CERATIZIT GROUP

Aerospace

Lift off made easy: first-class tools with long-haul ticket

TEAM CUTTING TOOLS

CUTTING SOLUTIONS BY CERATIZIT · KOMET · WNT · KLENK

CERATIZIT is a high-technology engineering group specialised in cutting tools and hard material solutions.

Tooling the Future

www.ceratizit.com

Industry Solutions

Industry-specific applications and bespoke solutions

Every sector has its own specific requirements. Tools and materials are expected to offer maximum cutting performance, wear resistance, precision and quality – from large-scale production to the manufacture of single parts. This applies to the machining of aluminium alloys, cast materials and high-alloy steel as well as super alloys and titanium. As such, almost every sector of industry is affected – from the automotive and heavy duty machining sectors to aerospace and energy technology.

As the leading supplier of solutions for numerous industry-specific applications, we draw upon our wide-ranging expertise to offer you first-class advice and support. Whatever you need, we will work with you to find a successful, innovative solution to optimise your production process.

> As our customer, you will benefit from one of the largest ranges on the market, an efficient sales operation and our leading expertise worldwide!

Team Cutting Tools from the CERATIZIT Group

The full-service provider in the machining sector

Team Cutting Tools from the CERATIZIT Group is your gateway to leading international experts in machining solutions.

We are masters of the carbide production process, from the powder to the finished cutting tool. Not only does this allow us to develop special-purpose tools for customer-specific applications, it also means we can draw upon a full range of sector-specific standard tools, which are kept in stock and are available immediately.

We are experts at developing solutions, including the ability to analyse and optimise existing processes. And there is one thing that will never change – direct contact with our customers – thanks to streamlined structures and personal contacts.

- Uniquely extensive expertise in the field of machining
- One of the most extensive ranges on the market – from standard and semi-standard tools to special-purpose tools.
- Best-in-class R&D, sales and customer service
- Leading expertise in future technologies such as digitalisation and innovative production processes
- Many years of in-depth experience in various industry segments
- All under one roof the global CERATIZIT Group

> 8.000
employees

30
production facilities

> 1.000
patents

Aerospace

Take it easy – the formula for success for pioneering first-class tooling solutions

Lower fuel consumption, longer range and the highest levels of comfort, plus reduced noise levels and maximum safety: the ideal characteristics of the perfect aircraft. To come as close as possible to this ideal scenario, engineers are turning to the latest materials and going on a structural diet. The secret of their success: making extensive use of lightweight materials such as fibre composites, aluminium, titanium and super alloys. However, these materials are extremely demanding when it comes to their machining, which can only be carried out economically using the latest tool and machining concepts.

As one of the leading suppliers of cutting tools and machinery for the manufacture of complex aerocomponents, Team Cutting Tools from the CERATIZIT Group is a reliable partner to the industry. Providing high-tech tooling solutions for the machining of the carbon-fibre reinforced outer fuselage skin and all structural components, together with system solutions for highly complex engine parts, is our overriding objective.

Structural components

We deploy powerful tooling solutions to achieve outstanding parameters in the machining of engine mounts, formers and wing ribs. Due to their high material removal rates, these solutions keep costs down and use the latest cutting material grades to achieve very long tool life figures and fast processes.

Wing rib → pages 8–9

Former → pages 10–11

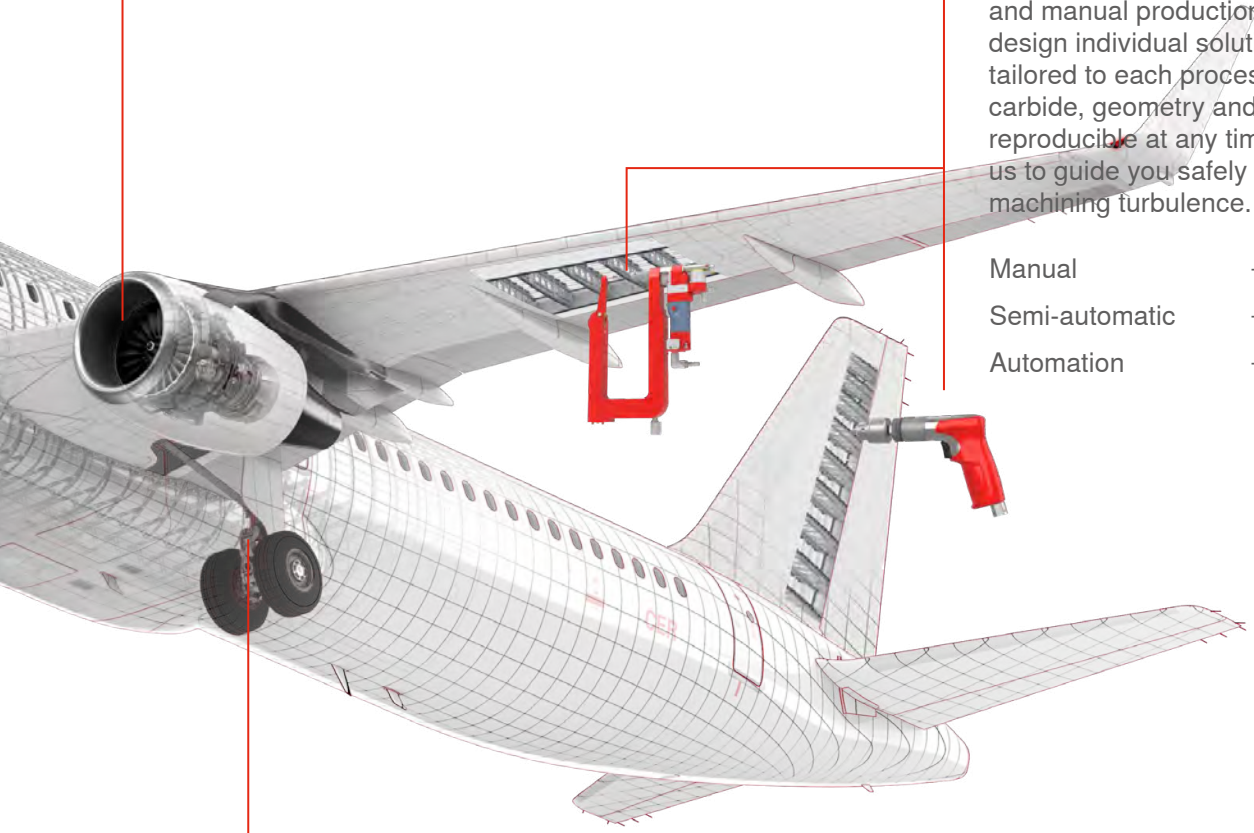
Engine mount → pages 12–13

Aero engine

Turbines provide the thrust required for the aerospace industry. They are constantly being asked to provide more power yet at the same time conserve resources. The same applies to the cutting tools, so we are now delivering solutions that enable even the most innovative materials to be machined to the highest levels of accuracy, quality and efficiency.

Assembly

Even the most modern aircraft assembly line contains elements of manufacturing. In order to optimally map the diverse material combinations and manual production steps, we design individual solutions that are tailored to each process step in terms of carbide, geometry and coating and are reproducible at any time.. This enables us to guide you safely through all that machining turbulence.

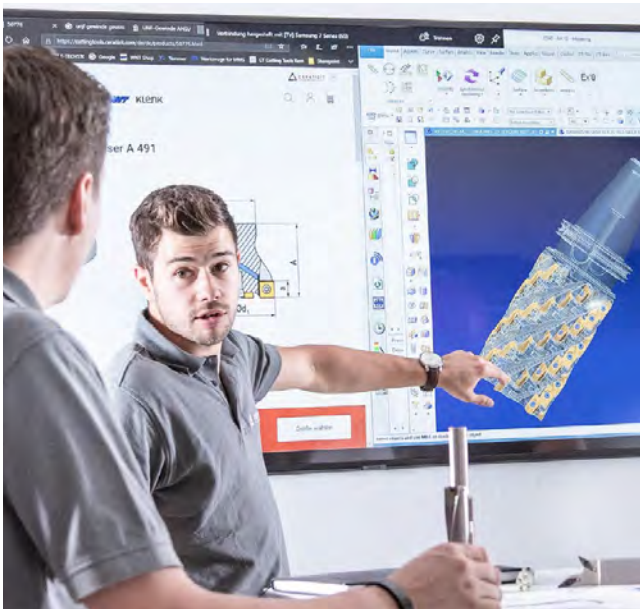


Landing gear

Because of their rigidity, high-alloy steels and titanium materials are frequently found in landing gear. In our role as a complete provider, and to ensure every operation ends as planned, we are able to extend to you a vast range of tooling solutions for turning, milling and drilling applications, not to mention a selection of controllable tools.

Our service – your competitive edge

Take advantage of our customer-specific service solutions that truly make the difference



Solutions for efficient machining processes

From expert advice and detailed project development to smooth implementation, our project engineering service will provide you with the ideal solution to meet your specific needs. Let our interdisciplinary expert team implement a customised solution for your projects.

More information → pages 32–33

Full process control with ToolScope

Our ToolScope monitoring and control system points the way for the digital future of machining. The system continuously records signals from the machine during the production process and monitors factors such as tool wear. This guarantees maximum process control.

More information → pages 34-35

Keen to set the pace on the international market? With Team Cutting Tools from CERATIZIT as your expert partner, you can! In addition to the latest technical standards, innovative materials and coatings, and special tools designed specifically for the aerospace industry, you will also benefit from our highly attractive, integrated service offerings.

Our trailblazing solutions are aimed explicitly at the aerospace industry and are adapted to the specific objectives of each customer. A unique offer that gives you a decisive competitive advantage. Take a closer look at our impressive range of services that will elevate your processes to an entirely new level and support you in the challenges you face.

Your professional partner – just a phone call away

An application engineer is always available by phone to answer your application-specific questions. Even if they are not on site with you, our experts are always ready to help.

More information → page 36

Environmentally friendly, sustainable & cost-effective

Certified recycling of valuable carbide.

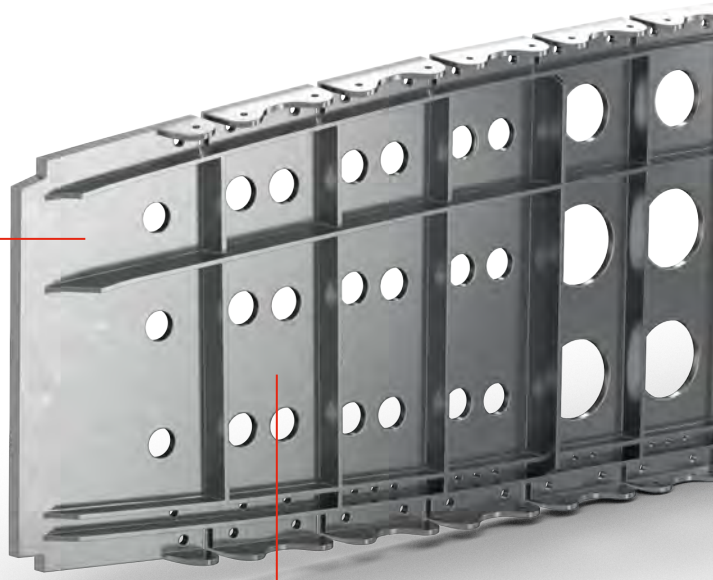
More information → page 37

Machining the wing rib

Material removal rates and tool life reach new heights

Together with the stringers, the wing ribs form the framework of the aircraft wings and are permanently exposed to enormous stresses while in the air. To save weight and counter the constant stress, aluminium wrought alloy has become the go-to material for wing ribs.

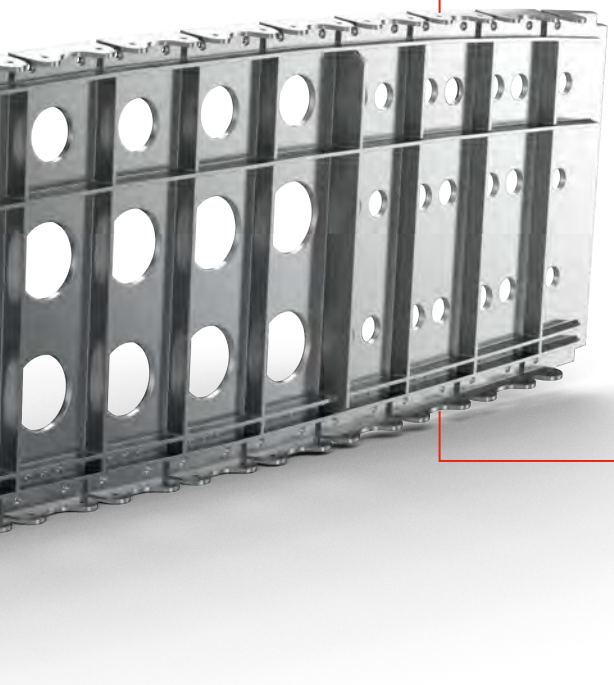
The process-secure tooling solutions of Team Cutting Tools from the CERATIZIT Group are designed to cope with high-speed machining operations and deliver outstanding parameters in machining processes.



High-speed milling

MaxiMill HPC/HSC indexable insert milling cutter

- ▲ 90° shoulder milling system for roughing and finishing light alloys
- ▲ Various milling applications possible
- ▲ Max. ap 18 mm
- ▲ Large range of corner radii up to 6.4 mm



Trochoidal milling

CCR-AL - solid carbide milling cutter

- First choice for the roughing of medium-sized aluminium pockets or slots
- Special cutting edge design perfect for trochoidal milling (CPC: circle power cutting)
- Cutting edge with chip breaker for safe chip evacuation even with a large cutting depth
- For milling of CPC applications up to 5xD

Conventional roughing

AluLine WR

- First choice for the roughing of smaller pockets and contours
- Modified cutting edge geometry ensures low cutting forces, thus improving machining parameters and productivity
- Uncoated grades, DLC coated or with PVD-multilayer coating

Universal machining

MaxiMill 491

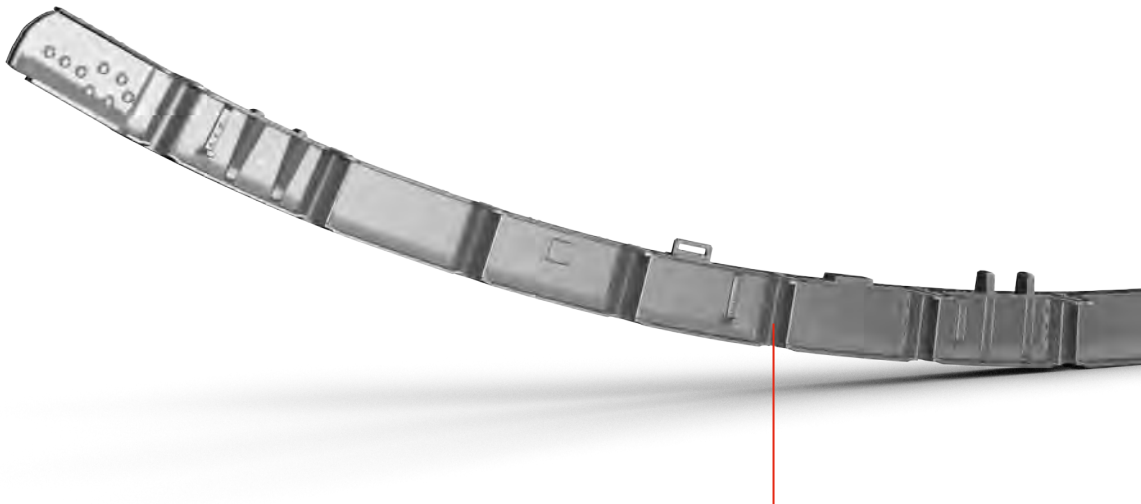
- Economical double-sided 90° indexable insert milling cutter system
- Ground indexable insert with 8 cutting edges
- Its outstanding surface quality allows roughing and finishing to be carried out with the same indexable insert

Machining the former

Rigidity from titanium

Formers and stringers give the fuselage the necessary rigidity. Titanium is often used for the formers as it is extremely light. Its high tensile strength also helps reduce the number of components required. However, these positive characteristics come at the cost of demanding machining properties, which in turn require a corresponding level of expertise and high-performance tooling solutions.

CERATIZIT can get you off to a flying start with its specialised cutting materials, which ensure reliable tool life and stable processes when roughing and finishing.



Trochoidal roughing of medium-sized pockets and slots in titanium, super alloys and high-alloy steel

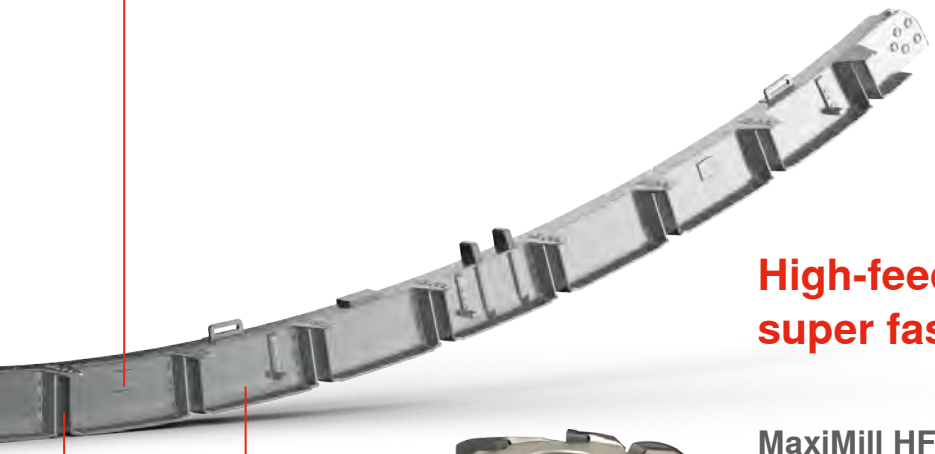
CircularLine CCR-UNI – solid carbide milling cutter

- ▲ Special cutting edge design perfect for trochoidal milling (CPC: circle power cutting)
- ▲ Cutting with chip breaker for safe chip evacuation when working with large cutting depths
- ▲ For CPC milling up to 5xD

90° shoulder, pocket or slot milling with high ap on medium and large structural components

MaxiMill 211-KN indexable insert porcupine cutter

- Indexable insert system for the machining of large pockets, for plunging or for universal applications
- Perfectly adapted tool holder
- Corner radius up to 6.0 mm
- Coated cutting material grade CTC5240 as benchmark in titanium machining



High-feed freeform milling with super fast machining rates

MaxiMill HFC-19 indexable insert milling system

- High-speed roughing and shaping of large 3D areas
- 4 cutting edges per indexable insert
- Max. ap 3.3 mm (19 mm insert)

Finishing of pockets and slots for various components in aircraft construction

MonsterMill TCR

- Machining of small and medium-sized titanium areas
- Perfectly adapted geometry for machining titanium and heat resistant super alloys
- Huge range of end mills, torus or ballnose cutters

Machining the engine mount

A lot hangs on it: extreme forces, toughest materials and high-performance cutting tools

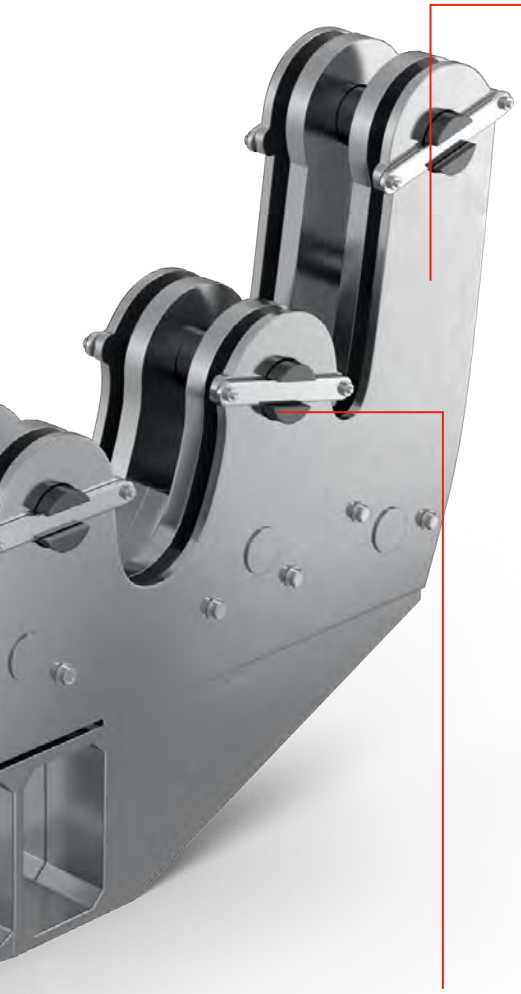
No tolerances are permitted when it comes to safety – especially in the development of engine mounts. They are subject to enormous stresses when taking off and landing, which is why only the most rugged materials can be used. The machining of these in turn has to be carried out to the highest levels of accuracy and process security.

Welcome aboard – CERATIZIT already has the solutions you need.

Universal with 90° setting angle for various applications on medium size and large areas

MaxiMill 211 90° shoulder milling system

- Indexable insert system for the machining of large pockets, for plunging or for universal applications
- Special insert design, perfect for plunge milling
- Comprehensive product range
- Suitable for various milling strategies and applications
- Cutting material grade CTCS245 developed for machining Ni-based alloys



Face milling for cost-effective roughing with large cutting depths and reduced power consumption

MaxiMill 271

- 8 cutting edges per indexable insert
- Max. ap 8.4 mm (17 mm insert)
- Double-sided indexable insert with integrated clearance angle for reduced power consumption

Productive drilling of large and medium diameter holes

MaxiDrill 900 indexable insert drill

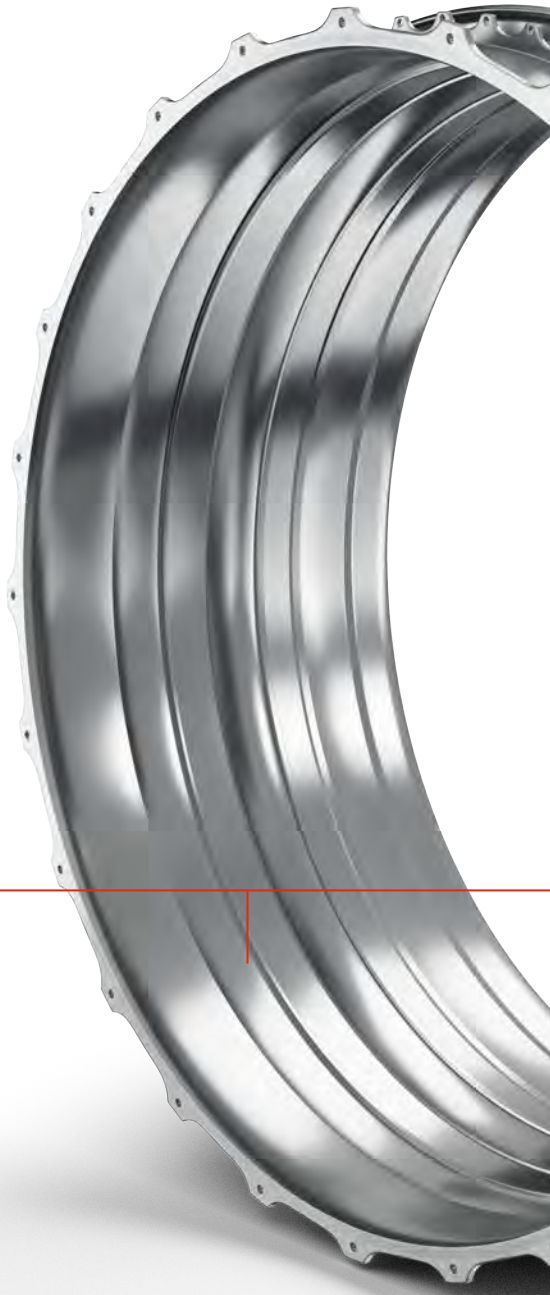
- Drilling of large and medium diameters
- PVD-coated universal grade for all common materials
- One indexable insert for centre and peripheral cutting
- Great performance even in difficult cutting situations
- High alignment accuracy thanks to 4 guide lands

Machining the fan case

Everything revolves around titanium – machining fans follow the contours

The dimensions of modern turbofan engines and their turbo fans are impressive. As are the challenges in the machining of the ring-shaped fan cases, which form the casing for the largest turbine blades of the entire engine. Highest possible levels of rigidity and uncompromising safety are the number one priority, which is why fan cases are also made from titanium.

Anyone involved with process security and productivity and who also places a great deal of importance on efficiency and surface quality will no doubt already have the tool portfolio of CERATIZIT on their radar.



Finishing and semi-finishing of the internal and external contours of titanium casings with RCMT button inserts

RCMT 1606MOTN-24 H216T indexable insert

- ▲ Specially adapted "-24" geometry for the copy turning of titanium
- ▲ Uncoated fine grain size H216T
- ▲ High temperature and wear resistance

Drilling of heat-resistant alloys

WTX-Ti solid carbide drill

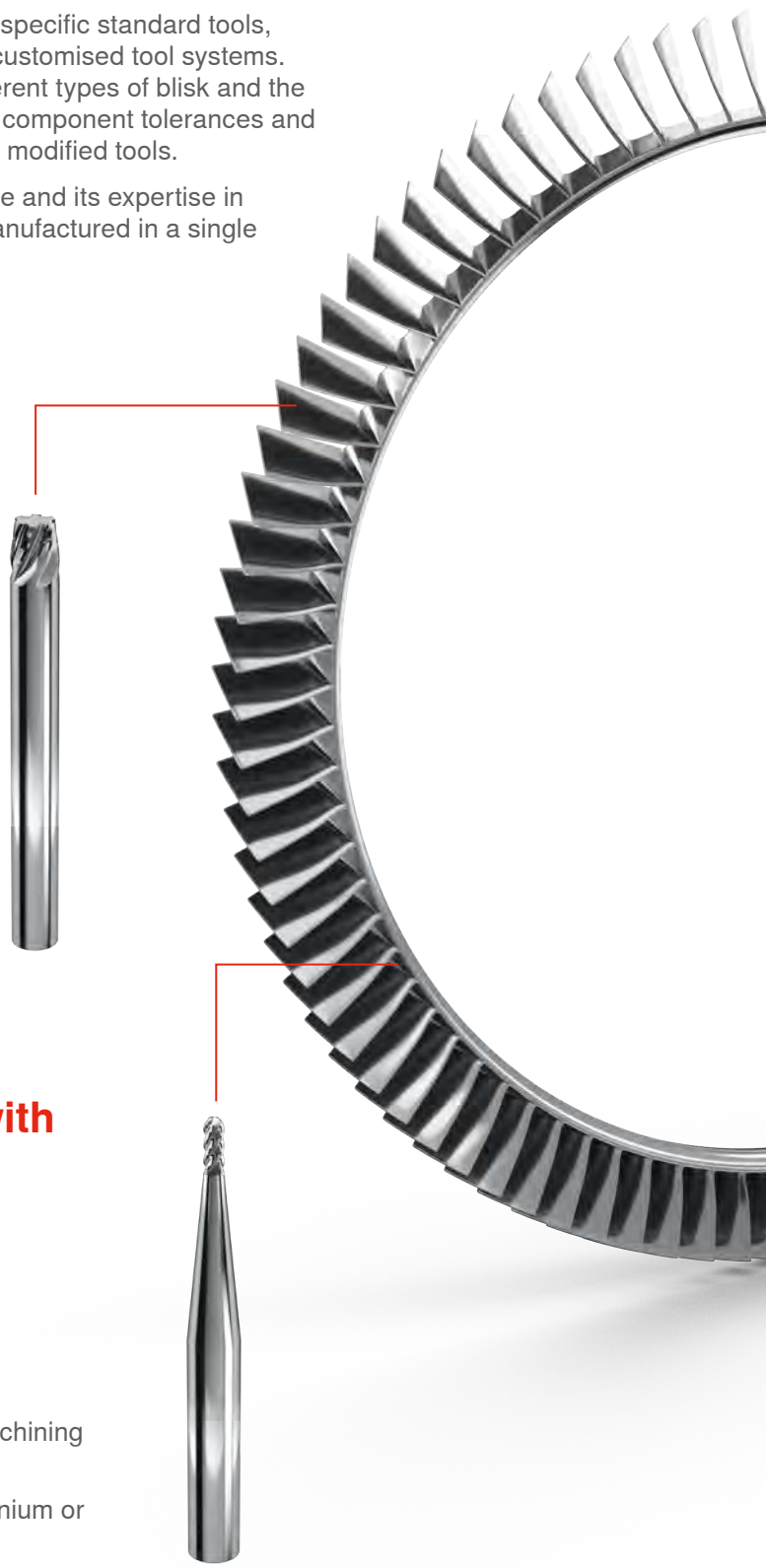
- Improved geometry and core diameter for maximum process security
- Unique performance due to new high-end double coating system
- Stabilisation chamfer on the cutting edge for greater tool stability

Machining the blisk

Inspired variety: the perfect blisk – in one clamping operation

Even though much can still be achieved using application-specific standard tools, machining of the blisk in particular requires modified and customised tool systems. The demanding contours found on the wide variety of different types of blisk and the stringent requirements with regard to surface quality, tight component tolerances and high-quality materials can only be satisfied using specially modified tools.

The broad scope of the CERATIZIT standard product range and its expertise in devising special solutions mean that blisks can now be manufactured in a single clamping operation.



Blisk pre-finishing and finishing with customised profile cutters

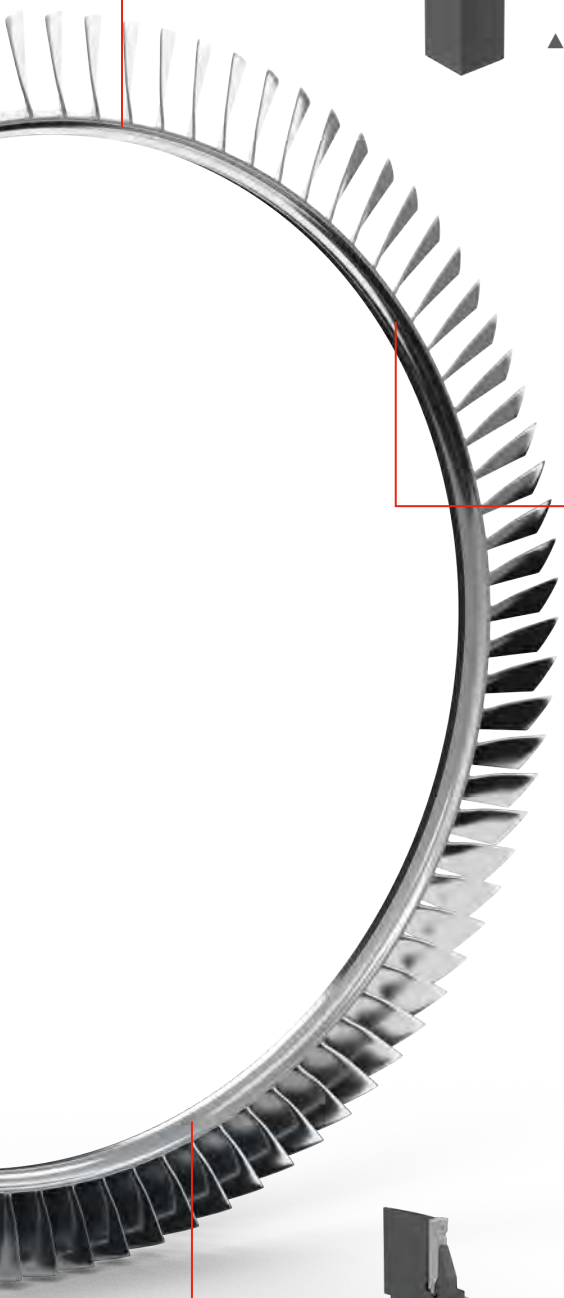
Solid carbide barrel milling cutter

- Ideal for flank milling
- Perfectly adapted to the customer's blisk shape and machining strategy
- Optimised geometry and grade for the machining of titanium or heat-resistant alloys

Blisk pre-finishing and finishing with customised radius milling cutters

Solid carbide ballnose milling cutter

- Ideal for platform and fillet radius milling
- Perfectly adapted to the customer's blisk shape and machining strategy
- Optimised geometry and grade for the machining of titanium or heat-resistant alloys



Finish machining with low cutting forces

CTPX710 carbide grade

- Latest PVD coating technology for machining heat-resistant alloys, stainless steel and titanium

Rough machining at impressive cutting speeds

SiAlON ceramic grade 1481

- 1481 SiAlON ceramic with excellent notch wear resistance, first choice for Inconel718
- CTKS710 whisker ceramic as alternative for other applications, particularly for continuous long cuts

Monoblock or flexible MSS modular tool system for axial or radial grooving

GX24 grooving system

- Radial, axial, internal, and external grooving applications possible
- Monoblock, parting blades, and the flexible MSS modular tool system available
- Straight cutting edge and radius plate in various geometries for a range of applications

Machining the combustion case

Not just a lot of hot air: the pressure's really on here!

The combustion chamber of an aircraft turbine is a system of superlatives: for instance, temperatures and pressures go sky-high when the compressed hot air and kerosene are ignited. This places tremendous demands on the construction material, which means heat-resistant super alloys are the only option. However, these can only be machined using extremely tough tools.

To ensure the required level of efficiency is maintained in face of all these challenges, CERATIZIT has optimised its tools for both long haul and shorter domestic flights.

Roughing of Ni-based alloys at impressive cutting speeds

SiAlON ceramic grade 1481

- ▲ 1481 SiAlON ceramic with excellent notch wear resistance, first choice for Inconel718
- ▲ CTKS710 whisker ceramic as alternative for other applications, particularly for continuous long cuts

Turning finish machining with low cutting forces

CTPX710 carbide grade

- ▲ Latest PVD coating technology for machining heat resistant alloys, titanium and stainless steel

Machining of smaller areas and pockets in titanium or Ni-based alloys

MonsterMill TCR solid carbide milling cutter

- ▲ Perfectly adapted geometry for machining titanium and heat resistant super alloys
- ▲ Huge range of end mills, torus or ballnose cutters

Thread milling with special solid carbide milling cutters

MGF M6 1.5D thread milling cutter

- ▲ Solid carbide thread milling cutter
- ▲ Optimised for machining Ni-based alloys

For precise drilling with the perfect finish

Fullmax 52P.57Un solid carbide reamer

- ▲ Solid carbide reamer for precise reaming of heat-resistant alloys with superb surface quality

Machining the turbine blade

Squeezing out air to increase efficiency: we clear the way!

Turbine blades are subjected to phenomenal thermal stresses and must always deliver peak performance over the entire life of the aero engine. Aircraft engineers are using super alloys or titanium alloys and a steady stream of newly developed materials to look for new ways of making turbine blades even tougher. This in turn increases the stresses imposed during machining, as these materials are extremely difficult to cut and efficient manufacturing is essential.

Thanks to the CERATIZIT tool systems, which are designed to deliver maximum levels of productivity, machining times are kept within acceptable limits, even during the complex roughing processes used for the rhombus and blade.

High-feed indexable insert milling system for larger cutting depths

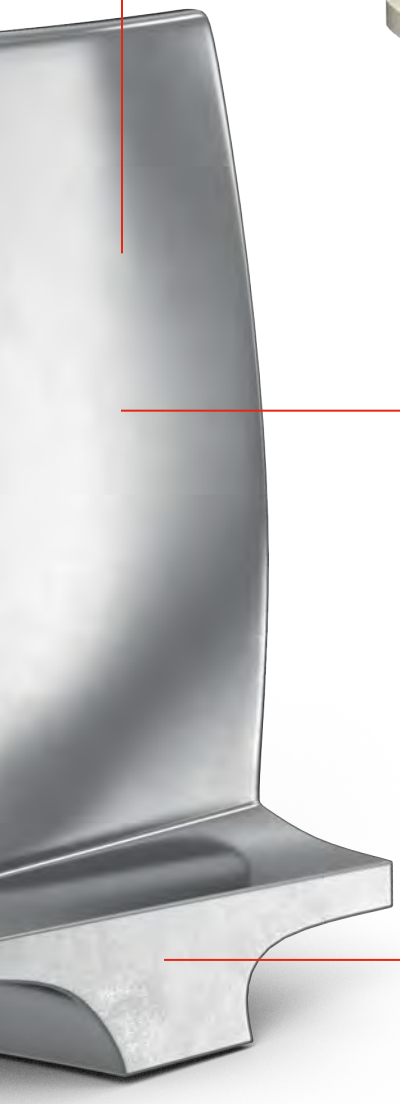
MaxiMill HFC-TUR

- HFC milling with larger cutting depths than conventional systems owing to the adapted setting angle
- Coated carbide insert grade CTCS245 for machining heat-resistant alloys and CTC5240 as benchmark in titanium machining

Extremely productive freeform milling with positive button inserts, machining of large areas of Ni-based alloys

MaxiMill 261 – ceramic

- Extremely productive: more than 10x higher cutting speeds possible compared to carbide inserts
- Drastically shortened machining times for roughing, regardless of the machining strategy



Highly efficient finishing due to patented exchangeable head system

MultiLock for solid carbide milling heads

- Cost effective, unbeatable price performance ratio
- Closes the gap between indexable insert and solid carbide systems
- Extensive product range for other applications

Versatile machining options with button inserts

MaxiMill 251

- Button insert milling system for large areas
- Universal freeform milling for every application and machining strategy
- Extensive range of tools and indexable inserts

Machining of transitions on blade root and blade tip

Solid carbide conical ballnose milling cutter

- Adapted geometry for the machining of special contours on Ni-based alloys and titanium

Machining the main cylinder

Precision landing achieved in the machining of titanium and high-alloy steels

The landing gear of an aircraft has to bear the total weight of the aircraft, its freight and its passengers. It must therefore absorb and dissipate all the dynamic forces, shocks and loads exerted on it, particularly when taxiing and landing. The main cylinder is the focal point of the landing gear. This heavily loaded component is generally constructed from titanium or high-alloy steels. However, it is not just the materials that are demanding; the components themselves are extremely complex. In addition to the tool technology, an optimum machining strategy is also needed.

Just as well that Team Cutting Tools already has suitable solutions and concepts available for contour milling, turning and drilling.

Indexable insert system for the machining of large pockets, for plunging or for universal applications

MaxiMill 211

- ▲ Special insert design, perfect for plunge milling
- ▲ Comprehensive product range
- ▲ Suitable for various milling strategies and applications

High performance tool for steel machining

HPC2 solid carbide universal milling cutter

- Small helix angle for low cutting force and large helix angle for rapid chip evacuation
- Patented core diameter and helix angle

Roughing of large 3D areas at high feed rate

MaxiMill HFC

- Smaller indexable insert setting angle for stable machining even with large overhangs
- Coated cutting material grade CTPP235 for reliable machining of high-alloy steel

Standard or modified versions for customer-specific tool holders and turning strategies

ISO turning inserts

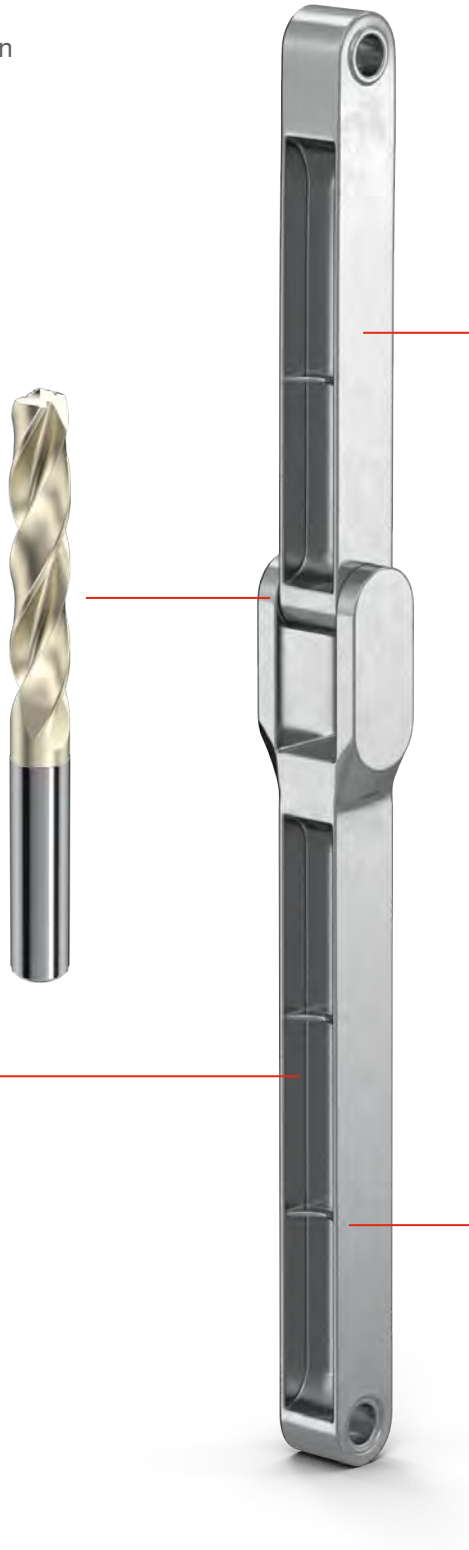
- Coated carbide grade CTCP125 for the process-secure machining of high-alloy steels
- Different geometries for short chip formation, e.g. –SMF
- Customer-specific indexable insert versions possible for different turning strategies

Machining the landing gear strut

Titanium alloys ensure it works

The landing gear strut retracts the landing gear into the fuselage after take-off and extends and locks it in position prior to landing. Titanium alloys are frequently used in its construction to enable it to withstand the enormous forces it is exposed to during take-off and landing. The demanding machining characteristics of these alloys, together with the complex structure of the component, make the machining process anything but easy. But whether trochoidal or conventional:

you'll always land on solid ground with tooling solutions from CERATIZIT.



Great performance in drilling titanium materials

WTX-Ti solid carbide drill

- Improved geometry and core diameter for maximum process security
- Unique performance due to new high-end double coating system
- Stabilisation chamfer on the cutting edge for greater tool stability

CCR-UNI solid carbide milling cutter optimised for trochoidal roughing

CircularLine

- Special cutting edge design perfect for trochoidal milling (CPC: circle power cutting)
- Cutting with chip breaker for safe chip evacuation when working with large cutting depths
- For milling in 3xD and 4xD CPC applications

Face milling for cost-effective roughing with large cutting depths and reduced power consumption

MaxiMill 271

- Double-sided indexable insert system for pre-roughing with large cutting depths
- 8 cutting edges per indexable insert
- Double-sided indexable insert with integrated clearance angle for reduced power consumption
- Cutting material grade CTCS245 specially developed for machining Ni-based alloys

90° deep shoulder, pocket or slot milling on medium and large components

MaxiMill 211-KN indexable insert porcupine cutter

- Perfectly adapted tool holder
- Corner radius up to 6.0 mm
- Coated cutting material grade CTC5240 as benchmark in titanium machining

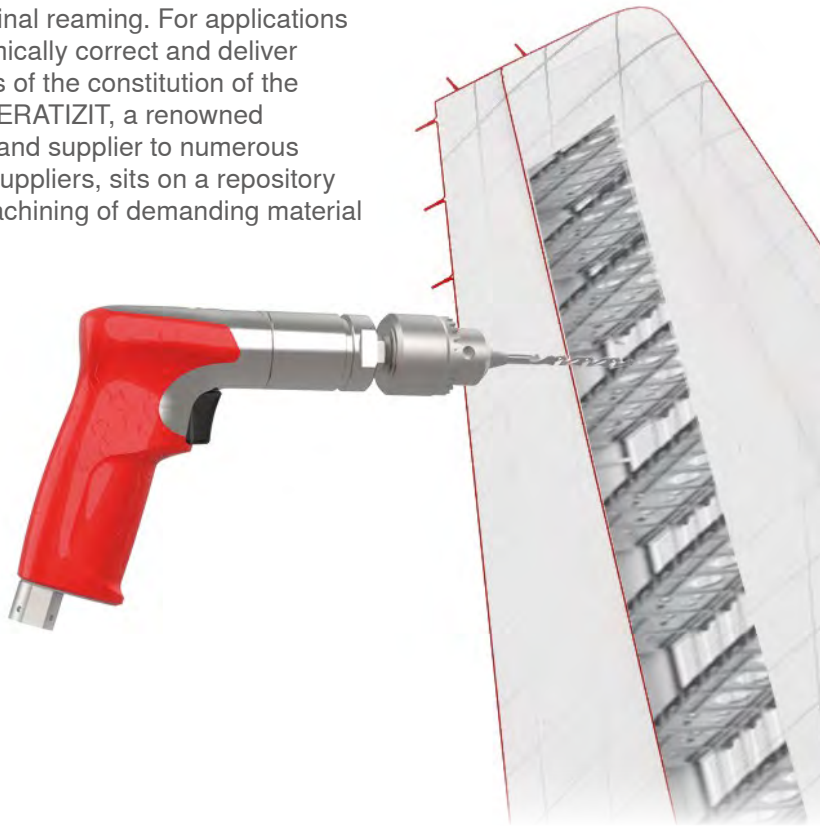
Assembly

Manual drilling

Ergonomic handling and highest quality guaranteed

Some parts of the manufacturing process are still manual, even on ultra-modern aircraft production lines. Using a fixed-speed drill and no lubrication, operatives use nothing but muscle power to drill holes in a wide variety of combinations of CFRP, aluminium or titanium. This often occurs in three stages – pilot hole, core drilling and final reaming. For applications like these, the tool has to be ergonomically correct and deliver the highest quality results, regardless of the constitution of the operative. All to the good then that CERATIZIT, a renowned manufacturer of manual power tools and supplier to numerous aircraft manufacturers and their subsuppliers, sits on a repository of the necessary expertise for the machining of demanding material stacks.

And as a result of its collaboration with universities and research institutions, Team Cutting Tools is actively helping to shape the future of machining.



Create efficient manufacturing processes, even in titanium

Titanium alloys: cool the hot chip

Among the main reasons that titanium is such an attractive option for aircraft manufacturers are its tensile strength at high temperatures, its low specific weight and its resistance to corrosion. However, its low thermal conductivity makes machining more difficult, as the process heat is transferred to the workpiece and the tool, rather than being carried off with the chips. Lubrication and the correct machining parameters, on the other hand, make for a cool process. Thanks to its decades of experience in working with titanium, Team Cutting Tools can define the appropriate combination of carbide grade and geometry.

And you have the extremely robust CERATIZIT solutions to thank, even with a material such as this, for your efficient manufacturing processes.

Materials – machining options

Many years of experience with all common single and mixed material stacks in the aerospace industry, plus other combinations, e.g. with steel or Inconel.

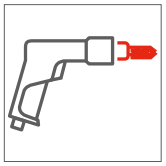
Fibre composites: not a problem

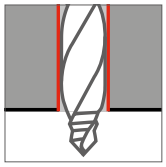
CFRP and GFRP are on the one hand extremely tough, yet they have a very low specific weight. The highest priorities in the machining of highly abrasive fibre composites are ensuring clean fibre cutting, preventing delamination, and avoiding projecting fibres. A long tool life or tight tolerances can therefore only be achieved by using adapted geometries and high performance diamond coatings or cutting tools equipped with PCD.

CERATIZIT has an ultra-precise manufacturing facility and experienced personnel who are eager to be challenged with fibre composites!

Top priority: clean fibre separation

Example: manual one-shot drilling of CFRP-ALU





Technical data

- Uncoated solid carbide drill
- Hole Ø 5.1 mm
- Drilling process: One-shot drilling (OSD)
- Mixed package CFRP-ALU (6 mm – 4 mm)
- Machine: Pneumatic manual drilling machine with 3,300 rpm
- Tool life >100 holes

Advantages/benefits

- Fewer process steps
  → lower costs
  → increased productivity
  → shorter process times
- Reduction in the number of different tools
- Tools can be reground
  → save money and improve environmental footprint
- Adapted cutting edge geometry offers ergonomic handling and operative-independent results with exceptionally good tool life

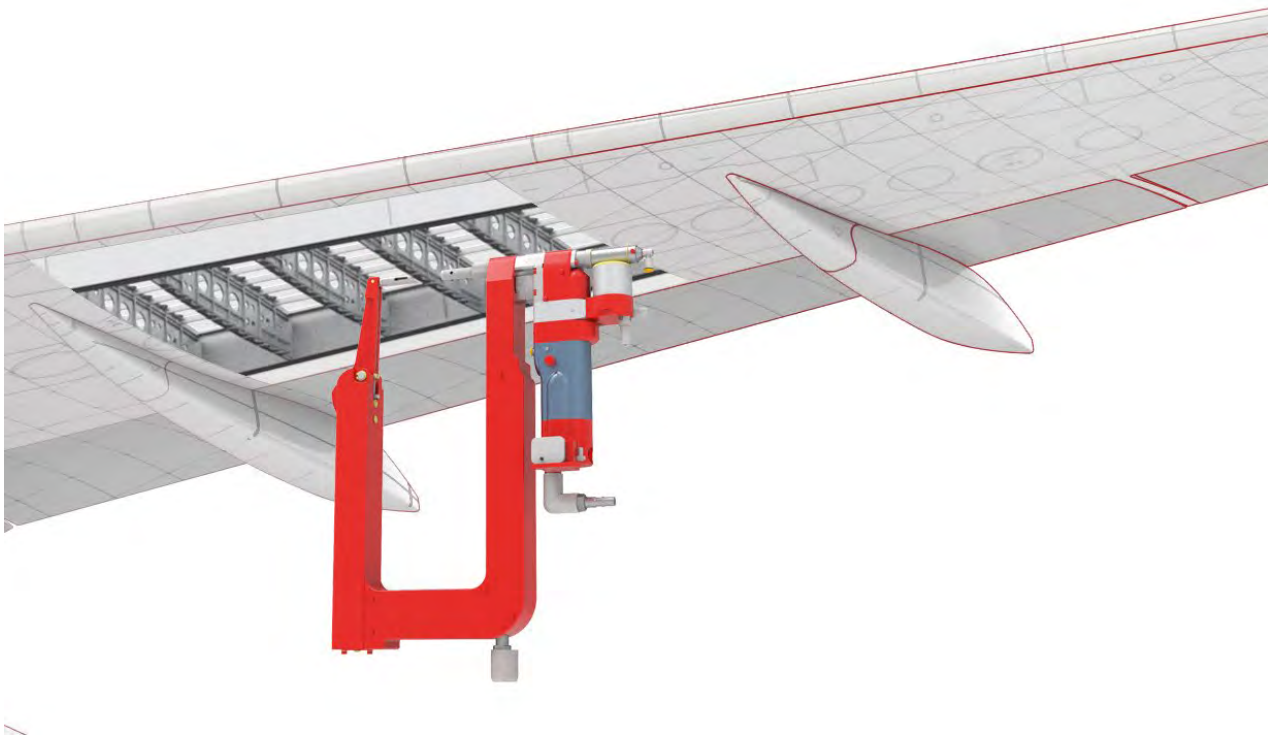
Assembly

Semi-automatic drilling

High process security and low costs per hole

Semi-automatic applications are carried out using hand-held pneumatic or electric machines at a fixed speed and feed. The cutting tools must be individually adapted to the component/template/machine situation for reasons of process security, competitive tool lives and low costs per hole. Team Cutting Tools is developing special solutions in diameters from 2.5 to 30 mm for all combinations of CFRP/GFRP, aluminium and titanium alloys, steel, Inconel and honeycomb structures. One-shot drilling with tolerances of up to 18 µm is possible depending on the material combination.

Need any support with tool requirements or want to carry out some preliminary tests? We've already packed the appropriate equipment and necessary expertise!



Fit tolerances down to IT8

Technology: one-shot drilling

A reliable one-shot drilling process reduces tool change and machining times, thus helping to increase efficiency and shorten process times. Save time in advance by asking Team Cutting Tools to adapt the macro and microgeometry to the respective machining situation. Every one-shot tool is also an extremely precise special design capable of achieving fit tolerances down to IT8.

Materials – machining options

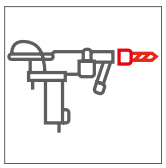
Many years of experience with all common single and mixed material stacks in the aerospace industry, plus other combinations, e.g. with steel or Inconel.

Aluminium alloys: a classic with (practically) no airs and graces

Aluminium is the classical lightweight material. After all, it's a durable, light and relatively easily machinable material. The fact that aluminium tends to exhibit material adhesion, which can reduce tool life or process parameters, determines the design of the cutting tools. The technical team at CERATIZIT pays special attention to the lubrication and the individual combination of cutting material, coating and geometry. Even dry machining is possible under certain circumstances.

Optimal tool design for dry machining

Example: one-shot countersinking in H7 in ALU-ALU with ADU



Technical data

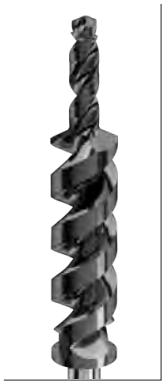
- Uncoated solid carbide countersink
- Holes
  Ø 4.1 mm – 32.0 mm
  Countersink Ø: up to 35.0 mm
- Countersinks in one-shot possible down to IT8
- Implemented in production both with lubrication and as a dry process

Advantages/benefits

- One-shot tool: reduces tool change times and costs, increases productivity and reduces the number of different tools
- Can be used without any lubrication whatsoever in dry drilling processes: better health conditions, drastic reduction in amount of cleaning required
- Process security for your manufacturing operations as result of reproducible premium quality with superb surface quality and tightest fit tolerances
- CERATIZIT has implemented countless special solutions across the globe and built up a wealth of experience that goes into every new application

Assembly

Automatic drilling

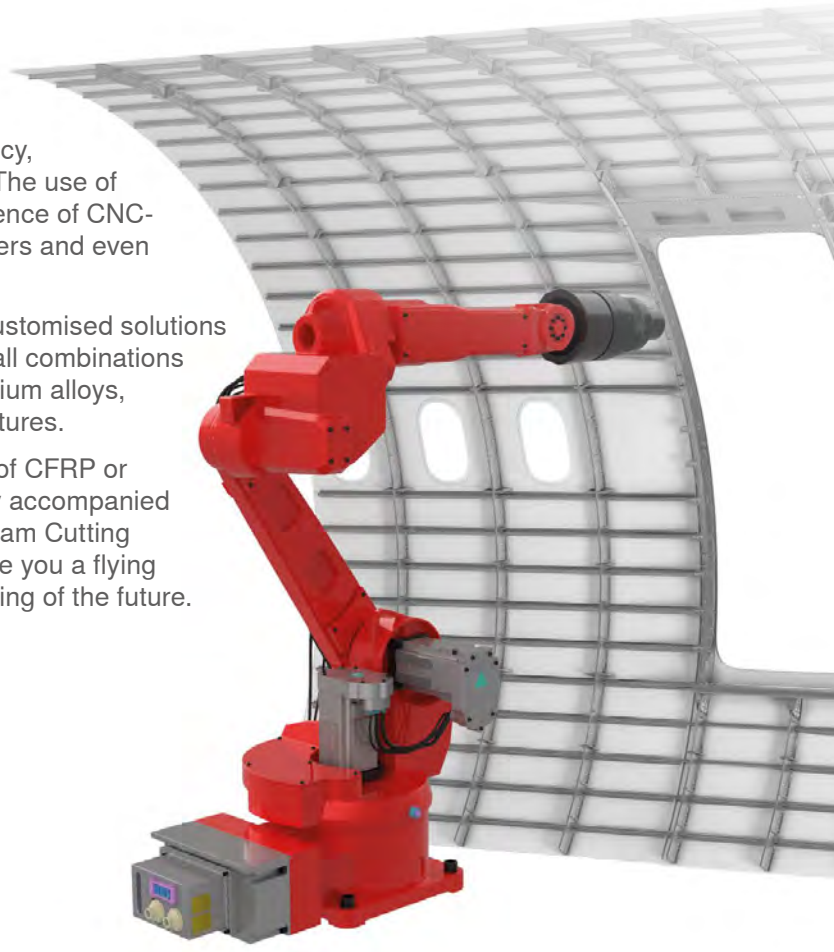


Top process security with customised solutions

Increased automation will undoubtedly be a feature of aircraft construction in the future – not least due to its greater efficiency, accuracy and reproducible quality. The use of drilling robots will herald the emergence of CNC-controlled, variable cutting parameters and even vibration drilling.

Team Cutting Tools is developing customised solutions in diameters from 2.5 to 30 mm for all combinations of CFRP/GFRP, aluminium and titanium alloys, steel, Inconel and honeycomb structures.

Whether it's the high-speed drilling of CFRP or extended tool life and drilling quality accompanied by top levels of process security: Team Cutting Tools is a reliable guide who will give you a flying start into the automated manufacturing of the future.



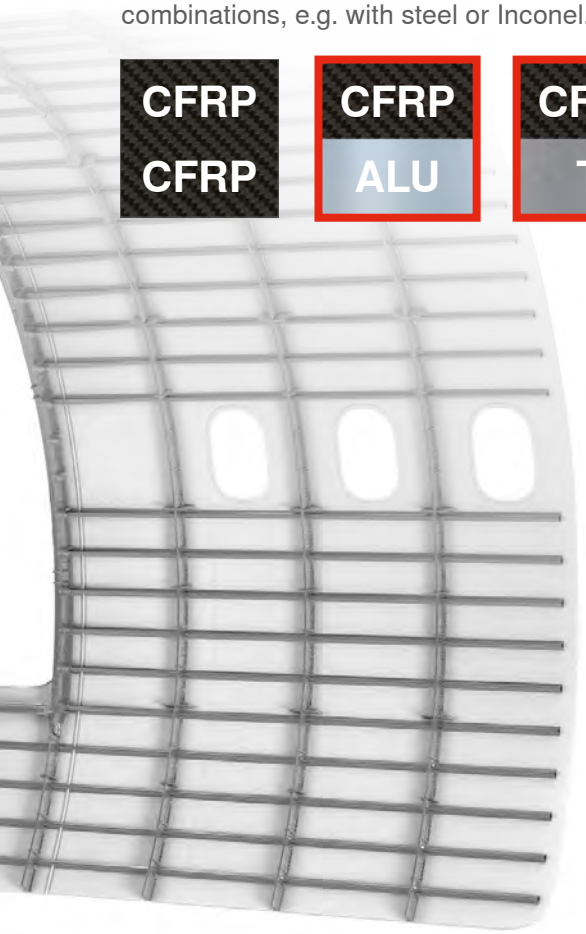
Special geometry with adapted diamond coating

Technology: dry drilling, one-way assembly

Dry drilling and one-way assembly are part of the essential vocabulary of cost-effective aircraft assembly. Dry drilling using today's state-of-the-art technology is possible in CFRP and pure aluminium packages and in CFRP-aluminium stacks. CERATIZIT is developing special geometries with adapted diamond coatings. Cutting tools for one-way assembly go a step further and ensure a totally contaminant-free process within sealed structures. Disassemble before cleaning? Never again!

Materials – machining options

Many years of experience with all common single and mixed material stacks in the aerospace industry, plus other combinations, e.g. with steel or Inconel.

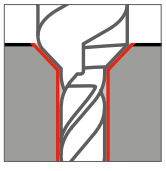


Material stacks: stronger together

Material stacks consisting of at least two dissimilar materials present machinists with a tricky situation, one that has a number of contrasting characteristics. The mission of Team Cutting Tools? To come up with a compromise tool package that delivers the best possible results for each material while at the same time satisfying the requirements in terms of burr formation, projecting fibres, delaminations, tolerances and surface quality. An essential prerequisite in this quest are individual tools that are tailored to the application in terms of both their micro and macrogeometry. If your processes need to maintain a consistently high performance level, then sooner or later you'll be talking to CERATIZIT. After all, top-quality tool production to tight manufacturing tolerances is part and parcel of our all-inclusive offering.

Customised tools

Example: automatic countersinking of ALU-TI



Technical data

- Coated solid carbide countersink
- Material package ALU (4 mm – 6 mm) – TI (2 mm)
- Machine: Robot with end effector 1300 rpm and 0.1 mm/rev.
- Tool life 5000 holes for both material combinations

Advantages/benefits

- Special tool with adapted cutting edge geometry for optimum performance in both materials
- Uses a special carbide-coating combination with outstanding bonding properties
- Increase tool life with a special coating that reduces frictional forces during the process and prevents adhesion
- Special countersinking angle geometry prevents vibrations and helps improve countersink surfaces

Projects in the best possible hands

From consulting to successful completion, we realise your application-specific project goals

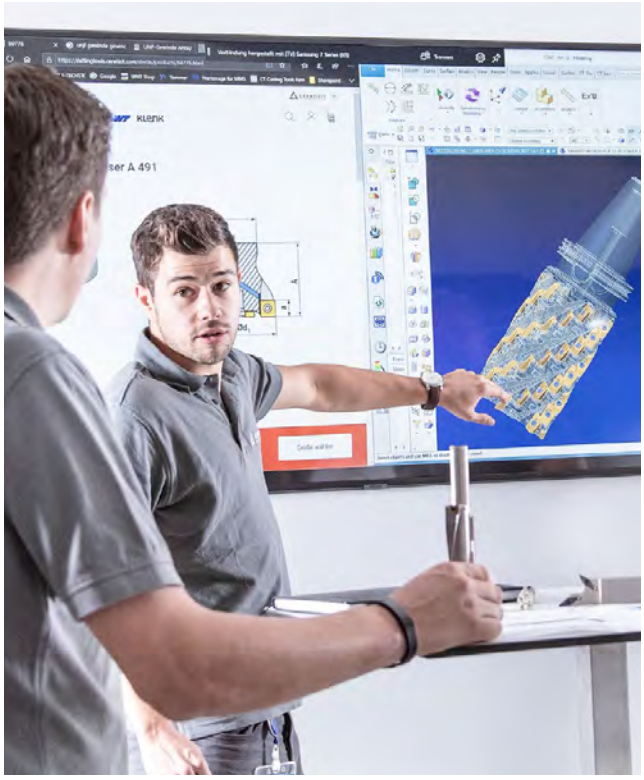
In order to machine increasingly complex workpieces cost effectively and to a high level of quality, all the process parameters need to be tailored to the specific task. Those who succeed in meeting these challenges will remain competitive on the global market.

However, the reality is that businesses often do not have the capacity to analyse manufacturing processes and optimise them to make them more efficient. There is also usually not enough time to tailor new cutting materials, tool geometries or process technologies to the individual machining operations.

This is precisely where our project engineering comes in. As one of the leading tool manufacturers and innovators in the machining industry, we develop ideal tool concepts for you based on key success factors such as efficiency, time and quality.

Why are we the ideal system partner for you? We have many years of experience in the development of innovative tooling solutions for the aerospace industry, have access to an in-depth pool of technical expertise and offer unrivalled levels of service. What's more, with our leading product brands Cutting Solutions by CERATIZIT, KOMET, WNT and KLENK, we are a full-service provider in machining, offering one of the most comprehensive ranges of cutting tools and services.

If you want to set the pace rather than risk falling behind the international competition, then get in touch with us!



Project consulting

We always keep your objectives in mind and provide you with advice across all industries in all application areas. Benefit from our many years of experience and our innovative solutions.

Project development & quotation

Our interdisciplinary project team develops the ideal machining concept for your individual specifications and objectives using high-end CERATIZIT tools.

Project implementation

Our expert team implements the concept on your machine, working closely with you and your dedicated CERATIZIT application engineer. This on-site support guarantees you will receive a stable and cost-effective manufacturing process for your product.

Ongoing support

Even after successful implementation of the project, we are here for you. Your dedicated application engineer keeps an eye on your manufacturing processes, determines further potential for optimisation and provides you with ongoing support for all the challenges you face.

The path to developing perfect tooling solutions

The more complex a workpiece, the more innovative the tool concept needs to be in order to ensure the highest level of quality and cost effectiveness. Our project engineering service is designed to develop tooling solutions of this kind.

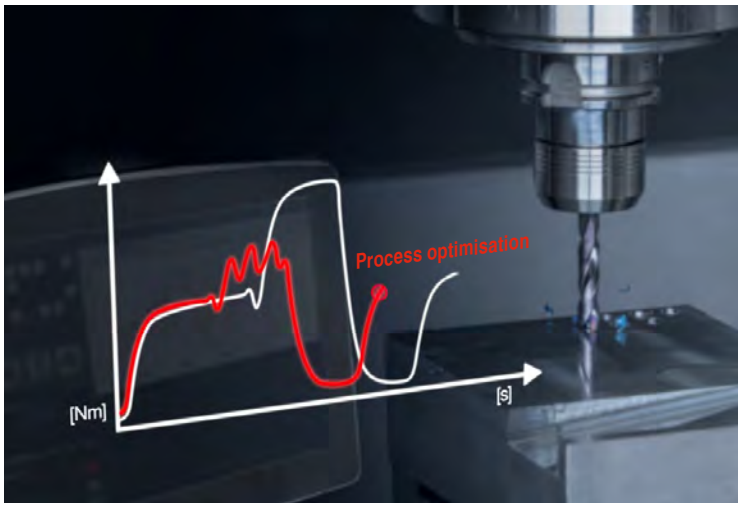
For example, our MaxiMill 211-KN indexable insert porcupine cutter was developed in response to a specific customer request. Whether milling 90° shoulders, larger pockets or slots – the indexable insert system comfortably handles these applications with a high width of cut (ap). We know we can develop the perfect tool concept for your requirements too. Why not put us to the test?

For more information about the MaxiMill 211-KN, turn to
→ pages 10–11, 24–25

Full process control – with ToolScope digital monitoring

No other sector utilises lightweight construction materials such as fibre composites, aluminium, titanium and super alloys to the same extent as aerospace. These materials are extremely difficult to machine and can only be processed in a commercially viable manner using the latest tool and machining concepts. As a powerful ally to the sector, we not only provide the perfect tooling solutions and strategies to ensure your processes run smoothly, we also offer an advanced Smart Factory solution. Leave nothing to chance with ToolScope, the groundbreaking monitoring and control system. You will have full transparency concerning your machining operations and, with this knowledge, can increase the efficiency of your processes.

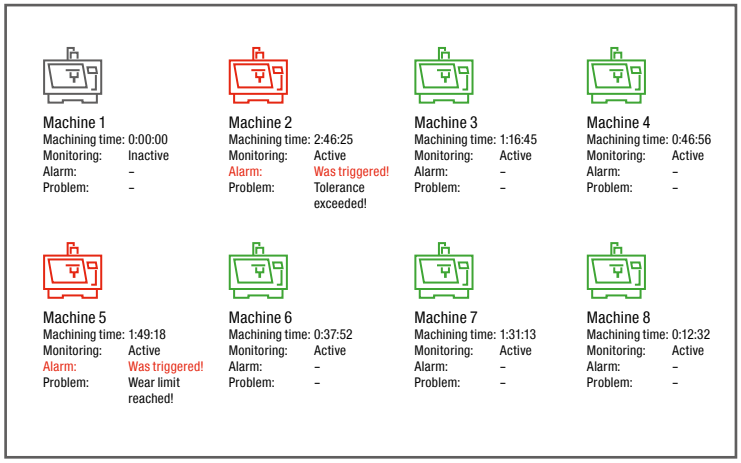
ToolScope is a digital assistance system for your production environment that monitors and optimises all machining processes. Its innovative functions are customised machining solutions that are integrated in the machine. With ToolScope, we are the only company to offer not only the right tool, but also the expertise and capabilities to master and improve machining processes. One hundred years of manufacturing expertise in tools and an in-depth understanding of digital systems make CERATIZIT the perfect partner for all the services related to any aspect of process optimisation.



An overview at a glance – digitalisation of production data

ToolScope, as the eyes and ears of the machine, digitalises your machine shop. You have full transparency over machine downtimes, meaning manual tool operation sheets become a thing of the past. The ToolScope "Cockpit" gives you a complete overview of your machine's performance.

Machine shop



Keep a close eye on your processes

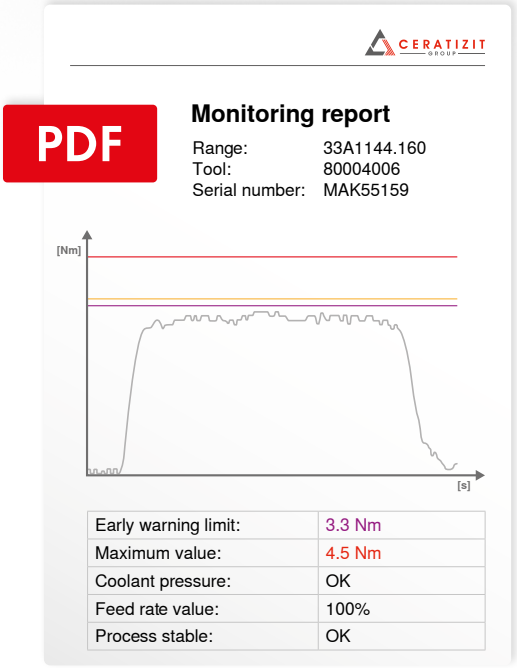
The machining of components for the aerospace industry is subject to extremely stringent quality requirements. Expensive materials that are difficult to machine and tight quality tolerances demand the highest degree of process accuracy. On top of that, all the machining parameters have to be recorded. ToolScope perfectly masters the process stability and documentation disciplines while meeting all traceability requirements.

Machining the blisk

ToolScope is an integrated solution so communicates with the machine tool. The system reliably identifies any deviations from the planned machining profile. In situations where tight manufacturing tolerances exist, the system can be set up so that a tool breakage is avoided, or at least recognised in good time. This real-time monitoring also prevents consequential damage to the workpiece and the machine tool. Customised monitoring strategies and CERATIZIT application engineering provide unique solutions to every challenge.

Quality monitoring to customer's requirements

Special requirements demand special monitoring strategies, which ToolScope is more than capable of realising. This enables particular customer requirements, such as an early warning limit, to be incorporated to provide a customised monitoring solution. ToolScope automatically generates a quality certificate for critical parameters, producing a PDF document for every hole in a blisk.



Your professional partner – just a phone call away

Personal advice from your application engineer

There is a simple reason why we like to support our customers:

we want the best for them. And the best solutions are developed when we work together. Thanks to many years of practical experience, our experts are able to quickly recognise your individual needs and help you optimise your productivity.

An application engineer is always available by phone to answer your application-specific questions. Even if they are not on site with you, our experts are always ready to help –

Monday to Friday
7.00 am – 7.00 pm

Environmentally friendly, sustainable & cost-effective

Certified recycling of valuable carbide

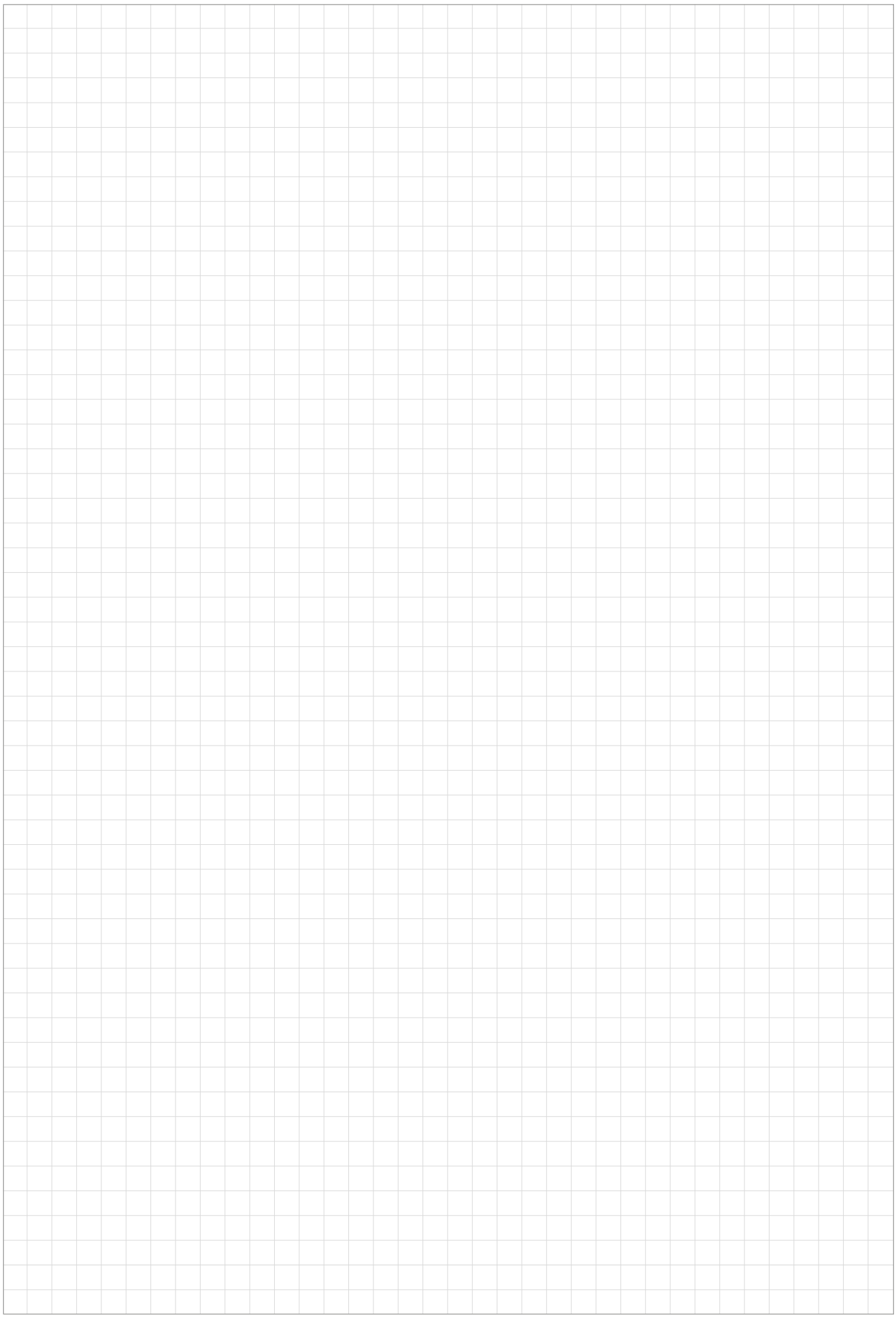
By deliberately conserving limited primary resources, we aim to significantly increase the proportion of recovered materials using carbide recycling. Our certified recycling process allows us to transform our used carbide products into a reusable powder and, using extremely low amounts of energy, to completely convert the finished product back into its original form.

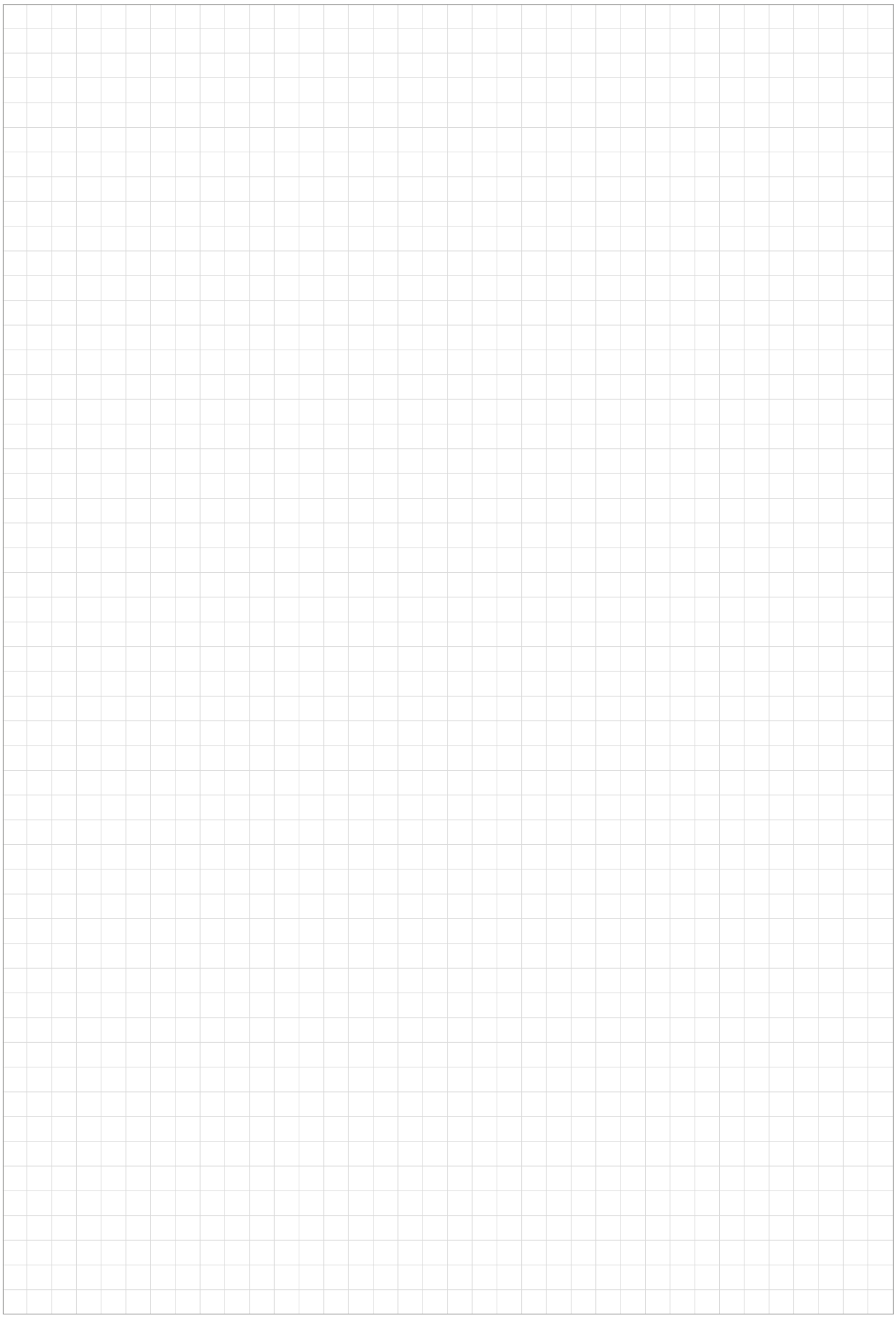
Join our sustainable material cycle

As part of our long-term partnership, we hope that we can together complete the cycle from the secondary raw material to a new finished product. Send us your used carbide. We will then process it in the approved manner. The price we offer for the returned carbide is always based on the current market price. Best of all: we deal with the entire process for you and also provide free, quantity-specific collection containers and transport solutions.

Would you like to join us in looking after valuable resources and make an important contribution to the environment? If so, our recycling process is just what you need. Get in touch with us at your convenience.

www.ceratizit.com/de/recycling
recycling@ceratizit.com



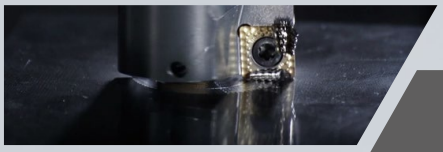


UNITED. EXPERIENCED. METAL CUTTING.

CUTTING SOLUTIONS BY CERATIZIT

SPECIALIST FOR INDEXABLE INSERT TOOLS FOR TURNING, MILLING AND GROOVING

The product brand CERATIZIT stands for high-quality indexable insert tools. The products are characterized by their high quality and contain the DNA of many years of experience in the development and production of carbide tools.



KOMET

THE QUALITY LABEL FOR EFFICIENT BORE PRODUCTION

High-precision drilling, reaming, countersinking and boring is a matter of expertise: efficient tooling solutions for drilling and mechatronic tools are therefore part of the KOMET brand name.

WNT

EXPERTS FOR ROTATING TOOLS, TOOL HOLDERS AND CLAMPING SOLUTIONS

WNT is synonymous with product diversity: solid carbide and HSS rotating tools, tool holders and efficient workholding solutions are all part of this brand.

KLENK

CUTTING TOOLS FOR THE AEROSPACE INDUSTRY

Solid carbide drills specially developed for the aerospace industry bear the product name KLENK. The highly specialized products are specifically designed for machining lightweight materials.

CERATIZIT GROUP

05/2020 – 94 221 00777