

## Full range brochure

Solid carbide tooling, drills and blades

The ultimate in  
**choice,  
quality and  
performance**


































INFINITE POSSIBILITIES.®

**QUICKGRIND**®  
carbide tooling

Page 4   Get the knowledge	Introducing our online shop and mobile app
Page 6   Infinite Possibilities®	The future of tool purchasing today
Page 8   Innovative tools	Eliminator barrel tools, Orbis lollipop cutters
Page 14   High feed tools	Spectre, Phantom, Bulldog, Reaper, Reaper-LS high feed end mills
Page 19   Tools for aluminium and non-ferrous materials	Alligator, Caiman, QAlu, QAlu-R, QAlu-CR high performance end mills
Page 22   End mills for HRSA and stainless steels	Mirage, Mirage Super, Delta, <b>NEW</b> Quantum, QVari, QVari-LR, QVari-CR, QVari-5, QVari-5CR, QVari-7 high performance end mills
Page 30   End mills for steels and cast irons	QPlus2, QPlus2-LS, QCut, QChamfer, Demon high performance end mills
Page 33   Ball nose tools	Ribcutter, <b>NEW</b> Warrior, <b>NEW</b> Samurai, QBall, Gladiator, Zodiac, Alligator high performance ball nose end mills
Page 41   Taper tools	Turbomill, Typhoon, Hypermill high performance taper end mills
Page 46   Tools for composites and non-metallics	Fusion range, Rapier clay cutters, Sovereign Blades
Page 50   Form tools	Undercuts, Dovetails, T-slot/Keyways, Port/Cavity tools, Reamers, Corner Rounding cutters
Page 56   Threadmilling	Pathfinder high performance threadmills
Page 57   Routers	Aluminium profile routing cutters
Page 58   Modular tools	ModX®, combining the performance and durability of solid carbide with the modularity of inserts
Page 60   Drilling	Panther, Lion GTC/GD, Puma HRSA, Lynx Micro/Mini, Leopard DH, Jaguar, Cougar TF, Tiger
Page 69   Coatings	MX (AlTiN), XRed/XRed SL (TiSiN), TX (ta-C), TiN, CXPlus (AlCrN), <b>NEW</b> XTF (AlTiN/TiSiXN)
Page 75   Technical data	Milling formulas, workpiece materials, cutting speeds/data
Page 83   Total Solutions Engineering	QuickCam, QuickLab, QuickVend, QuickEdge, Quickgrind Technical Centre

## Icons key

	Customisable – Infinite Possibilities®
	Standard – available ex-stock
	ModX® compatible – modular heads and shanks
	Remanufacture compatible – regrind, recoat, reuse
	Centre cutting
	Helix angle
	End angle
	VHM
	Coating type
	Variable index
	Variable helix
	Number of teeth
	Ball nose
	Coated ball nose
	Coated chamfer
	Coated corner radius
	Chip breaker
	Step down
	Orbis 270°
	Through-coolant
	Chamfer milling
	Slot milling
	Side finishing
	Side roughing
	Profile milling
	Ramping
	Trochoidal milling
	Plunge milling
	Pocket milling
	Helical milling
	3D milling

# Half a century of innovation

Quickgrind has been at the forefront of solid carbide tool design and manufacture for more than fifty years. Always at the cutting edge of engineering, we are constantly setting new standards to deliver the optimum tooling for your production.

This brochure introduces you to our full range of tools, all designed to meet your needs for a wide range of day-to-day and specialist applications.

For non-standard tooling there is our Infinite Possibilities® programme. See pages 6 and 7 to discover the future of tool purchasing today.

Operating in some 40 countries we have an international reputation for solid carbide cutting tools for the aerospace, aircraft, automotive, defence, extrusion die, F1, medical, motorsport, mould and die, oil and gas, power generation, renewables, sub-contract and general engineering industries.

But we don't just sell cutters. Our objective is to become your strategic tooling partner by helping you to increase your productivity. We do this by optimising metal removal rates and tool life, which in turn is achieved by applying the correct technology and the right tool for the job. And not just any job, your job.

This 'total solutions engineering' approach is so successful it has been expanded to include a range of compatible services including CAM strategies, remanufacture and tool vending. Our state-of-the-art Technical Centre is a purpose-built space for you to discover all of these services and more – see pages 83 to 91 to find out more.

**Welcome to Quickgrind. We look forward to you joining us on the next fifty years of our journey.**

**Call +44 (0) 1684 294090  
or visit [quickgrind.com](http://quickgrind.com)**

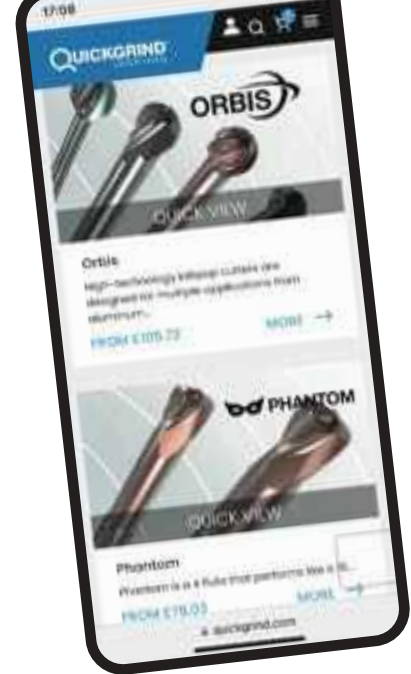
*Eddie Howell founded the business in 1970. Eddie and his son Ross have continued to invest, building the company into what is today one of the most specialised, respected and longest established family-owned solid carbide tooling companies in the UK.*



Online shop

# 24/7 purchasing

when and where you need



Check out our website complete with ecommerce facility for the convenience of tool purchasing any time, anywhere.

- **Ease of comparison:** You can easily compare prices, features and information on products across different ranges, helping you to make informed purchasing decisions. All of our current brochures are also available online.
- **Convenient payment options:** Our website offers various payment options including credit and debit cards, digital wallets and online payment gateways and, on approval, trade credit, providing you with flexibility, choice and convenience.
- **Efficient order management:** Streamline your order processing and fulfilment, reducing the time and resources required to manage your inventory and shipments.
- **24/7 accessibility:** Allows you to browse and shop at any time of the day or night, increasing convenience and accessibility.
- **Mobile enabled:** Accessible on mobile phone, tablet and computer, whatever your preference.
- **Areas covered:** Our ecommerce facility is currently available to all our UK customers with plans to expand internationally.
- **Convenience:** You can shop from wherever you want without the hassle of emails and telephone calls.
- **Promotions:** Be the first to hear about new products, promotions and offers.
- **Custom tooling quote:** Can't find what you need? Simply complete the online form to receive a custom tooling quote.

**Be smart, buy smart. Visit [quickgrind.com](http://quickgrind.com) now and click on the Shop link.**



Mobile app

# Knowledge is power

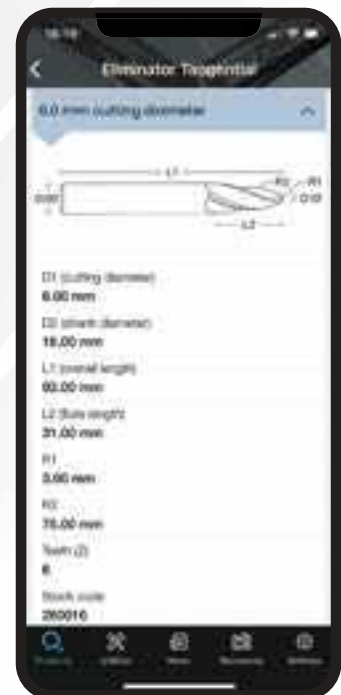
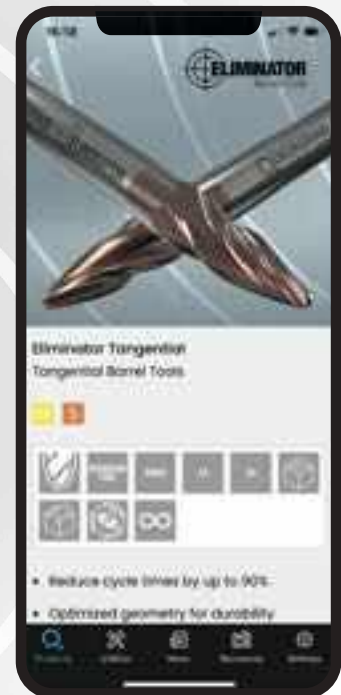


It's never been easier to tap into Quickgrind's 50+ years of tooling expertise and gain a competitive advantage in the fast moving world of machining.

By downloading the Quickgrind app you can enjoy...

- Milling and Drilling information at your fingertips
- Tool selection - the best tool for the job; find out more about our ranges
- Tool feed and speed calculator
- Ability to order standard range tooling direct from the app
- Easy access to videos
- Continual improvements to keep you ahead of the competition

Get the knowledge. Download the Quickgrind app today\*.



\*Currently available on the App Store. Google Play release to be announced.



## INFINITE POSSIBILITIES.®

What if you could have the optimum tool, with the marginal cost increase more than covered by improved production throughput and efficiency? With Quickgrind, you can. Welcome to a world of Infinite Possibilities.®

Our mission is to provide you with solution-based tooling, to give you the right tool, for the right job, at the right price.

Our aluminium cutters can be designed specifically for your application and are available in virtually any size, diameter, radius, neck relief, coating or reach. Through-coolant and other options are also available.

Contact our team today to discuss your applications, aims and requirements.

There are no limits, only Infinite Possibilities.®

Call +44 (0) 1684 294090  
or visit [quickgrind.com](http://quickgrind.com)

## Ordering is as easy as **one, two, three**

### 1. Choose your shank spec

- Length • Diameter • Tolerance
- DIN or other shank standards

### 2. Choose your neck spec

- Length • Diameter • Relief

### 3. Choose your head spec

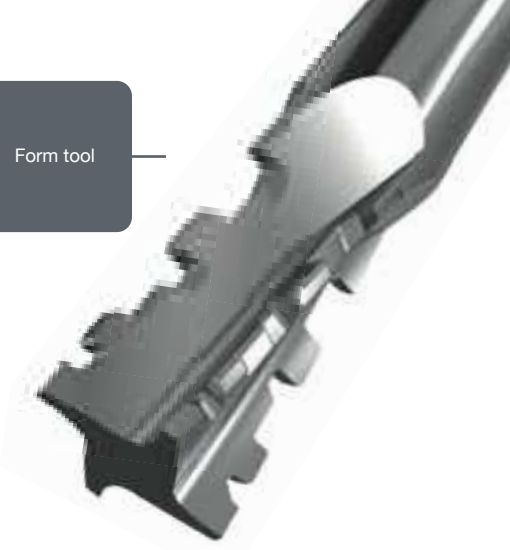
- Length • Diameter
- Tolerance • Number of flutes
- Helix angle • Anti-vibration
- Radius • Chamfer
- Radial/axial through-coolant
- Ballnose • Coating
- Chip breakers



Just tell us what you need for your job and we will make it for you. Even specials can be designed, proved and delivered in days, at a cost you could recoup on your first job.

**That's Infinite Possibilities.®**

# Because one size doesn't always fit all



Form tool

Ask engineers what the name Quickgrind means to them and they will invariably say 'bespoke tooling'. And whilst we do have a standard tooling range – some 400+ go-to cutters – our non-standard service is still central to what we do.

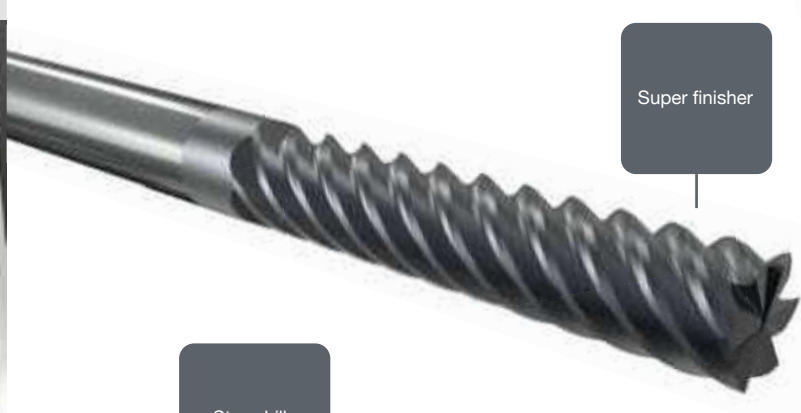
To help you identify which of our tools are suitable for the Infinite Possibilities process simply look for the infinity icon in the list of tooling features. It looks like this...

 Look out for this icon to see which of our tools is Infinite Possibilities® compatible

Shown here are examples of just some of the bespoke tools we have designed and made for our clients.



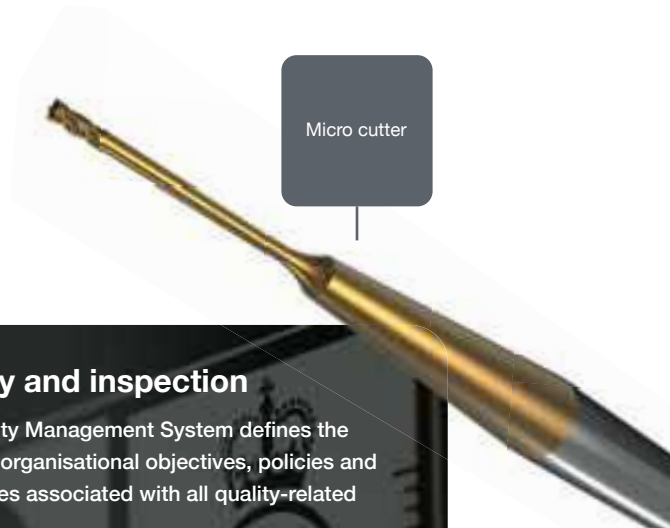
Dovetail undercut



Super finisher



Step drill



Micro cutter



Lollipop

## Quality and inspection

Our Quality Management System defines the strategic organisational objectives, policies and procedures associated with all quality-related activities.

We have established, documented, implemented and maintain a Quality Management System that is designed to comply with the requirements of ISO 9001:2015. Quickgrind is committed to both satisfying all applicable requirements and to continually improving their effectiveness.

Our inspection processes form a key part of the Quality Management System with all tools, both new and remanufactured, undergoing stringent pre- and post-production calibration and measurement checks using the very latest equipment and technology, including Bruker Alicona optical metrology machines and Walter Helicheck measuring machines.



# Innovating for unlimited potential

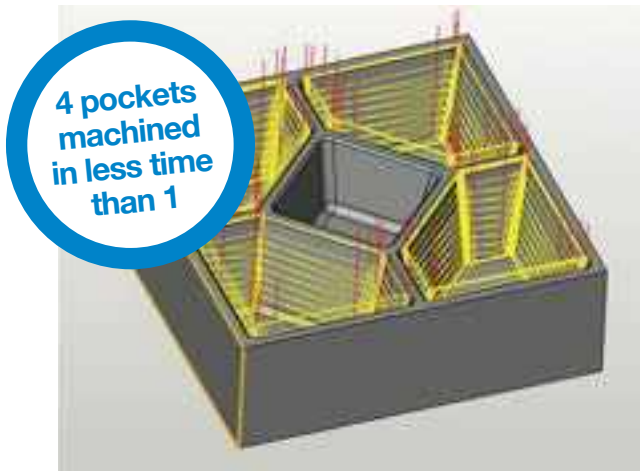
Eliminator is an exciting range of barrel tools that takes the arc segment of a circle to form the radius of the flute, enabling improved step down strategies when compared to ballnose endmills and reducing cycle times by up to 90%.

Until now the conventional way to produce a required finish was to use a ballnose. This limits the step down, generally calculated as  $ap = 0.02 \times D1$ . For example, a 10.00mm diameter ballnose can achieve an ap of 0.20mm.

Increasing the step down would normally require a much larger diameter cutter which would not be practical – the Eliminator barrel tool does not have such limitations. The contact area is much greater because the flute radius is adapted from the segment of a much larger circle. If you wanted to increase the step down from 0.20mm to 5.00mm you would need a 250mm diameter ballnose. However, by taking a segment of a 250mm diameter circle to form the flute of your tool, and applying this to any diameter tool, you can achieve a 5.00mm step down.

Available in (pictured left to right above) concave, lens type, tangential, form F and conical versions with geometries, number of flutes and dimensions to suit your individual applications, Eliminator significantly reduces finishing cycle times on deep pockets, shallow pockets with small radii, hard to reach faces, radial and tangential faces, gear cutting, blisks, vanes and moulds which would all normally require a ballnose.

Start your cycle time  
and finishing revolution today.  
Call +44 (0) 1684 294090  
or visit [quickgrind.com](http://quickgrind.com)



## Eliminator

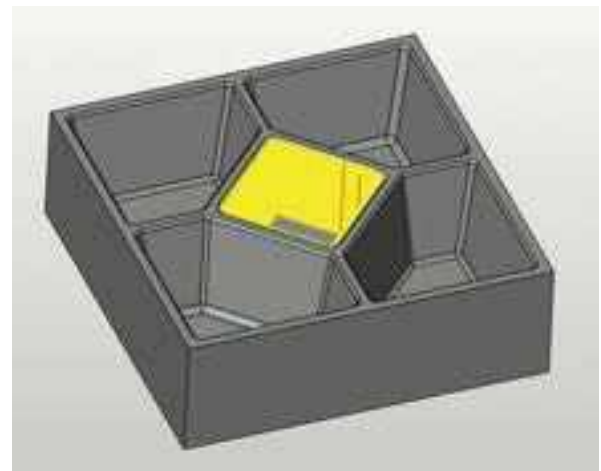
12mm Ø R3 conical barrel tool with 250mm flute radius

Spindle speed – 7,958 rpm

Feedrate – 2,984 mm/min

2 minutes 11 seconds for each pocket

**4 pockets machined in 8 minutes 46 seconds**



## Ballnose

6mm Ø ballnose

Spindle speed – 10,610 rpm

Feedrate – 2,122 mm/min

1 x middle pocket only

**1 pocket machined in 9 minutes 24 seconds**



Effective radius  $R_w$

Respective step down  $a_p$  (arc segments)

Radius  $r$

### Eliminator versus ballnose

Eliminator's large radius of curvature ( $R_w$ ) gives an increased contact area making it possible to realise larger step down distances without any detrimental impact on the theoretical scallop height.

The result is highly accurate surfaces with excellent characteristics and finishes that can eliminate the need for polishing and other time consuming finishing techniques.

# Transforming

## finishing and semi-finishing strategies

Quickgrind's Eliminator barrel tools are revolutionising finishing and semi-finishing strategies on a wide range of components in motor racing to mould and die, and aerospace to medical, including turbine blades and blisks.

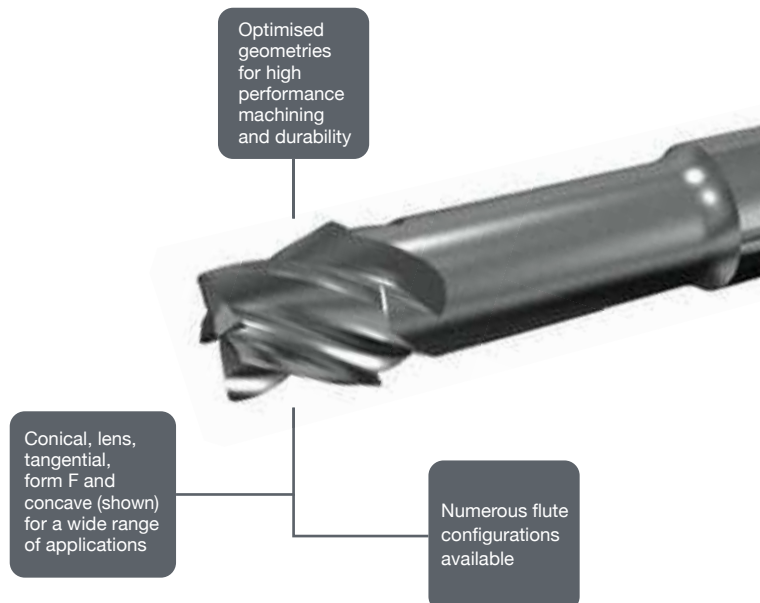
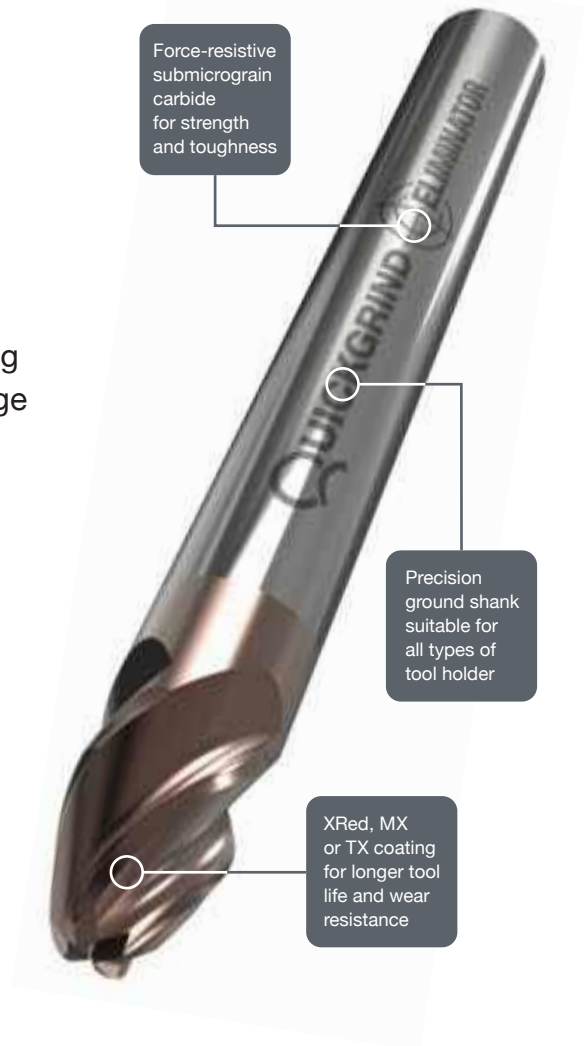
By implementing highly efficient machining processes we are able to realise substantial gains from effective cost reductions per part, by as much as 25% or more, to free-up valuable machine hours. Machine times are a costly element in all production processes and cycle time reductions of 25% are hard to achieve and limited to the machine's capabilities. By using our Eliminator range to greatly reduce finishing process times these savings become a reality.

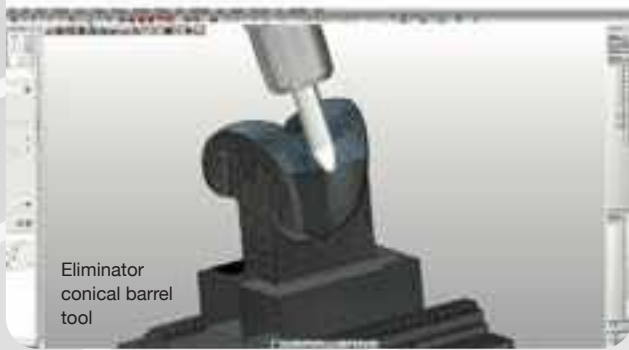
### Applications

- Replaces scanning with ballnose and corner radius endmills
- Highly efficient finishing and semi-finishing
- Profiling, flanks and steep walls
- Mill faces and blends with one tool
- Machining steep or flat planes
- Faces with minimal curvature

### Benefits

- Up to 90% cycle time reduction achievable
- Increased ap (step down) – greatly reduced machining time
- Smaller cusp (scallop) height
- Tool path distance greatly reduced – better for your machine
- Two-in-one tool – side cutting and ballnose cutting
- Low Ra finish
- Reduced effects of thermal deformation (heat transfer)
- Long tool life
- Suitable for sharpening and recoating multiple times with our QuickEdge programme





Eliminator conical barrel tool



Eliminator concave barrel tool

- Reduce or eliminate 5 axis grinding, manual finishing and polishing times
- Reduce machining time by more than 30%
- Multi-axis machining strategies



Cycle time down **60%**

### Comparative performance

Eliminator R80 4 flute barrel tool		R4 2 flute ballnose end mill
Vc	103 m/min	68 m/min
Step down	0.58mm	0.103mm
Cycle time	19 mins	47 mins

In partnership with 5X Technologies



High Technology Lollipop Cutters



Orbis lollipops work extremely well and Quickgrind's service is second to none. The fact that they will make the tools to any design is a great help when programming parts. The flexibility in Quickgrind's manufacture process enabled us to create the exact lollipop cutter for our medical application.

*Mihail Seckie, Takumi Precision Engineering*

# A new standard for complex components

Quickgrind's Orbis high technology lollipop cutters are designed for multiple applications in virtually all materials from aluminium to peek, stainless steel to titanium and others.

Lollipop tools are often only used for undercuts and de-burring. Orbis is setting new standards of unrivalled high performance and surface finish in applications and component features that have previously caused many issues.



## Applications and benefits

- Spherical cutting in all directions
- Sphere angle only limited by neck diameter
- Huge options of neck reach and diameter
- Multiple flute numbers
- Uncoated and coated
- High speed cutting HSC
- Machine manifolds and ports
- Helical interpolation
- Milling of complex thin walled components
- Machining contour shapes





The quality of Quickgrind's tools and their speed of delivery is truly world class. We specify tolerances such as  $\pm 10\mu\text{m}$  on diameter and form and other suppliers are not able to compete. We are able to spend less time chasing tooling suppliers and worrying about accuracy issues, and more time focussing on what we do best.

# Innovation

with precision

Available with 2 to 20 flutes and in a choice of diameter, reach and overall length Orbis lollipop cutters are ideal for 5-axis tube milling and machining contour shapes.

The tools featured have been designed with a reduced neck to give full access. They are suitable for fine finishing of irregular, uneven surfaces and can be specified with material-specific geometries and coatings (see previous page) for aluminium, titanium/high temperature alloys, steels, stainless steels and plastic for example.

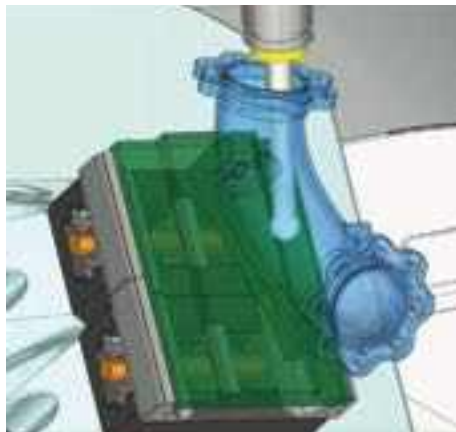
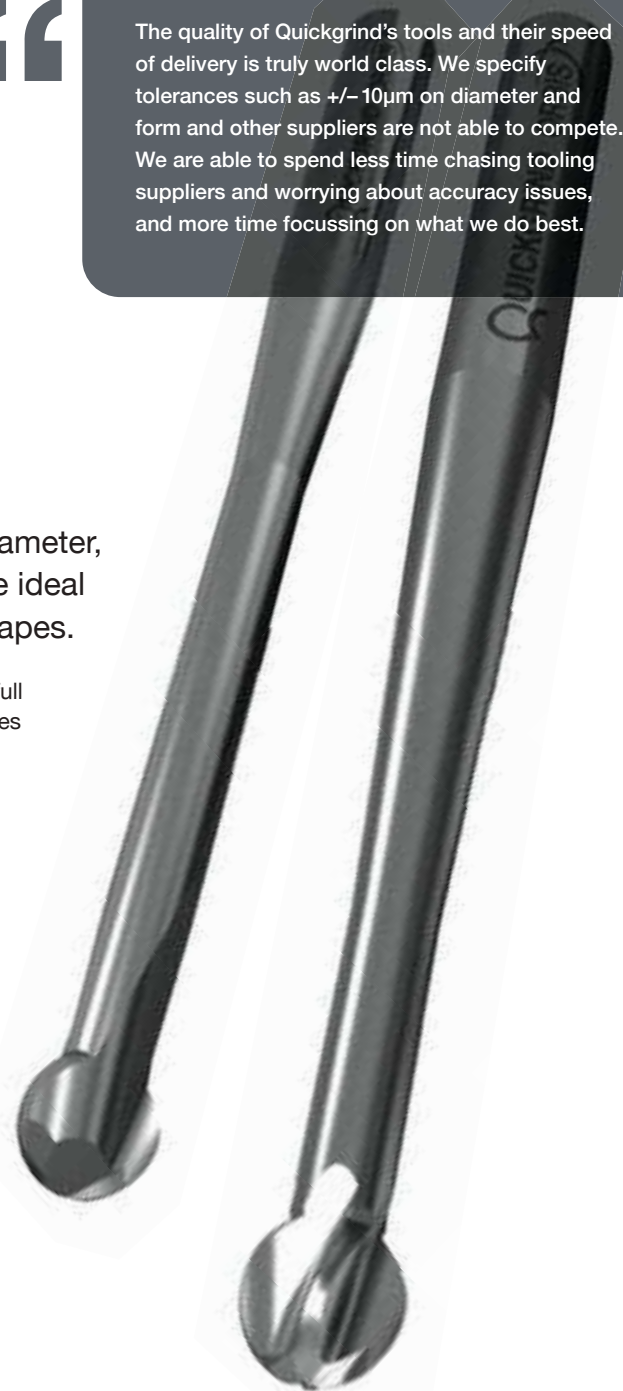


Image: 5X Technologies



Scan the QR code to see how we achieved an 80% cycle time saving on this part



## Automotive manifold

### Component information

- Material: T6511 tempered aluminium alloy
- Tool: 16mm 3 flute Orbis lollipop cutter
- Speed: 12,870rpm
- Feed rate: 4,280mm/min
- Depth of cut: 3.00mm
- Total cycle time: 2 hours 13 minutes for complete part

### Key benefits

- One operation machining from both sides
- Simplify machining of complex, hard to reach features
- Unlock pioneering tube milling strategies
- Dramatically reduce cycle times

# Unique geometries

## for lower cutting forces

The precision ground end geometry of our high feed ranges allows for highly efficient chip removal at high feed rates.

The strategy involves using shallow depth of cut (ap) to produce a small average chip thickness to eliminate vibration and tool deflection. This is compensated by utilising high feed rates resulting in greatly reduced cycle times, by up to 60% in some cases.

The tools lend themselves to roughing and semi-finishing operations in deep and shallow pockets and are designed with cutting geometries to suit a wide range of materials.

Available from 2.00mm to 32.00mm diameter in numerous lengths from stub to extra long.

Force-resistant submicrograin carbide for strength and toughness

DIN or other shank standards as required

Neck relieved to overcome reach issues – stub to extra long options

Unique end geometries – 2 flutes and more

### Applications

- Rough machining operations such as slotting, pocket milling and contour machining
- Pocketing with high length over diameter ratios and intricate features
- Consider these tools where the use of small diameter, long series and extra long end mills is fraught with danger
- Plunge milling and helical ramping
- Stainless steels, duplex, super duplex, Inconel, titanium, PH materials, tool steels, cast iron and hardened steels
- Ideal for extended reach in deep cavities

### Benefits

- Unique edge geometry lowers cutting forces
- Strong, stable and efficient machining
- Coating aids chip flow with high wear-resistance



# High feed, high ROI

This solid carbide coated high feed tool was initially developed with 3 flutes to machine deep pockets for a UK-based F1 team.

Due to its success Spectre has also now been produced with 5 flutes. As with all high feed tools the large radii enables excellent stability when roughing at high feed rates. The combination of our unique geometry, small depth of cut and high feed means clients realise a very good return on investment. Cycle times are reduced resulting in greatly improved production throughput.

We encourage our clients to tell us what their issues, aims and future expectations are and through our Infinite Possibilities® programme we then develop the optimised tools and cutting strategies for their production.



Neck lengths to suit your application

Coating options to improve chip flow and wear resistance



Available in 2.00 to 32.00mm Ø and numerous lengths

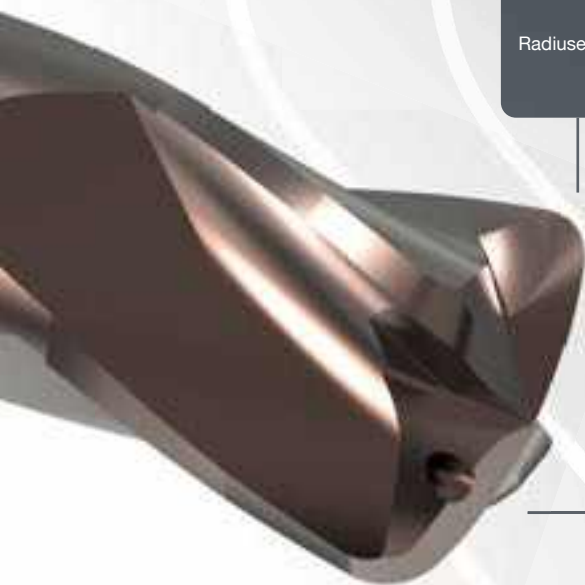
Example: 2.00mm Ø with 80.00mm reach

# Four flutes, extended life

“Phantom is a 4 flute that performs like a 16 flute” – so said one satisfied client. A development of our Spectre the Phantom is a lens type tool that has been designed to be remanufactured many times.

Phantoms achieve 5-6x tool life over normal end mills in roughing operations and have become firm favourites in motorsport and aerospace, where they are used to machine titanium and stainless steel. Through-coolant versions blast away chips and can last three to four times longer than non-through-coolant tools.

A relatively small depth of cut at high feed delivers great advantages to engineers and programmers. Join them and talk to us about your applications today – by working together we can provide you with optimised tools and programming data to satisfy your production aims and ambitions.



Radiused end



Diameters from 2.00 to 32.00mm

Designed to be remanufactured multiple times



Through-coolant options

Applications	Benefits
<ul style="list-style-type: none"> <li>• Contour machining</li> <li>• Slotting</li> <li>• Pocket milling</li> <li>• Plunge milling</li> <li>• Helical ramping</li> </ul>	<ul style="list-style-type: none"> <li>• Low cutting forces</li> <li>• Coating aids chip flow</li> <li>• Ideal for extended reach in deep cavities</li> <li>• QuickEdge compatible – remanufacturable</li> </ul>



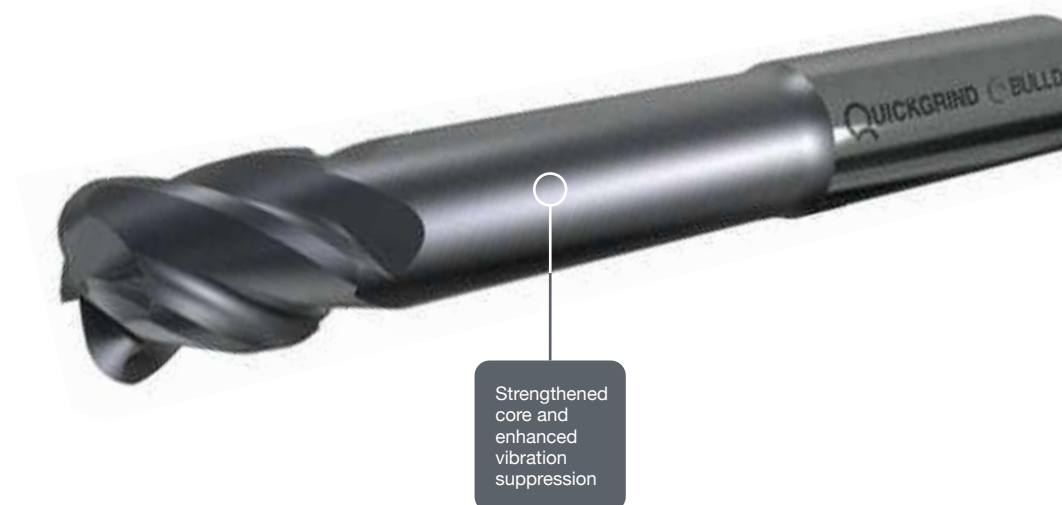


# The very best of **British**

The superior mould and die tool, Bulldog is available in an almost infinite choice of size, diameter, radius and reach. This state-of-the-art masterpiece produces exceptional results with significant productivity increases and reduced production costs.

Specially designed to reduce vibration under heavy cutting conditions and with high volume metal removal (HV-MRR), Bulldog is ideal for operations such as deep pocketing and slotting in difficult to machine materials without push-off as found with inferior tools.

- Higher speeds and feeds possible with increased productivity and high metal removal rates
- XRed and MX coatings aid chip flow and give high resistance to wear
- Developed to suppress vibration and harmonics with reduced machining forces and to give increased tool life
- Enhanced radii geometries ensure high stability during machining with enhanced chip flow
- Variable index design
- Strengthened core
- Ideal for roughing applications in mould and die steels
- Suitable for tool steels such as H11, H13, D2 and P20 and hardened alloys up to 62Hrc





# High feed, for hardened steels

Available in stub and short length in sizes from 2.00 to 12.00mm, and in LS (Long Series) versions from 66.00 to 100.00mm, this tool performs extremely well in hardened steels such as H13 and D2  $\geq 45\text{Hrc}$ .

A highly efficient roughing tool for producing pockets and cavities up to 1"/25mm deep, Reaper's 4 flutes and specially designed end geometry make it suitable for running at high speed and feed, taking shallow depths of cut.

The corner radii enable excellent chip thinning with rapid chip removal and long tool life. Reaper's end design also makes it suitable for flat bottom finishing.



Neck lengths to suit your application

Stub and short lengths in sizes from 2.00 to 12.00mm



LS (Long Series) version from 66.00mm to 100.00mm overall length



Neck relieved to overcome reach issues

Applications	Benefits
<ul style="list-style-type: none"> <li>• Slotting</li> <li>• Pocket milling</li> <li>• Plunge milling</li> <li>• Helical ramping</li> </ul>	<ul style="list-style-type: none"> <li>• Low cutting forces</li> <li>• Coating aids chip flow and wear resistance</li> <li>• Ideal for hardened steels</li> <li>• Long tool life</li> </ul>



# High feed

with excellent finish

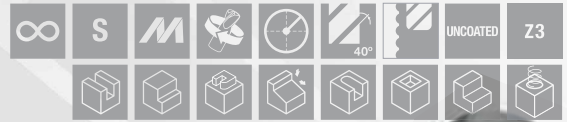
The Alligator range is designed for machining a wide range of non-ferrous materials such as aluminium alloys. Versions are available as standard in 2 flute, 3 flute, ball nose and 2 flute long reach for those difficult to access areas.

This is a well-proven, tried and tested design that has been used for many years on a huge range of components from aerospace and motorsport to mould and die parts.

- Optional TX-R coating for ultimate abrasion resistance and low co-efficient of friction
- Maintains sharp edges and also suitable for remanufacture and recoating
- Versions with surface thickness options of 0.5-2µm and micro hardness of >500Hv



Available with features and dimensions designed for your specific applications, including chip breakers, ball nose and through-coolant (not shown)



# The choice

## for 6000/7000 series aluminium

The Caiman is fast becoming the preferred tool when machining 6000 and 7000 series aluminium such as 6082 and 7075. Roughing and finishing at high speeds and feed rates are where this tool excels.

Combine this with trochoidal milling where 25% + width of cut (ae) and depth of cuts (ap) of 2-3xD are possible, this tool provides high MRR and excellent swarf evacuation resulting in very high tool life. When provided with our chip breaker flute form, full flute engagement of 3.5-4xD can be achieved resulting in high productivity and greatly reduced cycle times.

Optional neck relief for improved access

Optional TX-R coating (not shown - see page 71)

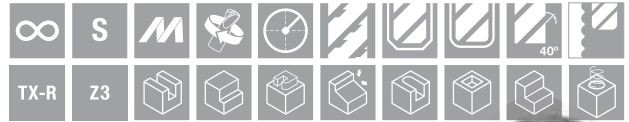
Optional chip breakers

### Applications

- Roughing
- Finishing
- Slotting
- Profiling
- HSM strategic milling
- Trochoidal milling
- Ramping

### Benefits

- Higher feeds and speeds
- Higher wear resistance
- Vibration suppression
- Increased material removal rates
- Efficient chip removal
- Low cutting forces
- Excellent finish



# Balanced 3 flutes

for high speed and trochoidal milling

QAlu is a high performance 3 flute solid carbide end mill designed with 3 teeth to centre for balanced HSM.

Open gullets within the geometry allow for ramping and plunging at higher feed rates while the TX-R coating and polished flutes enhance performance and finish. QAlu is excellent for roughing and finishing.

Designed with sharp corner geometry QAlu is ideal for machining square corners in manufactured parts.

The QAlu-R derivative is a high performance aluminium cutter with flat-crested-style geometry for enhanced performance in roughing applications. It can be used in conventional and trochoidal machining strategies with lower power requirements. It has variable index and helix and comes with TX-R coating.

QAlu-CR is a high performance 3 flute solid carbide end mill with corner radii for machining aluminium and non-ferrous materials. The special 3 flute geometry and TX-R coating enhances tool life and achieves excellent surface finishes.

- TX-R is a ta-C PVD Arc coating with a thickness of <math><0.5\mu\text{m}</math>
- Hardness HV 0.02 >5000
- Oxidation temperature 500°C
- Coefficient of friction <math><0.1</math>
- Process temperature below 180°C
- Very good, typically class 1 adhesion

Ramping and plunging at high feeds

Sharp corner edge geometry for clean cutting and finishing

Corner radii for machining aluminium and non-ferrous

Variable index and helix with TX-R coating (see page 71)



# Top flight performers

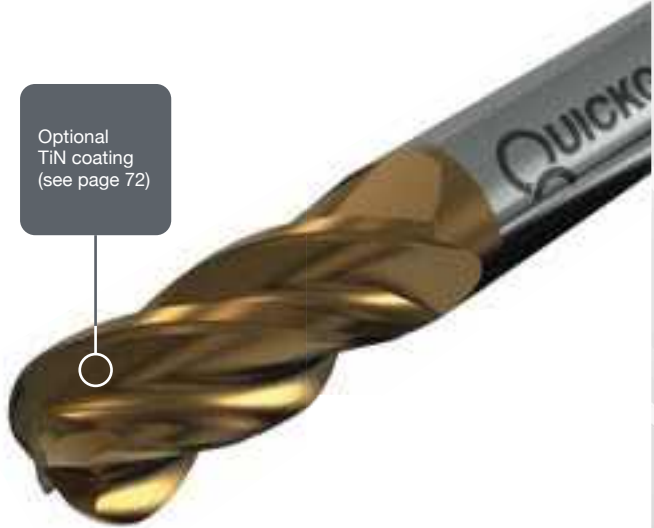
Designed for multiple applications in a wide range of materials especially stainless steel, titanium and super alloys, Mirage end mills provide unrivalled high performance. Delta, its three flute counterpart, also has extended reach as a normal feature.



### Features

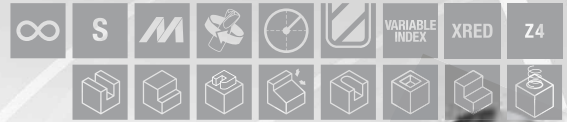
- True thoroughbreds, giving high performance to discerning buyers, engineers and programmers around the world
- Mirage options include 4, 5 or 6 flutes, stub and long flute, long series, chip breakers and through-coolant
- With any combination of edge preparation, radius or reduced neck to allow you to optimise your programming and machining without compromise
- Unrivalled performance on titanium, inconel, duplex or stainless steel
- Suitable for trochoidal milling with full flute engagement as much as 3xD
- Our chip breaker versions reduce swarf to small, manageable sizes
- Capable of being reground and recoated a number of times with our remanufacturing service – reducing your tool budget by as much as 40%

Optional TiN coating (see page 72)





High Performance Chipbreaker End Mills



# A cut above the rest

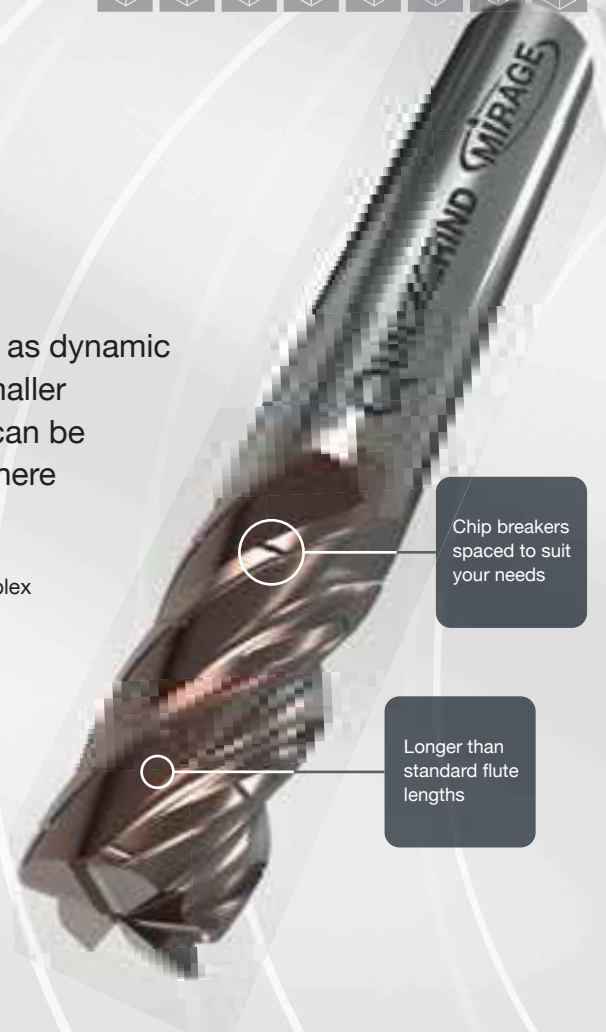
Ideal for trochoidal milling strategies (also known as dynamic milling, peeling cut and chip thinning) where a smaller chip is required, Quickgrind's chip breaker form can be produced on any of our tooling ranges, featured here on the Mirage.

Mirage chip breakers are ideally suited for machining stainless steels, duplex steels, titanium and other super alloys where a high MRR is required.

Trochoidal milling allows for full flute engagement with step overs (ae) of anything from 5% to 15% in super alloys/stainless steel. This strategy will produce long, thin swarf which can cause issues. In this case we recommend having chip breakers which will provide a more secure cutting action – this is especially helpful when you want to reduce your cycle time by machining to full depth in one pass rather than two or three.

This in turn will require a longer than standard flute length, and with our Infinite Possibilities® programme we can provide you with exactly the cutter you need.

For example you can have a 12mm diameter tool with 36.00mm or 40.00mm flute length rather than the usual 26.00mm.



Chip breakers spaced to suit your needs

Longer than standard flute lengths



Neck relieved to overcome reach issues

Applications	Benefits
<ul style="list-style-type: none"> <li>• Roughing</li> <li>• Finishing</li> <li>• Slotting</li> <li>• Profiling</li> <li>• HSM strategic milling</li> <li>• HSC strategic milling</li> <li>• Trochoidal milling</li> </ul>	<ul style="list-style-type: none"> <li>• Higher feeds &amp; speeds</li> <li>• Higher wear resistance</li> <li>• Vibration suppression</li> <li>• Increased material removal rates</li> <li>• Better swarf/chip management</li> </ul>



# Any length you need

Some components will have features that require a non-standard tool, such as a greater overall length, an extended neck or a smaller diameter to overcome upstands and other obstacles, or to reach the bottom of a side wall or pocket.

Rather than reverting to modular tool holding or even special tool holders, talk to us and together we will design the optimal tool for your work. If you are worried this will incur high costs and long deliveries, our Infinite Possibilities® programme is here to provide you with exactly the tool you need at little more than a standard tool price and on a short delivery time.



Relieved diameter with radial runout to shank provides added strength

Short flutes for stability and increased rigidity

Long reach – no need for extension holders

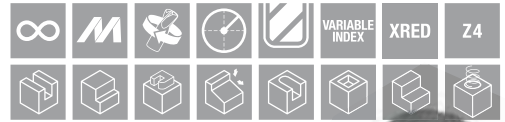
Small diameter to get past obstacles and reach pocket floors/walls

Applications	Benefits
<ul style="list-style-type: none"> <li>• Roughing &amp; finishing</li> <li>• Slotting</li> <li>• Profiling</li> <li>• HSM strategic milling</li> <li>• HSC strategic milling</li> <li>• Trochoidal milling</li> </ul>	<ul style="list-style-type: none"> <li>• Higher feeds &amp; speeds</li> <li>• Higher wear resistance</li> <li>• Vibration suppression</li> <li>• Increased material removal rates</li> </ul>





High Performance End Mills



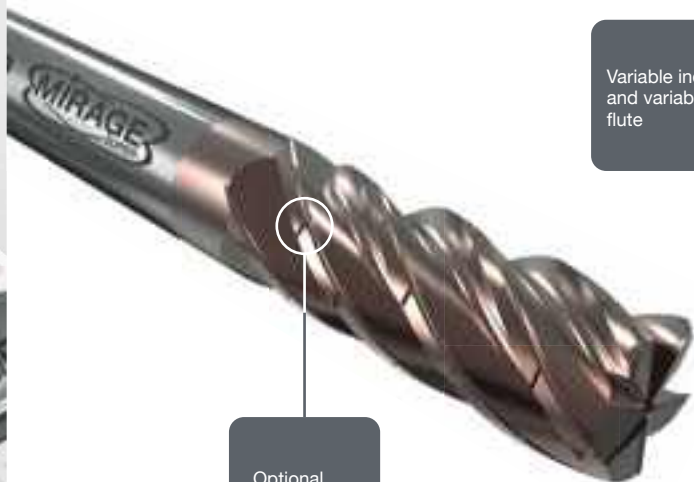
# Tougher by design

Introducing the new Mirage Super, for when your applications demand something out of the ordinary.

At Quickgrind we never stand still, always looking to offer more to our clients. Through clever design, experience and by using the latest grade of carbide and coating this tool takes our Mirage to new heights of performance, helping you to achieve your aims for critical parts in super alloys.

With our new Super we have used the toughest substrate with a high wear resistant coating and polished flutes, together with a balancing option.

Don't forget, as part of our Infinite Possibilities® programme we will work with you to develop the right tools for your applications.



Optional chip breakers

Variable index and variable flute



XRed SL coating

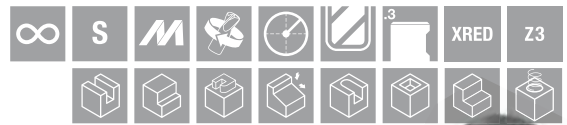
High resistance to wear

4, 5 or 6 flute with choice of radii, chamfer or square end





High Performance 3 Flute End Mills



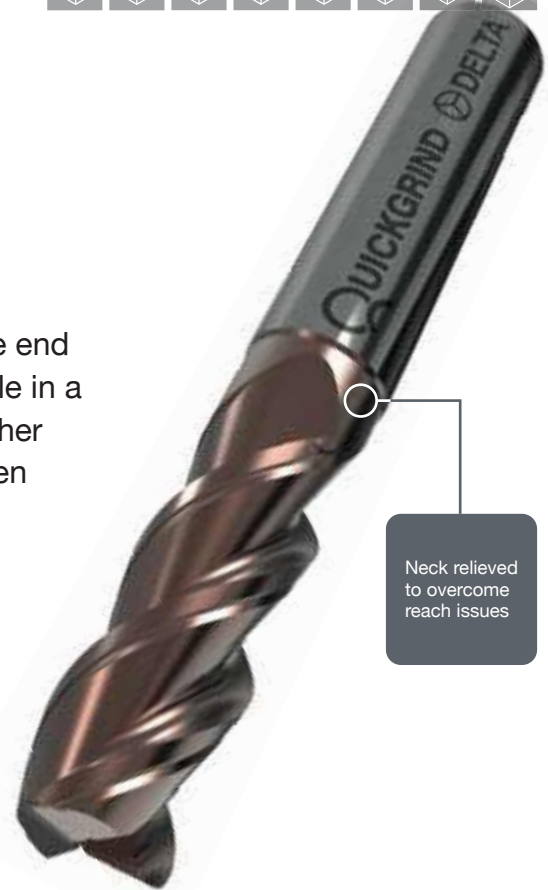
# Three can be better than four

Certain applications benefit from a high performance end mill that has three flutes. Often normally only available in a general design and for non-ferrous materials from other manufacturers, our Delta range fits the bill nicely when machining super alloys.

A very capable tool, Delta is designed to work in a wide range of component materials. The additional feature of extended reach increases the versatility of the tool. It is ideal for aggressive slotting, pocketing and ramping due to increased chip clearance and reduced harmonics.

When considering which tool to use, understanding the pros and cons of the number of flutes should be taken into consideration. The higher number of flutes generally allows a higher feed rate per tooth, but a high flute count means a larger core and smaller flute depth.

For example a three flute tool has a smaller core and larger flute space than an eight flute tool, providing more room for the chips to be ejected. Operations such as slotting and horizontal milling on driven tooling benefit from this tool.



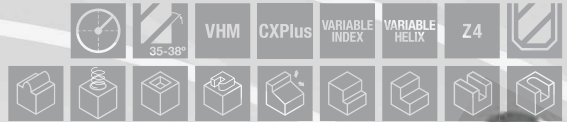
Neck relieved to overcome reach issues



Optional Weldon or whistle notch shank



Extra long for super-extended reach



# A quantum leap in MRR and tool life

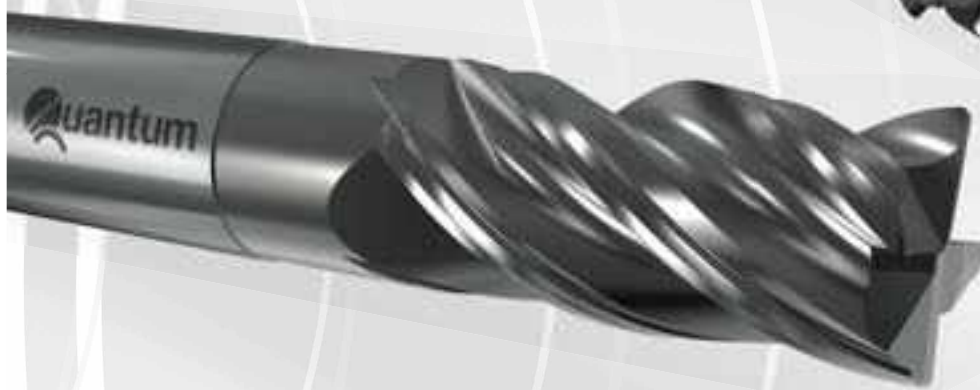
Quantum is a new HPC solid carbide end mill designed for a wide range of applications in all materials.

It can be used for both conventional machining or more modern machining methods such as dynamic or trochoidal milling.

With the aid of modern CAD/CAM software Quantum will perform under all types of cutting conditions. Its unique carbide recipe makes it the go-to tool for all types of machine shop, while Quickgrind's new coating technology is delivering hugely improved results in both MRR and tool life.



CXPlus coating for wet and dry machining at medium to high speeds



Neck relieved to overcome reach issues





# Two tools in one

QVari is high performance 4 flute carbide end mill with variable helix and index design, suitable for both roughing and finishing, where applicable, with one tool.

The XRed coating is designed for a wide range of materials including steels, stainless steels, titanium and exotic alloys. QVari can be used in both conventional and trochoidal machining strategies.

This tool is also available in the QVari-LR (Long Reach) format for long reach applications.

QVari-CR (Corner Radius) can be used in both conventional and trochoidal machining strategies, while the variable corner radius sizes make it very popular within the aerospace industry, or other applications when there is a corner radius requirement.



XRed coating for steels, stainless and exotics

Suitable for roughing and finishing



LR (long reach) version for improved access



CR version with variable corner radius



**QVari-5 | QVari-5CR | QVari-7**

High Performance End Mills



# High feed rates with reduced vibration

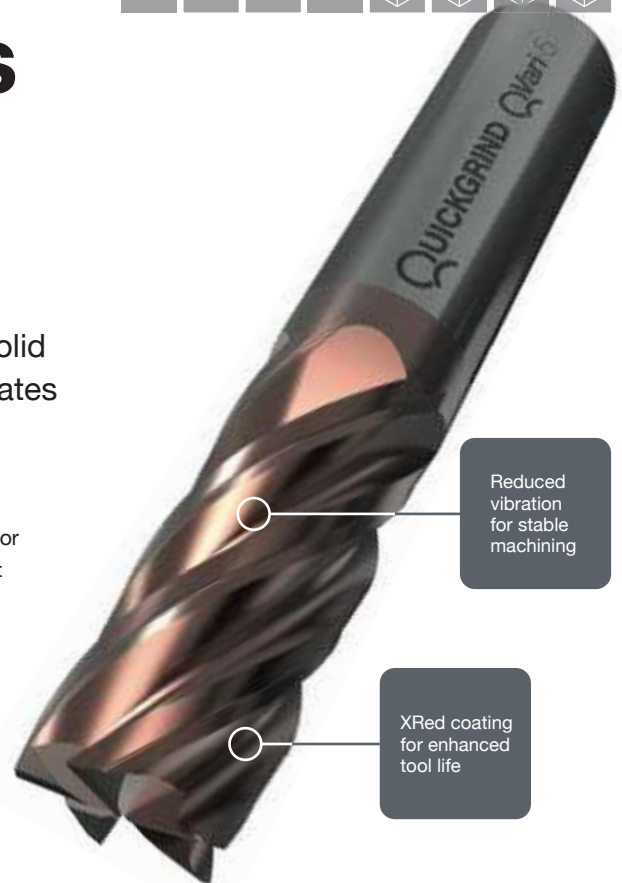
QVari-5 is a high performance 5 flute variable solid carbide end mill designed to enable high feed rates with reduced vibration for stable machining. QVari-5CR is our optional corner radii cutter.

The XRed coating enhances tool life and makes this tool very suitable for steels, stainless steel, titanium and super alloys. QVari-5 is an excellent tool for applying trochoidal machining strategies.

QVari-7 is a high performance multi-flute end mill especially suited for trochoidal milling in stainless steels, PH-stainless, titanium and other HRSA materials.

High feed rates with low width of cut and full flute engagement results in high MRR. With high core strength this tool provides highly stable cutting in many applications.

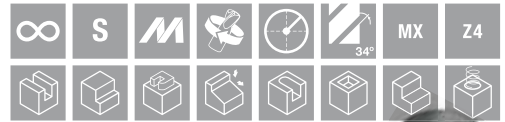
QVari-7 comes with chip breakers as standard for excellent swarf management.



Square corner shown – QVari-5CR features corner radii

Corner radii





# Extended reach

reduced costs

QPlus2 is a performance tool for many general machine shop operations and applications. An excellent go-to tool with the benefit of extra flute lengths above the standard.

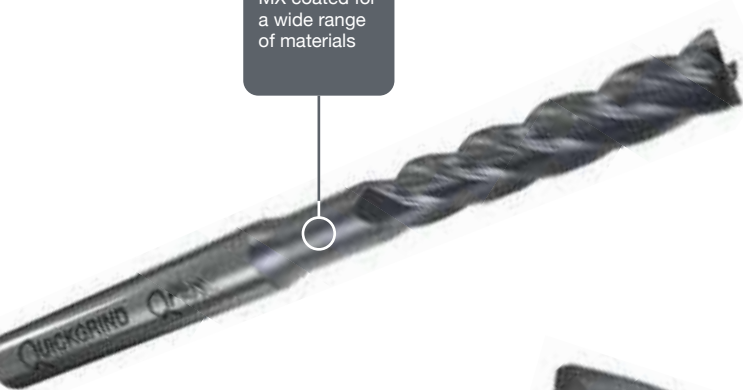
Designed with sharp corner geometry this tool is very useful when looking to achieve square corners in manufactured parts.

The QPlus2-LS (Long Series) 4 flute universal carbide end mill with MX coating is suitable for steels, cast irons and some stainless steels.



Unique recipe of base material and geometry

MX coating for excellent wear resistance



MX coated for a wide range of materials

Long Series for extended reach

Sharp corner edge geometry for clean cutting and finishing





# Chamfer and more

in all materials

QChamfer can be used for many machining operations from chamfering to bevelling, deburring, spotting and countersinking.

Our Infinite Possibilities® programme means we can adapt this tool to suit your operation. Consider QChamfer for deburring the component while still on the machine to reduce manual deburring.

Our standard QChamfer has a 90° inclusive point angle and comes with our CXPlus coating which is recommended for applications in low/high tensile steels, cast irons, tool steels, stainless steels, titanium and nickel alloys.



CXPlus coating on our standard Chamfer (see page 73)



Chamfering of holes and along edges

Optional MX coating (see page 69)

Chamfer, bevel, deburr, spot and countersink



90° inclusive point angle



# The strong finisher

The Demon multi-flute end mill will provide you with unrivalled high performance.

With a choice of 6 or 8 flutes Demon is designed for super-fine finishing applications in a wide range of components and materials, our unique geometry is the precise recipe to ensure highly accurate machining of any surface requiring a superb finish.

Ideal for profile milling in steels and hardened steels up to 55 Hrc, the Demon's higher speeds and feeds rates deliver increased productivity and high material removal rates.

- Latest MX PVD coating developed specifically for aggressive machining conditions in steels and cast iron
  - Maintains sharp edges and also suitable for remanufacture and recoating
  - HV hardness 3300, 2-4µ thickness, <0.6 coefficient of friction PVD AlTiN and micro hardness of >500Hv
- See page 69

DIN or other shank standards as required

Force-resistive submicrograin carbide for strength and toughness

A choice of 6 or 8 flutes

TiN coating for low and medium cutting speeds in a wide range of applications (see page 72)

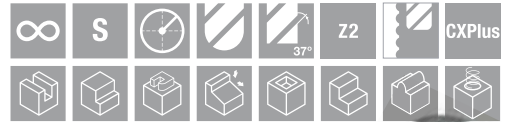
Neck relieved to overcome reach issues





## RIBCUTTER

High Performance Rib-Type Ball Nose End Mills



# Reaches the parts...

Our Ribcutter ball nose end mills are designed to overcome a multitude of production issues where small diameter tools are required.

As parts become smaller and more intricate and the finest finishes are called for, these tools hit the spot every time.

Solid carbide and coated with our unique CXPlus coating they are ideally suited for use in aluminium, titanium and stainless steels.

Ribcutter is available ex-stock or on a short delivery. Other sizes are available as part of our Infinite Possibilities® range.



CXPlus coating for smooth operations and extended tool life



Neck relief for improved access



Sizes from 0.30mm Ø (1.00mm Ø shown)

# Winning in hardened steels

Our new Warrior 2 flute ball nose has been honed through experience by our R&D experts. The recipe of submicrograin solid carbide substrate and specially developed coating deliver excellent tool life in hardened tool steels and Inconels.



Taper and neck relief versions available

New multi-layer XTF coating (see page 74)



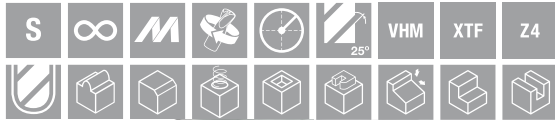


**NEW SAMURAI**

High Performance Ball Nose End Mills

# Killer performance

When the application demands four flutes, our exciting new Samurai is more than a match for those demanding situations. Superior submicrograin solid carbide and newly developed coating results in excellent tool life in the most complex components.



For the most difficult components and materials

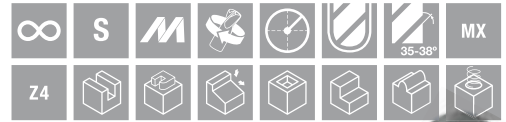
Superior submicrograin solid carbide

Multiflute options available

New multi-layer XTF coating



High Performance Ball Nose End Mills



# Unique geometry for most applications

The QBall 4 flute universal carbide ball nose with MX coating is suitable for a wide range of materials, from steels through to exotic alloys. Its unique geometry makes this tool suitable for most applications.



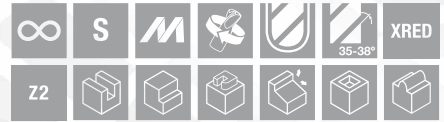
- Latest MX PVD coating developed specifically for aggressive machining conditions in steels and cast iron
- Maintains sharp edges and is also suitable for remanufacture and re-coating
- HV hardness 3300, 2-4 $\mu$  thickness, <0.6 coefficient of friction PVD AlTiN and micro hardness of >500Hv



Radial runout provides added strength



High Performance Ball Nose End Mills



# A real winner

This world beating 2 flute ball nose cutter is used to great effect in mould and die, general engineering and on components such as turbine blades.

Whether used with a 90° or 10-15° tilt approach Gladiator is a stable and accurate tool allowing for high speed cutting and machining. It is suitable for roughing, semi-finishing, finishing and super-finishing with profile, copy or contour milling. We encourage our clients to tell us what their issues, aims and future expectations are and through our Infinite Possibilities® programme then develop the optimised tools and cutting strategies for their production.



Coating options to aid chip flow and resist wear



Flute lengths to suit your applications

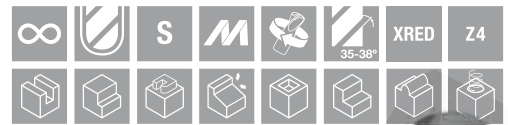
Relieved diameter with radial runout to shank provides added strength

Micro ball nose with taper neck for added strength

From stub length to long series or extra long



High Performance Ball Nose End Mills



# A stellar performer

The Zodiac is based on our exceptional Mirage end mill and brings a new dimension to ball nose end milling.

Four flutes provide for highly efficient swarf evacuation and enable high speed and feed machining with great stability. Whether contour milling or profiling this tool excels at roughing, semi-finishing, finishing and super-finishing in a wide range of materials.

As part of the Infinite Possibilities® programme we can design the optimum tool for your applications. This can be stub length, long reach with short flutes, neck relieved and with any flute number to give you the best performance with repeatable quality, ensuring high productivity and reduced cycle times.




## Applications

- Contour milling
- Profiling
- Roughing
- Semi-finishing
- Finishing
- Super-finishing

## Benefits

- Higher feeds and speeds
- Great stability
- Highly efficient swarf evacuation
- Supreme wear-resistant coatings



 **ALLIGATOR DUO Ball Nose**  
High Performance Ball Nose End Mills



# A ball nose with bite

The Alligator ball nose is part of our successful Alligator end mill range and provides exceptional performance in most non-ferrous materials including aluminium and aluminium alloys.

Copy milling, contour milling and profile milling are all strategies these tools cope well with, providing a high degree of swarf removal and tool wear resistance. They are available with 2 or 3 flutes and to any overall, flute or neck length you require. They can be left uncoated for most applications or with our TX coating for more testing materials.



Relieved diameter with radial runout to shank provides added strength




Uncoated for most applications

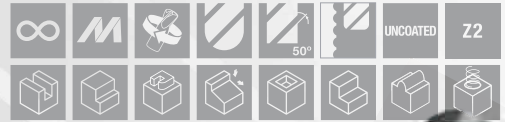


2 or 3 flutes and any overall, flute or neck length

<p><b>Applications</b></p> <ul style="list-style-type: none"> <li>• Copy milling</li> <li>• Contour milling</li> <li>• Profile milling</li> </ul>	<p><b>Benefits</b></p> <ul style="list-style-type: none"> <li>• Higher wear resistance</li> <li>• Increased swarf removal rates</li> </ul>
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 **ALLIGATOR** Ball Nose  
High Performance Ball Nose End Mills



# Deep pockets

## short flutes

In mould and die components, pockets with deep side walls can cause headaches. Our Alligator ball nose parallel cutter with taper neck gives hard working engineers and programmers much needed relief.

Machining angled side walls is a common issue which is why we developed this tool, with short flute lengths and tapered necks to give adequate clearance when profile machining cavities.

Other industries also benefit from this type of tool due to the ever increasing demand for complex parts requiring angled walls, which are pushing the boundaries of feasibility for straight reach tools. A tapered reach tool brings many advantages due to the increased cross-section strength.

A tapered tool of 3-5° will give 60-70% less deflection than a straight tool, resulting in less chatter, a far better surface finish and greatly improved tool life.

Force-resistive submicrograin carbide for strength and toughness

Increased cross-section equals less deflection and a stronger tool

Tapered for angled walls and deep pockets

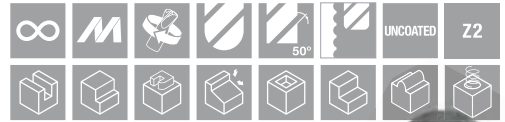
Short flutes for optimum access

Relieved diameter with radial runout to shank provides added strength

Uncoated for most applications







# High stability

minimal deflection

Our Turbomills are designed for harder cutting materials and for high feed applications, as an alternative to standard milling strategies.

They offer greater lateral stability, with the specification of the taper and tip size being an important factor in minimising deflection. This makes the Turbomill better than traditional taper tool designs for three dimensional milling.

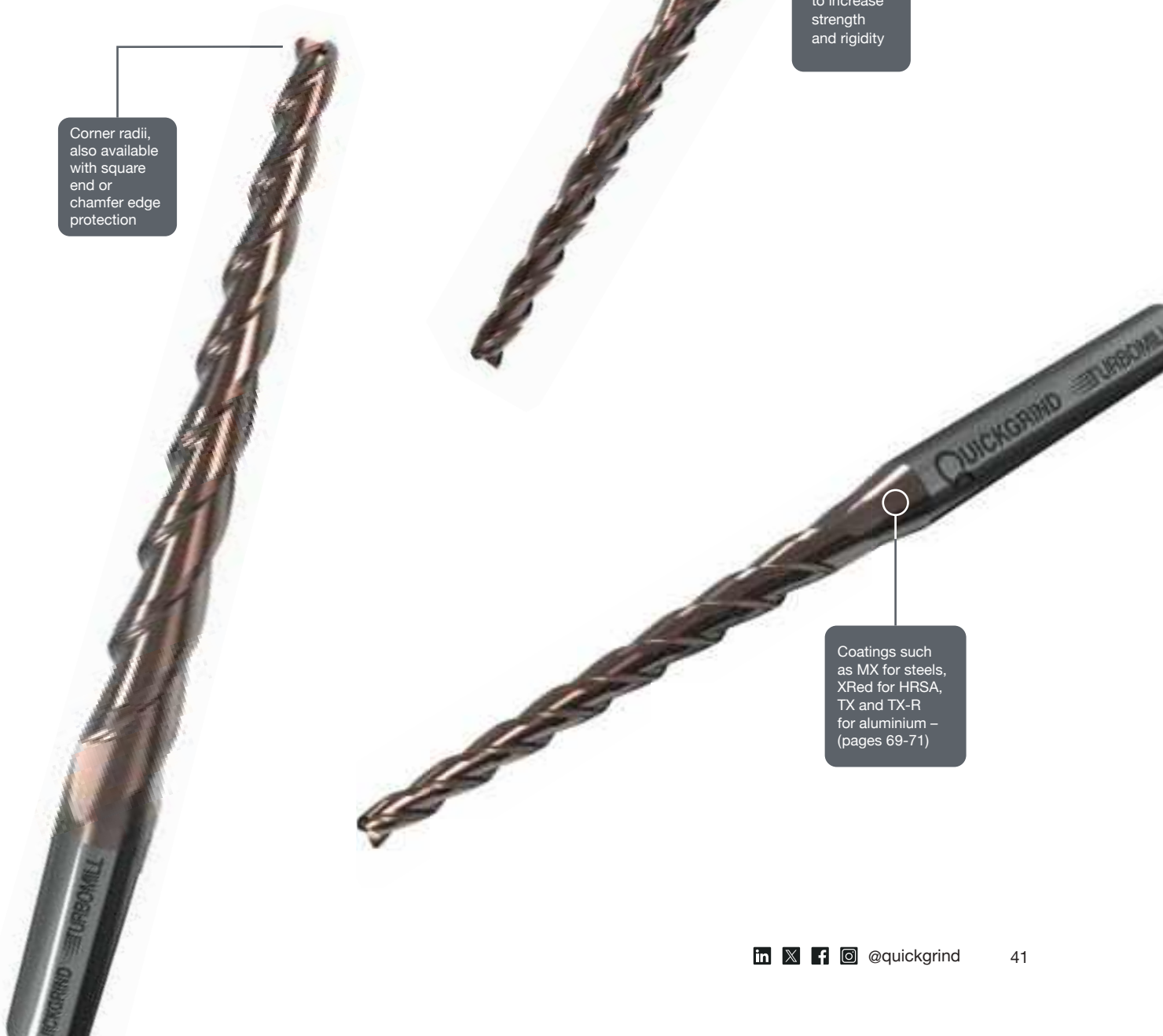
Where other methods can cause issues with chip evacuation, using Quickgrind Turbomills in high feed results in cleaner, more consistent cutting.

DIN or other shank standards as required

Taper neck to increase strength and rigidity

Corner radii, also available with square end or chamfer edge protection

Coatings such as MX for steels, XRed for HRSA, TX and TX-R for aluminium – (pages 69-71)





**TYPHOON**

High Performance Solid Carbide Taper End Mills

UNCOATED	XRED	MX	TX-R	CXPlus	Z2	Z3	Z4			

# Ultimate

high performance

Quickgrind is the UK's largest producer of taper tooling. Experience the ultimate in high performance tooling with these extremely efficient, tried and tested taper end mills.

Typhoon taper tools are one of our biggest selling ranges and are supplied to our clients throughout the world. Their main use is the machining of flat tapered walls where they produce better and more consistent finishes, without the witness marks caused when using multiple passes with other end mills. Aerospace components such as turbine blades are also an area which benefits from our taper flute end mills.

Typhoon taper tools are divided into two categories – ball nose and square end.

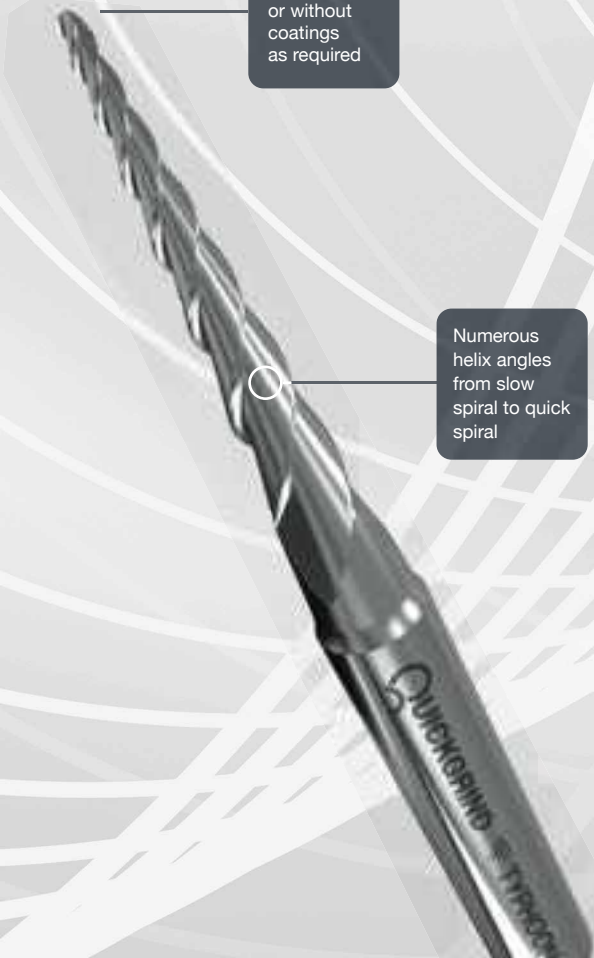
DIN or other shank standards as required

Cutting geometries and helix angles to suit your applications


Ballnose versions with or without coatings as required

Numerous helix angles from slow spiral to quick spiral

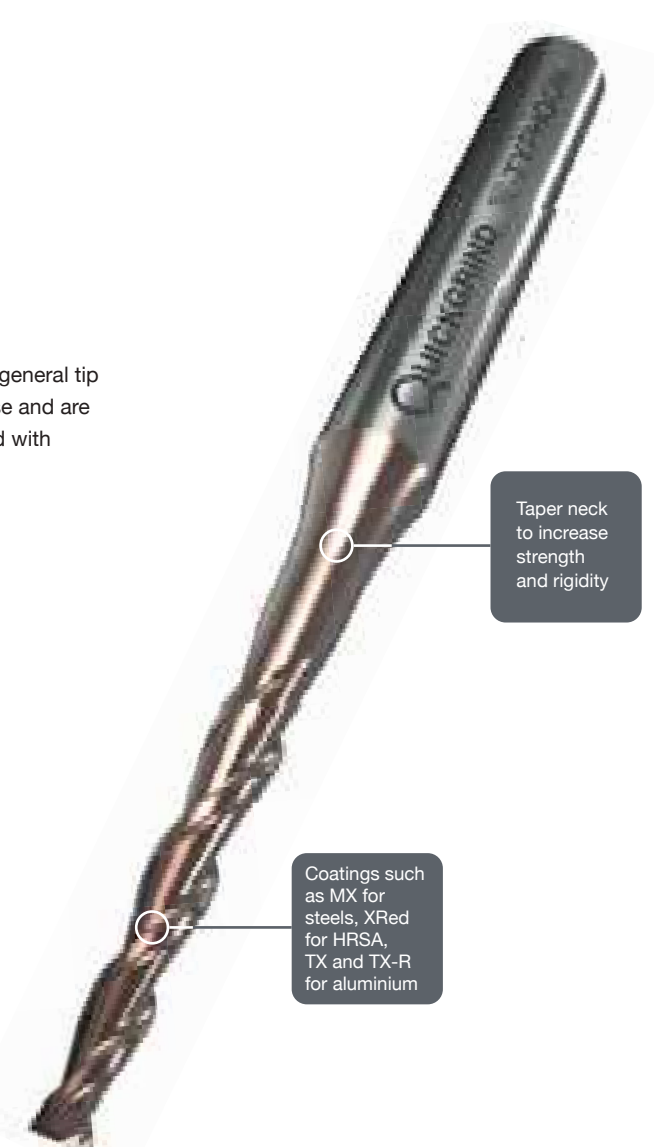
Application specific helix angle and flute geometries



There is virtually no limit to what size and taper we can produce. In general tip diameters range from 1.00mm to 12.00mm in square end or ballnose and are available with 2, 3, 4 or more flutes. Typhoon's can also be specified with chip breakers.



Square end, also available with corner radii or chamfer edge protection



Taper neck to increase strength and rigidity



Coatings such as MX for steels, XRed for HRSA, TX and TX-R for aluminium

## Features and benefits

- Force resistive micrograin carbide
- Superior coatings to aid chip flow and give high wear resistance
- Enhanced end and radii geometry
- Strengthened core
- Square-end and ballnose versions
- Tapers from 0.5° to 45°
- Available with plain and Weldon shanks
- Geometry ensures high stability during machining with enhanced chip flow
- Higher speeds and feeds possible with increased productivity and high metal removal rates
- Suitable for regrinding and recoating up to 9 times with our QuickEdge remanufacturing process
- Overall length, flute length, neck length/diameter, and corner radii to your specification
- Developed to suppress vibration and harmonics with reduced machining forces and to give increased tool life



# Strength with durability

Hypermills were developed mainly for use in the mould and die industry but have since been an extremely useful tool for machinists and programmers in a variety of industries.

Capable of milling deep cavity profiles without the need for long series tool holders, we design the taper neck to have sufficient reach and taper to overcome the reach issues on your component.

The weakest part of some tools is the area between the taper and the shank but our Hypermills are produced with a radius blend to give added strength and durability. This is especially relevant on small and miniature end mills where long reach necks are required.

DIN or other shank standards as required

Tapered neck for strength and support

Micrograin solid carbide and a choice of coatings (MX shown)

Various edge preparations available

TiN coating

Hypermills are available with 2, 3, 4 or more flutes and with square-end or corner radius. Flute lengths are generally 1.5-2.5xD. Shanks are tapered for added rigidity, with fillet radii for further strength.

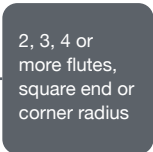
Geometry and coatings, where required, are designed into your tool for optimum performance.



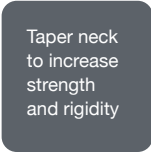
DIN or other shank standards as required



Radius blend for increased strength and durability



2, 3, 4 or more flutes, square end or corner radius



Taper neck to increase strength and rigidity



Additional tapering to improve access and strength



High Performance Solid Carbide Composite Cutters

TiN	CXPlus	Z2	Z3	Z4	Z5	Z6	Z7	Z8

# Conquering composites

Quickgrind has been at the forefront of developing and manufacturing tools for the high productivity trimming, milling, routing, drilling and reaming of composite materials for many years.

Take our Dagger drills, used for producing accurate holes without delamination as they exit the hole. For even finer tolerance work we also offer our Dagger drill/ream.

Working with our clients we have developed some of the most efficient tooling for difficult-to-machine composite materials including CFRP (carbon fibre reinforced polymers), glass epoxy laminates, sandwich materials, engineered plastics and wood, where common issues include delamination, fibre pull-out, abrasion and thermal distortion.

-  **Fusion-P** for polymers
-  **Fusion-M** for metals
-  **Fusion-C** for carbons



DIN or other shank standards as required

Neck length and diameter to suit application

Diamond cut



TX coating (see page 71)

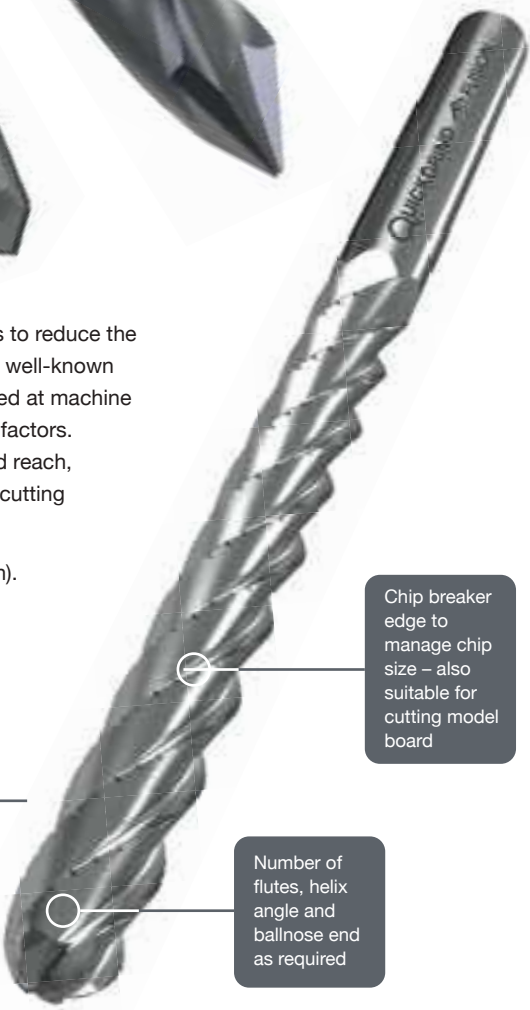
Amrita anti-vibration feature



## Dagger drills, drill/reamers

Our R&D team will analyse your manufacturing method and produce cutting tools to reduce the effects of vibration, heat, material build up and tool wear. When approached by a well-known aerospace manufacturer to improve the machining of glass epoxy board we looked at machine set up, stability of workpiece, spindle power and swarf extraction amongst other factors. Using the correct mix of carbide grade, cutting edge geometry, length of flute and reach, coating and by introducing our Amrita anti-vibration technology, the result was a cutting tool that reduced their cycle times by 40% and improved tool life by 60%.

Other options include through-tool air blast or MQL (minimum quantity lubrication).

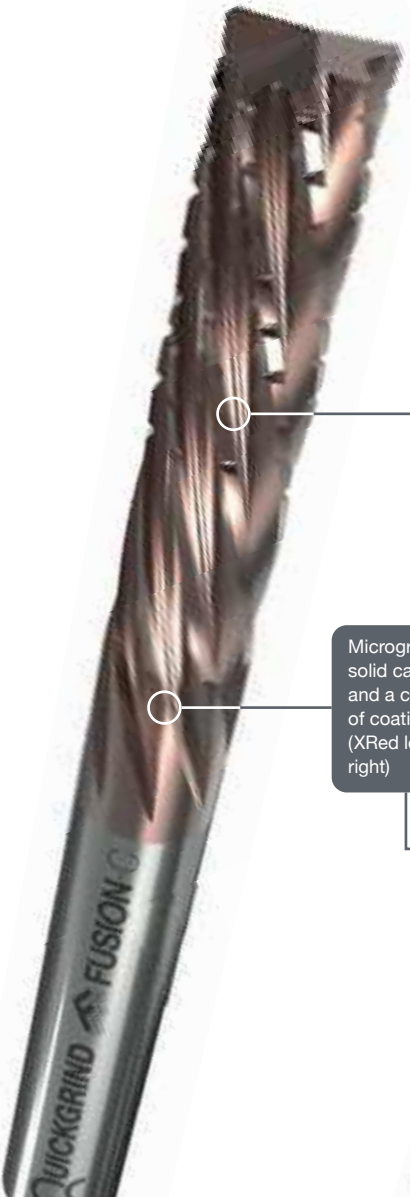


Chip breaker edge to manage chip size – also suitable for cutting model board

Number of flutes, helix angle and ballnose end as required

## 8 flute routers for sandwich material

## Model board cutters



Straight flutes, right hand helix or left hand helix

Micrograin solid carbide and a choice of coatings (XRed left, MX right)

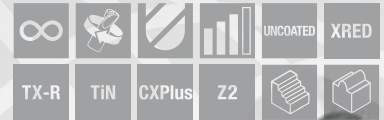


## Rippers





High Performance Solid Carbide Clay Cutters



# The clay cutting specialist

Rapier is a specialist range developed for the high productivity cutting of automotive modelling.

Using clay milling machines and our Rapier tools, clay modellers have been able to greatly reduce the time to produce the vehicle model by milling the clay closer to the desired depth ready for hand finishing.

Milling studio clay is not as simple as you may think. The clay is abrasive, sticks to tools and clogs in the flutes which can stall spindles.

When approached by a well known UK vehicle manufacturer our mission was to produce a cutting tool that would cope with all the above. This meant we needed the very sharpest relief to cleanly slice through the clay and a helix angle to spin the cut material clear from the tool and model. To cope with the hard wearing characteristics of the clay we also needed a hard wearing surface on the tool and found TiN coating to be the best with the added benefit of having a slippery surface which also aided in spinning the cut material clear away.

Previously the client had to change a tool every vehicle but our tools have lasted for five complete models without any problem. They also benefited by using our QuickEdge service which remanufactures the tools to 'as-good-as-new' many times.

The cost savings of the combination of the right tool design and remanufacture speak for themselves.

Available in single flute and twin flute designs in both ballnose and square end versions.

Sizes from 2.00mm to 20.00mm diameter with flute lengths and reach and overall lengths to help you achieve your desired result.

Balanced tools are also available if required.

Cylindrical shanks to DIN standards or other, and diameters as required

Application specific helix angle and flute geometries

Micrograin solid carbide and a choice of coatings (TiN shown)

2.00 to 20.00mm Ø with a choice of flute lengths and reach

Tapered shank for added strength and stability on small diameter tools





# High precision

with improved productivity

Developed especially for use in the LVT (Luxury Vinyl Tiles) industry Quickgrind's Sovereign blades are of the highest precision and manufactured to withstand the wear effect of various blends of material.

Our unique grinding techniques produce sharp and accurate geometries allowing for a very smooth cutting action and long tool life. Tough carbide grades deliver a high degree of stability resulting in fewer blade changes and greater productivity.

Bevel blades can be used in dual blade/bevel holders in conjunction with our cutting blades. Chamfer angles can be adapted to your own specifications.

**We will work with you to develop the right cutting and bevel blades to cope with the particular vinyl composition and depth of material you are working with.**



Tough carbide grades for high stability and fewer blade changes



Unique grinding techniques for sharp and accurate geometries





## UNDERCUTS

High Performance Solid Carbide Undercuts

					UNCOATED	XRED	MX
TX-R	CXPlus	Z2	Z3	Z4	Z5	Z6	Z8

# Undercutting with ease

Undercut tools (sometimes called recess tools or clip cutters) are designed to produce features that are below an overhang feature.

The tool's end diameter and thickness, shank recess diameter and length, plus the shank diameter and overall length, can be produced to overcome the difficulties inherent when machining undercuts. We design the number of flutes, flute geometry and coating, if required, to provide you with the optimised tool to enable you to achieve the most cost-effective components. The limitations are down to the physical requirements and machinability of the feature.

We will provide the tool with top and bottom radii if required plus the right number of teeth to allow for efficient cutting data to be used.

In some cases the undercut may require a lollipop-type cutter – please see our Orbis range on pages 12 and 13.



## DOVETAILS

High Performance Solid Carbide Dovetail Cutters



					UNCOATED
MX	TX-R	CXPlus	Z2	Z3	Z4

# Get into the groove

Dovetail cutters are used in a broad range of applications and can be specified with taper angle, top and bottom diameters to suit your operation.

They are typically used to produce dovetail O-ring grooves in fluid and pressure components as well as industrial slides.

The trapezoidal 'dovetail' shape makes it important to understand the correct selection of cutting data in order to realise optimum results. The larger end diameter is used to calculate the speed while the smaller neck diameter is used when calculating the feed.

The most common cutters have 45° or 60° angles but we regularly produce tools with anything from 5° to 120° and with wide variations of corner radius.

We will work with you to achieve the optimum geometry, number of teeth and any coating to give you a smooth-cutting and efficient tool.

DIN or other shank standards as required

Neck diameter and length to suit your application

Micrograin solid carbide and a choice of coatings (XRed shown)

Blend radii to deburr mouth of slot if required

Optional Weldon or whistle notch shank

Trapezoidal 'dovetail' shape





## T-SLOTS

High Performance Solid Carbide T-slot and Keyway (Keyseat) Cutters



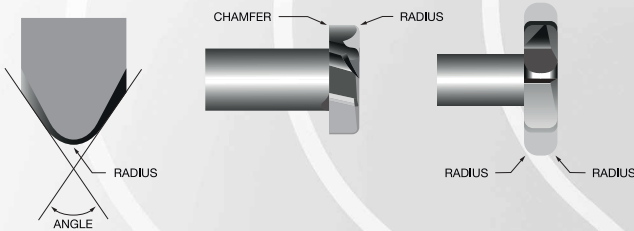
# T-slotting

with accuracy

T-slot cutters are used to produce accurate keyways and T-slots in various components, often in tables and beds for machine tools. A slot must first be milled using endmills or slot drills to allow the neck of the tool to enter the slot.

Working with you and by understanding your requirements we will design a T-slot cutter with the geometry and specifications to suit your application.

We are often asked by our clients to provide T-slot cutters which require specific angles along with combinations of corner detail such as radii or chamfers on one or both corners, as shown below.



DIN or other shank standards as required



Geometry, flute number and radius combinations are virtually infinite



# Complex forms no problem

Port tools are essential for creating complex multi-diameter forms with ease.

These tools require the bores to be pre-drilled on accurate CNC machines. The port tool then follows on creating precise, detailed, accurate bores with dimensionally correct features.

The main uses for these time saving tools are on hydraulic ports and actuators.

DIN or other shank standards as required

Through-coolant and other options

From simple to complicated, our range of port tools is almost unlimited. Talk to us about your next project.





## REAMERS

High Performance Solid Carbide Reamers and Step Reamers



# Multi-diameter holes in one operation

Reaming is the process of enlarging and sizing a hole by means of a multi-fluted cutting tool. Our precision reamers are designed to enlarge the size of a previously formed hole by a small amount but with a high degree of accuracy to leave smooth sides.

We produce a wide variety of reamer types from straight fluted to spiral fluted in either right- or left-hand cutting.

We also produce step reamers which are used to follow on from our step drills all produced with the dimensions and flute configuration to suit your specific application.

Things to consider which affect the success of your reamed hole:

**Pre-ream stock:** Generally between 2 and 3% of the diameter is sufficient for most materials for example 2% for steels and tough materials and 3% for soft and non-ferrous materials.

**Tools holders:** Using hydraulic holders and precision collets is essential for successful reaming

**Tool overhang:** Using tools that are too long (perhaps due selecting from a standard catalogue) will cause runout. By using the shortest tool possible you will alleviate most of the problems.

**Workpiece clamping:** Ensuring the component is securely held is a must to prevent tool breakage, oversized holes, poor finishes and shortened tool life.

**Checking TIR:** Check the reamer diameter with a dial indicator (at the circular margin). It is critical your reamer runs concentric with the machine spindle.



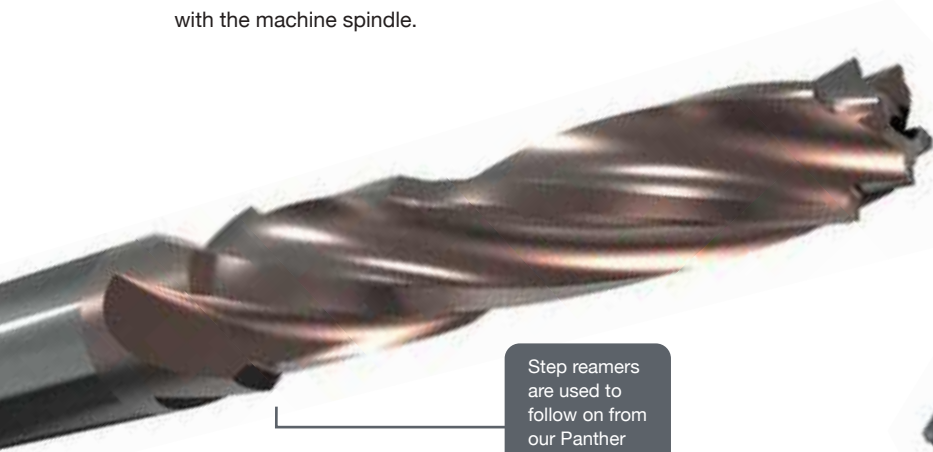
DIN or other shank standards as required

Straight or spiral fluted in either right- or left-hand cutting



Through-coolant option

Axial through-coolant



Step reamers are used to follow on from our Panther step drills (see page 61)



## ◀ CORNER ROUNDERS

High Performance Solid Carbide Corner Rounding Cutters



# Corner rounding and deburring made easy

Generally used to produce a specific radius on a component in one operation corner rounders can also be used to remove burrs or sharp edges.

The pilot diameter significantly impacts the tool's performance. Larger pilot diameters enable the tool to operate at lower speeds while smaller ones allow for higher speeds due to their increased effective cutter radius. The effective cutter diameter can be calculated using these equations based on the radius-to-pilot ratio:

#### Radius/Pilot Ratio

< 2.5: Effective Cutter Diameter = Pilot Diameter + Radius

#### Radius/Pilot Ratio

≥ 2.5: Effective Cutter Diameter = Pilot Diameter + 0.7x Radius

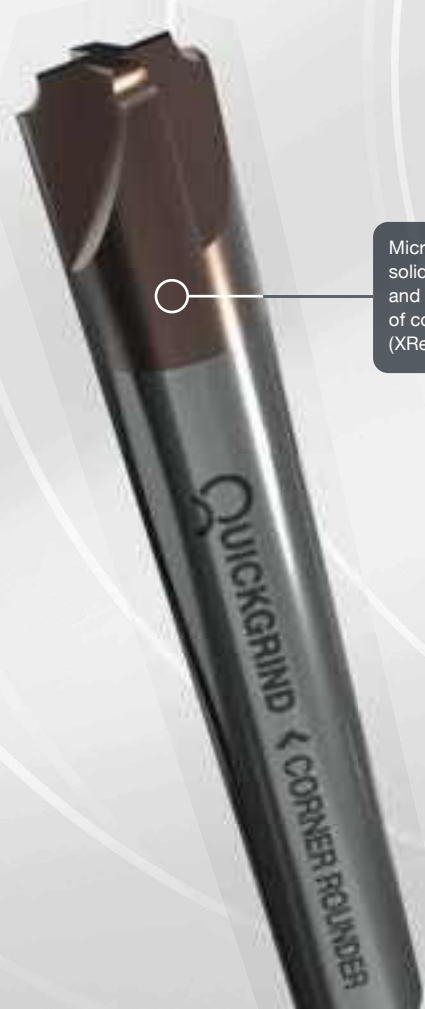
Larger pilot diameters offer enhanced strength compared to smaller ones, thanks to the extra material behind the radius. Smaller pilots may be required for clearance in narrow slots or holes, facilitating tighter turns when machining inside corners.

Take advantage of our QuickEdge tool remanufacturing service to extend the life of these products even more and reduce costs. Turn to page 80 to find out more.



DIN or other shank standards as required

Geometry and coating for your specific application



Micrograin solid carbide and a choice of coatings (XRed shown)



Our highly accurate tool grinding enables clean and secure machining



# Three tools in one

Interpolating a bore, thread and chamfer with one tool gives good cost savings and cycle time reduction. Introducing the Pathfinder threadmill.

Using three tools to produce the chamfer, the correct pre-threaded bore followed by a tap or threadmill can be replaced with one of our highly efficient Pathfinder drill-chamfer-threadmills. Having this one tool to do the work of three frees-up tool station space and counters any possible alignment issues.

Using a single pitch tool to produce more than one diameter thread such as a P1.00 is suitable for producing M6x1mm and MF7x1mm threads.

Pathfinders can achieve thread depths of 2xD and 3xD. Through-coolant and coated tools, which are recommended for 3xD in cast iron and aluminium applications, are available on a short delivery, as are long reach versions.

Tools are designed to suit your application and will be provided with the appropriate chamfer angle as required.

Pathfinders can be used for machining pre-cast threads or pre-drilled holes and again these will have the appropriate coating as required.

This tool is also suitable for internal threads in blind or through holes.

Thread systems include ISO Metric, American UN, BSP, NPT and BSPT.

Please note Pathfinder drill-chamfer-threadmills can have 1, 2, 3 or more full profile threads.



DIN or other shank standards as required

Long reach versions available on short delivery



**Two cutting teeth**

2nd tooth – full profile (finishing)

1st tooth – partial profile (roughing)



TM-IT tools are left handed – for CNC use M04 code



Features and coatings to suit your applications







# Accurate finishes and extended tool life

Our routing cutters are designed for rapid removal of material in extruded aluminium and other soft, non-ferrous materials. Ideal where long tool life and accurate, fine finishes are required, they are available in a wide variety of types designed to suit your applications.

Cutters are available in single or two flute versions, in stub length, medium and long series. We also offer downward spiral compression routers to eliminate lifting when routing single or stacked sheets.

Where a coating is required our unique TX formulation is the favoured choice – its high resistance to abrasion and low co-efficient of friction provides long tool life and excellent surface finish. With a surface hardness of >500Hv and thickness options of 0.5-2µm the TX coating helps to maintain the sharp edge of the tool.



## Applications and benefits

- High productivity machining of aluminium, aluminium alloys, non-ferrous materials, composites and acrylics
- Superior grinding techniques provide high material removal rates and excellent chip evacuation
- Types available for routing, slotting, plunging, roughing, finishing and profiling

# Two (three, four, five) heads are better than one

Combining the performance and durability of solid carbide with the modularity of inserts the new ModX<sup>®</sup> range from Quickgrind gives you the best of both worlds, but without the compromise of either.

## Features and benefits

- Carbide shank with 2µm tolerance for accurate, reliable machining
- Unique ModX<sup>®</sup> locking mechanism for maximum coupling stability between shank and head
- Modular shank system and interchangeable heads means reduced costs
- Infinite Possibilities<sup>®</sup> compatible – full customisation including shank length, head length, diameter, coatings and more
- QuickCam<sup>®</sup> compatible – we will work with you to produce the optimum machining strategies for your operations
- QuickEdge<sup>®</sup> compatible – heads can be remanufactured to as-new for up to 9x extra usage
- Cost-effective shipping – less weight equals reduced costs
- Environmentally friendly – reduces the need for virgin carbide, a finite natural resource





Look out for this icon throughout the rest of this brochure to discover which of our tools is ModX® compatible



**End mills**

A collection of 4 to 7 flute variable end mills with a choice of coatings and geometries for a wide range of materials and operations.



**Ball nose end mills**

A choice of 2 and 4 flute ball nose end mills with flute lengths to suit your applications and coatings to aid chip flow and resist wear.



**Barrel tools**

Revolutionising finishing and semi-finishing strategies and slashing cycle times by up to 90%, our barrel tools come in a wide range of geometries including conical, convex, tangential, lens and type-F.



**Roughing end mills**

This high performance aluminium cutter with flat-crested-style geometry has enhanced performance in roughing applications. It is ideal for conventional and trochoidal machining strategies and also has variable index and helix.



**Aluminium cutters**

A range of 2 to 3 flute end mills, ball nose end mills and roughing end mills designed for machining a wide range of aluminium alloys and other non-ferrous materials in aerospace, motorsport and mould and die.



**High feed end mills**

A selection of 3 to 5 flute tools with unique precision ground end geometries for lower cutting forces and highly efficient chip removal at high feed rates. Achieve up to 60% cycle time reductions.



**Chamfer tools**

Suitable for a wide range of materials and can be used for many machining operations from chamfering to bevelling, deburring, spotting and countersinking. Our standard chamfer tool has a 90° inclusive point angle.

**Working with you to transform your operations**

The modular heads you see here are just a selection of the tools we can offer. Talk to us about your machining operations and we will work with you to find the perfect combination of tool and cutting strategy to achieve the optimum results.



# Any drill for any job

Quickgrind's ability to understand our quality standards and manufacturing process enables them to provide drills which achieve repeatable dimensional accuracy in difficult aerospace-grade stainless steels. Their drills are also highly productive compared with off-the-shelf offerings from other suppliers, with tool life increasing by over 75%.

Here at Quickgrind we know that choosing the right drill for the right job isn't always easy. We understand the importance of selecting the tool to match your workpiece material and the specification required, and the effect this has on your bottom line.

You may not realise that Quickgrind makes such a huge variety of high performance drill designs, but we have always produced drills for dedicated applications, just like we do for any other type of tool we make. That is what Infinite Possibilities® is all about.

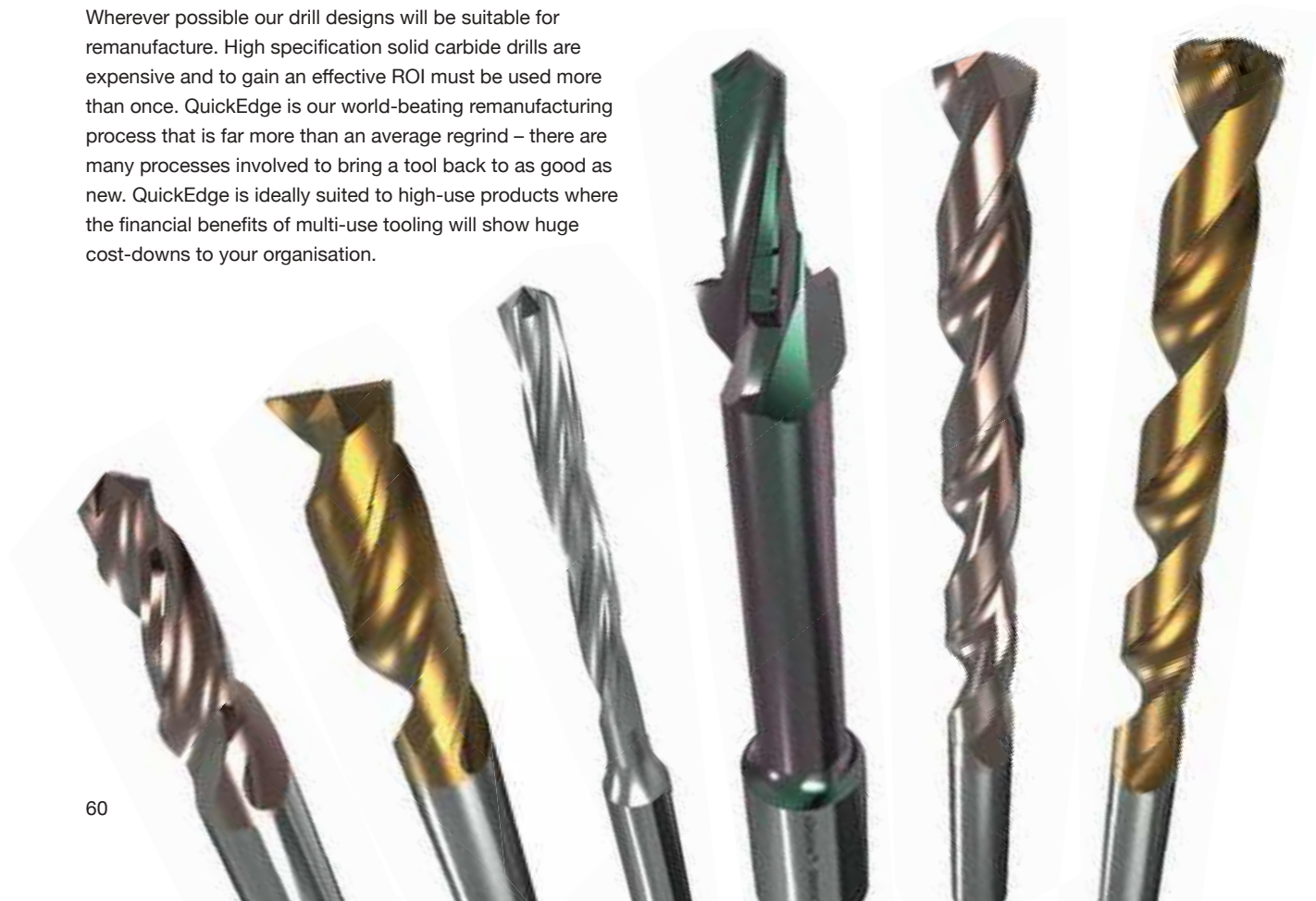
We can make virtually any type of drill specifically for your job, whether it is a new design or one that is already running with another manufacturer. We will either design a new drill for you to help you achieve your goals, or we will match the drills you use and optimise the design.

So if you are happy with your current drills but want to improve your tool life and your cycle times, we can help. We have the expertise, the highest specification CAD/CAM and machines plus a highly motivated R&D Technical Centre, together with decades of know-how to enable us to be extremely competitive not just in the UK but worldwide.

Wherever possible our drill designs will be suitable for remanufacture. High specification solid carbide drills are expensive and to gain an effective ROI must be used more than once. QuickEdge is our world-beating remanufacturing process that is far more than an average regrind – there are many processes involved to bring a tool back to as good as new. QuickEdge is ideally suited to high-use products where the financial benefits of multi-use tooling will show huge cost-downs to your organisation.

Of course, if you want an off-the-shelf tool we can do that too, but in our experience the benefits of dedicated tools, optimised for your applications, provide you with far more stable and consistent production than simply making do with standard tools.

Finally, when it comes to management of your tools, we can provide standard tools or make your own unique tools and store them in your premises with QuickVend, our vending solutions service.



# Accuracy up cycle times down

Our Panther multi-diameter drills are designed to create multiple bores in one pass whilst reducing cycle times and machining costs, all with highly accurate bore alignment.

These application-specific drills are designed to your requirements and are used for pre-drilling bores, ready for follow-on tools such as machine taps and reamers – for example prior to threading in hydraulic ports, whether two, three or more diameters.

Available in various diameters from 3.00mm to 20.00mm and with flute and overall combinations to suit your feature, such as top chamfer, front counter-bore, single or multiple steps, with a taper, shoulder or radius.

Panther drills are suitable for machining a wide variety of materials including cast iron, steel, stainless steel, aluminium and plastics. We design the tools with relevant geometries, with or without coatings, to suit your specifications.

**Highly  
accurate  
bores in  
one pass**



Force-resistive submicrograin carbide for strength and toughness

DIN or other shank standards as required

Single or multiple steps with chamfer angles as required

Optimised point geometries

XRed coating



# Versatility and cost-effectiveness

Our Lion GTC (through-coolant) and GD (solid) drills have our unique blend of micrograin carbide substrate and superior coatings, providing a recipe that guarantees high performance, cost-effective drilling in a wide range of materials.

Quickgrind's high quality manufacturing processes ensure a high quality surface finish and excellent coating for optimal chip evacuation. High process temperatures are dissipated safely and effectively.

Lion drills can be designed with application-specific helix angle and flute geometries. The flute form geometry, designed especially for long-chipping steels, ensures optimal chip generation characteristics even at low cutting speeds.

The GTC through-coolant version ensures perfect penetration and cutting characteristics when machining long-chipping steels. Cutting forces and temperatures are considerably reduced.

With their precision-ground point geometry and strong rake angle, combined with high wear and low coefficient of friction coating, Lion GTC and GD drills are versatile and effective in numerous applications. Whether you go for the through-coolant or solid variant, these drills deliver incredible performance at depths of 3xD to 10xD.



**GD**

DIN or other shank standards as required

Application specific helix angle and flute geometries

Point geometries and margin options



**GTC**

Micrograin solid carbide and a choice of coatings (XRed shown)

Through-coolant ensures perfect penetration and cutting characteristics

# A tough drill for tough materials

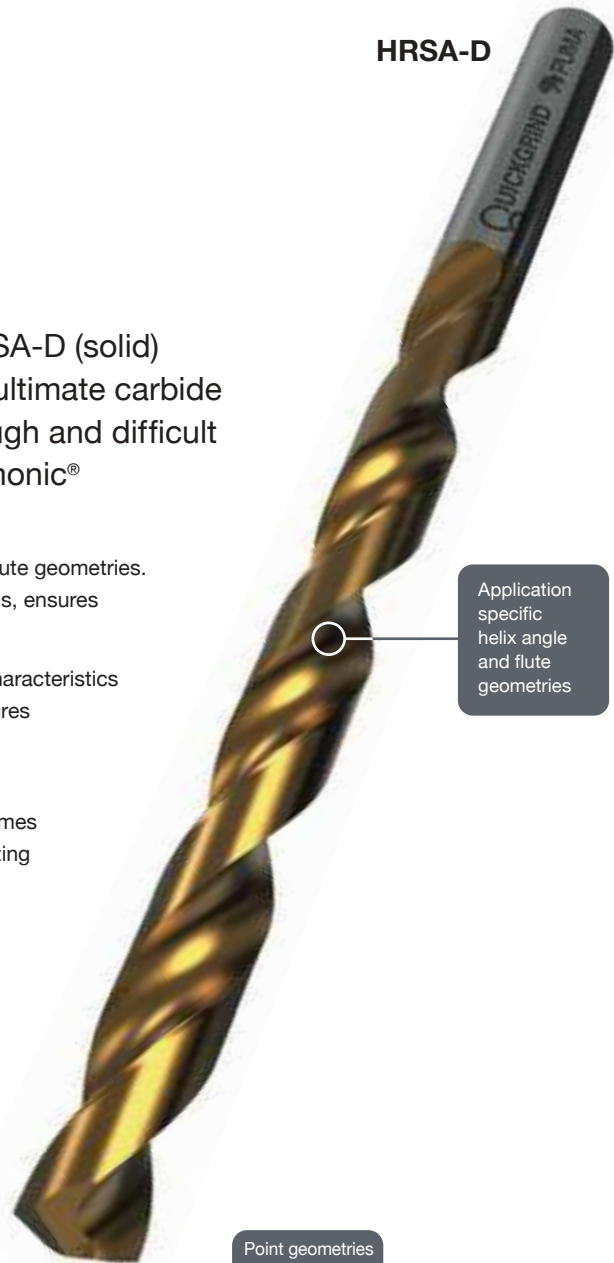
The Puma HRSA-TC (through-coolant) and HRSA-D (solid) are the result of extensive work to develop the ultimate carbide drills for the economic and secure drilling of tough and difficult materials such as titanium, stainless steels, Nimonic® and other super alloys.

Puma drills can be designed with application-specific helix angle and flute geometries. The flute form geometry, designed especially for long-chipping materials, ensures optimal chip generation characteristics even at low cutting speeds.

The through-coolant version ensures perfect penetration and cutting characteristics when machining long-chipping materials. Cutting forces and temperatures are considerably reduced.

These types of materials can result in work-hardening, chip elongation, low thermal conductivity and welding on the tool, but the Puma overcomes these problems. Clever flute design produces optimal chip shape resulting in smooth chip evacuation.

HRSA-D



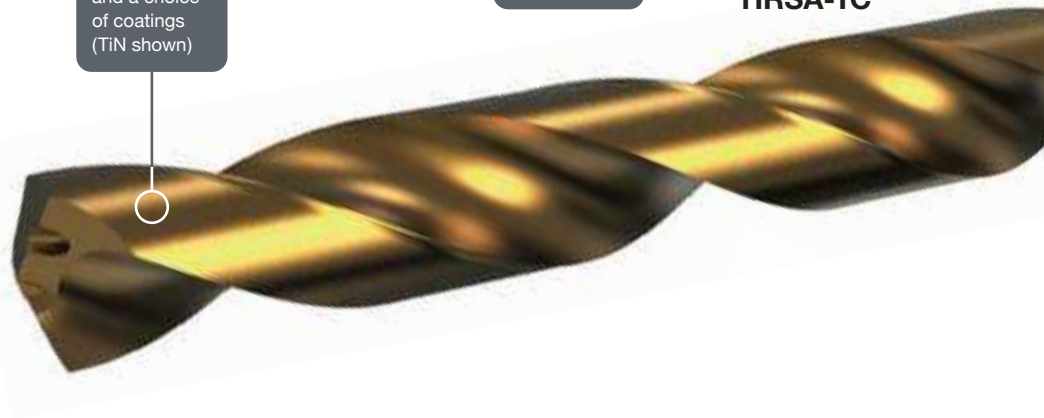
Application specific helix angle and flute geometries

Point geometries and margin options optimised for excellent resistance to tool wear

Micrograin solid carbide and a choice of coatings (TiN shown)

HRSA-TC

Through-coolant reduces cutting forces and temperatures



# Small but perfectly formed

Our Lynx Micro and Mini drills are suitable for a wide range of applications in carbon steel, alloy steel, die steel and stainless steel.

PVD coatings, specially formulated for these small diameter drills, result in high durability and long life.

Lynx's recipe of rigid design and strong, tough carbide substrate results in high levels of breakage resistance.







# Process-reliable

## deep hole drilling

The Leopard DHD rises to the challenge of deep hole drilling with reliable efficiency, up to 50xD.

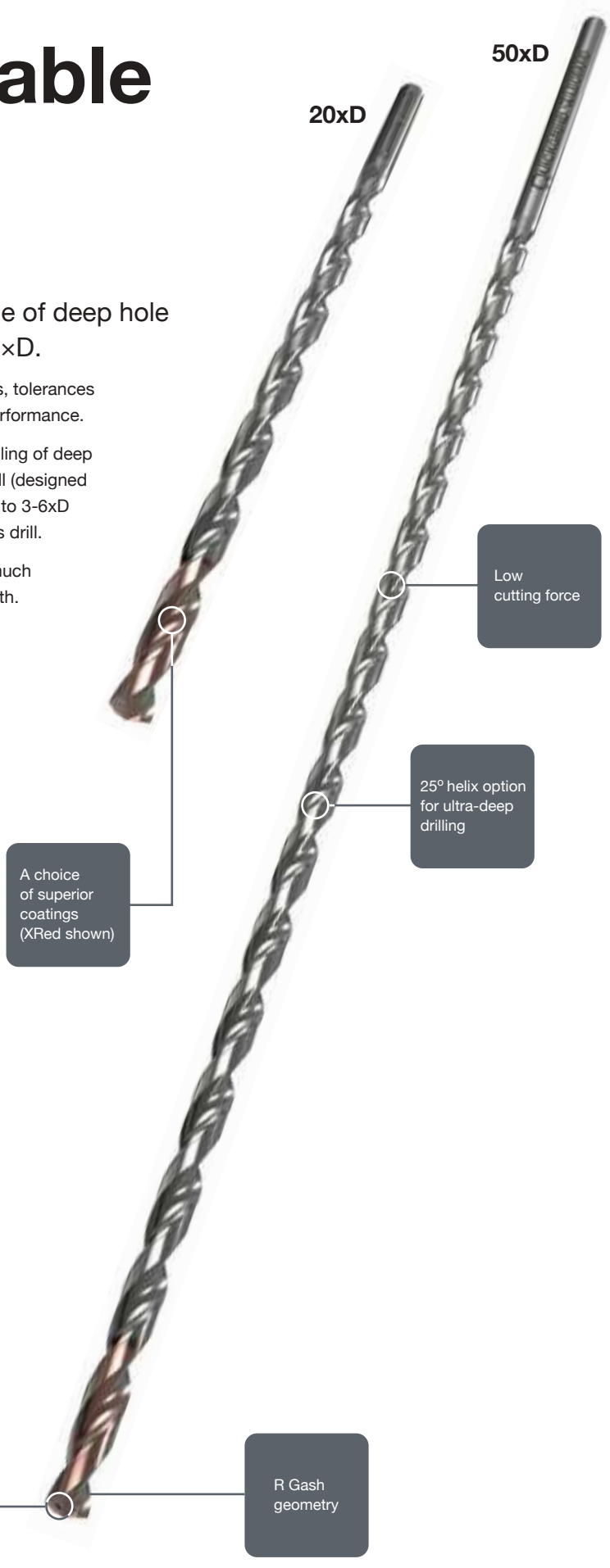
Each tool is produced with perfect symmetry – geometries, tolerances and point angles are all optimised for the best possible performance.

Correct procedures need to be adopted for successful drilling of deep holes  $\geq 20xD$  and above. Always use a Quickgrind pilot drill (designed +0.02-0.05mm larger than the long drill diameter) and drill to 3-6xD (depending on drill depth) in preparation for the long series drill.

The follow-on drill should enter without coolant and at a much reduced speed and feed, stopping short of the drilled depth. Run at selected higher speed and with coolant before proceeding.

Pecking is recommended on some applications and full retraction of the drill on horizontal operations must be considered. Once full depth is achieved reduce speed and feed on retraction.

As with all drilling applications there are many variables which is why we recommend discussing with our technical team who will help with drill selection and design.



Through-coolant option

R Gash geometry



High Performance Solid Carbide Drills



# More throughput lower costs

Jaguar drills are made with the latest submicrograin carbide which, combined with a special coating and self-centring geometry, results in increased productivity and a reduced cost per hole.

The Jaguar is primarily designed for use in steels and tool steels but is versatile enough to work well in other materials. Various coatings are available to aid performance and lengthen tool life. Centre-drilling is not required when boring high quality holes.





# High feed accurate holes

Cougar TF (three flute) drills are used on difficult steels, alloyed steel and non-ferrous materials and are designed for core drilling and opening out existing bores.

The three flutes allow direct penetration of hard, tough steels and other materials without the need of pre-centring.

Cougar drills are capable of achieving a reamer class finish with added support during the cutting process due to the extra flute.

With three flute drills, under the right circumstances, it is possible to achieve up to 50% higher feed rate per revolution.



Force-resistive submicrograin carbide for strength and toughness

Capable of a reamer class finish

Designed for direct penetration of hard steels





High Performance Solid Carbide Drills



# Straight to the point

Tiger straight-flute drills are designed for highly productive holemaking in aluminium and cast iron automotive and motorsport components.

Their dedicated substrate and optional coatings withstand the abrasive wear resulting from high speeds and temperatures, typical in aluminium silicon alloys and cast iron machining. This helps extend tool life and improve productivity.

Typical applications are cylinder blocks, cylinder heads, cases, steering knuckles and brake cylinders in aluminium silicon alloys and all grades of cast iron including GCI, CGI and nodular.

These drills are also ideal for pre-tapping hole sizes, chamfer holes, radii and multi-step forms.

Tiger drills support complex, multi-step applications and are custom made to suit your precise component requirements. Features include step angles with chamfer and radii, point angle and up to 8xD capability. All of this adds up to high productivity and long tool life, providing you with a low cost per hole.

Like all our drills, Tiger is designed for multiple remanufactures, guaranteeing you new tool performance again and again.

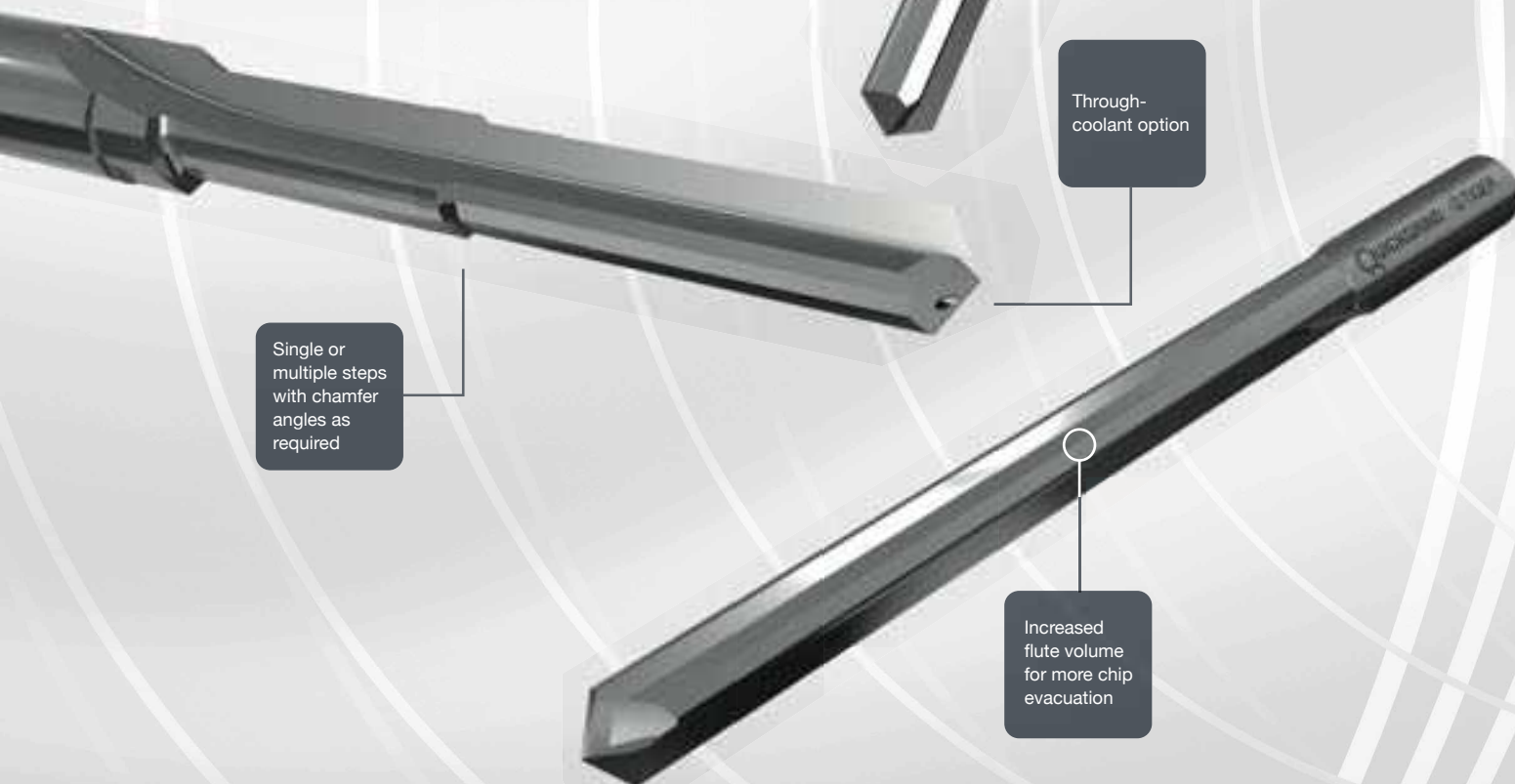
DIN or other shank standards as required

Micrograin solid carbide with coating options

Through-coolant option

Single or multiple steps with chamfer angles as required

Increased flute volume for more chip evacuation



# MX

AlTiN Coating

## The coating for moderate cutting speeds

MX AlTiN is designed to handle high levels of shear stress and impact fatigue. It can cope with cutting temperatures of up to 850°C.

Crystallite size and internal stress levels are controlled by a selected PVD Arc deposition process.

MX's optimum cutting performance is ensured by its unique composition modulation and stress gradient formula.

Performance is predictable across a wide range of materials including mild steels to tool steels with up to 50Hrc.

Cutting speeds range from 40 to 250 M/min depending on conditions and work piece material.

The coating can be applied to virtually any of our solid carbide tools and will be offered where applicable.



### Technical data

Coating material	AlTiN
Coating thickness	2-4µm
Deposition process	PVD Arc
Hardness HV 0.05	3300
Oxidation temperature	850°C
Coefficient of friction	<0.6
Process temperature	450-500°C
Colour	Blue/black

Cutting speed M/min	40	60	80	100	120	140	160	180	200	220	250	300
Steels up to 700 N/mm <sup>2</sup>												
Steels 800-1000 N/mm <sup>2</sup>												
Steels >1400 N/mm <sup>2</sup>												
Tool steels >45-55Hrc												
Tool steels >55-60Hrc												
Cast iron												
Martensitic stainless steels												
Austenitic stainless steels												
Titanium up to 900 N/mm <sup>2</sup>												
Titanium alloys >900 N/mm <sup>2</sup>												
Nickel alloys up to 900 N/mm <sup>2</sup>												
Nickel alloys >1200 N/mm <sup>2</sup>												

Cutting data is subject to application and machining parameters. Please contact our Technical Support team for advice.

# XRed/XRed SL

TiSiN Coating

## The coating for challenging conditions



XRed TiSiN is engineered to withstand temperatures of up to 1100°C at the cutting edge, making it perfect for the machining of hard materials at high speeds and with low or no lubrication.

Its multi-layer coating, with crystalline TiN matrix/Si<sub>3</sub>N<sub>4</sub> nano crystallite outer layer, is designed to protect the cutting edge from excess wear, oxidation and heat transfer.

XRed is ideal for machining titanium, stainless steels, super alloys and steels up to 60Hrc. It is very capable in applications such as roughing, trochoidal milling, semi-finishing and finishing where there are high temperatures at the cutting edge.

Quickgrind's high quality grinding and expertise allows for excellent chip formation and evacuation at high speed and feed without fear of damage to the tool or the component.

Our XRed SL coating is the higher-performing version of the standard XRed. Please contact our Technical Support team for advice.

Technical data	
Coating material	TiSiN
Coating thickness	2-4µm
Deposition process	PVD Arc
Hardness HV 0.05	3500
Oxidation temperature	1100°C
Coefficient of friction	<0.4
Process temperature	450-550°C
Colour	Copper

Cutting speed M/min	40	60	80	100	120	140	160	180	200	220	250	300
Steels up to 700 N/mm <sup>2</sup>												
Steels 800-1000 N/mm <sup>2</sup>												
Steels >1400 N/mm <sup>2</sup>												
Tool steels >45-55Hrc												
Tool steels >55-60Hrc												
Cast iron												
Martensitic stainless steels												
Austenitic stainless steels												
Titanium up to 900 N/mm <sup>2</sup>												
Titanium alloys >900 N/mm <sup>2</sup>												
Nickel alloys up to 900 N/mm <sup>2</sup>												
Nickel alloys >1200 N/mm <sup>2</sup>												

Cutting data is subject to application and machining parameters. Please contact our Technical Support team for advice.

# TX

ta-C Coating

## A smooth ta-C coating

Our TX range of three advanced coatings (TX-R; TX-G and TX-T) has been developed for the machining of non-ferrous metals, composite structures and plastic materials. With an sp<sup>3</sup> content of 60%-70% they reach a hardness of over 5000HV.

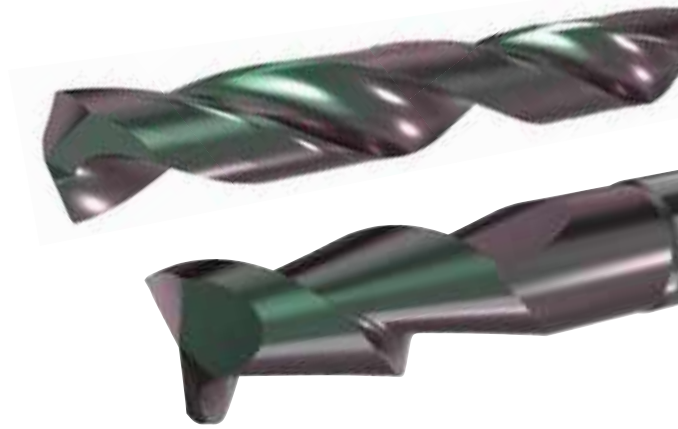
These thin, smooth and extremely hard coatings are designed to maintain maximum cutting edge sharpness when machining abrasive materials such as graphite, composite materials with glass or carbon fibre, glass-reinforced PCB materials and high Si content aluminium alloys.

The TX range excels in cutting soft noble metals like gold, silver and copper as well as lead-containing and lead-free bronzes and brass alloys. Their variable thickness, very low coefficient of friction and anti-stick properties makes them excellent for machining a wide range of plastics and sticky materials where they avoid the build-up of material on the sharp cutting edge.

Our TX coatings supersede the conventional DLC coatings and are available on almost all of our solid carbide cutting tools.

Combined with our special grinding knowledge and techniques TX coatings have proven to be a very economical solution for machining difficult materials, reducing the need for expensive PCD inserts and diamond-coated tools.

TX-coated tools are also suitable for remanufacture and recoating thereby bringing even greater savings.



### Technical data required

Coating material	ta-C*
Coating thickness	0.5-3µm
Deposition process	PVD Arc
Hardness HV 0.02	>5000
Oxidation temperature	500°C
Coefficient of friction	<0.1
Process temperature	Below 180°C
Adhesion	Very good, typically class 1
Colours	TX-R – rainbow TX-G – dark grey/black TX-T – dark grey/black

\*Tetrahedral amorphous carbon  
(also known as diamond-like carbon)

Name	Colour	Thickness	Recommended applications
TX-R (rainbow)		<0.5µm	Soft non-ferrous/metal machining (Al, Mg, plastic, rubber, wood laminates)
TX-G (general)		<0.6-1µm	Non-ferrous/metal machining AISI and auto parts, injection moulds & dies
TX-T (thick)		<2-4µm	AISI >12%, graphite, CFRP, MMC Machining

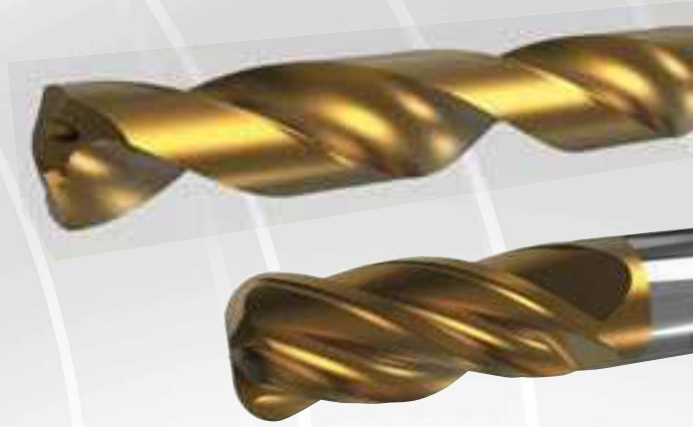
TiN

# The multi-purpose coating solution

Our TiN coating is a multi-purpose solution for low and medium cutting speeds in a wide range of applications.

It is a cost-effective solution designed for tools in a variety of general machining conditions where a high-end coating is not needed.

It is ideal for milling, drilling and turning mild steels at cutting speeds below 100 M/min.



## Technical data

Coating material	TiN
Coating thickness	2-4µm
Deposition process	PVD Arc
Hardness HV 0.05	2800
Oxidation temperature	500°C
Coefficient of friction	<0.5
Process temperature	450-550°C
Colour	Gold

Cutting speed M/min	40	60	80	100	120	140	160	180	200	220	250	300
Steels up to 700 N/mm <sup>2</sup>	■	■	■									
Steels 800-1000 N/mm <sup>2</sup>	■	■										
Steels >1400 N/mm <sup>2</sup>	■											
Tool steels >45-55Hrc												
Tool steels >55-60Hrc												
Cast iron	■											
Martensitic stainless steels												
Austenitic stainless steels												
Titanium up to 900 N/mm <sup>2</sup>												
Titanium alloys >900 N/mm <sup>2</sup>												
Nickel alloys up to 900 N/mm <sup>2</sup>												
Nickel alloys >1200 N/mm <sup>2</sup>												

Cutting data is subject to application and machining parameters. Please contact our Technical Support team for advice.



## CXPlus

AlCrN Coating

# Smoother, harder, **stronger**

CXPlus's AlCrN advanced arc deposition process deposits coatings at far higher energy levels than conventional processes.

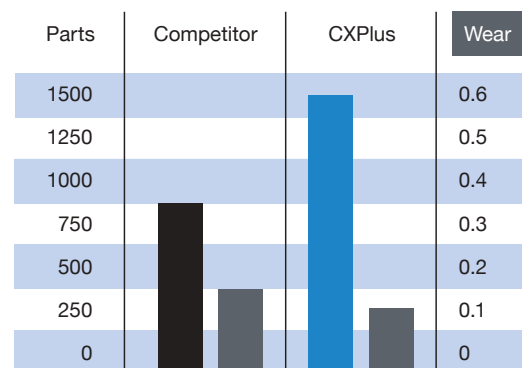
This results in increased density, a higher resistance to wear and a reduction in chipping on cutting edges. Its smooth surface and the controlled coating composition ensures improved tool performance.

CXPlus is suitable for wet and dry machining at medium to high speeds in milling and drilling operations with temperatures reaching up to 1050°C. Its versatility makes it suitable for a wide range of materials including low to high tensile steels, cast irons, tool steels, stainless steels, titanium and nickel alloys.



### Technical data

Coating material	AlCrN
Coating thickness	2-4µm
Deposition process	PVD Arc
Microhardness HV 0.02	3200
Friction vs steel (dry)	0.55
Max service temp	1050°C
Process temperature	450-500°C
Colour	Grey



## NEW XTF

AlTiN/TiSiXN Coating

# A dual-layer coating for hardened materials

Mould-making, aerospace and 3C (computers, communications and consumer electronics) operations push tooling to the limit when machining titanium, nickel-based alloys, stainless steel and hardened steel.

Quickgrind's new dual-layer XTF coating provides outstanding oxidation resistance, high thermal stability and excellent wear resistance and is the perfect solution for machining these demanding materials.

The AlTiN based layer offers high degree of ductility while the TiSiXN hardened layer resists oxidation and wear.

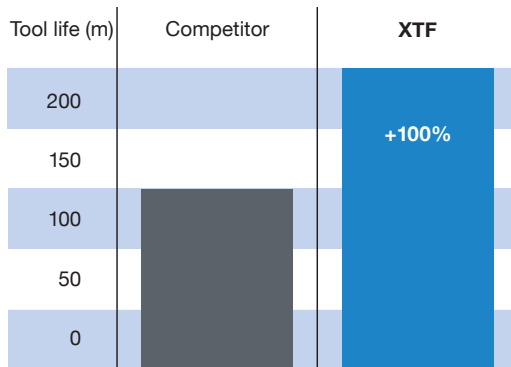
Other benefits include reduced crack formation and improved resistance to chipping, maintenance of high temperatures at the cutting edge and significant reductions in adhesive wear resulting in extended tool life.



### Technical data

Coating material	AlTiN / TiSiXN
Coating hardness HIT	38 +/-5 GPa
Deposition process	Arc
Intrinsic stress	-5 +/-1 GPa
Max service temperature	1100°C
Process temperature	<600°C
Colour	Bronze

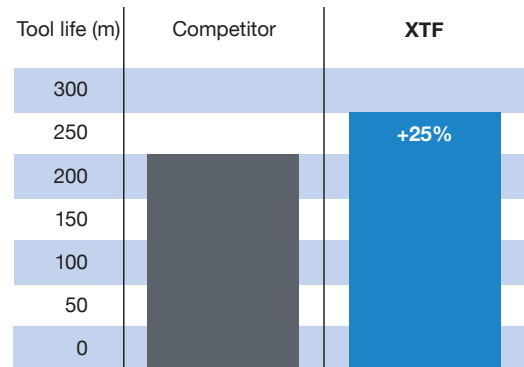
### Nickel alloy



16mm Ø end mill / Nickel alloy 2.4650, NiCo20Cr20MoT (UNS N07263, Nimonic® C-263) /  $V_c$  45m/min /  $f_t$  0.09 mm/tooth /  $a_p$  0.50mm  
 $a_g$  variable

Cutting data is subject to application and machining parameters. Please contact our Technical Support team for advice.

### Hardened steel



10mm Ø end mill / Steel 1.2344, X40CrMoV5-1 (AISI H13, JIS SKD61) 45Hrc /  $V_c$  220m/min /  $f_t$  0.10 mm/tooth /  $a_p$  10.00mm /  $a_g$  0.50mm  
Wet

Cutting data is subject to application and machining parameters. Please contact our Technical Support team for advice.

# Technical data

## Milling formula

$$Vc = \frac{d \times \pi \times n}{1000} \text{ (M/min)}$$

$$n = \frac{Vc \times 1000}{\pi \times d} \text{ (rpm)}$$

$$Fz = \frac{Vf}{z \times n} \text{ (mm)}$$

$$Vf = Fz \times z \times n \text{ (mm/min)}$$

Vc = cutting speed (m/min); z = number of flutes; Fz = feed per tooth (mm); n = spindle speed (rpm); d = tool diameter (mm);  $\pi = 3.142$   
 $a_p$  = depth of cut (mm);  $a_e$  = width of cut

## Calculation of average chip thickness

$$hm = Fz \sqrt{\frac{a_e}{d}}$$

$$Fz = hm \sqrt{\frac{d}{a_e}}$$

$a_e$  max = maximum lateral infeed depending on the material to be machined (mm); Fz = feed per tooth (mm); hm = average chip thickness (mm);  
 d = tool diameter (mm)

## Workpiece materials key

Steels	P1	Low carbon	EN1A, EN8, 1006, 1008, 1015, 1018, 1020, 1022, 1025, 1117, 1140, 1141, 11L08, 11L14, 1213, 12L13, 1215, 133
	P2	Medium carbon, Alloy steels	1030, 1035, 1040, 1045, 1050, 1052, 1055, 1060, 1085, 1095, 1541, 1551, 9255, 2515, 3135, 3415, 4130, 4140, 4150, 4320, 4340, 4520, 5015, 5115, 5120, 5162, 5140, 5155, 6150, 8620, 9262, 9840, 52100, O1, O2, O6, S2, W1 to W310
	P3	Die/tool steels	O7, M1, M2, M3, M4, M7, T1, T2, T4, T5, T8, T15, A2, A3, A6, A7, H10, H11, H12, H13, H19, H21, L3, L6, L7, P2, P20, S1, S5, S7, 52100, A120, D2, D3, D4, D5, D7
Stainless steels	M1	Free machining	430F, 301, 303, 410, 416 Annealed, 420F, 430, 430F
	M2	Austenitic, Martensitic, PH stainless	301, 302, High Tensile, 304, 304L, 305, 316, 420, 15-5PH, 17-4PH, 17-7PH
	M3	Cobalt chrome alloys, Duplex 22%, Super Duplex 25%	302B, 304B, 309, 310, 316b, 316L, 316Ti, 317, 317L, PH13-8Mo, Nitronics
Cast irons	K1	Grey cast iron (GG) <180HB	ASTM A48, CLASS 20, 25, 30, 35, SAE J431C, Grades G1800, G3000, G3500, GG10, 15, 20, 25, 30, 35, 40
	K2	Ductile cast iron	-
	K3	Malleable cast iron (SG) 180>260HB	60-40-18, 65-45-12, D4018, D4512, D5506, 32510, 35108, M3210, M4504, M5503, 250, 300, 350, 400, 450
Non-ferrous	N1	Aluminium < 10% Si	Aluminium/Aluminium Alloys < 10% Si
	N2	Aluminium > 10% Si	Aluminium/Aluminium Alloys > 10% Si
	N3	Copper/copper alloys, Brass/bronze	Brass, Cu/Cu Alloys/Magnesium
Special alloys	S1	High temp alloys	Nimonic, Inconel 625, 718, 925, Monel, Hastelloy
	S2	Titanium alloys	6Al-4V, 5Al-2.5 Sn, 6Al-2 Sn-4Zr-6Mo, 3Al-8V-6Cr4Mo-4Zr, 10V-2Fe-3Al, 13V-11cR-3Al
Hardened steels	H	Hardened steels (44-55Hrc)	H10, H11, H12, H13, H19, H21, L3, L6, L7,P2, P20, D2, D3, D4, D5, D7

Example: ● Primary ● Secondary ○ Unsuitable

## Cutting speeds by material group

Tool diameter (mm)		Feed recommendations					
		3.00	4.00	5.00	6.00	8.00	
		Vc (M/min)	Feed per tooth (mm)				
Steels	P1	180-220	0.013-0.020	0.020-0.030	0.040-0.050	0.040-0.055	0.050-0.060
	P2	160-180	0.010-0.015	0.012-0.018	0.015-0.020	0.018-0.022	0.020-0.026
	P3	90-140	0.008-0.013	0.010-0.015	0.012-0.017	0.015-0.020	0.018-0.022
Stainless steels	M1	70-90	0.013-0.015	0.013-0.018	0.014-0.020	0.020-0.028	0.028-0.038
	M2	55-70	0.010-0.015	0.012-0.016	0.013-0.018	0.018-0.023	0.024-0.034
	M3	40-50	0.008-0.013	0.009-0.015	0.010-0.016	0.015-0.021	0.019-0.029
Cast irons	K1	160-180	0.013-0.020	0.020-0.030	0.040-0.050	0.040-0.055	0.050-0.060
	K2	120-150	0.013-0.020	0.020-0.030	0.040-0.050	0.040-0.055	0.050-0.060
	K3	70-120	0.008-0.013	0.010-0.015	0.018-0.025	0.015-0.020	0.018-0.022
Non-ferrous	N1	300-550	0.028-0.042	0.030-0.044	0.045-0.050	0.050-0.060	0.065-0.072
	N2	200-350	0.025-0.040	0.028-0.042	0.025-0.040	0.045-0.052	0.058-0.065
	N3	120-220	0.020-0.032	0.022-0.035	0.025-0.032	0.030-0.038	0.036-0.046
Special alloys	S1	35-55	0.003-0.005	0.003-0.006	0.005-0.008	0.006-0.009	0.008-0.015
	S2	50-70	0.008-0.010	0.008-0.010	0.010-0.015	0.015-0.020	0.020-0.030
Hardened steels	H	40-50	0.008-0.013	0.008-0.013	0.010-0.015	0.015-0.020	0.020-0.030

Tool diameter (mm)		10.00	12.00	16.00	20.00	-	
		Vc (M/min)	Feed per tooth (mm)				
Steels	P1	180-220	0.060-0.070	0.065-0.075	0.070-0.080	0.080-0.090	-
	P2	160-180	0.030-0.035	0.040-0.045	0.050-0.060	0.060-0.070	-
	P3	90-140	0.025-0.030	0.028-0.035	0.040-0.050	0.050-0.060	-
Stainless steels	M1	70-90	0.045-0.055	0.058-0.065	0.075-0.080	0.082-0.090	-
	M2	55-70	0.035-0.047	0.045-0.058	0.060-0.065	0.066-0.075	-
	M3	40-50	0.030-0.041	0.039-0.054	0.054-0.060	0.059-0.065	-
Cast irons	K1	160-180	0.013-0.021	0.020-0.031	0.040-0.060	0.040-0.065	-
	K2	120-150	0.013-0.021	0.020-0.031	0.040-0.060	0.040-0.065	-
	K3	70-120	0.025-0.030	0.028-0.035	0.040-0.050	0.050-0.060	-
Non-ferrous	N1	300-550	0.068-0.076	0.080-0.100	0.100-0.200	0.200-0.300	-
	N2	200-350	0.065-0.072	0.068-0.085	0.080-0.095	0.100-0.200	-
	N3	120-220	0.046-0.051	0.052-0.063	0.068-0.085	0.080-0.100	-
Special alloys	S1	35-55	0.015-0.030	0.020-0.030	0.030-0.040	0.045-0.050	-
	S2	50-70	0.025-0.035	0.030-0.040	0.040-0.045	0.045-0.050	-
Hardened steels	H	40-50	0.025-0.035	0.030-0.040	0.035-0.045	0.040-0.050	-

Note: Cutting data recommendations are guidelines only and are based on ideal cutting conditions.

## Cutting data – Warrior 2 flute ball nose end mills

Hardened steels 50-55Hrc		H						
Diameter (mm)	Radius (mm)	Vc (M/min)	n (rpm)	Fz (mm)	F (mm/min)	ap (mm)	ae (mm)	Teeth
2.00	1.00	180-205	30000	0.040	2400	0.15 - 0.25	0.25	2
3.00	1.50	170-195	19800	0.050	1980	0.20 - 0.35	0.38	2
4.00	2.00	170-185	14500	0.060	1740	0.25 - 0.40	0.50	2
5.00	2.50	175-185	12000	0.080	1920	0.28 - 0.45	0.63	2
6.00	3.00	165-185	9800	0.100	1960	0.35 - 0.50	0.75	2
8.00	4.00	165-180	7500	0.120	1800	0.40 - 0.57	1.00	2
10.00	5.00	160-175	5700	0.140	1596	0.50 - 0.63	1.25	2
12.00	6.00	150-170	5400	0.160	1728	0.60 - 0.75	1.50	2

Hardened steels 55-65Hrc		H						
Diameter (mm)	Radius (mm)	Vc (M/min)	n (rpm)	Fz (mm)	F (mm/min)	ap (mm)	ae (mm)	Teeth
2.00	1.00	145-155	24000	0.058	2800	0.08	0.25	2
3.00	1.50	145-155	16000	0.088	2800	0.10	0.38	2
4.00	2.00	145-155	12000	0.111	2660	0.15	0.45	2
5.00	2.50	145-155	9600	0.133	2550	0.19	0.68	2
6.00	3.00	145-155	8000	0.153	2440	0.24	0.80	2
8.00	4.00	145-155	6000	0.140	1680	0.60	1.00	2
10.00	5.00	145-155	4800	0.171	1640	0.75	1.25	2
12.00	6.00	145-155	4000	0.186	1490	0.90	1.50	2

## Cutting data – Samurai 4 flute ball nose end mills

Hardened steels 50-55Hrc		H						
Diameter (mm)	Radius (mm)	Vc (M/min)	n (rpm)	Fz (mm)	F (mm/min)	ap (mm)	ae (mm)	Teeth
1.00	0.50	130-140	41375	0.020	3310	0.06	0.13	4
2.00	1.00	130-140	20687	0.030	2482	0.10	0.25	4
3.00	1.50	130-140	13792	0.040	2207	0.13	0.38	4
4.00	2.00	130-140	10344	0.050	2069	0.15	0.50	4
5.00	2.50	130-140	8275	0.060	1820	0.20	0.63	4
6.00	3.00	130-140	6896	0.080	2069	0.25	0.75	4
8.00	4.00	130-140	5172	0.100	2069	0.30	1.00	4
10.00	5.00	130-140	4137	0.140	2317	0.50	1.25	4
12.00	6.00	130-140	3448	0.160	2207	0.60	1.50	4

Hardened steels 55-65Hrc		H						
Diameter (mm)	Radius (mm)	Vc (M/min)	n (rpm)	Fz (mm)	F (mm/min)	ap (mm)	ae (mm)	Teeth
1.00	0.50	100-110	31827	0.020	2546	0.06	0.12	4
2.00	1.00	100-110	15913	0.032	2037	0.08	0.25	4
3.00	1.50	100-110	10609	0.048	2037	0.10	0.38	4
4.00	2.00	100-110	7957	0.058	1846	0.15	0.45	4
5.00	2.50	100-110	6365	0.070	1782	0.19	0.68	4
6.00	3.00	100-110	5304	0.080	1697	0.24	0.80	4
8.00	4.00	100-110	3978	0.151	2400	0.60	1.00	4
10.00	5.00	100-110	3183	0.189	2400	0.75	1.25	4
12.00	6.00	100-110	2652	0.207	2200	0.90	1.50	4

Note: Cutting data recommendations are guidelines only and are based on ideal cutting conditions.

## Cutting data – trochoidal milling

			Feed recommendations						
Tool diameter (mm)			6.00	6.00	8.00	8.00	10.00	10.00	
			ae	ae	ae	ae	ae	ae	
ap			≤ 0.9 x L2	0.05 x D	0.1 x D	0.05 x D	0.1 x D	0.05 x D	0.1 x D
Steels	P1	Vc	200-300	200-300	200-300	200-300	200-300	200-300	
		Fz	0.130	0.090	0.160	0.110	0.200	0.140	
	P2	Vc	240-260	240-260	240-260	240-260	240-260	240-260	
		Fz	0.110	0.080	0.140	0.100	0.180	0.130	
	P3	Vc	200-220	200-220	200-220	200-220	200-220	200-220	
		Fz	0.110	0.080	0.140	0.100	0.180	0.130	
Stainless steels	M1	Vc	180-200	180-200	180-200	180-200	180-200	180-200	
		Fz	0.080	0.060	0.100	0.070	0.130	0.090	
	M2	Vc	140-160	140-160	140-160	140-160	140-160	140-160	
		Fz	0.080	0.060	0.100	0.070	0.130	0.090	
	M3	Vc	120-140	120-140	120-140	120-140	120-140	120-140	
		Fz	0.040	0.030	0.050	0.040	0.130	0.090	
Cast irons	K1	Vc	250-280	250-280	250-280	250-280	250-280	250-280	
		Fz	0.080	0.060	0.090	0.070	0.130	0.100	
	K2	Vc	160-220	160-220	160-220	160-220	160-220	160-220	
		Fz	0.080	0.060	0.090	0.070	0.130	0.100	
	K3	Vc	90-130	90-130	90-130	90-130	90-130	90-130	
		Fz	0.080	0.060	0.090	0.070	0.130	0.100	
Special alloys	S1	Vc	50-60	50-60	50-60	50-60	50-60	50-60	
		Fz	0.040	0.030	0.050	0.040	0.070	0.050	
	S2	Vc	80-110	80-110	80-110	80-110	80-110	80-110	
		Fz	0.040	0.030	0.050	0.040	0.070	0.050	
Hardened steels	H	Vc	60-90	60-90	60-90	60-90	60-90	60-90	
		Fz	0.050	0.040	0.060	0.050	0.090	0.070	
Tool diameter (mm)			12.00	12.00	16.00	16.00	20.00	20.00	
			ae	ae	ae	ae	ae	ae	
ap			≤ 0.9 x L2	0.05 x D	0.1 x D	0.05 x D	0.1 x D	0.05 x D	0.1 x D
Steels	P1	Vc	200-300	200-300	200-300	200-300	200-300	200-300	
		Fz	0.250	0.180	0.290	0.210	0.340	0.240	
	P2	Vc	240-260	240-260	240-260	240-260	240-260	240-260	
		Fz	0.230	0.160	0.270	0.190	0.290	0.210	
	P3	Vc	200-220	200-220	200-220	200-220	200-220	200-220	
		Fz	0.230	0.160	0.270	0.190	0.290	0.210	
Stainless steels	M1	Vc	180-200	180-200	180-200	180-200	180-200	180-200	
		Fz	0.160	0.110	0.190	0.130	0.270	0.190	
	M2	Vc	140-160	140-160	140-160	140-160	140-160	140-160	
		Fz	0.160	0.110	0.190	0.130	0.270	0.190	
	M3	Vc	120-140	120-140	120-140	120-140	120-140	120-140	
		Fz	0.160	0.110	0.190	0.130	0.270	0.190	
Cast irons	K1	Vc	250-280	250-280	250-280	250-280	250-280	250-280	
		Fz	0.160	0.140	0.180	0.160	0.240	0.200	
	K2	Vc	160-220	160-220	160-220	160-220	160-220	160-220	
		Fz	0.160	0.140	0.180	0.160	0.240	0.200	
	K3	Vc	90-130	90-130	90-130	90-130	90-130	90-130	
		Fz	0.160	0.140	0.180	0.160	0.240	0.200	
Special alloys	S1	Vc	50-60	50-60	50-60	50-60	50-60	50-60	
		Fz	0.080	0.060	0.117	0.083	0.160	0.120	
	S2	Vc	80-110	80-110	80-110	80-110	80-110	80-110	
		Fz	0.080	0.060	0.117	0.083	0.160	0.120	
Hardened steels	H	Vc	60-90	60-90	60-90	60-90	60-90	60-90	
		Fz	0.100	0.080	0.120	0.100	0.160	0.140	

Note: Cutting data recommendations are guidelines only and are based on ideal cutting conditions.

## Cutting speeds – Spectre and Phantom high feed end mills

Radial cut $a_e$ 60-75% x D							
Spectre $a_p$		0.150-0.250	0.200-0.300	0.250-0.400	0.300-0.450	0.400-0.600	
Phantom $a_p$		-	-	-	0.400-0.600	0.500-0.700	
Tool diameter (mm)		3.00	4.00	5.00	6.00	8.00	
		Vc (M/min)		Feed per tooth (mm)			
Steels	P1	150-200	0.090	0.100	0.150	0.200	0.300
	P2	140-190	0.080	0.090	0.120	0.180	0.250
	P3	120-160	0.060	0.080	0.100	0.100	0.120
Stainless steels	M1	90-130	0.080	0.090	0.100	0.150	0.200
	M2	60-100	0.060	0.070	0.090	0.100	0.120
	M3	60-70	0.040	0.055	0.060	0.070	0.080
Cast irons	K1	120-150	0.090	0.090	0.150	0.200	0.300
	K2	110-130	0.090	0.090	0.150	0.200	0.250
	K3	100-130	0.080	0.080	0.100	0.150	0.120
Special alloys	S1	25-40	0.060	0.070	0.090	0.100	0.120
	S2	50-90	0.040	0.055	0.060	0.070	0.080
Hardened steels	H	80-140	0.040	0.055	0.060	0.070	0.080

Radial cut $a_e$ 60-75% x D							
Spectre $a_p$		0.500-0.700	0.600-0.800	0.700-1.000	-	-	
Phantom $a_p$		0.600-0.800	0.700-1.000	0.750-1.100	0.800-1.250	-	
Tool diameter (mm)		10.00	12.00	16.00	20.00	-	
		Vc (M/min)		Feed per tooth (mm)			
Steels	P1	150-200	0.360	0.450	0.480	0.510	-
	P2	140-190	0.280	0.320	0.360	0.380	-
	P3	120-160	0.180	0.220	0.220	0.240	-
Stainless steels	M1	90-130	0.240	0.260	0.280	0.320	-
	M2	60-100	0.140	0.190	0.220	0.280	-
	M3	60-70	0.090	0.120	0.140	0.180	-
Cast irons	K1	120-150	0.360	0.450	0.480	0.510	-
	K2	110-130	0.280	0.320	0.320	0.380	-
	K3	100-130	0.180	0.220	0.220	0.240	-
Special alloys	S1	25-40	0.140	0.190	0.220	0.280	-
	S2	50-90	0.090	0.120	0.140	0.180	-
Hardened steels	H	80-140	0.090	0.120	0.140	0.180	-

Notes: Cutting data recommendations are guidelines only and are based on ideal cutting conditions. Subject to material group – use lower values for harder materials.

## Cutting speeds – Bulldog and Reaper high feed end mills

Radial cut $a_e$ 60-75% x D							
Bulldog $a_p^1$		0.300-0.450	0.400-0.600	0.500-0.700	0.600-0.800	0.700-1.00	
Tool diameter (mm)		6.00	8.00	10.00	12.00	16.00	
		Vc <sup>2</sup> (M/min)		Feed per tooth (mm)			
Steels	P1	120-250	0.200	0.300	0.360	0.550	0.600
	P2	110-200	0.180	0.250	0.280	0.360	0.400
	P3	90-160	0.060	0.120	0.180	0.250	0.300
Cast irons	K1	120-250	0.200	0.300	0.360	0.550	0.600
	K2	110-200	0.200	0.250	0.280	0.360	0.400
	K3	90-160	0.150	0.120	0.180	0.250	0.300
Hardened steels	H	80-140	0.050	0.090	0.120	0.150	0.190

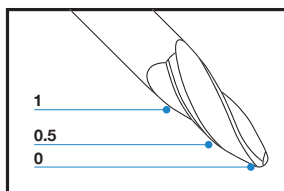
Radial cut $a_e$ 60-75% x D							
Reaper $a_p$		0.200-0.350	0.300-0.400	0.350-0.500	0.400-0.650	-	
Tool diameter (mm)		6.00	8.00	10.00	12.00	-	
		Vc (M/min)		Feed per tooth <sup>3</sup> (mm)			
Steels	P1	160-300	0.125	0.170	0.220	0.280	-
	P2	140-200	0.130	0.170	0.220	0.280	-
	P3	120-160	0.110	0.140	0.160	0.200	-
Hardened steels	H	80-140	0.100	0.140	0.180	0.220	-

Notes: Cutting data recommendations are guidelines only and are based on ideal cutting conditions. Subject to material group – use lower values for harder materials. Bulldog: (1) Reduce  $a_p$  for HXL -10% and HXLL -20%; (2) reduce Vc for HXL -20% and HXLL -25%. Reaper Long Series: (3) Reduce Fz -20%.

## Cutting data – Eliminator barrel tools

Feed recommendations							
Tool diameter (mm)		6.00	8.00	10.00	12.00	16.00	
		Vc (M/min)		Feed per tooth (mm)			
Steels	P1	170-200	0.030-0.050	0.050-0.070	0.070-0.095	0.100-0.115	0.120-0.155
	P2	140-170	0.030-0.050	0.050-0.070	0.070-0.095	0.100-0.115	0.120-0.155
	P3	90-120	0.010-0.030	0.030-0.050	0.050-0.070	0.070-0.090	0.090-0.135
Stainless steels	M1	110-140	0.030-0.050	0.050-0.070	0.070-0.095	0.100-0.115	0.120-0.155
	M2	60-90	0.030-0.050	0.050-0.070	0.070-0.095	0.100-0.115	0.120-0.155
	M3	40-70	0.025-0.045	0.035-0.060	0.055-0.080	0.090-0.100	0.100-0.120
Cast irons	K1	130-150	0.030-0.050	0.050-0.070	0.070-0.085	0.100-0.115	0.120-0.155
	K2	110-135	0.030-0.050	0.050-0.070	0.070-0.085	0.100-0.115	0.120-0.155
	K3	70-120	0.010-0.030	0.030-0.050	0.050-0.070	0.070-0.090	0.090-0.135
Non-ferrous	N1	250-500	0.045-0.060	0.060-0.075	0.065-0.090	0.085-0.110	0.090-0.120
	N2	150-350	0.045-0.060	0.060-0.075	0.065-0.090	0.085-0.110	0.090-0.120
	N3	130-275	0.035-0.050	0.050-0.065	0.055-0.080	0.080-0.100	0.090-0.115
Special alloys	S1	25-40	0.020-0.030	0.030-0.050	0.050-0.070	0.070-0.100	0.100-0.120
	S2	55-80	0.020-0.030	0.030-0.050	0.050-0.070	0.070-0.100	0.100-0.120
Hardened steels	H	60-90	0.025-0.035	0.035-0.055	0.055-0.075	0.080-0.110	0.120-0.150

Notes: Lower Vc needs to be chosen for the small end diameter and higher Vc on the larger diameters. Data shown is based on the shank diameter.



### Barrel tool contact area options

Your CAM system will provide options as to where the barrel tool engages with the workpiece, thereby the effective diameter will change. Some CAM providers call this the 'contact point' and will have in-built functions to enable the cutting data at this point to be compensated for.

There are three possible engagement points (effective diameters) as shown, represented at 1 (largest diameter), 0.5 (middle diameter) and 0 (smallest diameter).



## Cutting speeds – ball nose end mills

				Feed recommendations					
Tool diameter (mm)				3.00	4.00	5.00	6.00	8.00	
		$a_p$	$a_e$	$V_c$ (M/min)	Feed per tooth (mm)				
Steels	P1	0.1 x D	0.5 x D	150-200	0.025	0.025	0.036	0.044	0.060
	P2	0.1 x D	0.5 x D	140-190	0.028	0.028	0.036	0.044	0.060
	P3	0.1 x D	0.5 x D	120-160	0.030	0.030	0.030	0.036	0.050
Stainless steels	M1	0.1 x D	0.5 x D	90-115	0.023	0.030	0.030	0.036	0.050
	M2	0.1 x D	0.5 x D	60-80	0.020	0.024	0.024	0.029	0.040
	M3	0.1 x D	0.5 x D	60-70	0.018	0.020	0.020	0.025	0.034
Cast irons	K1	0.1 x D	0.5 x D	120-150	0.036	0.036	0.036	0.044	0.060
	K2	0.1 x D	0.5 x D	110-130	0.030	0.030	0.030	0.036	0.050
	K3	0.1 x D	0.5 x D	100-130	0.024	0.024	0.024	0.029	0.040
Non-ferrous	N1	0.1 x D	0.5 x D	300-500	0.075	0.080	0.100	0.120	0.150
	N2	0.1 x D	0.5 x D	250-300	0.060	0.070	0.080	0.100	0.125
	N3	0.1 x D	0.5 x D	250-300	0.060	0.070	0.080	0.100	0.125
Special alloys	S1	0.1 x D	0.3 x D	25-40	0.030	0.030	0.030	0.036	0.050
	S2	0.1 x D	0.3 x D	50-90	0.016	0.016	0.016	0.019	0.026
Hardened steels	H	0.1 x D	0.5 x D	80-140	0.027	0.027	0.027	0.033	0.045

				10.00	12.00	16.00	20.00	-	
Tool diameter (mm)		$a_p$	$a_e$	$V_c$ (M/min)	Feed per tooth (mm)				
Steels	P1	0.1 x D	0.5 x D	150-200	0.072	0.083	0.101	0.114	-
	P2	0.1 x D	0.5 x D	140-190	0.072	0.083	0.101	0.114	-
	P3	0.1 x D	0.5 x D	120-160	0.061	0.070	0.087	0.101	-
Stainless steels	M1	0.1 x D	0.5 x D	90-115	0.061	0.070	0.087	0.101	-
	M2	0.1 x D	0.5 x D	60-80	0.048	0.056	0.070	0.081	-
	M3	0.1 x D	0.5 x D	60-70	0.040	0.047	0.057	0.065	-
Cast irons	K1	0.1 x D	0.5 x D	120-150	0.072	0.083	0.101	0.114	-
	K2	0.1 x D	0.5 x D	110-130	0.061	0.070	0.087	0.101	-
	K3	0.1 x D	0.5 x D	100-130	0.048	0.056	0.070	0.081	-
Non-ferrous	N1	0.1 x D	0.5 x D	300-500	0.175	0.200	0.250	0.280	-
	N2	0.1 x D	0.5 x D	250-300	0.150	0.175	0.200	0.250	-
	N3	0.1 x D	0.5 x D	250-300	0.150	0.175	0.200	0.250	-
Special alloys	S1	0.1 x D	0.3 x D	25-40	0.061	0.070	0.087	0.101	-
	S2	0.1 x D	0.3 x D	50-90	0.032	0.037	0.046	0.054	-
Hardened steels	H	0.1 x D	0.5 x D	80-140	0.054	0.062	0.077	0.088	-

Note: Cutting data recommendations are guidelines only and are based on ideal cutting conditions.

## Cutting data – aluminium conventional milling

		Feed recommendations					
Tool diameter (mm)		3.00	4.00	5.00	6.00	8.00	
		Vc (M/min)	Feed per tooth (mm)				
Non-ferrous	N1	300-550	0.028-0.042	0.028-0.050	0.050-0.063	0.052-0.065	0.070-0.082
	N2	200-350	0.028-0.042	0.028-0.050	0.050-0.063	0.052-0.065	0.070-0.082
	N3	120-220	0.020-0.032	0.022-0.034	0.025-0.038	0.040-0.058	0.065-0.078
Tool diameter (mm)		10.00	12.00	16.00	20.00	-	
		Vc (M/min)	Feed per tooth (mm)				
Non-ferrous	N1	300-550	0.100-0.140	0.120-0.152	0.170-0.182	0.185-0.220	-
	N2	200-350	0.100-0.140	0.120-0.152	0.170-0.182	0.185-0.220	-
	N3	120-220	0.090-0.120	0.100-0.130	0.132-0.150	0.145-0.180	-

Note: Cutting data recommendations are guidelines only and are based on ideal cutting conditions.

## Cutting data – trochoidal milling

		Feed recommendations						
Tool diameter (mm)		6.00	6.00	6.00	8.00	8.00	8.00	
		ae	ae	ae	ae	ae	ae	
ap		≤ 0.9 x L2	0.05 x D	0.1 x D	0.3 x D	0.05 x D	0.1 x D	0.3 x D
Non-ferrous	N1	Vc	300-500	300-500	300-500	300-500	300-500	300-500
		Fz	0.420	0.310	0.205	0.450	0.350	0.250
	N2	Vc	300-400	300-400	300-400	300-400	300-400	300-400
		Fz	0.350	0.250	0.175	0.380	0.270	0.190
	N3	Vc	250-350	250-350	250-350	250-350	250-350	250-350
		Fz	0.350	0.250	0.175	0.380	0.270	0.190
Tool diameter (mm)		10.00	10.00	10.00	12.00	12.00	12.00	
		ae	ae	ae	ae	ae	ae	
ap		≤ 0.9 x L2	0.05 x D	0.1 x D	0.3 x D	0.05 x D	0.1 x D	0.3 x D
Non-ferrous	N1	Vc	300-500	300-500	300-500	300-500	300-500	300-500
		Fz	0.450	0.350	0.250	0.500	0.360	0.250
	N2	Vc	300-400	300-400	300-400	300-400	300-400	300-400
		Fz	0.400	0.300	0.205	0.430	0.320	0.220
	N3	Vc	250-350	250-350	250-350	250-350	250-350	250-350
		Fz	0.400	0.300	0.205	0.430	0.300	0.230
Tool diameter (mm)		16.00	16.00	16.00	20.00	20.00	20.00	
		ae	ae	ae	ae	ae	ae	
ap		≤ 0.9 x L2	0.05 x D	0.1 x D	0.3 x D	0.05 x D	0.1 x D	0.3 x D
Non-ferrous	N1	Vc	300-500	300-500	300-500	300-500	300-500	300-500
		Fz	0.600	0.450	0.310	0.700	0.550	0.380
	N2	Vc	300-400	300-400	300-400	300-400	300-400	300-400
		Fz	0.550	0.400	0.290	0.600	0.450	0.320
	N3	Vc	250-350	250-350	250-350	250-350	250-350	250-350
		Fz	0.570	0.430	0.290	0.600	0.450	0.320

Note: Cutting data recommendations are guidelines only and are based on ideal cutting conditions.

## Total Solutions Engineering

# Everything you need under one roof

You will have seen from the preceding pages that we have a tool for every situation. The following pages cover our complementary services, all of which are designed to help you get the most out of those tools. We call this Total Solutions Engineering.

With QuickCam our aim is to optimise machining by creating ideal tool paths. Leveraging our tooling expertise, we enhance application strategies, leading to increased productivity with up to 90% cycle time reduction. We provide remote and on-site support for verification and simulation, harnessing the synergistic benefits of tool development and application strategies under one roof.

QuickLab is our specialised rapid, customised tool design service. With dedicated one-to-one design guidance, we offer over 100 years of extensive experience and knowledge in this field. Our approach follows the best practices in tool design, allowing us to meticulously craft every characteristic of the tool to suit your specific needs.

Our designs incorporate the latest advancements in research and development, ensuring that you benefit from cutting-edge tool design techniques. Additionally, we have low minimum order requirements, making our services accessible to a wide range of clients.

QuickEdge is our remanufacturing service which brings your tools back to an as-new state, providing a cost-effective solution. By opting for remanufactured tools, you can significantly reduce your overall tooling spend while enjoying the benefits of consolidation, as multiple vendor tools can be included in our remanufacturing programme.

We are committed to maximizing your investment by ensuring that your tools are revitalised to their full potential. As part of our dedication to environmental, social and governance (ESG) considerations, remanufacturing also contributes to sustainability efforts.

Remanufactured tools can also offer a quicker turnaround compared to obtaining new tooling, enabling you to resume your operations promptly and efficiently.

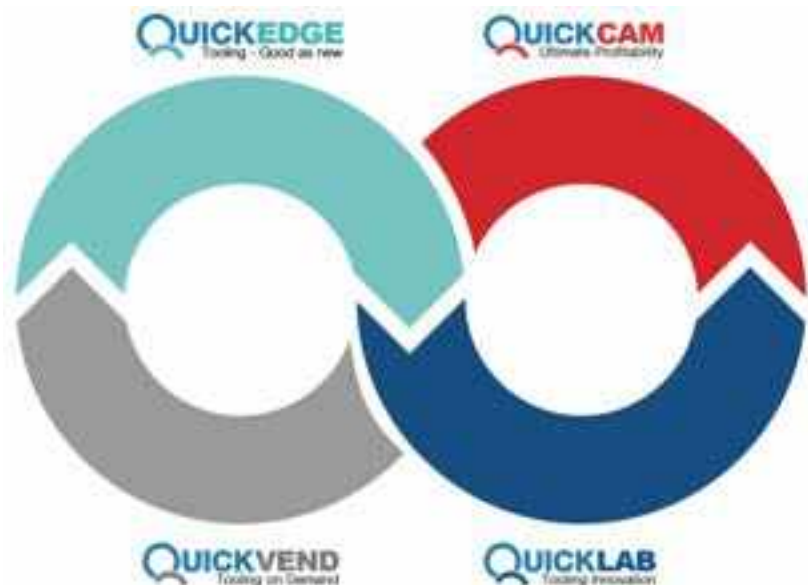
Finally, our QuickVend service is designed to help you increase cash flow and improve financial efficiency.

We achieve this by closely monitoring and strategically reducing your tooling expenditure, streamlining the process of tool purchase administration.

With meticulous tracking of all tooling usage, including details down to the operator, time and day, we ensure comprehensive insights into your operations. Through effective consolidation and inventory management, we work to minimize stock-outs, dead stock and overstock situations, optimising your resources and inventory levels.

We also handle tool transitions seamlessly, ensuring a smooth flow in your operations. By promoting increased usage of remanufactured tooling over new ones, we drive cost savings and sustainability in your tooling practices.

Our flexible “pay as you go” tooling approach further supports your financial goals, allowing you to manage costs efficiently while accessing the tools you need when you need them. Ultimately, this comprehensive service aims to reduce your overall tooling costs and contributes to the financial success of your business.



# Reducing cycle times and increasing profits

Do you have a component that is taking too long to manufacture? Are you struggling to find the time and resources to investigate advanced machining and cutting tool strategies that could easily double your output? Yes? Then you need to put QuickCam to the test.

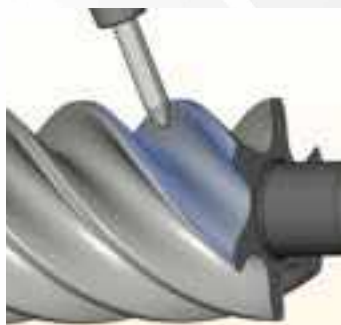
QuickCam is the advanced service from Quickgrind designed to support you with the machining of complex parts in difficult materials.

Implementing QuickCam in your business will give you reduced cycle times, leading to reduced tooling costs, increased output and improved capacity.

The bottom line? Improved throughput, more satisfied customers and increased profitability.

CAM programming is essential for maximizing your tooling investment and improving production efficiency.

Proper production engineering can eliminate up to 80% of manufacturing waste and unlock the full potential of your cutting tools.



## Benefits

- Reduced cycle time costs
- Reduced tooling costs
- Increased output
- Improved capacity
- Increased profits

## Tight timescales

No need to programme, organise standard tooling, or free-up valuable machine time

## We do the whole package

In-house tool design – no more outsourcing

## In-house technology design centre

No more waiting to get on the machines

## End-to-end service

Programming and tooling knowledge all under one roof

Your business may not have the in-house expertise and resources to programme their tooling effectively, leading to suboptimal toolpaths and cutting parameters. Leveraging production-programming expertise is the smart solution to address these challenges and optimise production while addressing application issues.

In manufacturing solutions, it's vital to distinguish between two key components: application strategies and production programming. Application strategies optimise machining and create ideal tool paths for each part, while production programming considers the machine, post-processing verification, and precise binary codes for accurate part cutting. Both application and CAM experts play a significant role in achieving optimised results by refining the tool path and ensuring precise execution by the equipment.

Thanks to CAM simulations, the outdated practice of test cuts for various cutting tool paths is largely obsolete. Modern CAM software incorporates simulation capabilities, eliminating the need to run equipment or waste materials during testing. Application experts use dedicated simulators to achieve the highest precision in perfecting the tool path. Using *hyperMILL*® MAXX machining cycles (our in-house CAM), we can offer a very competitive and professional service by ensuring that we always use the most up-to-date machining tool paths. We are an application partner with OPEN MIND and work with many other CAM providers including EdgeCAM, SolidCAM and Siemens NX.

Finding a trusted source of expertise for these procedures can be challenging, as engineering companies may overlook critical factors like machine behaviour and workholding challenges when creating CAM files. Quickgrind provides a comprehensive solution, offering expertise in optimisation, increased productivity, reduced cycle times and on-site support for verification and simulation procedures. Our team possesses intimate knowledge of tool behaviour within the manufacturing context, enabling us to apply best practices and deliver real value and enhanced productivity.

By optimising the processing data through features in CAM software a tool path can be improved by up to 50%. Our programming experts can guide you towards production and tool-cost savings, cycle-time reductions and improved product quality by considering customer perspectives and all factors influencing production efficiency.

Quickgrind's expertise extends beyond cutting tools to optimise every step of your production process, helping you to produce outstanding parts. We offer a holistic view, understanding each step involved, and addressing your unique tooling needs and job requirements for optimal success.

Contact us today to arrange  
your free initial CAM assessment.

**t** +44 (0) 1684 294090

**e** [quickcam@quickgrind.com](mailto:quickcam@quickgrind.com)



# Best practice design

## for the best performing tools

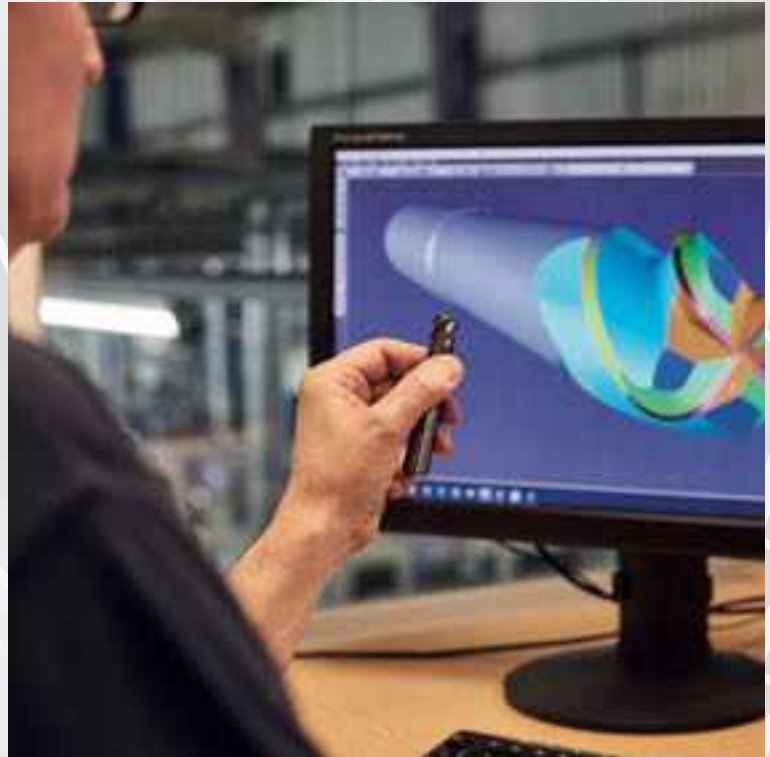
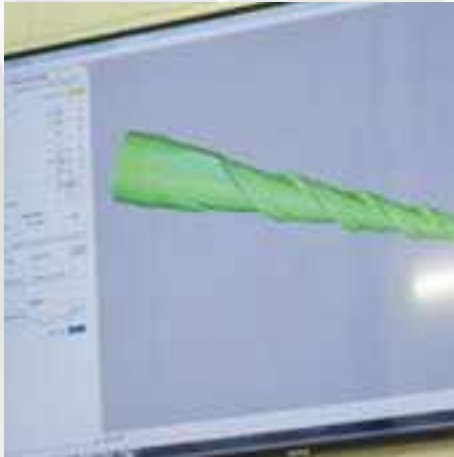
QuickLab allows you to quickly access custom tool designs. With more than 100 years of combined experience and knowledge Quickgrind utilises the best practices in tool design, with complete control over every characteristic of the tool.

On the one hand a typical business might have to juggle with the limitations of off-the-shelf tooling or accepting long lead-times for bespoke tooling. Large minimum order quantities for 'specials' compounds the problem. The bottom line? Your tooling can be driving the application strategy instead of increasing your efficiency and profitability.

With QuickLab you get rapid turnaround of bespoke tools, often in hours and days not weeks and months.

Adopting the best practices in tool design and with access to the latest advancements in R&D tool design we have control over every aspect of the tool from the ground up.

Finally, enjoy low minimum order requirements. Gone are the days of having to commit to hundreds of tools you don't need.



# 24/7 control of your tooling inventory



Compact table top vending machine with 24 locations equipped with a range of our solid carbide tools

**Call today**  
**+44 (0) 1684 294090**

Is your tooling inventory reduced to a minimum? Is it secure?  
Are your re-stocking orders generated automatically and on time?  
Do you want to reduce your tool purchase administration costs?

Quickgrind's robust, proven tool vending solutions are the answer to all these issues and more. Once we have audited your tooling requirements and consumption levels, we will supply you with a fully stocked machine (our machines can hold from 528 to 1,680+ individual tools). Usage and stock levels are then automatically monitored and replacement tools sent before your stock runs out.

And because your tooling inventory and usage levels are pre-determined, you regain complete control of your purchase administration time, and costs – to as little as one purchase order and one invoice per month.

Save time, save money. Take control of your tooling with a vending solution from Quickgrind.



## Benefits

- 24/7 secure access
- Allows minimum stock holding
- Automatic re-ordering
- User-friendly operation
- Tailor access to specific users and times
- Easy access to stock information and statistics
- Audit your tooling stock at the push of a button
- Suitable for new and remanufactured tools
- Stocks a wide range of tools types and sizes, and for high or low stock turnover
- Reduces purchase administration costs

# Adding value to your tooling investment

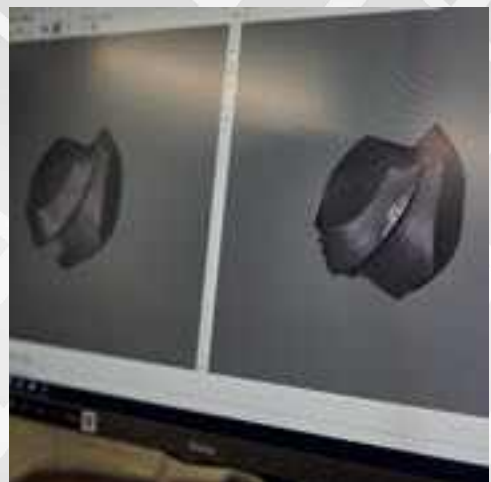
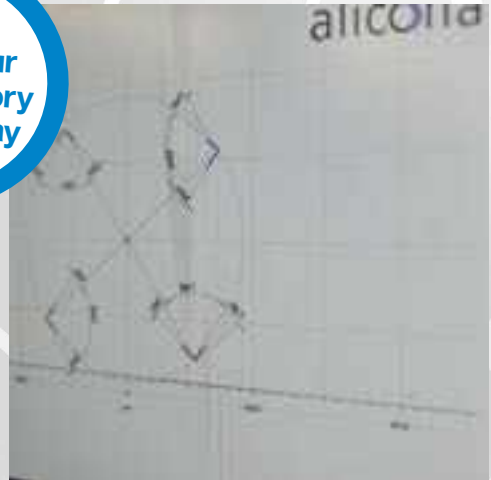
Many of our cutters are suitable for remanufacture. Our unique QuickEdge process can give you up to nine times extra usage out of your tooling, and with material (and environmental) costs increasing, the benefits of remanufacture are clear.

- Tools controlled by size, number of reissues and remanufactures
- Extremely attractive price and performance over the life of the tool
- Reduces the need for virgin raw material, a limited resource

Remanufacture doesn't mean compromising on quality. It has always been our policy to produce tools of such high quality that they can be used more than once. Which means that even after nine remanufactures you will continue to enjoy new tool performance, and a clear conscience.



Ask  
about our  
introductory  
offer today





## Quality and speed

Remanufactured to an as-new state and can be quicker than ordering new tooling

## Cost and investment

Reduces overall tooling spend and maximises your investment

## Consolidate your purchasing

Combine multiple vendor tools into one remanufacturing programme

## Environmental, social and corporate governance

Reduce your carbon footprint, enhancing your environmental and corporate credentials

Our service is a far superior form of the regrinding process to an as-new state. Because we have access to our proprietary programmes your remanufactured tool will perform as new, every time, with no compromise. We have seen tools in use for over a decade and many that have been through over 9x remanufacturing cycles.

Properly remanufacturing carbide tools, as opposed to standard regrinds, can greatly enhance the value of your tooling investment. It is crucial that certain techniques for remanufacturing be used to maximize the tool's life and productivity, and a remanufacturing schedule should be developed based on tool life to avoid excessive downtime or catastrophic tool failure.

Of equal importance is the need to recycle and renew. By using our remanufacturing services we can help reduce your carbon footprint enhancing your environmental as well as corporate credentials.

High-performance cutting tools will provide increased efficiency and productivity but they can also be a drain on tooling budgets. Cost-justifying these tools often requires remanufacturing them when they are worn or damaged. A successful reconditioning programme reduces tooling costs by extending life as long as possible.

We can consolidate your requirements, remanufacturing both ours and non-Quickgrind tools, removing the need for you to work with multiple companies. We also remove the hassle out of selecting tools that can and cannot be remanufactured. And you set the parameters on the remanufacturing specifications and we ensure these are maintained – no more having a slightly undersize tool causing a catastrophic issue. The QuickEdge quality processes mean this doesn't happen.

We see a lot of tools every day and have built up a specialised knowledge on wear and tear. Leveraging our Alicona Optima machine we can see in-depth where tools may be deteriorating faster than they should be, if they're failing or, ultimately, if they could be improved to overcome any design limitations.

Finally, because we have been operating internationally for many years, an overseas service is available on quick lead times. With our government AEO accreditations we can expedite shipments both into and out of the UK, therefore reducing the overall lead time.

Don't forget, we happily accept solid carbide cutting tools made by other manufacturers and apply the same expertise to remanufacturing them.

[Call us today for more information – +44 \(0\) 1684 294090.](#)



# Improving your machining performance

Quickgrind's state-of-the-art Technical Centre offers a comfortable and technologically advanced environment to discuss all of your cutting tool requirements, challenges and ambitions.

Our experts will work with you to conduct trials whilst generating and running tool paths and machining strategies. Our investment in the centre enables us to demonstrate what is possible with our ground-breaking tooling and tool management solutions.

The centre is fully equipped with a seminar theatre and training room, meeting rooms and machining centres. Visitors can take a guided tour of our production facility, undergo technical training and discuss their specific requirements.



Call us  
today to  
arrange  
your visit



## Conduct important R&D

Significant investment in state-of-the-art research and training facility

## Simulate component cutting

Tailor tooling solutions to optimise productivity and reduce costs

## Host industry events

Share best practices, insights and emerging trends

## QUEST Education Programme

Training the engineers of tomorrow today

At the heart of Quickgrind's success is a solid commitment to Research and Development. The company has invested significantly in its Technical Centre in order to explore advanced manufacturing techniques and innovative tooling design. Through this continuous pursuit of excellence, we can create tooling solutions that deliver unparalleled precision, efficiency and durability to its clients across various industries.

Understanding the unique challenges faced by clients is crucial to developing effective tooling solutions. Our dedicated team of engineers and experts collaborates closely with clients to simulate their components' production processes. By gaining deep insights into the machining requirements and constraints, we can tailor tooling solutions to optimise productivity, reduce costs and enhance overall manufacturing capabilities.





The Technical Centre is an ideal training venue. We regularly host industry and client events, providing a platform for knowledge exchange and networking. These events bring together industry leaders, manufacturing experts and clients to share best practices, insights and emerging trends. Such engagements foster a collaborative environment, where Quickgrind can understand its clients' evolving needs and, in turn, provide bespoke solutions.

Quickgrind understands the importance of empowering the engineers of the future with knowledge and skills to maximize the potential of its tooling solutions. Our QUEST Education Programme offers comprehensive training workshops, seminars and online resources to educate students on cutting-edge machining techniques, tooling best practices and industry advancements. By empowering young engineers with this knowledge we are ensuring that they can harness the full capabilities of Quickgrind's tooling solutions.

Contact us today about your training requirements or if you need to run your own cutting tool trials.  
Call +44 (0) 1684 294090.





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