



Automotive & motors

Innovation drivers in machining:
Tool solutions for the mobility of tomorrow



TEAM CUTTING TOOLS



CUTTING SOLUTIONS BY
CERATIZIT



KOMET



klenk

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

Tooling the Future

www.ceratzit.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.

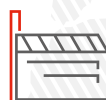
We are masters of the carbide production process, from the powder to the finished cutting tool. Not only does this allow us to develop special-purpose tools for customer-specific applications, it also means we can draw upon a full range of sector-specific standard tools, which are kept in stock and are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

Automotive and engines

Innovation drivers in machining: Tool solutions for the mobility of tomorrow

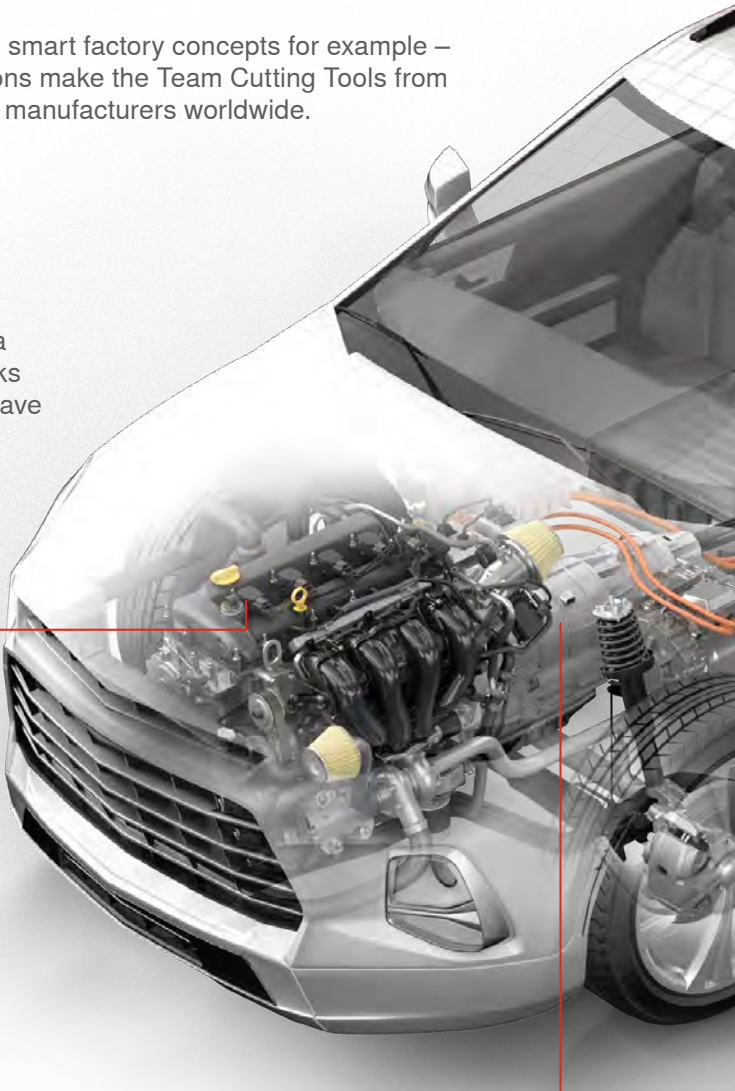
The automotive industry is facing one of the biggest changes in its history. Aspects such as lightweight construction, electrification of drive systems or new concepts for increasing efficiency make vehicle development more challenging than ever. So it is good to be able to rely on a strong partner who has the right tools and strategies for every single vehicle component. We are ready to face the mobility challenges of tomorrow with maximum innovation, expertise and by working closely with our customers.

An unconditional service promise, wide-ranging expertise – in smart factory concepts for example – and a firm focus on special-purpose, customer-specific solutions make the Team Cutting Tools from the CERATIZIT Group the ideal project partner for automobile manufacturers worldwide.

Powertrain

Whether it is a conventional vehicle with combustion engine, a hybrid, or powered by a fuel cell or battery: the machining tasks on the powertrain are as varied as the tool solutions that we have to offer. We are the driving force behind efficient production.

Engine



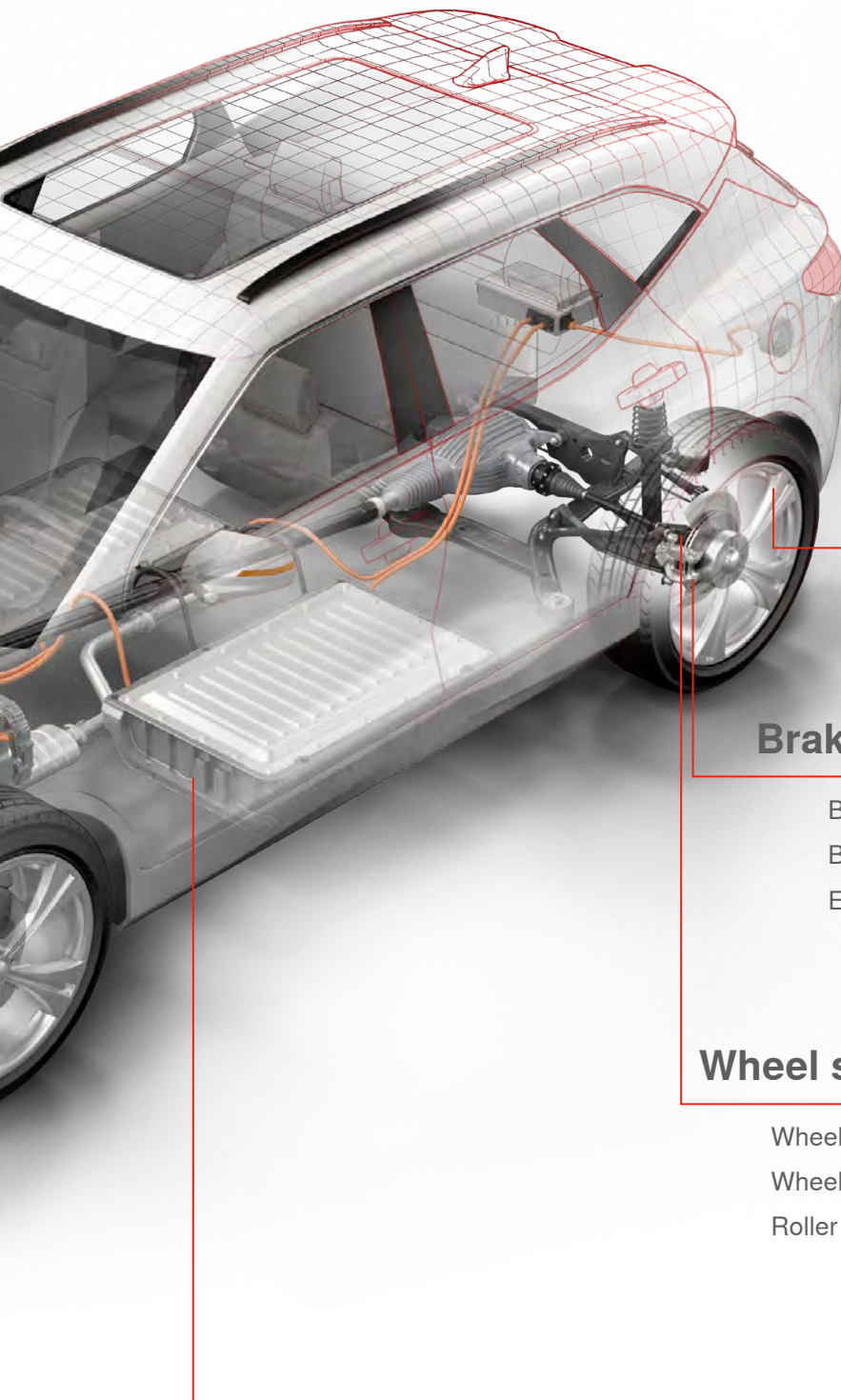
Cylinder head	→ Page 8–9
Crankcase	→ Page 10–11
Crankshaft	→ Page 12–13
Connecting rod	→ Page 14–15
Fuel rail	→ Page 16–17
Turbocharger	→ Page 18–19

Gearbox

Gear housing	→ Page 20–21
Differential housing	→ Page 22–23

Electrification

Electric motor enclosure	→ Page 24–25
Battery tray	→ Page 26–27



Chassis

Lightweight concepts combined with the ultimate in ride comfort call for alternative processes when it comes to cutting. We develop solutions so that new materials can also be machined with maximum precision, quality and efficiency.

Aluminium wheel → Page 34–35

Braking system

- Brake disc → Page 28–29
- Brake calliper → Page 30–31
- Electronic braking system → Page 32–33

Wheel suspension

- Wheel bearing → Page 36–37
- Wheel hub → Page 38–39
- Roller bearing → Page 40–41

Our service – your competitive edge

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

Do you want 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 technological standards, innovative materials and coatings, and unique special tools for the automotive industry, you can benefit from our highly attractive, comprehensive range of services.

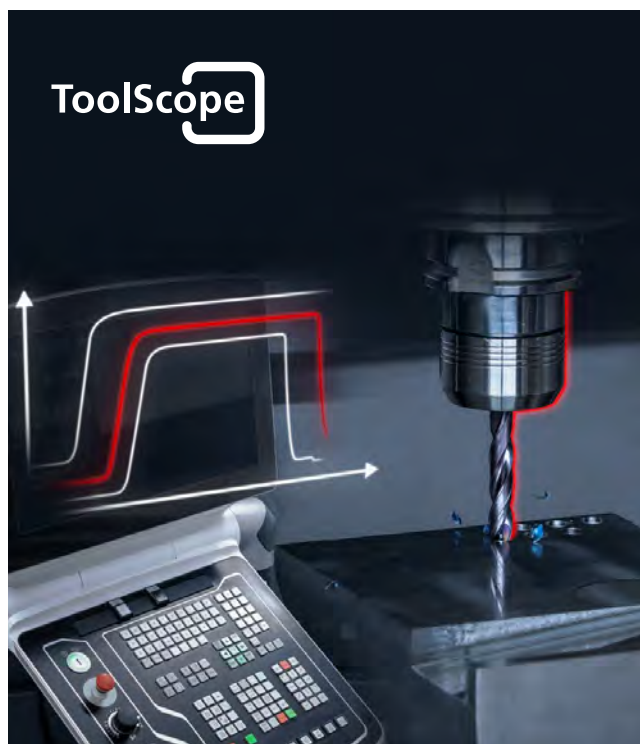
The pioneering services we offer are specifically aimed at the automotive sector and, most importantly, are tailored to the goals of each individual customer – a unique offer that gives you a decisive competitive advantage. Take a closer look at our impressive range of services that will elevate your processes to an entirely new level and support you with the challenges you face.

Projects in the best possible hands

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 **42–43**





Full process control – with ToolScope digital monitoring

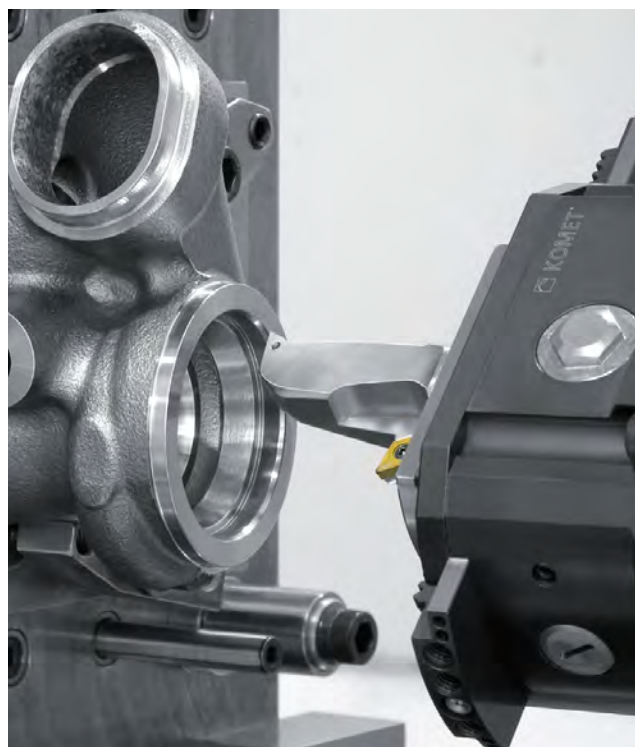
With the ToolScope monitoring and assistance system, we have paved the way for the digital future of machining. The system continuously records signals from the machine during the production process and monitors factors such as tool wear. This guarantees maximum process control.

More information → Pages **44-45**

Master complex contours and tight tolerances

Complex contours, tighter tolerances and rapidly changing product life cycles require flexible manufacturing concepts. With the programmable KomTronic U-axis systems, we offer intelligent actuating tools that enable turning operations to be performed on parts that are not rotationally symmetrical. Coupled with customised snap-on tools and specially selected indexable inserts, these systems give you an unrestricted level of flexibility.

More information → Pages **46-47**



Cylinder head machining

Our tools turn heads

Modern cylinder heads made of aluminium alloys are a challenge for machine operators and tool manufacturers both in terms of material and process. Complex tasks such as machining valve seats, camshafts and injectors have to be more and more process-secure and efficient, as they make up a large proportion of the unit costs. At the same time, precision requirements are becoming more stringent with tighter tolerances and surface specifications.

Team Cutting Tools from the CERATIZIT Group responds to this with tool designs that are also user friendly.

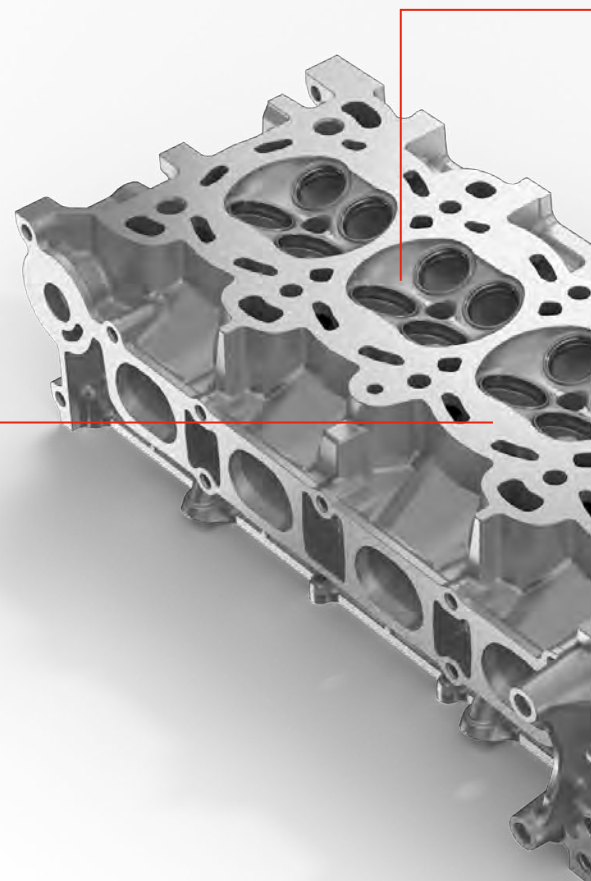
Face milling with the suction effect – up to 100% chip-free interiors on the component

Milling cutter with suction

- ▲ Uncompromising roughing up to an ap of 8 mm
- ▲ PCD-equipped indexable insert, robust and yet smooth cutting
- ▲ Extremely long service life above the usual market standard
- ▲ No adjustment required (plug & play)
- ▲ Modular structure of standard components (face mill, indexable insert, mill adapter)
- ▲ Ø 50 mm – Ø 315 mm



Further information
can be found on
→ Pages 42–43

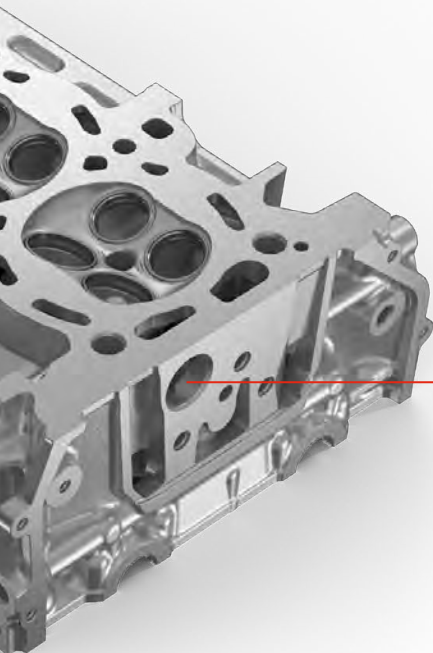




Semi and finish machining for valve ring and valve guide on both the intake and exhaust

Boring bar multi-function tool with CBN indexable insert and PCD reamer

- ▲ Up to 8-edged full face CBN fixed indexable insert solution
- ▲ PCD reamer up to Z6 for maximum cutting values (carbide also available)
- ▲ No adjustment required thanks to maximum precision (plug & play)
- ▲ Tool system with micrometre-accuracy for maximum process security and repeatability thanks to a special hydraulic clamping system
- ▲ Modular tool structure of standard and semi-standard components (DAH holder, hydraulic adapter, tool holder sleeve, reamer)
- ▲ Runout and angle of the machine spindle can be finely re-adjusted thanks to DAH



Counterboring the water plug hole – up to 100% chip-free interiors on the component

PCD counterboring tool

- ▲ 3D-printed chip spoiler for diverting the coolant to the chip and removing chips from the hole
- ▲ PCD with three edges for maximum efficiency
- ▲ Process-secure machining of water plug holes

Crankcase machining

We're on the case at the heart of the engine

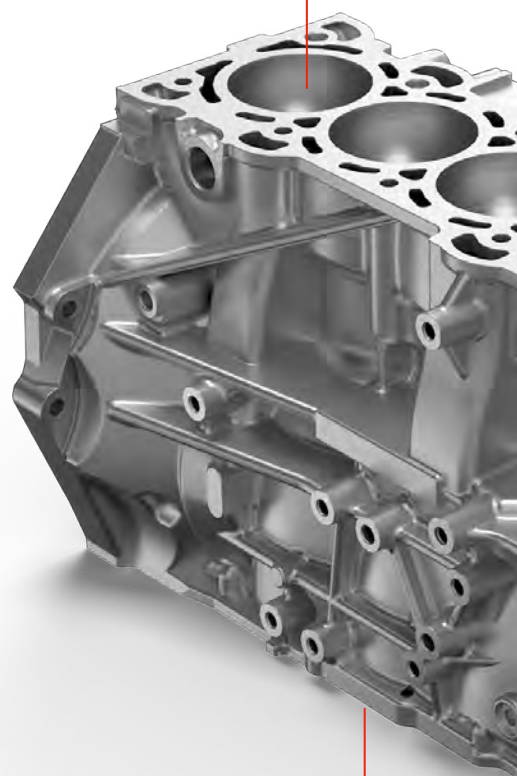
Crankcases are currently made from a range of aluminium alloys, which often puts tool manufacturers to the test. When it comes to service life and precision, the cutting material and tool must be designed for maximum performance, especially given the coating technologies, such as wire arc spraying, that are now frequently used in the cylinder bore.

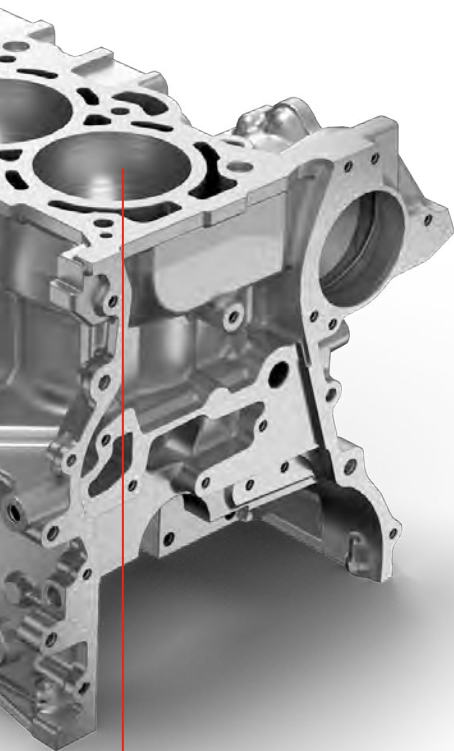
The expertise and development work by the CERATIZIT Group's Team Cutting Tools also pays off in terms of reliable and efficient processes when machining mixed materials with one cutting edge, such as in the cylinder and crankshaft bore and on the combustion chamber side.

Uncompromising roughing with high cutting depths and casting burr

PCD tangential face milling cutter

- ▲ Tangential PCD indexable inserts with 4 cutting edges and ap up to 11 mm
- ▲ Extremely sturdy base body and indexable insert design, but still smooth cutting and quiet running
- ▲ Tangential carbide indexable inserts remove large projecting casting burr with ease
- ▲ Maximum service life and efficiency, much greater than the usual market standard
- ▲ Attractive solution for foundries





High-precision finish machining of cylinder bores

Coolant-controlled boring bar

- ▲ Five-edges with PCD indexable insert for short process times thanks to accelerated retraction without leaving scores
- ▲ Hole roundness within 0.01 mm
- ▲ Cutting edge compensation for diameter correction (can also be integrated in the machine)
- ▲ Process-secure tool system with accurate repeatability



Milling the microcontour for wire arc spraying (LDS) pre-machining

LDS QMill

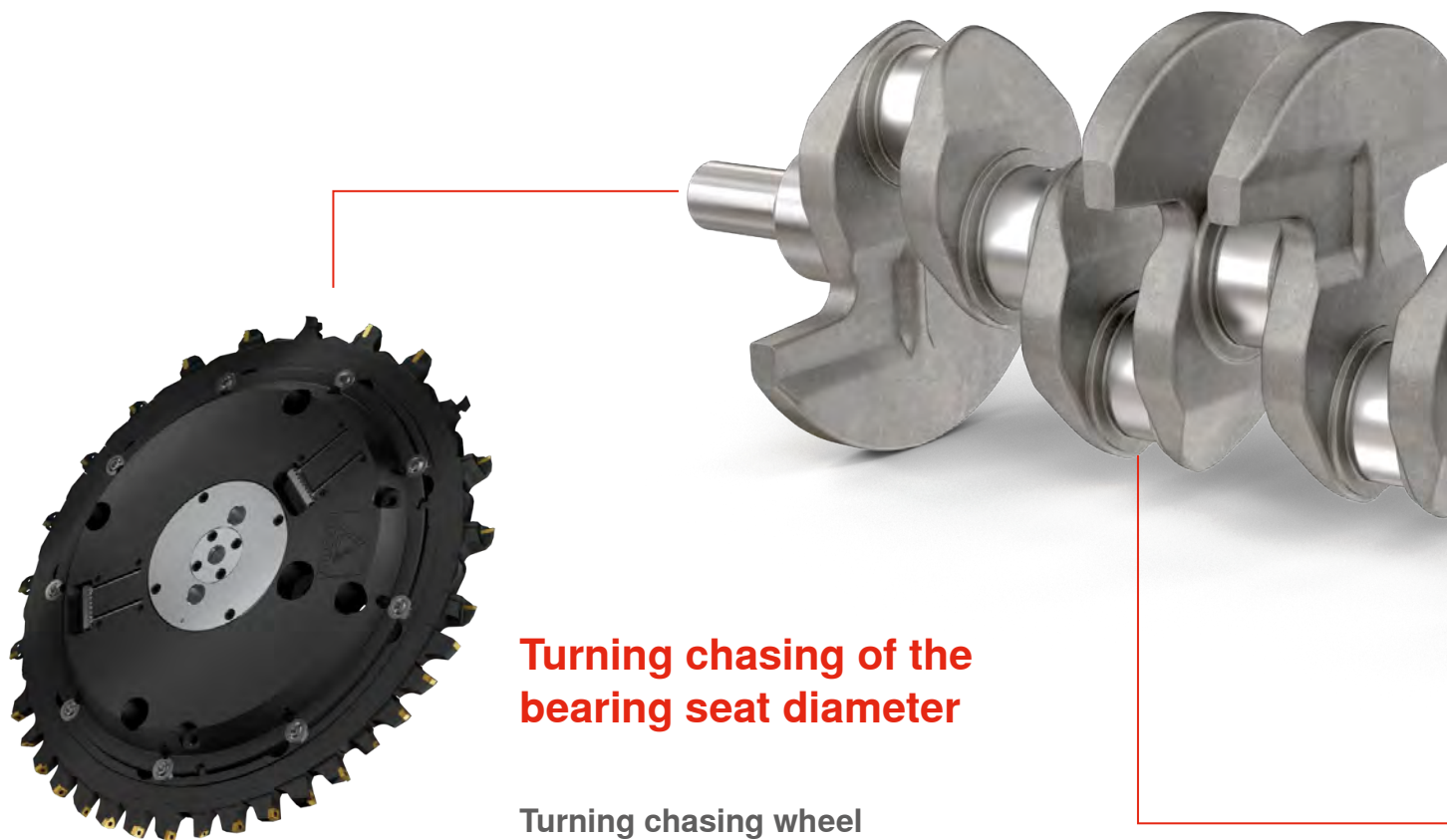
- ▲ The entire microcontour can be milled in the cylinder bore in just one milling pass
- ▲ High-precision lasered CVD cutting edge on the indexable insert for maximum efficiency and service life
- ▲ Up to three-edged design
- ▲ Quick and cost-effective re-equipping, as often as you want

Crankshaft machining

Tools that are a stroke of genius

Whether it is a 12 or 3 cylinder engine, it would grind to a halt without a crankshaft. Likewise, when it comes to machining, nothing is possible without a large range of cutting materials and tool systems – after all, the most resistant and therefore challenging materials are used to produce these heavy-duty automotive components. Crankshaft machining goes hand in hand with complex cycle times and extremely variable machining steps, which present a huge challenge for machines, programming and, above all, the tools. Success comes to those who can reliably implement innovative ideas and intelligent tool solutions.

The CERATIZIT Group's Team Cutting Tools offer innovative cutting material grades, new geometries and tool solutions, which make machining processes more reliable, increase the cutting speed and cutting depth, raise productivity and therefore help to minimise production costs.



Turning chasing of the bearing seat diameter

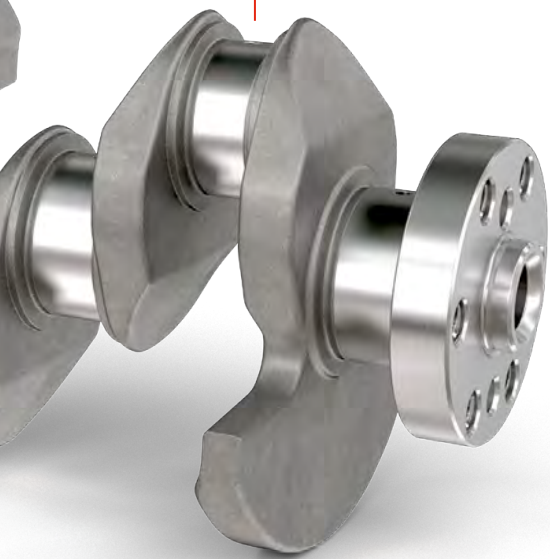
Turning chasing wheel

- ▲ Handling weight of less than 15 kg
- ▲ Tool change without lifting device
- ▲ Extremely quick tool changeover time
- ▲ Easy handling
- ▲ Cartridge design, flexible, individual
- ▲ Same level of stability as a monotool
- ▲ Extensive range of indexable inserts

Pin and main bearing milling

Milling wheel

- ▲ High precision milling wheel
- ▲ Max. number of teeth possible
- ▲ X-Lock cartridge system: user friendly, flexible
- ▲ Developed for high cutting values
- ▲ Large selection of indexable inserts



Deep hole drilling of oil passage bores

Deep hole drill Drillmax 24 CSD

- ▲ Straight primary cutting edge for low cutting forces
- ▲ TiAlN coating
- ▲ Overall length from 20xD to 30xD
- ▲ Diameter range from 4 to 8 mm
- ▲ Big smooth polished chip spaces for secure chip transport
- ▲ High alignment accuracy thanks to 4 guide lands
- ▲ Regrindable

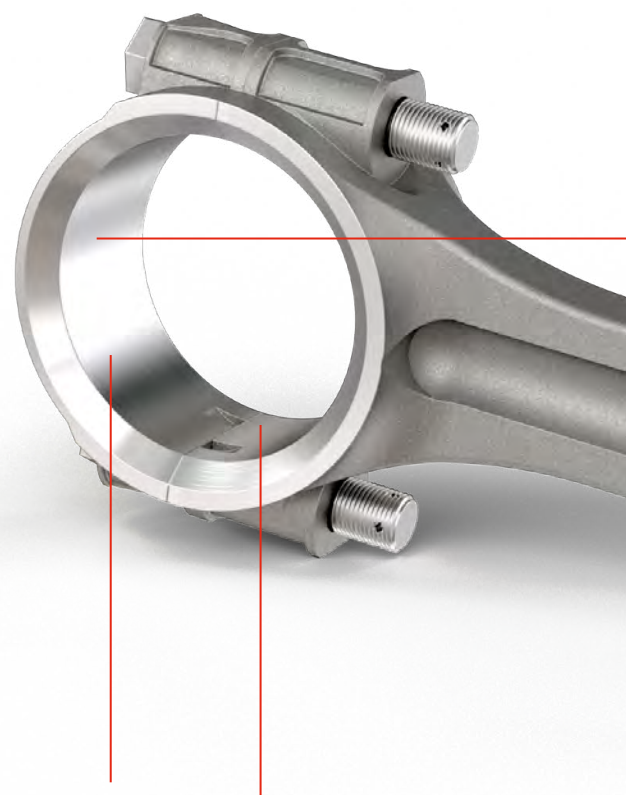


Connecting rod machining

Hot rod your process! Fewer tool changes, longer service life

The connecting rod connects the piston and the crankshaft and converts the linear upward and downward motion of the piston into the circular motion of the crankshaft. Unsurprisingly, it is subjected to unrelenting tension, pressure, bending and torsion. Microalloyed or carbon-manganese steels, which are processed using a drop forging method, ensure that connecting rods can withstand such permanent stress when the engine is running.

For these kinds of materials, which are being steadily refined, vast expertise in tool systems and cutting materials is needed – such as that offered by the CERATIZIT Group's Team Cutting Tools.



Big end finish machining

Snap-on tool for tilt drill head

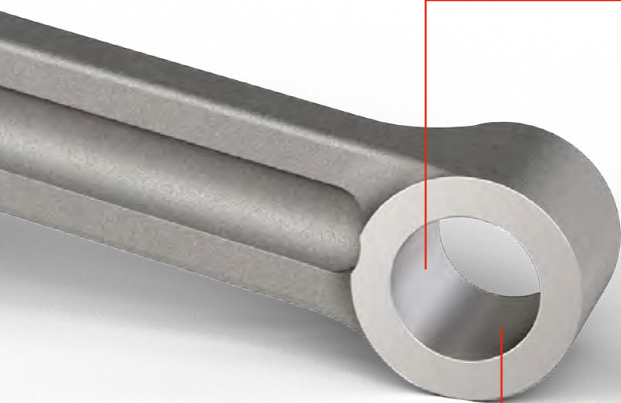
- ▲ Sturdy four-edge Quatron indexable insert
- ▲ Outstanding drilling quality with no retraction scoring
- ▲ Long service life and efficiency



Solid drilling, counterboring of the big and small end including chamfering in a single operation

Multi-purpose tool

- ▲ Sturdy four-edge Quatron indexable insert
- ▲ Suitable for difficult conditions, such as mould drafts, mill scale and interrupted cut
- ▲ Fewer tool changes
- ▲ Long service life and efficiency thanks to multi-purpose solution
- ▲ Solid drilling and counterboring tool in one



High-precision finishing for the big and small end



Tilt drill head

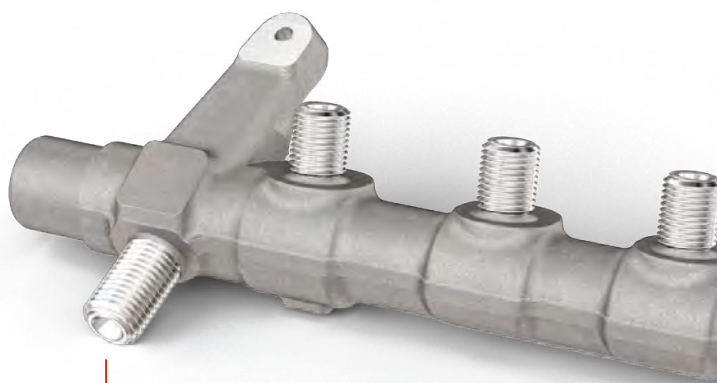
- ▲ Micrometre-precise adjustment
- ▲ Tilt-adjustment mechanism is automatically triggered in the tool through the feed and return motion of the machine drawbar
- ▲ Cutting stroke/drawbar stroke 1:85
- ▲ Maximum process security with tight tolerances
- ▲ 100% balanced tool system
- ▲ Snap-on tool adapter with HSK and ABS

Fuel rail machining

Take the pressure off: High-end machining for short process cycles

Highly efficient common rail injection systems are an essential component of modern engines, designed to reduce consumption and emissions. Their fuel rails release the pressure evenly across all the components that make up the high-pressure system. The load on these components is extremely high, so cutting-edge, difficult-to-machine materials are needed.

Thanks to the extensive range of tools and the expertise of CERATIZIT Group's Team Cutting Tools, the pressure in the machining halls is also evenly spread: Machining there is as efficient as the latest generation of engines.



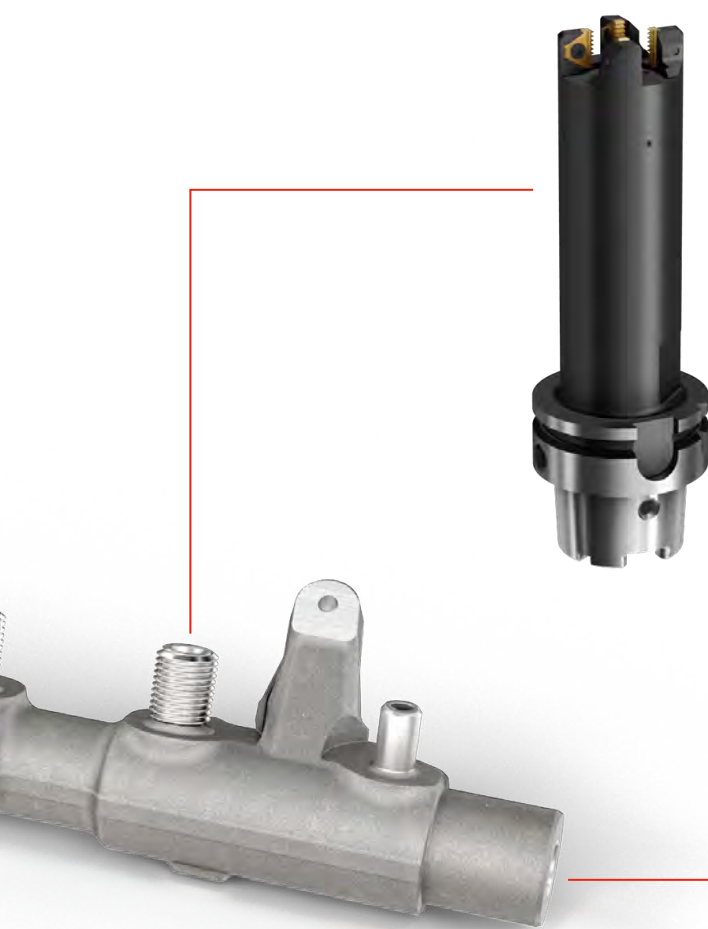
Over turning and countersinking the fuel connection

Multi-purpose over turning tool

- ▲ Three-edged, smooth cutting indexable insert
- ▲ Turning, face milling and countersinking with just one tool
- ▲ Fewer tool changes
- ▲ Long service life and efficiency thanks to multi-purpose solution



Further information on monitoring and optimising all machining processes using ToolScope can be found on
→ Pages 44–45



External thread milling on the pressure pipe connections

Thread milling tool

- ▲ Reduction in the machining time through 4x thread profile indexable inserts
- ▲ High tool stability enables high cutting values and therefore shortens the process time
- ▲ Indexable insert can be quickly changed with no adjustment required (plug & play)
- ▲ Very short, manageable chips
- ▲ Perfect cutting edge cooling thanks to thro' coolant supply, resulting in a longer service life
- ▲ Thread profile indexable inserts can be reground

Thread milling the connection thread

MGF HPC thread milling cutter

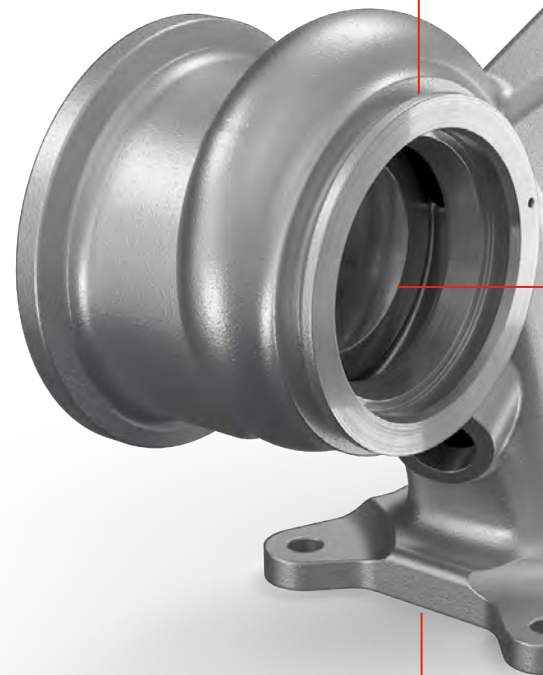
- ▲ Process-secure thread milling with accurate repeatability
- ▲ Reduction in the process time compared to conventional threading
- ▲ Eight cutting edges for maximum cutting values and efficiency
- ▲ Thread depth down to the base possible
- ▲ The same tool can be used on different materials (steel up to a tensile strength of 1,200 N/mm², stainless steels, cast iron materials, titanium alloys)
- ▲ Very short, manageable chips
- ▲ M4 – M20 available in 1.5xD and 2xD from stock
- ▲ M4x0.5 – M16x1.5 available in 1.5xD and 2xD from stock



Turbocharger machining

No-compromise tools for turbo speed

Turbochargers are a common component in modern vehicles as they offer greater efficiency than their naturally aspirated counterparts, whilst also helping to lower emissions. However, these advantages come at the expense of a challenging machining process. On the exhaust side, high-alloy, heat-resistant materials with a high level of nickel and chromium or cast iron are used. Both materials are either extremely abrasive or result in very high temperatures in the machining zone – neither of which are economical conditions for tools. Yet thanks to clever interpolation turning and circular milling strategies and combined 4-in-1 tool systems, machining times are reduced and precision is ramped up – production is also turbocharged.



No-compromise milling of the manifold face

MaxiMill 275 face milling cutter

- ▲ Robust design, stable seat in the base body
- ▲ Octagonal indexable inserts with 16 usable cutting edges
- ▲ Special cutting material designed for maximum thermo-mechanical loads
- ▲ Defined, stable cutting edge guide
- ▲ Ensures maximum productivity, process security and efficiency
- ▲ Available in diameters ranging from 63 – 125 mm as standard





Finishing the V-belt with interpolation recess turning

Boring bar

- ▲ Extremely sturdy tool design
- ▲ Cutting edge geometry adapted to the machining process
- ▲ Thro' coolant supply directly at the cutting edge
- ▲ Turning operation can be performed on the machining centre thanks to circular motion of two linear axes
- ▲ Coated solid carbide grades, specially developed for machining nickel-based alloys

Complete finishing of the V-belt side

KomTronic U-axis system

- ▲ Time savings of up to 67 %
- ▲ Up to 25 % quicker machining
- ▲ One tool instead of four
- ▲ Better surfaces and greater accuracy of form
- ▲ Integrated micron-precise path measurement system for ultimate precision
- ▲ 3D-printed snap-on tools can be used, perfectly suited for the process
- ▲ The U-axis system has an extremely long service life with maintenance and repair service



Further information on the
U-axis system can be found on
→ Pages 46–47

Gearbox housing

Silky-smooth gear changes, thanks to high-precision production

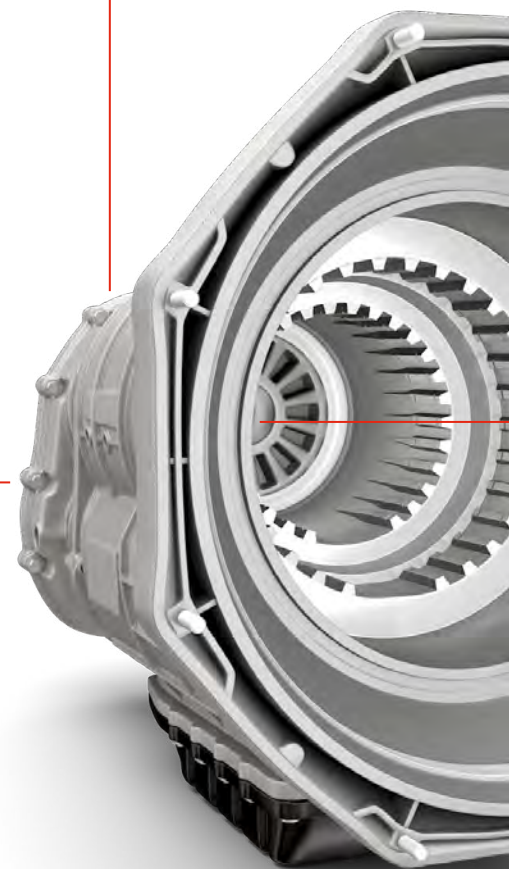
Six manual gears and up to nine in automatic transmissions are a common feature today. The gearbox is protected and supported by a housing consisting mainly of cast aluminium alloy, which is no small feat to manufacture. Ever tighter geometric and positional tolerances call for extreme care when designing the tool. Only the right machining concept can fulfil these stringent requirements. Tools with a long overhang often have to carry out several machining operations simultaneously, and in a manner that is process-secure.

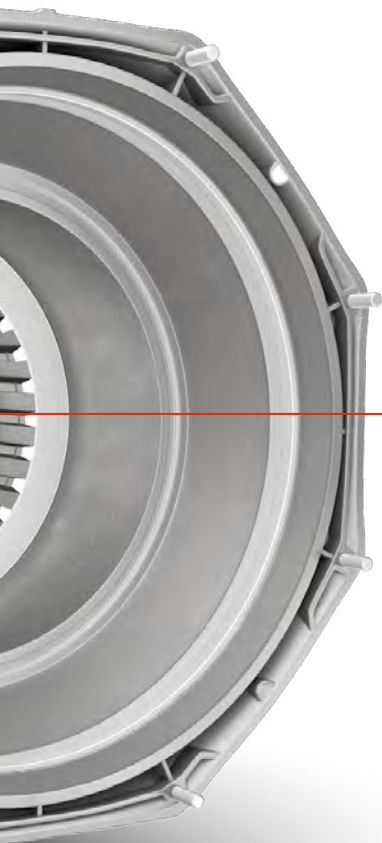
At the same time, minimum quantity lubrication is often used instead of traditional wet lubrication for environmental and financial reasons – with the tools from the CERATIZIT Group's Team Cutting Tools this means no compromises when it comes to cutting values and cycle times.

Reaming and counterboring the selector fork group with minimum quantity lubrication

Multi-purpose tool

- ▲ Reaming, counterboring and chamfering with a single tool saves on tools and reduces cycle times
- ▲ Maximum performance despite long overhang length, thanks to dynamic balancing
- ▲ Diameter can be precisely set via micrometre-precise fine adjustment





Reaming and fine boring the selector unit hole with minimum quantity lubrication

PCD multi-purpose tool

- ▲ A combination of soldered PCD reamers and steel base body with indexable inserts that can be adjusted with micrometre-precision
- ▲ Challenging machining due to high standards for geometric and positional tolerances
- ▲ Maximum performance despite long overhang length, thanks to dynamic balancing



High-precision forward and reverse machining of the output shaft hole with minimum quantity lubrication

Boring bar

- ▲ Diameter can be precisely set via micrometre-precise fine adjustment
- ▲ VCGW insert for fine boring and axial groove
- ▲ Maximum performance despite long overhang length, thanks to dynamic balancing
- ▲ Forward and reverse machining to keep concentricity errors to an absolute minimum

Differential housing machining

Get ahead of the curve with smart tool solutions

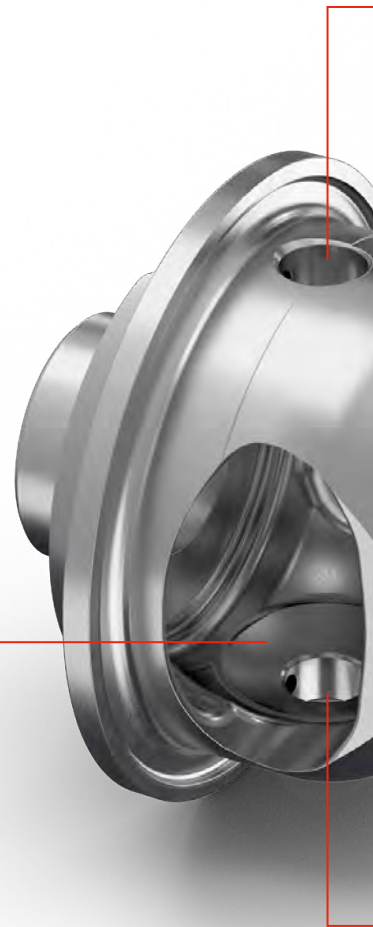
The differential plays a key role in a car's driving stability. On corners, it compensates for the difference in speed between the inner and outer wheels. Machining the inner contour of a differential is an extremely difficult task. Clever tool systems, however, enable high-precision production methods to be used – without much adjustment at all.

Whether you are working with special-purpose machines or machining centres, Team Cutting Tools from the CERATIZIT Group will help you corner the market with the aid of our perfect tool solutions.

Internal turning of the spherical countersinks with a mechanically-actuated special-purpose tool

Ball turning tool

- ▲ Tools with fixed insert seats for special-purpose machines
- ▲ High-precision insert seats thanks to special production methods
- ▲ No adjustment required after the indexable insert has been changed
- ▲ Quick and process-secure
- ▲ Rotary slide is driven by drawbar





Internal turning of the spherical countersinks

U-axis with snap-on tool

- ▲ Tools with fixed insert seats for machining centres
- ▲ High-precision insert seats, thanks to special production methods, i.e. no adjustment required after the indexable insert has been changed
- ▲ Quick and process-secure
- ▲ Tool cross-section optimised by FEM analysis for reliable machining
- ▲ Reverse internal turning of the entire contour with one U-axis tool



Further information on the U-axis system can be found on
→ Pages 46–47



Sphere production through bilateral countersinking

Ball countersink

- ▲ Tools with fixed insert seats for special-purpose machines
- ▲ High-precision insert seats thanks to special production methods
- ▲ No adjustment required after the indexable insert has been changed
- ▲ Quick and process-secure
- ▲ Ideal for large quantities

Electric motor housing machining

The home of torque

Hybrid or fully electric cars move to the beat of their heart – the electric motor, which has become the key element in the powertrain, thanks, in part, to its enormous torque.

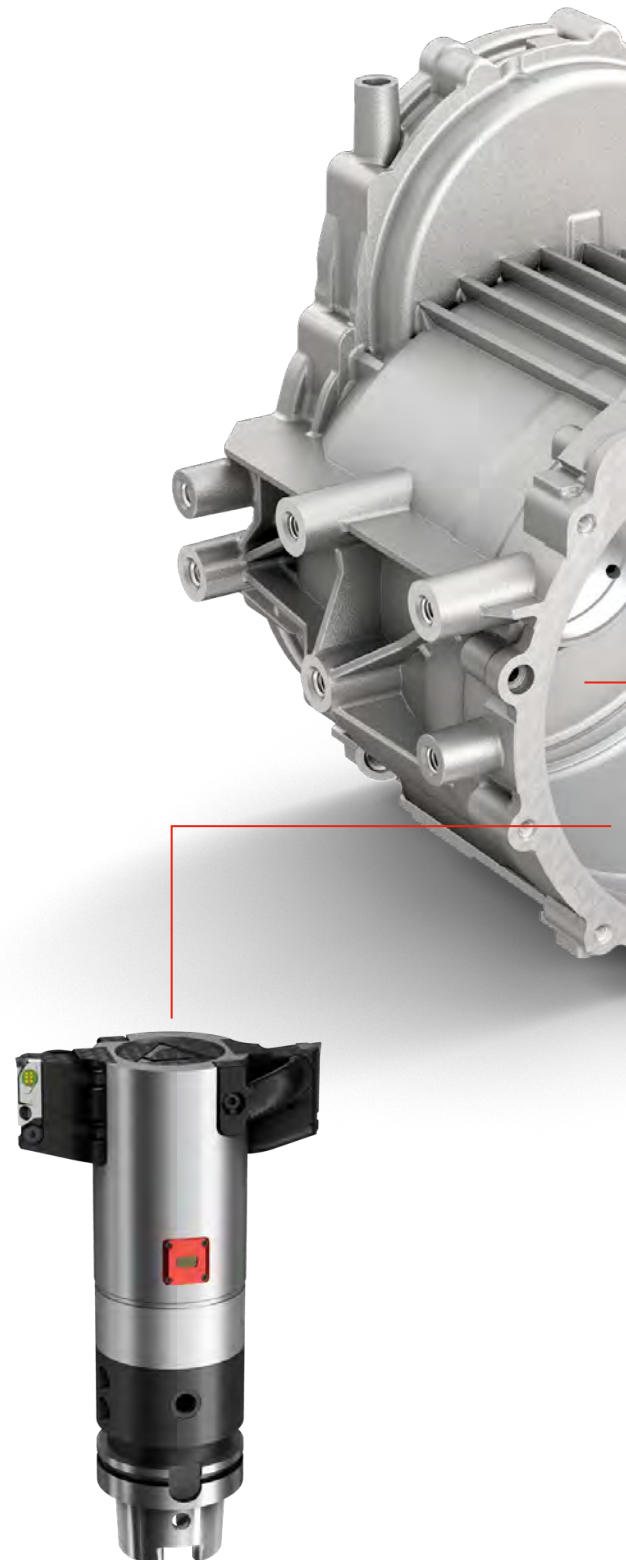
Of particular interest to machine operators is the electric motor housing made of a wide range of aluminium alloys. Given that annual quantities have now reached series production levels, unit costs are becoming increasingly important. The stator bore is the most cost-intensive part, placing high demands on the tool and cutting edge. In the case of bore diameters of 200 mm and above, reducing the weight of the tools plays an essential role in preventing the breakdown torque and torque of the machining centre used from being maxed out.

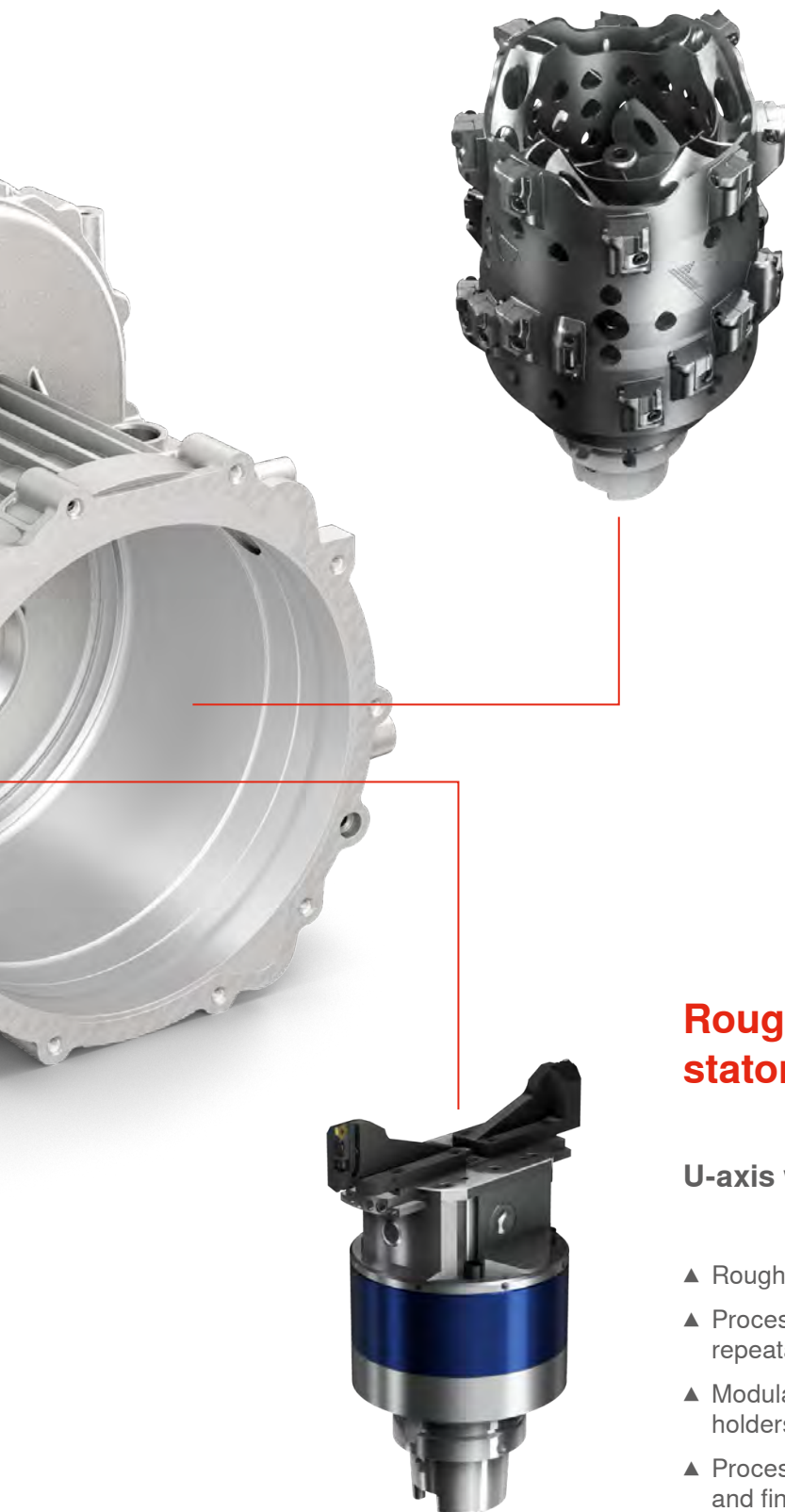
Team Cutting Tools from the CERATIZIT Group has the perfect solution to hand for these challenges too.

Stator bore machining

Synthetic boring bar

- ▲ The individual stages are made of a special carbon-fibre reinforced plastic developed in-house
- ▲ The special plastic damps vibrations and can systematically dissipate machining forces into the base body
- ▲ Weight reduction far below the usual market standard
- ▲ Stator machining in a single shot with multi-stage version
- ▲ Digitally adjustable tool cartridges
- ▲ Service life monitoring via KOMlife digital display





Finish machining the stator bore in one shot

Boring tool

- ▲ Base bodies and cartridges are fully 3D-printed
- ▲ The innovative and clever design enables extreme weight reduction far below the usual market standard
- ▲ Tool has a stiffness-optimized design
- ▲ Efficient machining with multiple cutting edges and in a single shot
- ▲ Controlled chip removal, thanks to innovative 3D-printed cooling system

Rough and finish machining of the stator bore in a single operation

U-axis with snap-on tools

- ▲ Roughing and finishing with a single tool
- ▲ Process-secure stator bore machining with accurate repeatability
- ▲ Modular structure (U-axes, snap-on tools, short clamping holders, indexable inserts)
- ▲ Process time reduction thanks to multi-purpose roughing and finishing solution



Further information on the U-axis system can be found on
→ Pages 46–47

Battery tray machining

Take charge: efficient series production of the battery box

The batteries for electric and hybrid vehicles must be carefully protected to ensure safety and a long service life. Thin-walled battery trays made of high-strength aluminium alloys are the container of choice as they add little to the overall weight. To keep the cost at a reasonable level, durable and innovative tool systems which can carry out several cutting operations in one go, for example, are used for the array of holes and threads. Speed is also essential when it comes to the long seating surfaces for the battery tray lid.

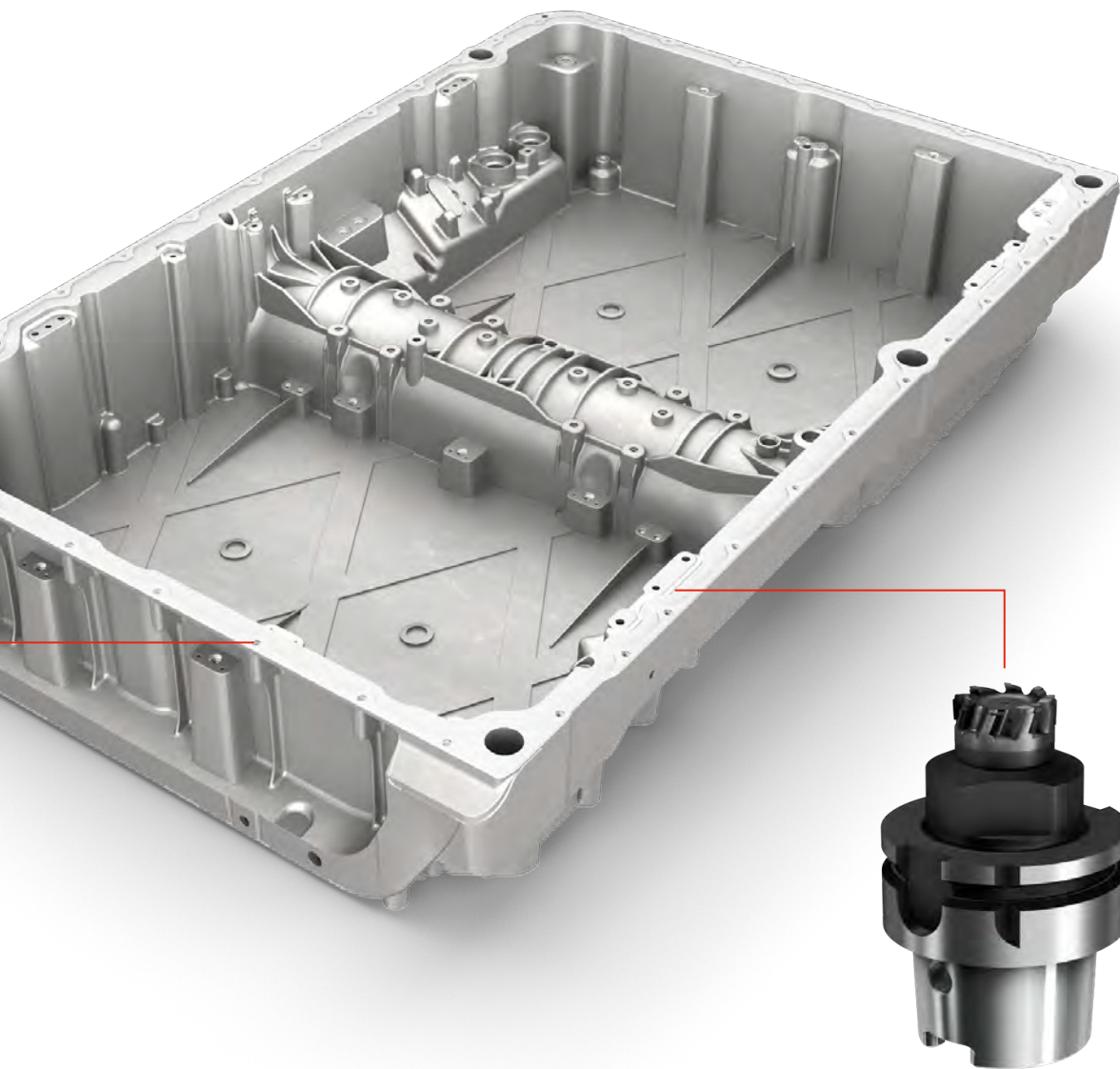
HSC and HPC-tested milling tools from the CERATIZIT Group's Team Cutting Tools fly in the face of all speed limits.

Drilling, threading and chamfering the screw thread in a single operation

Thread milling cutter

- ▲ Three tools in one
- ▲ Extremely efficient on large quantities of threads
- ▲ Exact thread depths with accurate repeatability
- ▲ Over 50% reduction in the primary processing time, thanks to high cutting speed and feed
- ▲ No chip root residue in the thread
- ▲ High-speed cutting (HSC) can be performed
- ▲ Free TPT app for creating CNC programs and for use as a tool finder





Face milling the long seating surfaces

HPC PCD milling cutters

- ▲ Significant reduction in the primary processing time by up to 72 %
- ▲ 3D-printed milling ring for maximum number of cutting edges and perfect coolant supply
- ▲ Maximum cutting values and service life for efficient production
- ▲ Less burr formation and quieter running than conventional PCD milling cutters
- ▲ PCD cutting edges can be re-lasered
- ▲ Available as face mills, screw-in cutters or monoblock milling cutters from stock (dia. 10 – 100 mm)

Brake disc machining

Put the brakes on abrasive wear

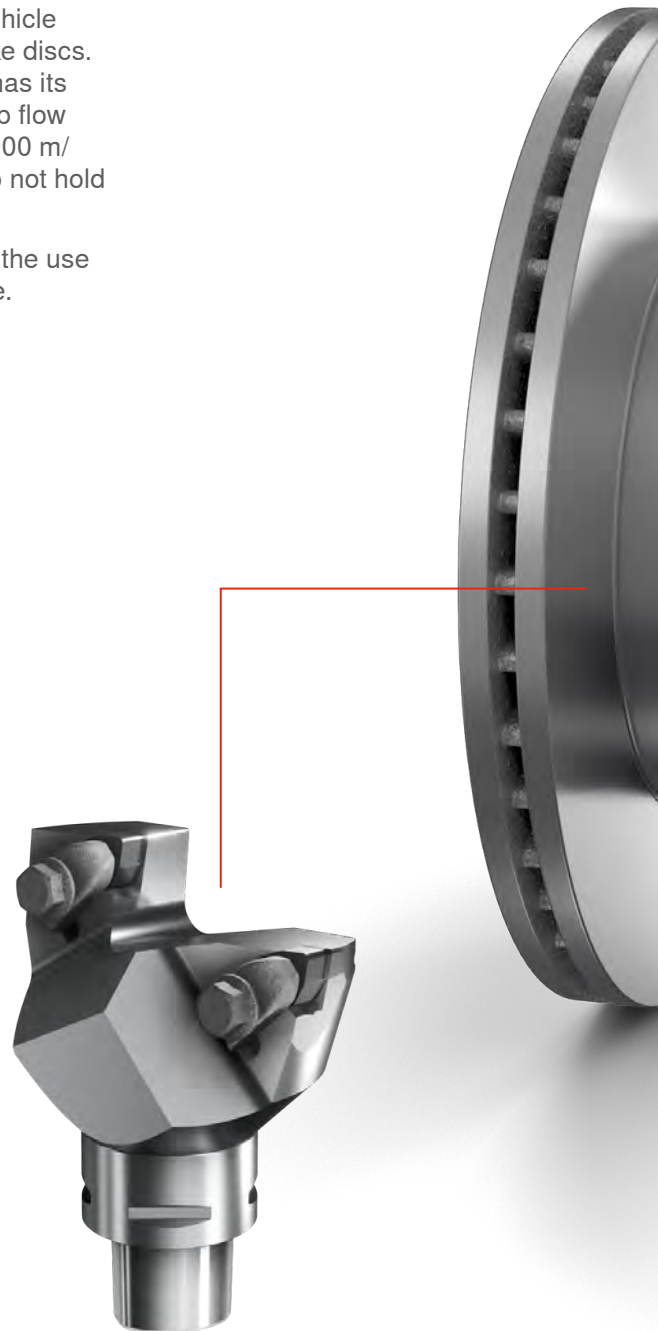
There is huge competition when it comes to machining brake discs and brake drums. And yet both components need to provide ever greater levels of performance at increasingly lower prices. Series production, above all, places high demands on application data and process security, in order to keep the unit costs as low as possible. In the car and commercial vehicle sector, grey cast iron is still predominantly used to manufacture brake discs. However, despite supposedly being easy to work with, the material has its challenges: In particular, the extremely fine, but just as abrasive, chip flow is a real test for clamping devices. At cutting speeds in excess of 1,000 m/min and with feeds of over 0.5 mm, normal steel clamping fingers do not hold much longer than a single cutting edge.

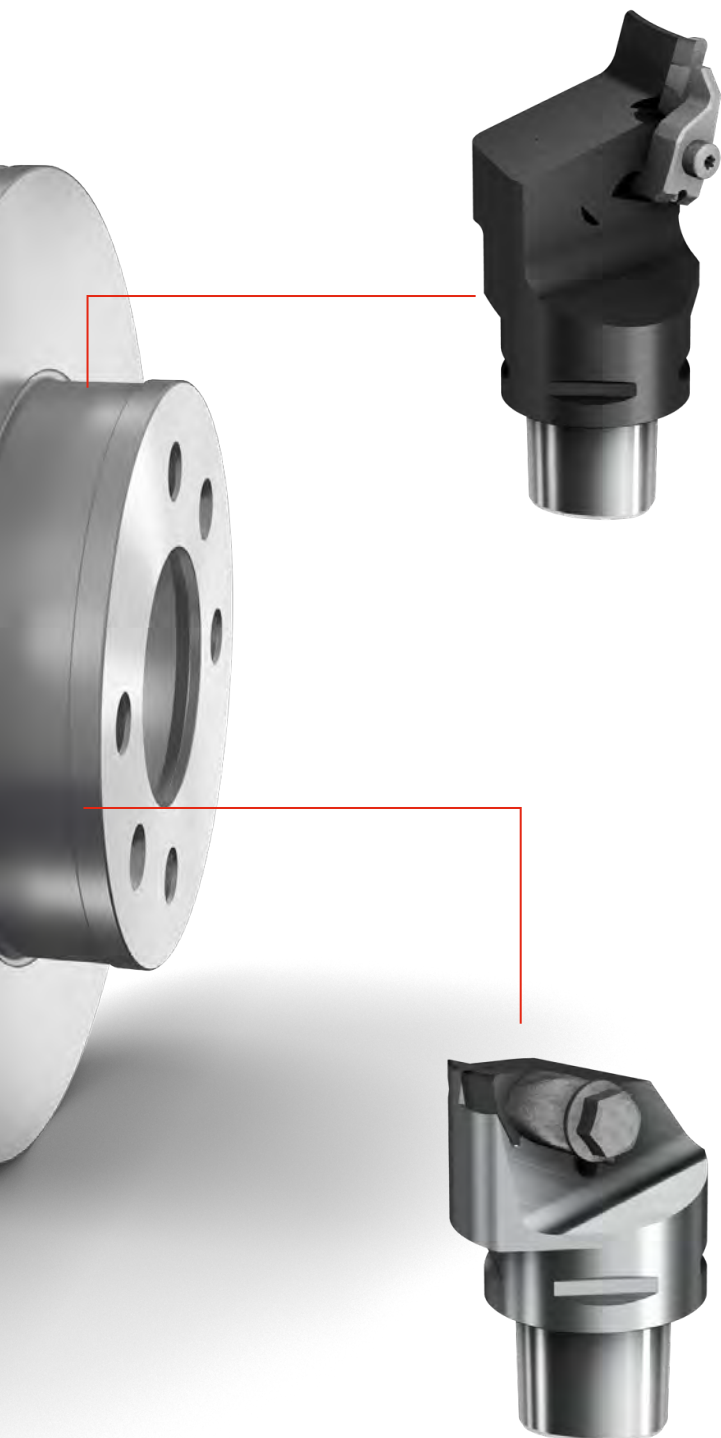
The CERATIZIT Group's Team Cutting Tools deal with wear through the use of innovative solid carbide solutions – with an unbeatable service life.

Turning the braking surface and pot rest face in a single operation

C-CLAMP 2.0 – double tool

- ▲ All the advantages of the C-Clamp 2.0 clamping system
- ▲ Cycle time savings, thanks to simultaneous machining
- ▲ Simultaneous machining of the braking surface and pot system reduces cycle time and magazine positions
- ▲ Specially for "W" indexable inserts





Grooving the thermal groove

Ceramic CX24 grooving system

- ▲ Efficient, process-secure, flexible
- ▲ Cutting force is distributed into two components due to installation at an angle
- ▲ Profiling can be carried out with side feed $f = 0.6$ through 110° prism
- ▲ Wedge shape as pull-out protection during reverse profiling
- ▲ Safe attachment even with profile grooving inserts

Turning the braking surface

C-CLAMP 2.0 – clamping system with solid carbide claw

- ▲ Practically no wear on the claws
- ▲ Maximum feeds and cutting speeds
- ▲ Solid hexagon head screw → no more contamination of the TORX or hexagon socket screw key profiles
- ▲ Larger contact surface → optimised surface pressure
- ▲ 20 Nm tightening torque!

Brake calliper machining

Get a grip on service life and performance with cast iron and aluminium

Machining brake callipers comes with a range of challenges. If nodular cast iron is used, then the service life of the tools is what counts, whereas if aluminium is used, it is the performance. On top of that, the machine concepts also have an effect on the tool alloys in question. But no matter whether a machining centre, a lathe, or a special-purpose machine is used, our customers always receive the perfect solution for their particular application.

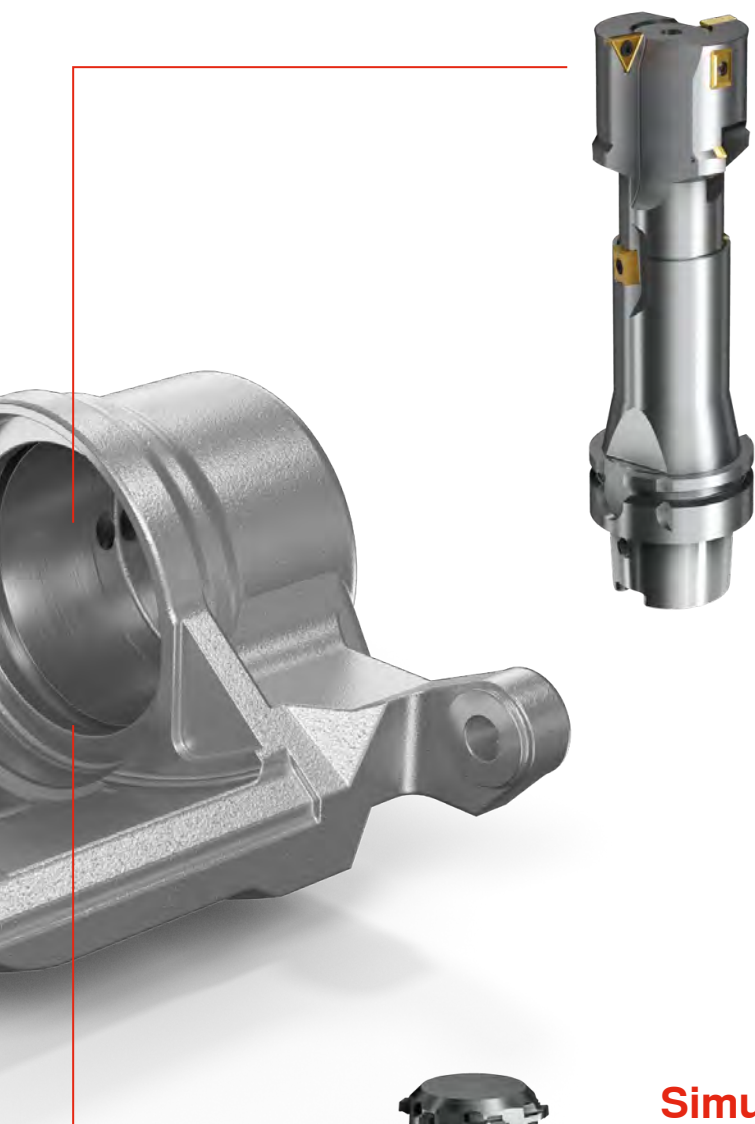
A wide range of tools, and many years of experience in machining brake callipers worldwide, enables the Team Cutting Tools from the CERATIZIT Group to surpass all requirements, from the simplest of carbide drills to a high-end solution with mechatronic tools.

Milling of pad face, disc clearance and dust cap face in one cut

Side and face milling cutters

- ▲ Cycle time savings of approx. 50%
- ▲ Tangential inserts for maximum performance
- ▲ Surface completion in a single step or rough/finish machining is possible with a two-part milling disc with adjustable width
- ▲ Cross-pitching of the inserts eliminates vibrations
- ▲ Left and right-hand cutting can be used





Roughing and chamfering the piston bore in a single operation

Roughing boring bar

- ▲ TOHT indexable inserts with POWER support chamfer technology enable high feeds and quiet running despite long overhang lengths
- ▲ Additional solid carbide support elements at 90° to the indexable insert axis also stabilise the tool when countersinking the base of the piston bore
- ▲ Additional tangential inserts for the control cut



Simultaneous machining of the sealing ring groove and clamping ring groove

Sealing ring groove milling cutter

- ▲ Maximum precision thanks to ground cutting body and eroded adapter chambers
- ▲ Tool accuracy of ± 0.025 mm in diameter
- ▲ No complicated adjustment
- ▲ Wear resistant CTCP325 cutting material guarantees a long service life despite high cutting speed

Electronic braking system machining

ABS, TCS and ESC: on the cutting edge

Electrification has been on trend for decades. Assistance technology such as antilock braking systems, traction control systems or electronic stability control all play a huge role in vehicle safety and are now included as standard in modern cars. In terms of quality, the holes in the control housing pose somewhat of a challenge for machine operators and tools, and complex contours often have to be produced with absolute precision.

To prevent jams on the production lines, state-of-the-art tool concepts from the CERATIZIT Group's Team Cutting Tools release the brakes and guarantee a clear run for efficient production.

Drilling the solenoid valve bore with maximum precision

PCD stepped drills

- ▲ Carbide base body with centring tip and soldered-in 5-stage PCD blanks
- ▲ Complex drilling contour
- ▲ A cutting speed of up to 400 m/min can be reached
- ▲ Surface quality < Ra 0.8

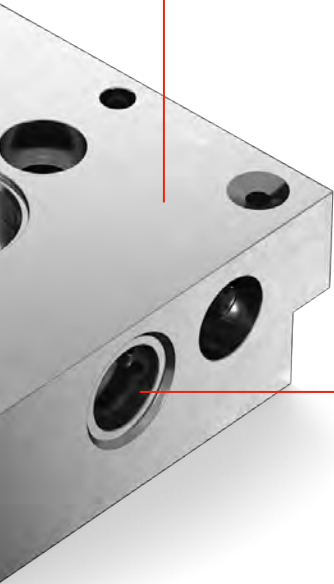


Face milling the exterior



HPC PCD milling cutters

- ▲ Significant reduction in the primary processing time by up to 72 %
- ▲ 3D-printed milling ring for maximum number of cutting edges and perfect coolant supply
- ▲ Maximum cutting values and service life for efficient production
- ▲ Less burr formation and quieter running than conventional PCD milling cutters
- ▲ PCD cutting edges can be re-lasered
- ▲ Available as face mills, screw-in cutters or monoblock milling cutters from stock (dia. 10 – 100 mm)



Complex drilling contour of the pump interface in a single operation



PCD stepped drills

- ▲ Carbide base body with centring tip and soldered-in PCD blanks
- ▲ Highly wear-resistant PCD grade for maximum service life and performance
- ▲ Lasered PCD contour for optimum surface results and contour accuracy

Aluminium wheel machining

Run rings round your competitors

The machining of aluminium wheels requires high cutting speeds and extremely hard cutting materials. Robust tools are needed to withstand the enormous centrifugal forces that arise at high speeds.

Team Cutting Tools from the CERATIZIT Group has decades of knowledge and experience in this segment, and has consistently expanded and optimised its range of tools and indexable inserts. We are now full-service providers: We are able to offer the optimal tool for every process involved in the production of aluminium wheels – from machining the inside and outside profiles through to valve and screw hole bores. Today, our tools are used to machine around 50 percent of all aluminium wheels found on cars, motorbikes, HGVs and even aeroplanes.

Turning for internal and rest face machining

OvalFlex

- ▲ A modular tool system tailor-made for compete machining of aluminium wheels
- ▲ Maximum stability thanks to backlash-free interface, oval and conical design and sturdy X32 inserts
- ▲ Reduced stock requirements due to large standard range
- ▲ Excellent repeatability during tool head changeover





Turning the outside profiles

Shank tool system

- ▲ Excellent surface quality and process security
- ▲ Identical positioning, thanks to standardisation
- ▲ Optimum designs, thanks to FEM calculations



Hub machining

HubStar

- ▲ Excellent time savings (up to 50 % per wheel)
- ▲ Maximum stability, thanks to oval and conical design
- ▲ Reduced stock requirements (no need for complex special-purpose tools)
- ▲ Maximum application reliability and efficiency

Wheel bearing housing machining

Complex shapes are a challenge for the tool and machine

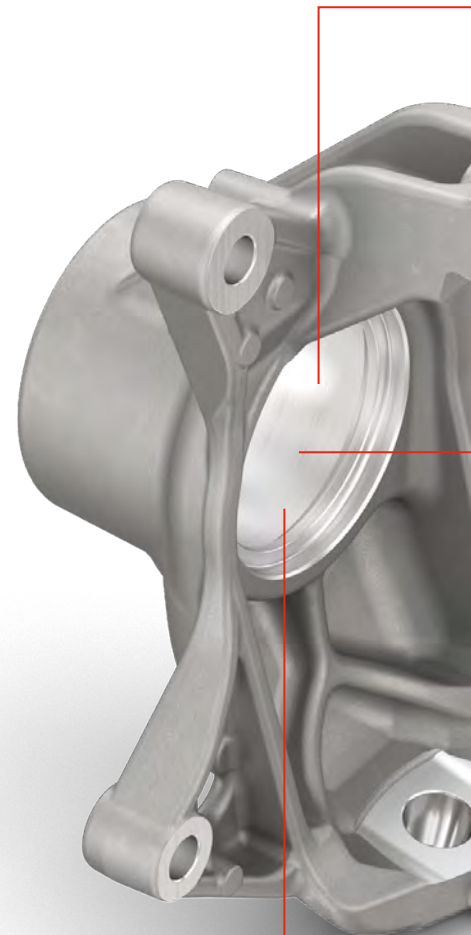
The complex geometries of a wheel bearing housing made of aluminium alloys often pose a challenge for many machine operators. For example, the milling and drilling operations in the bearing seat have to be ever more process-secure, accurate and efficient, as they account for a significant proportion of the production time. The sheer variety of cylindrical, conical or spherical holes call for state-of-the-art machining centres and precision drills to ensure optimum machining.

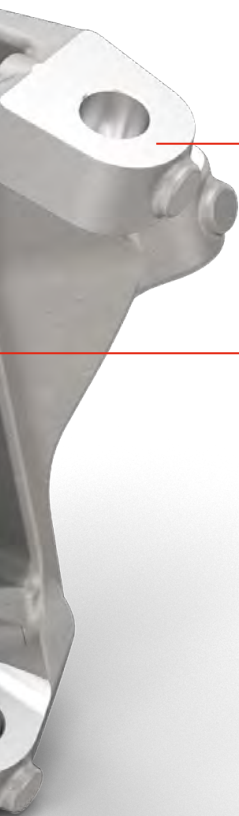
Team Cutting Tools from the CERATIZIT Group can provide the latter.

Semi-machining of the wheel bearing bore including flat surface

PCD multi-purpose tool

- ▲ Soldered and lasered PCD cutting edges guarantee micrometre-precise results
- ▲ The combination of several diameters and contours in a single tool leads to excellent cycle time savings
- ▲ High balance quality ensures quiet running during machining despite long overhang lengths





Pre-machining the wheel bearing bore

Roughing boring bar

- ▲ Indexable inserts with TiB² coating for high cutting speeds and feeds
- ▲ Diameter can be adjusted via short clamping holder for a consistent pre-machining dimension on the wheel bearing bore and therefore excellent process stability during finish machining
- ▲ Quiet running during machining despite long overhang length, thanks to high balance quality



Finish machining the mounting surfaces and wheel bearing bore

PCD multi-purpose reamer

- ▲ Multi-stage special-purpose tool with soldered PCD blanks
- ▲ A single tool for milling over several surfaces and counterboring/intermediate machining
- ▲ Excellent cycle time savings, thanks to several tools combined in one
- ▲ Quiet running during machining despite long overhang, thanks to high balance quality

Wheel hub machining

Precision and a long service life that turn things to your advantage

Many assume that a wheel hub is an easy-to-produce turned part. However, tools with a long service life are required to manufacture these components, which are made of tempering steel, efficiently and accurately. If wheel hubs made of case hardened material are needed, then in-depth expertise and intensive development work are needed to create the tool's cutting edge, to ensure continued precision and a long service life.

Finish machining the wheel hub outside profile

Turning with CERATIZIT

- ▲ Clear, consistent range and easy selection of indexable insert
- ▲ High cutting speed and longer service life increases productivity
- ▲ Universal application with high reliability and outstanding performance
- ▲ For maximum process security and reduction of the reject rate
- ▲ Greater stability in the tool holder increases process security even in difficult machining situations



Drilling the wheel screw connections

WTX – UNI solid carbide drill

- ▲ High feeds and cutting speeds can be achieved, thanks to wear resistant substrate and the latest PVD coating technology
- ▲ One of its key features is the special post-treatment of the cutting edges
- ▲ Drill into all materials up to 1,200 N/mm²
- ▲ Dia. 3 – 25 mm
- ▲ Lengths: 3xD, 5xD, 8xD
- ▲ Available with/without thro' coolant

Thread cutting the wheel screw connections

UNI machine taps

- ▲ Powder metallurgy HSS with TiN coating
- ▲ A reliable all-rounder for the majority of applications in ISO groups P, M, K, N
- ▲ For threads $\leq 3xD$
- ▲ Version available for various thread types

Roller bearing machining

Speed things up with the Swiss army knife of cutting tools

Roller bearings are used wherever components rotate at high speed or heavy loads need to be set in rotational motion. Their simple design – inner ring, outer ring and rolling element – belies the sophisticated functions and high quality standards of these components. And the tool systems used must be up to the job, so that stringent requirements relating to service life and precision are met during the machining of these complex parts.

Whether it is grooving, turning, drilling or all these things with a single tool: Team Cutting Tools from the CERATIZIT Group will help you optimise your processes with multi-talented tools.

Drilling into solid, external turning, face turning and internal turning of the roller bearing contour

Multi-function tool – ProfileMaster

- ▲ Race turning without steps with a single tool
- ▲ Turning internal contours
- ▲ Turning grooves and undercuts
- ▲ Turning external profiles
- ▲ Range: Dia. 10 – 32 mm
 Lengths 1.5xD, 2.25xD





Drilling into solid, external turning, face turning and internal turning of the roller bearing contour

Multi-function tools – EcoCut

- ▲ One tool for several machining operations
- ▲ Fewer tool stations occupied
- ▲ Fewer tool changes
- ▲ Reduced machining times
- ▲ Range: Dia. 8 – 32 mm
 Lengths 1.5xD, 2.25xD, 3xD

Projects in the best possible hands

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

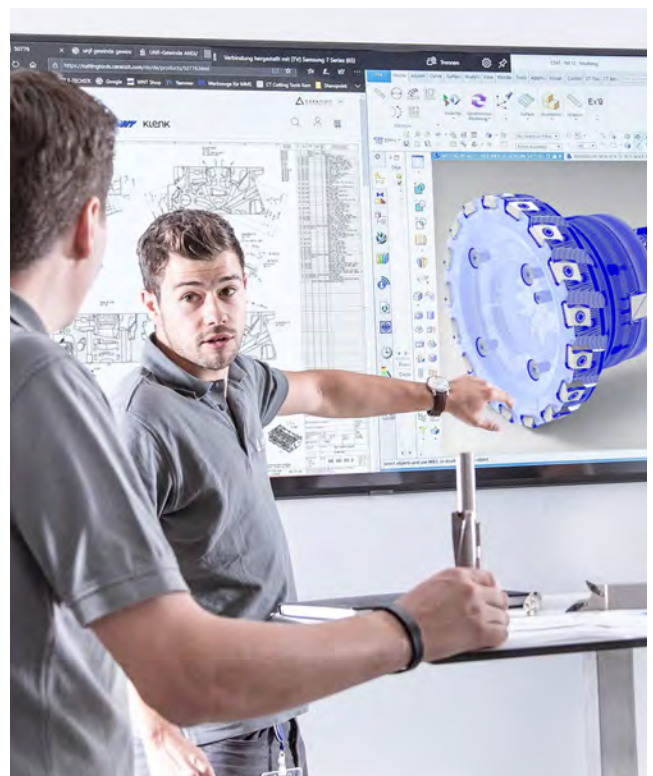
In order to machine increasingly complex workpieces cost effectively and to a high level of quality, all the process parameters need to be tailored to the specific task. Those who succeed in meeting these challenges will remain competitive on the global market.

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 tool solutions, can draw on sound technical expertise and provide first-rate service. What's more, with our leading product brands Cutting Solutions by CERATIZIT, WNT, KOMET 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

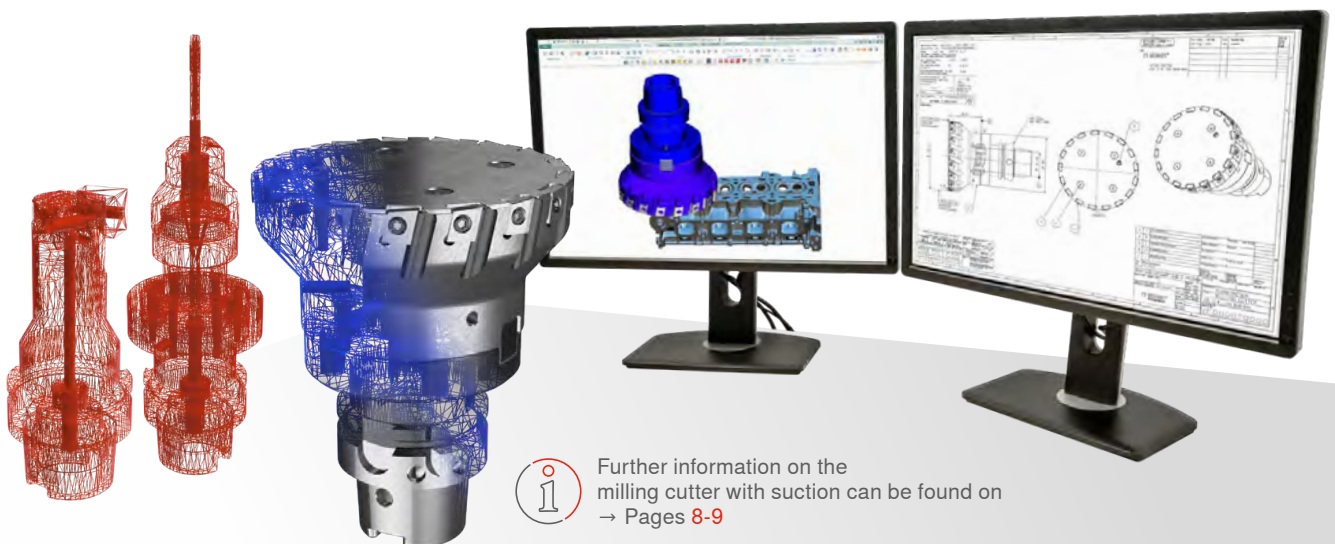
Our expert team implements the concept on your machine, working closely with you and your dedicated CERATIZIT application engineer. This on-site support guarantees you will receive a stable and cost-effective manufacturing process for your product.

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 the perfect tool 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 tool solutions of this kind. For example, face milling with the "suction effect" was developed due to one customer's specific requirement and enables 100% chip-free interiors during cylinder head machining. We are certain we can develop the perfect tool concept for your requirements too. Why not put us to the test?

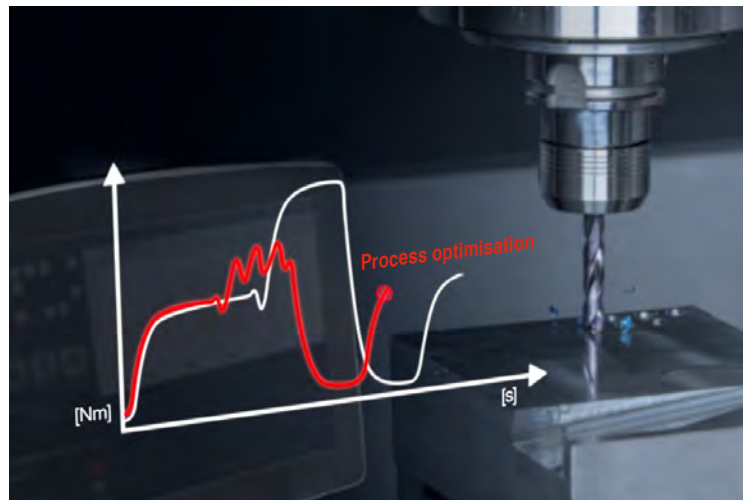


Further information on the
milling cutter with suction can be found on
→ Pages 8-9

Full process control – with ToolScope digital monitoring

The automotive industry must overcome major challenges in the coming years. In addition to strong competitive pressure and the constant increase in productivity in high volume production, manufacturing electric vehicles in the millions is a key issue. As a strong partner to the automotive sector, we not only offer suitable tools and strategies for optimal processes, but also an advanced smart factory solution. With ToolScope, the pioneering monitoring and assistance system, nothing will be left to chance. 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. CERATIZIT's 100 years of tool manufacturing expertise and in-depth understanding of digital systems make us the ideal partner to offer services encompassing all aspects 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 thorough overview of your machine's performance.

Machine shop

 Machine 1 Machining time: 0:00:00 Monitoring: Inactive Alarm: - Problem: -	 Machine 2 Machining time: 2:46:25 Monitoring: Active Alarm: Was triggered! Problem: Tolerance exceeded!	 Machine 3 Machining time: 1:16:45 Monitoring: Active Alarm: - Problem: -	 Machine 4 Machining time: 0:46:56 Monitoring: Active Alarm: - Problem: -
 Machine 5 Machining time: 1:49:18 Monitoring: Active Alarm: Was triggered! Problem: Wear limit reached!	 Machine 6 Machining time: 0:37:52 Monitoring: Active Alarm: - Problem: -	 Machine 7 Machining time: 1:31:13 Monitoring: Active Alarm: - Problem: -	 Machine 8 Machining time: 0:12:32 Monitoring: Active Alarm: - Problem: -

Increase in process security of up to 25%

Over turning and countersinking the fuel connection...

...with process monitoring

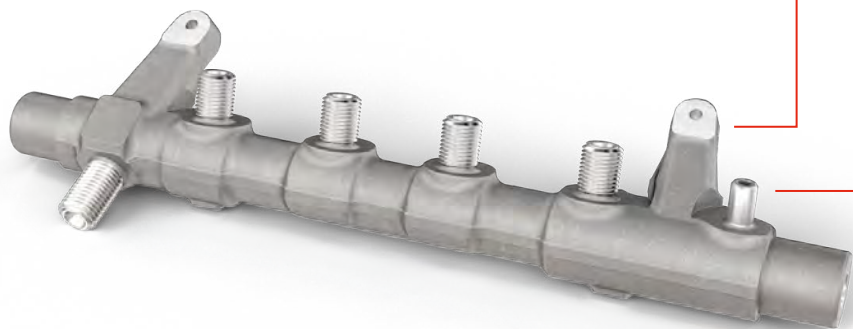
The process monitoring feature is at the heart of the ToolScope system. It detects deviations from the ideal machining process. ToolScope triggers a machine response in order to react to tool breakages promptly. This protects against resultant damage to the workpiece and the machine tool.

Reduction in cycle times of up to 15%

Finish machining...

...with adaptive feed control

The ToolScope adaptive feed control optimises every process in real time by regulating the feed between 80 and 120%. If the load on the cutting edge is higher than intended, ToolScope regulates the feed to 80% to intercept load peaks on the tool. Conversely, ToolScope identifies underloading of the tool and increases the axis feed to achieve cycle time savings. This allows you to make optimum use of your tool at all times, without damaging it and while retaining the same level of machining quality.



Increase in tool service life of up to 30%

Diverse drilling, turning and milling operations...

...with wear monitoring

The ToolScope wear monitoring feature determines the optimal wear limit of the tool so that it can be used for as long as possible, while taking into account the required surface quality. The increase in the tool service life leads in turn to a rise in machine availability.

Optimal tool service life

ADDITIONAL tool usage with ToolScope of up to + 30%

ToolScope wear monitoring enables the tool's service life reserves to be used without any worries

Tool usage up to now

+ 30% with ToolScope

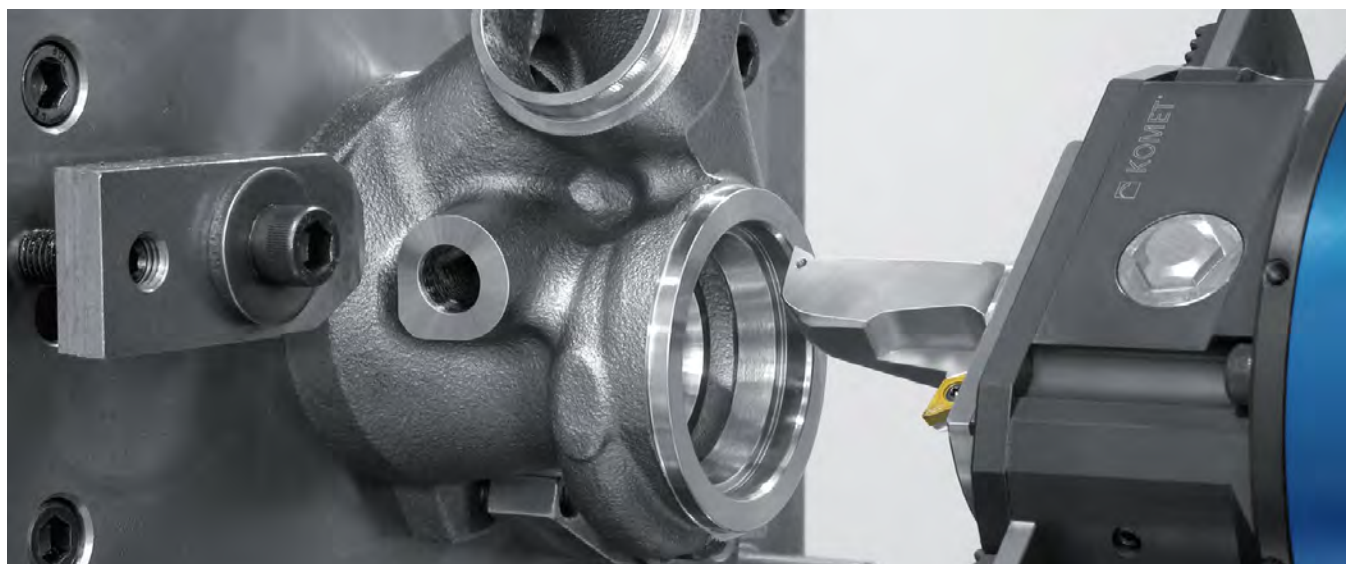
U-Axis System KomTronic

Efficient Feed-Out Tools for Turning Contours on the Machining Centre when Working with a Stationary Workpiece

Complex contours, tighter tolerances and rapidly changing product life cycles – many components in the automotive industry make flexible manufacturing concepts a must. With the KomTronic U-axis system, connecting rods, differentials, turbochargers, hubs, stator housings and more can be manufactured efficiently.

The KomTronic U-axis systems are programmable and are used for contour turning and turning operations on parts that are not rotationally symmetrical. Maximum flexibility can be achieved using customised snap-on tools and specially selected indexable inserts, with which contouring in bores and external machining are also possible. This results in significantly shorter production times with an improved level of quality and greater accuracy of form.

Users can make further time and cost savings thanks to the reduction in the variety of tools required. The U-axis can be operated in a fully closed (unmanned) loop and adapted to new machining contours at any time, meaning it boasts high precision and robustness. Innovations like the direct path measurement system on the operating slide, permanent oil lubrication and remote maintenance via web server make the KomTronic U-axis system future-proof and the first choice for cost-effective machining of stationary workpieces.



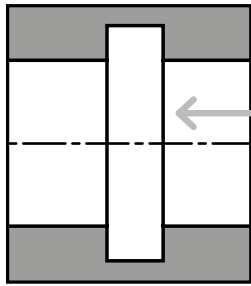
Your Technical Sales Engineer will be happy to answer any further questions or please contact directly

Offer.Actuatingtools@ceratizit.com

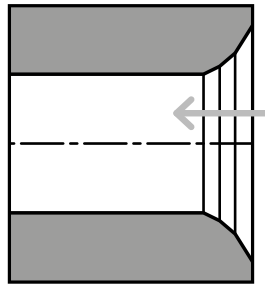


Further information on the
U-axis systems can be found on
→ Pages **19, 23, 25**

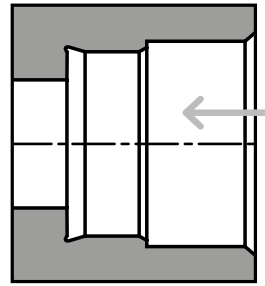
Machining Examples



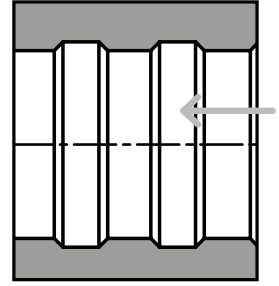
Grooving



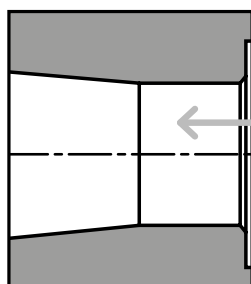
Turning Valve Seats



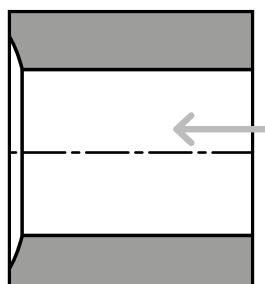
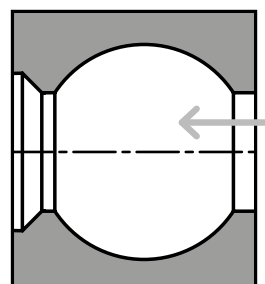
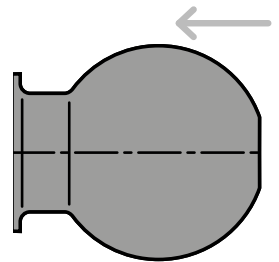
Bearing Seat



Bore with Coolant Passages



Tie Rod

Undercutting
Differential HousingInternal Contour
TurningExternal Contour
Turning

It Makes Turning Contours Possible when Working with a Stationary Workpiece

Higher Economy

- ▲ Use of standard instead of special machines
- ▲ Reduction in number of tools
- ▲ No need for clamping devices for finish machining on turning machines

Reduced Unit Costs

- ▲ Reduction in machining and throughput times
- ▲ Savings on tool changes
- ▲ Replacement of time consuming circular machining operations
- ▲ Reduced holding times
- ▲ High cutting capacity

Lower Operating Costs

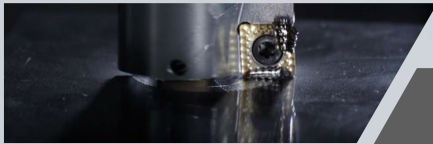
- ▲ Complete machining on one machine without the workpiece being rotated
- ▲ Minimum power consumption because of U-axis systems

UNITED. EXPERIENCED. METAL CUTTING.



**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.



**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.



**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.



**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.