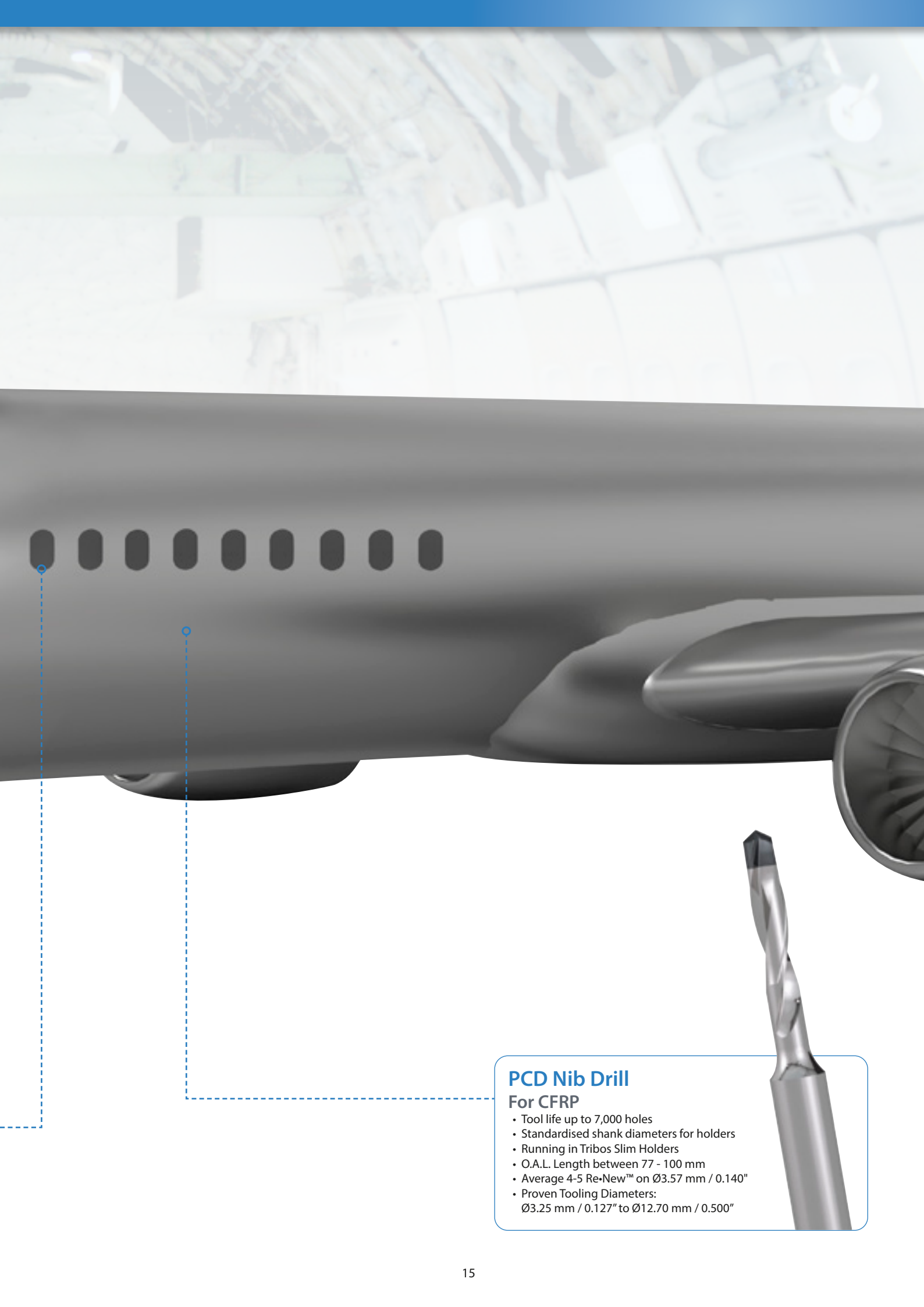
Portal Machining



PCD Vein Mill

For CFRP

- Exceptionally high surface quality
- Extreme cutting speeds
- Up to 6x Re-New™ - A completely refurbished tool every time for a small amount, compared to the price for new tools
- Cutting length up to 19 mm
- Cemented carbide body - Less vibrations
- Diamond veins - Long tool life
- Positive and negative helix - Less delamination/vibrations and reduced cutting force



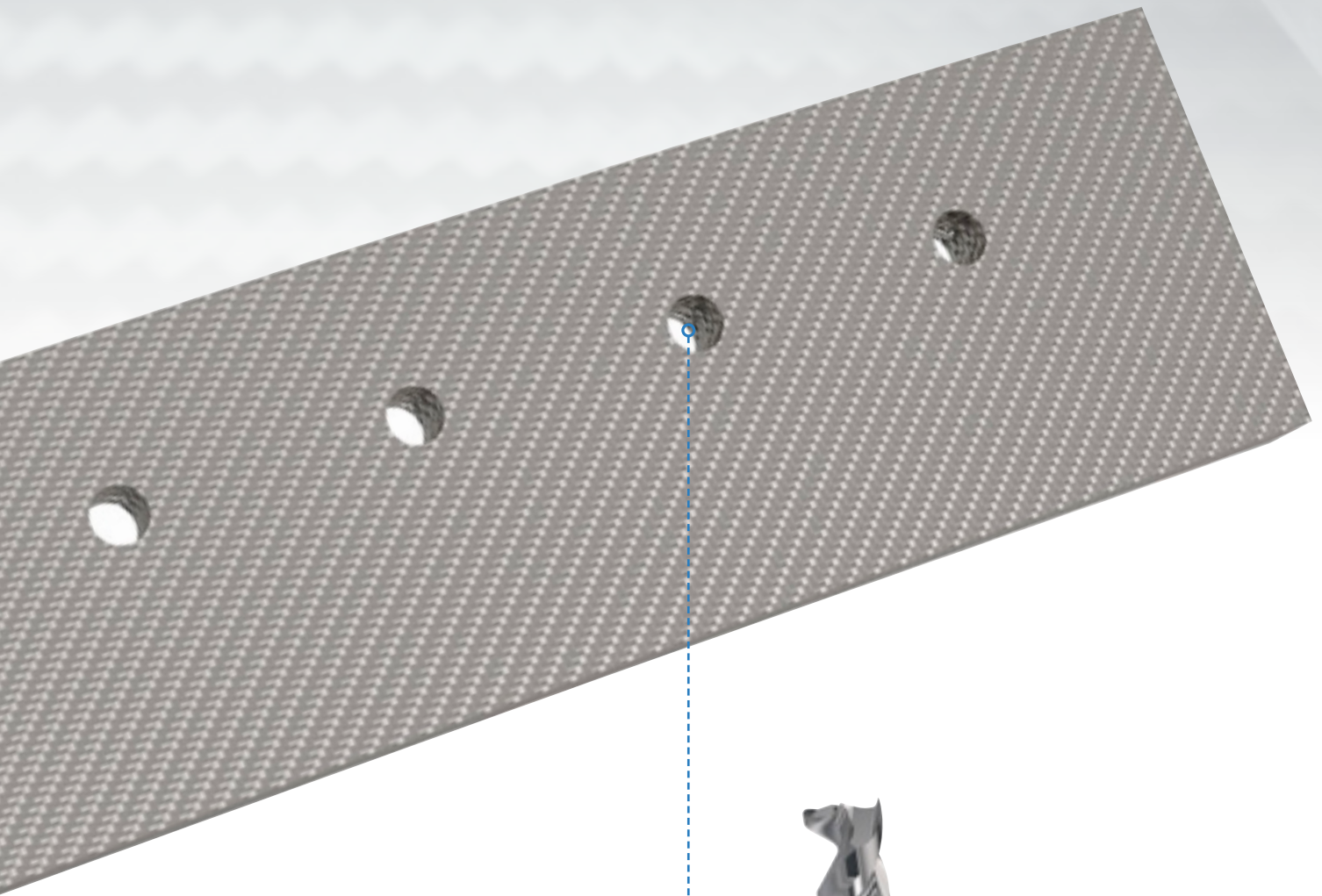
PCD Nib Drill

For CFRP

- Tool life up to 7,000 holes
- Standardised shank diameters for holders
- Running in Tribos Slim Holders
- O.A.L. Length between 77 - 100 mm
- Average 4-5 Re-New™ on Ø3.57 mm / 0.140"
- Proven Tooling Diameters:
Ø3.25 mm / 0.127" to Ø12.70 mm / 0.500"

COMPOSITE

CFRP / AFRP / GFRP



Custom Drill

For AFRP (Kevlar)

- Highly efficient AFRP machining
- Long tool life



Diamond Coated Drill

Drilling in CFRP

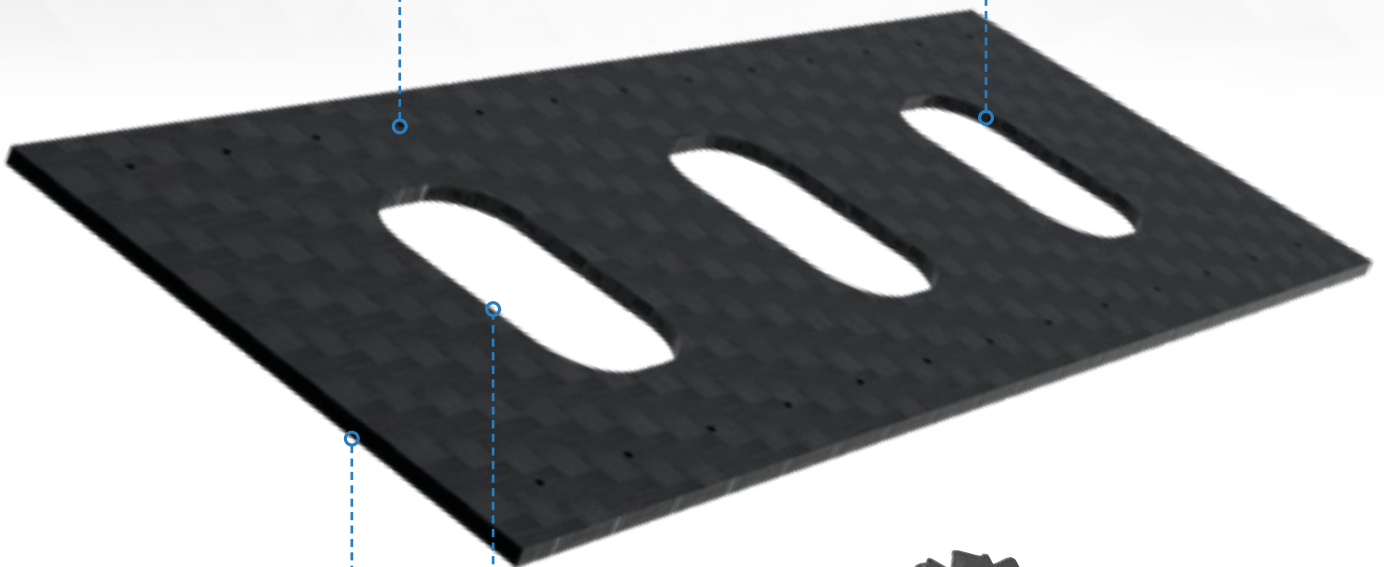
- Special tool geometry
- Smooth diamond coating
- Long tool life due to the low cutting force
- High precision machining of CFRP



Diamond Coated End Mill

Trimming/Milling in CFRP

- Variable flute design prevents chattering
- Sharp cutting edges cut off strong carbon fibers and reduces delamination and burr build-up
- Smooth diamond coating
- Long tool life due to the low cutting force
- High quality surface finishes



Routers

Milling in CFRP

- One-pass trimming to finish quality
- Can be designed for thermoset CFRP as well as thermoplastic CFRP
- Diameter + cutting length balanced to specific part thickness
- Feed rate: 2-6 m/min.
- CVD diamond coating



STACKED APPLICATIONS

CFRP / TITANIUM / AFRP / ALUMINIUM

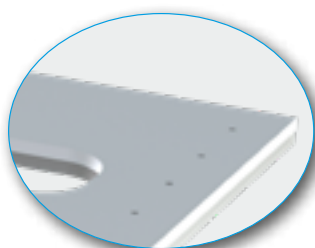


**CFRP
ALUMINIUM**

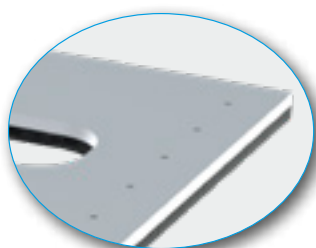
**Dry
drilling also
available!**

One-Shot Drill/Countersink
Drilling in various stack combinations

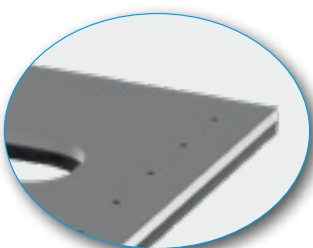
- Designed for: CFRP/Al, Al/CFRP, CFRP/CFRP and Al/Al
- With internal coolant (wet, MQL or compressed air)
- Exceptional performance with vibration assisted drilling equipment
- Fully customizable to your specifications
- Multiple tool diameters can be incorporated
- ADU or CNC shaft available
- CVD diamond coating



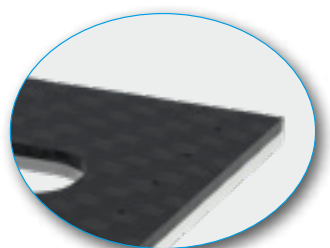
**ALUMINIUM
TITANIUM**



**ALUMINIUM
CFRP**



**TITANIUM
CFRP**



**CFRP
TITANIUM**



PCD Drill Countersink

For robot assisted drilling in CFRP/TI

- Wet/MQL coolant possible
- Exceptional performance with vibration assisted drilling equipment
- Improved tool life due to PCD tips

CFRP
TITANIUM



Drill Countersink / Drill / Reamer

For CFRP/TI and CFRP/SS

- Wet/MQL coolant possible
- Exceptional performance with vibration assisted drilling equipment
- C7E coating

FITTING, RIB, SUPPORT

Titanium - Ti-6Al-4V (Gr.5)

ROUGH



MECHT-JS (PR1535)

Pocketing

- Ideal for shoulder face milling, plunge cutting, slot milling and ramping
- The different insert sizes stabilizes the titanium alloys machining and significantly improves the fracture resistance
- The flute design prevents the chips from clogging and reduces not only chattering issues but also renewed chip re-cutting issues
- Positive and very light-cutting, which achieves perfect 90° shoulders and smooth surfaces
- The very low cutting force ensures a long tool life.

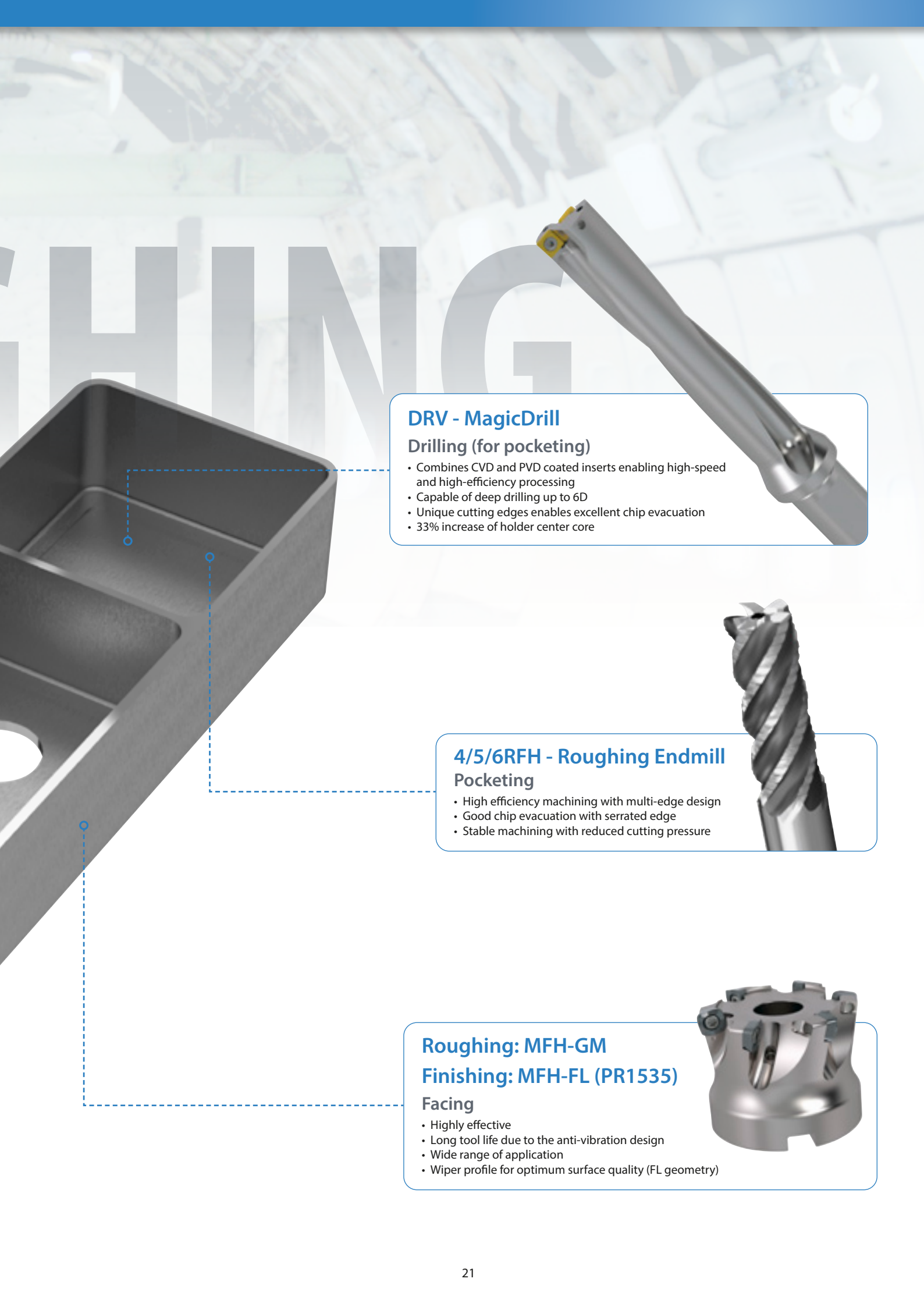


4TFR

Shouldering

- No chip clogging
- Reduced cutting force
- Excellent surface quality





DRV - MagicDrill

Drilling (for pocketing)

- Combines CVD and PVD coated inserts enabling high-speed and high-efficiency processing
- Capable of deep drilling up to 6D
- Unique cutting edges enables excellent chip evacuation
- 33% increase of holder center core



4/5/6RFH - Roughing Endmill

Pocketing

- High efficiency machining with multi-edge design
- Good chip evacuation with serrated edge
- Stable machining with reduced cutting pressure



Roughing: MFH-GM

Finishing: MFH-FL (PR1535)

Facing

- Highly effective
- Long tool life due to the anti-vibration design
- Wide range of application
- Wiper profile for optimum surface quality (FL geometry)



FITTING, RIB, SUPPORT

Titanium - Ti-6Al-4V (Gr.5)

FINIS

NTS Ball

Chamfering

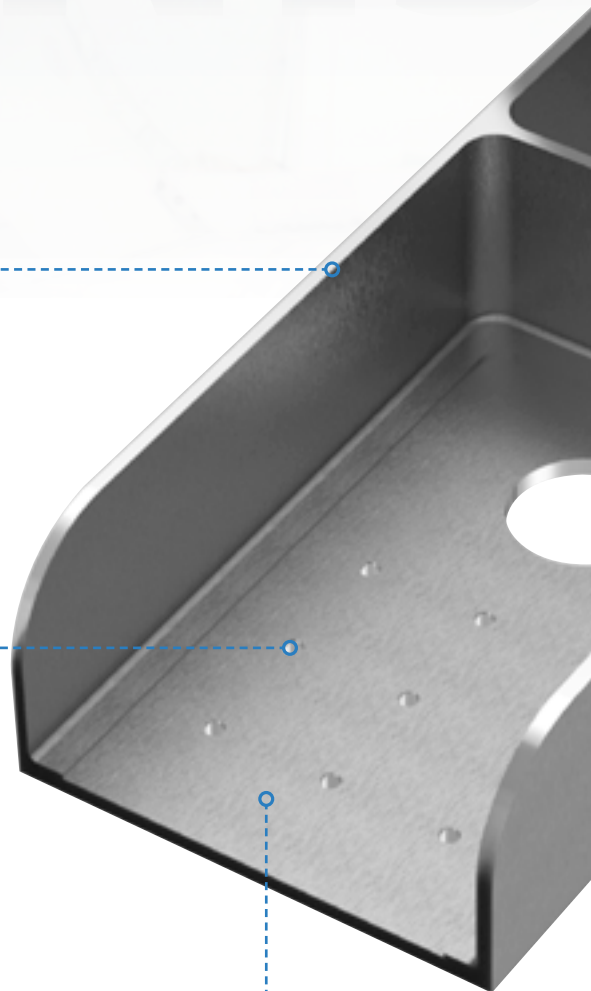
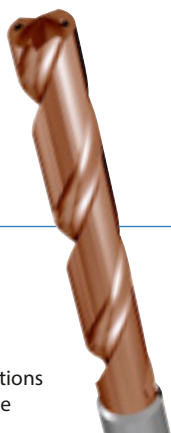
- Multi-flute tool for profile finish machining
- Suitable for conventional or high-speed machining
- New corner radius geometry gives longer life and improved surface finish
- 1st choice for finishing blending radius in shallow corners
- Tough, sub- μm grain, chip resistant carbide with Kyocera PVD coating
- Customizable semi-standard range with diameters from $\varnothing 5$ to $\varnothing 32$ mm

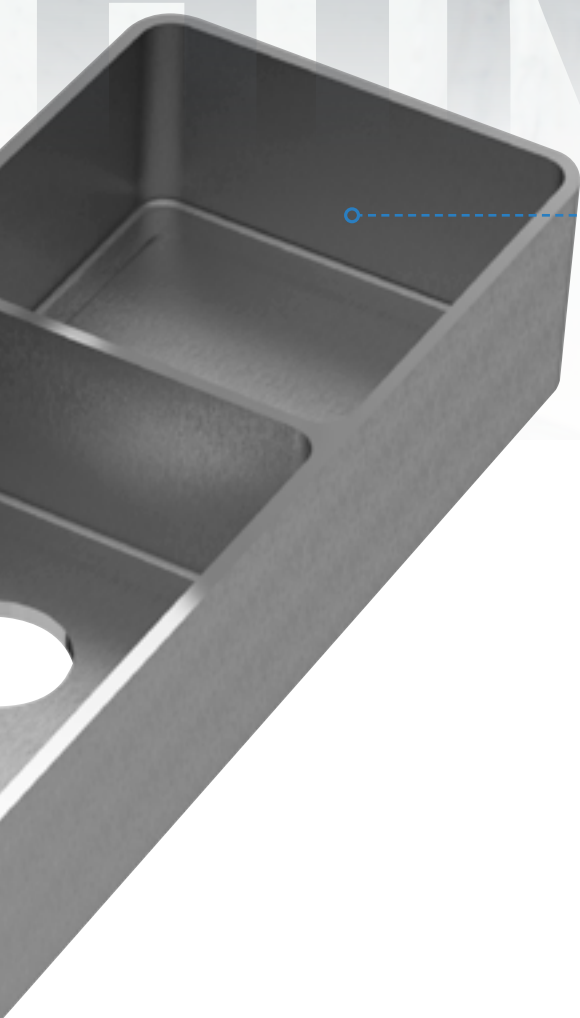


KDA 5xD

Drilling small diameters

- Excellent all-round drill performance
- Large lineup to accommodate a wide variety of applications
- Stable machining with a unique cutting edge shape





NTS Finisher

SC High performance finishing cutter

- Unequally divided cutting edges
- Quad-helical flute design interrupts chatter frequencies
- Tough, Sub- μ m grain, chip resistant carbide with Kyocera PVD coating
- Suitable for conventional speeds or high-speed machining
- Customizable to meet your individual needs
- Diameters between $\varnothing 6$ and $\varnothing 32$ mm



NTS HPC Milling Cutter

Slot milling and heavy roughing

- Deeper and stable cuts
- Suitable for semi finishing and finishing machining
- Z4 unequally divided cutting edges
- Quad-helical flute design interrupt chatter frequencies
- Tough, Sub- μ m grain, chip resistant carbide with Kyocera PVD coating
- Tool geometries designed for high performance machining of Stainless; Titanium and Nickel alloys
- Diameters between $\varnothing 5$ and $\varnothing 32$ mm



WING (RIB, BEAM, SPAR)

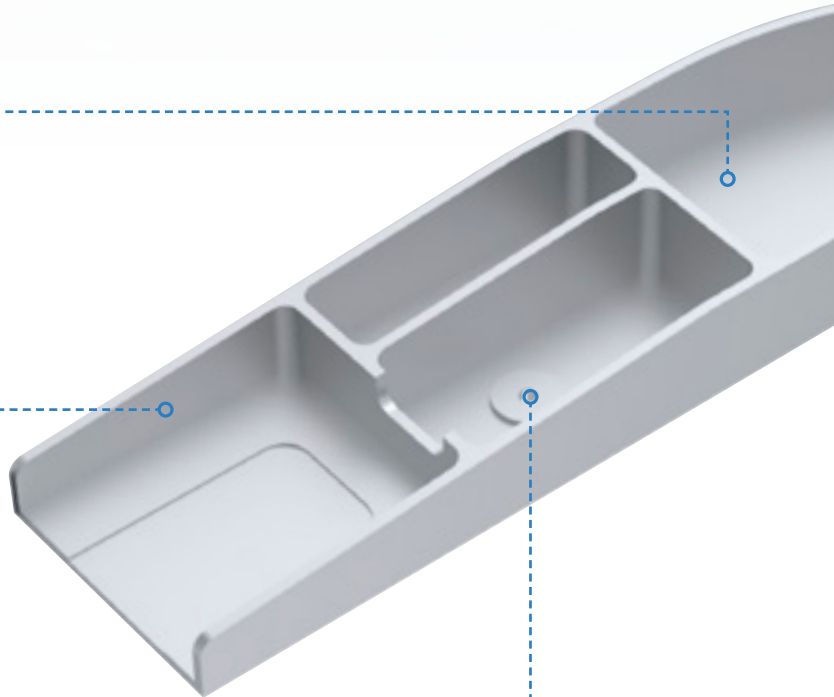
Duralumin (Al-Zn ,Al-Li Alloy)



MEAS (PDL025)

Facing/Pocketing

- Ø32: Recommended max cutting speed $V_c=3,000$ m/min.
- Serrated insert pockets to resist centrifugal force and ensure stable, high speed machining
- 3-axis machining with a max. ramping angle of 20° (ø25)
- PDL025 achieves long tool life with hardness close to that of diamond
- Inserts are specially designed for aluminium machining



Barrel Tool

Thin Wall Finishing

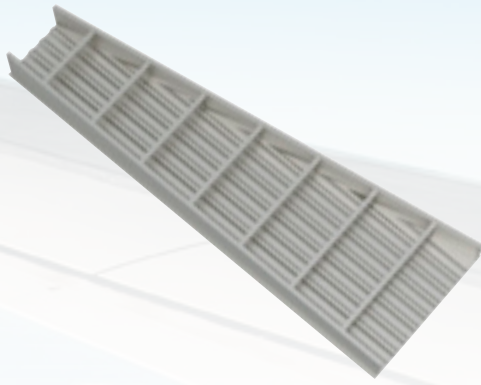
- Low radial cutting forces - eliminates vibrations
- High surface generation ratio
- Reduced cycle times – Up to 90%
- Improved surface finishes



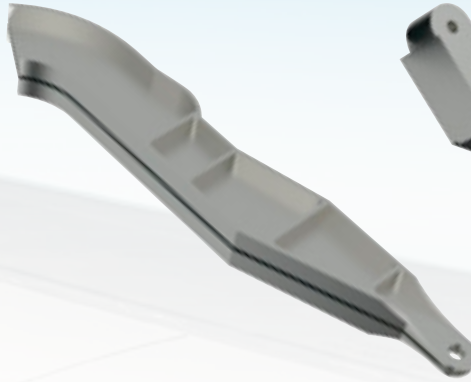
GammaDrill

Drilling

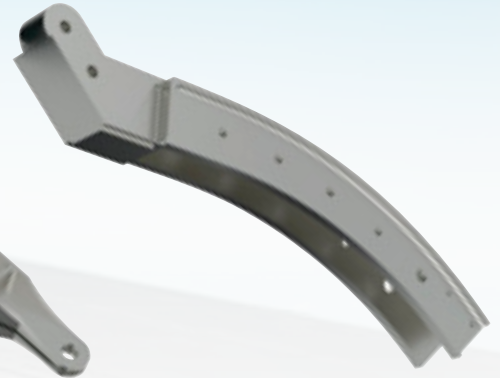
- Easy cutting geometries
- Polished flutes and internal coolant
- Special 150° point angle
- Extreme long tool life
- Standard sizes available from Ø4.0 mm
- Customized sizes available from Ø3,3 mm



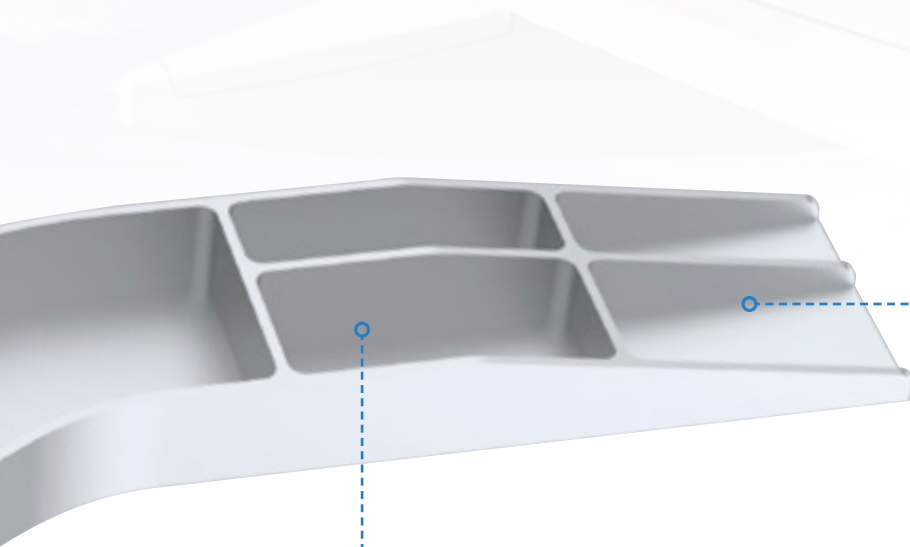
Tail



Trailing Edge



Leading Edge



UA RIP SC End Mill

Pocketing/Roughing

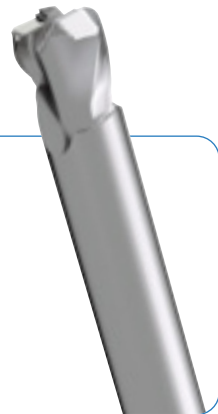
- Can be used in large cutting depths and with relatively low rpm
- Leaves a wave-formed workpiece surface
- Number of flutes: 2-3



UA HSC SC End Mill

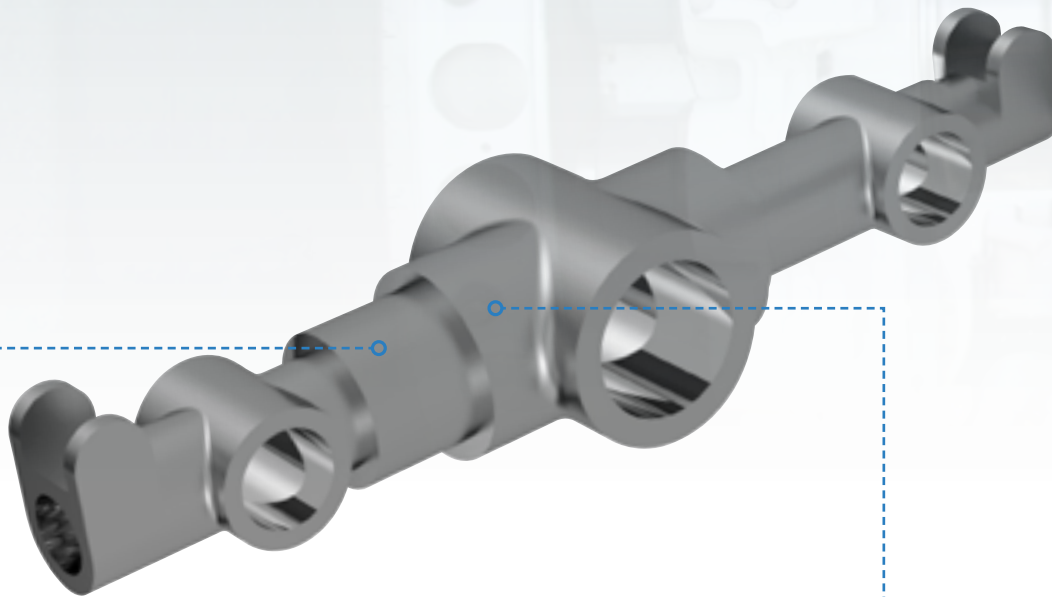
Pocketing/Finishing

- Optimized for high speed machining in aluminium
- Can be used in large cutting depths
- Stocked in standard dimensions
- Can be made in custom dimensions as well as ball nose



LANDING GEAR

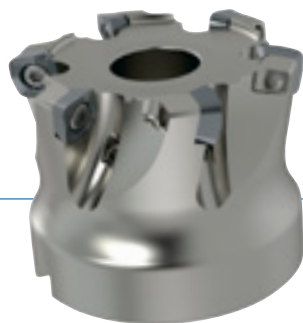
High strength Titanium alloy
(TI-5553,TI-10-2-3)



MFH-GM(PR1535)

Facing and Profiling

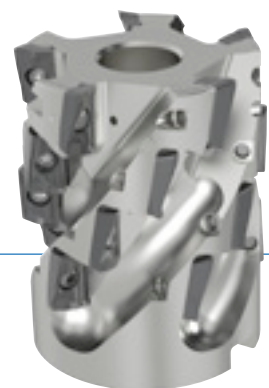
- Highly effective
- Long tool life due to the anti-vibration design
- Wide range of application
- Wiper profile for optimum surface quality (FL geometry)



MECHT-JS (PR1535)

Roughing

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- The flute design prevents the chips from clogging and reduces not only chattering issues but also renewed chip re-cutting issues
- Positive and very light-cutting, which achieves perfect 90° shoulders and smooth surfaces
- The very low cutting force ensures a long tool life.



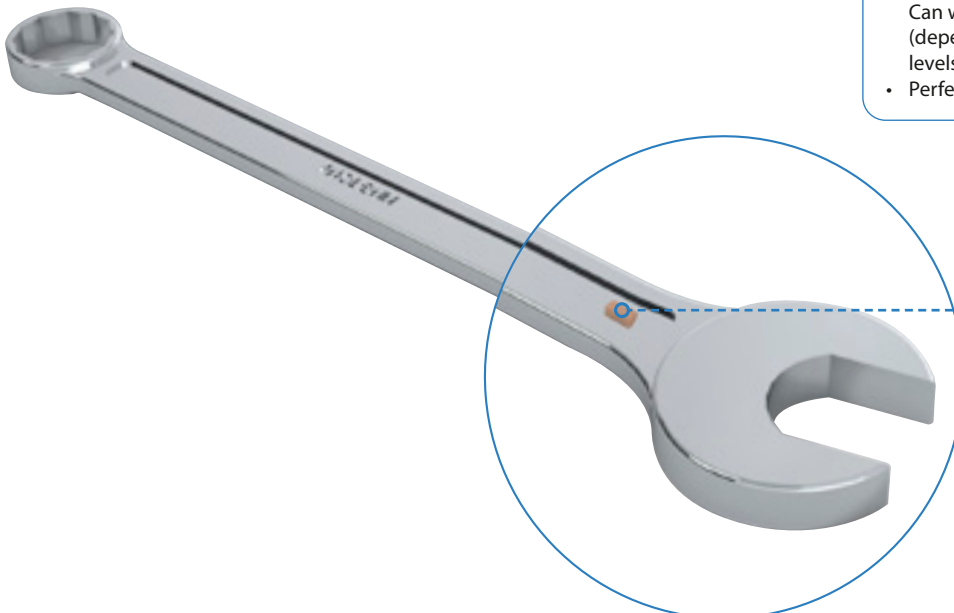
CERAMIC UHF RFID TAGS

Tool tracking for the aerospace industry



Dimensions*		5 x 2 x 1.5 mm	6 x 3 x 1.7 mm	10 x 5 x 1.7 mm	15 x 5 x 1.7 mm
Read Range	250 mW	10 cm	10 cm	25 cm	35 cm
	1 W	40 cm	60 cm	120 cm	180 cm
IC type		Monza R6-P	Monza 4QT	Monza 4QT	Monza 4QT
Connection		Flip-Chip	Wire Bonding	Wire Bonding	Wire Bonding
EPC memory		128 bits	128 bits	128 bits	128 bits
User memory		32 bits	512 bits	512 bits	512 bits

* Customized designs can be provided upon request.



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Tool Tracking

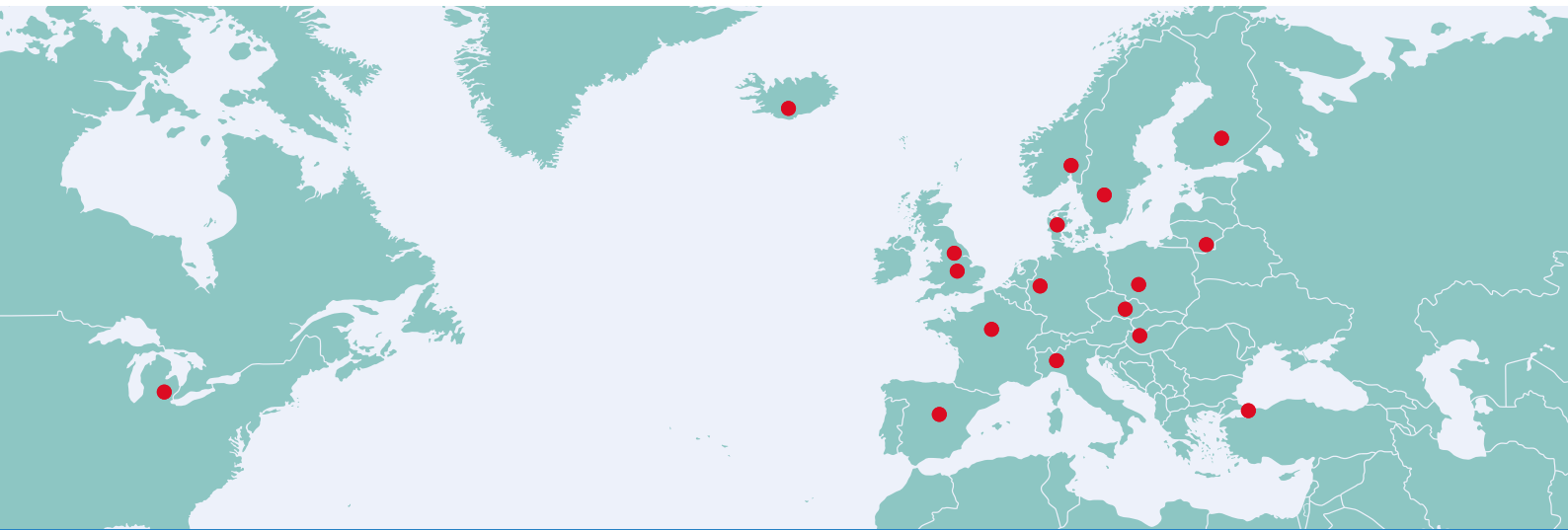
- Comes in 4 standard sizes
- Custom design is also possible
- Robust ceramic packaging:
Can withstands temperatures up to 300°C
(depending on RFID tag structure) and humidity
levels up to 85 %
- Perfect for the aerospace industry.

Industrial tooling solutions

Kyocera Unimerco is a global manufacturer and distributor, providing standard and customised cutting tool solutions as well as know-how and optimisation guidance for the manufacturing industry.

The company was founded in 1964 and has since expanded into 17 countries, with more than 700 employees.

Today the company is part of the Japan-based Kyocera Corporation.



www.kyocera-unimerco.com