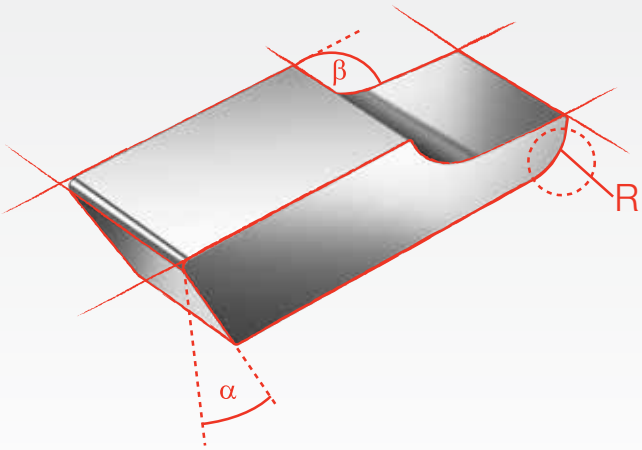
Hard Material Solutions

2021 **EN**

Solutions for the construction industry



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

Tooling a Sustainable Future

ceratizit.com

CERATIZIT GROUP

Carbide components are widely used in the construction industry. Thanks to a deep knowledge developed over the years, CERATIZIT produces numerous standard and customer-specific types of products for this industry.

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Dear valued customer,

CERATIZIT Hard Material Solutions offers you a unique complete package with excellence in all fields, including product development, a broad variety of products, best availability and personal service. We offer everything tool manufacturers need and – just as you do – set a high value on quality and reliability. Always one step ahead: our solution-oriented range is constantly being improved and expanded with new products. Because your needs are important to us, we will work together with you to find the ideal solution for your application and requirements.

You can rest assured that with us you are not just a customer but a partner.

Yours,
the CERATIZIT team

For more information and other product catalogues, please visit our download section at www. ceratizit.com

CERATIZIT Group

For over 100 years, CERATIZIT has been a pioneer developing exceptional hard material products for cutting tools and wear protection. The privately owned company, based in Mamer, Luxembourg, develops and manufactures highly specialised carbide cutting tools, inserts and rods made of hard materials as well as wear parts.

The CERATIZIT Group is the market leader in several wear part application areas, and successfully develops new types of carbide, cermet and ceramic grades which are used for instance in the wood, metal and stone working industry.

Facts & figures

Headquarters

Mamer, **Luxembourg**

25 more than **production sites**

7 000 more than **employees**

80 more than **countries in which we are active**

100 000 more than **products**

1 000 more than **patents & utility models**

200 more than **R&D employees**

35 % of products **developed in the last 5 years**

15 more than **innovation awards**

CERATIZIT worldwide

CERATIZIT Group

- Headquarters
- Production & Sales
- Production
- Sales

CB-CERATIZIT

- Production & Sales
- Production
- Sales

Production site

The CERATIZIT Group has its headquarters in Mamer, Luxembourg. Today the plant in Mamer has more than 1,100 employees and concentrates on industrial wear protection, wood, metal and stone working as well as inserts and tools.

Mamer, Luxembourg

Project management in collaboration with our customers

Welcome on board!

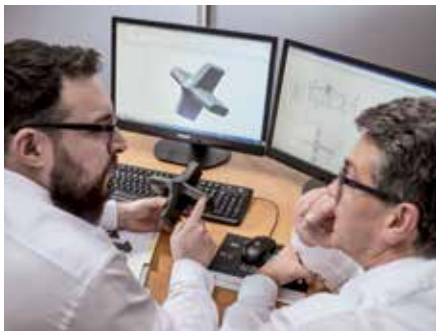
The CERATIZIT team is happy to invite you to join us on an innovative journey! Let us guide you through all the project steps leading to your success. Thanks to our engineering expertise, we can take your ideas and concepts all the way to the desired destination – the needs of your customers. We will travel together through the different steps of this trip, from feasibility study to prototypes and finally to serial production.

Our target is to guide you all along the way in developing new products or improving existing ones. We will take care of your project and support you with our supreme carbide experience, grinding experts and our engineering team.

So on each step of the way you will be provided with innovative carbide solutions tailored to your own manufactured tools.

Let's go!

Prototype

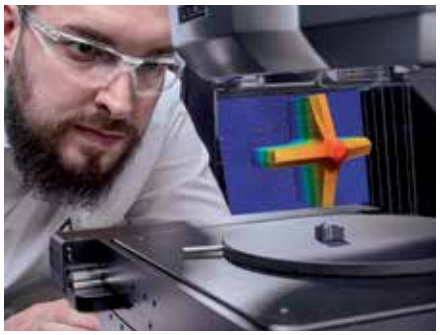


Feasibility study

Meeting between the customer and CERATIZIT

Serial production

Customer test and approval



Quality control

A step ahead for your success

Construction industry

The construction industry involves a wide variety of manufacturing processes and working materials. Continuous investments in R&D and in production, combined with in-depth expertise and global market knowledge, make CERATIZIT your preferred partner in this area. Our innovative strength is reflected in a broad product portfolio, with a great variety of standard and customised product solutions for toolmakers and high storage capacity for fast availability.

Dedicated grades for all kinds of materials, like softwood, hardwood, MDF, HDF, stone and metals, will help you maximise the performance of your products. For customised product developments, including rapid prototyping, our project management team will be happy to advise you. A dedicated team of specialists for each application ensures that you are always talking to an expert in your field.

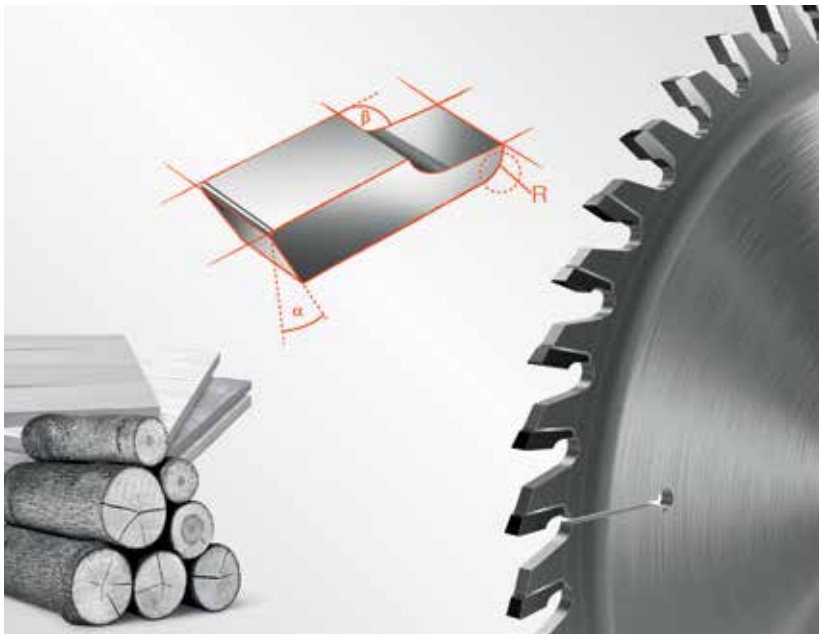
Main applications of our products are:

- ▲ Wood working
- ▲ Stone working
- ▲ Sawing
- ▲ Drilling

Saw tips for circular sawing

CERATIZIT offers a competitive edge thanks to innovative grades and a variety of geometries.

Extensive product portfolio
Our large portfolio of saw tips for circular wood and metal sawing comprises a wide variety of geometries: different sizes, angles and radii are available in metric and inch measures. Of course, other than our large standard catalogue, we also offer dimensions on demand. Our saw tips are also available with pre-tinning to simplify your brazing process. All our carbide grades can be surface-treated to simplify your brazing or welding operations, resulting in higher process reliability and a better performance potential thanks to the improved ratio of hardness to fracture toughness.



Blanks for circular saws and knives

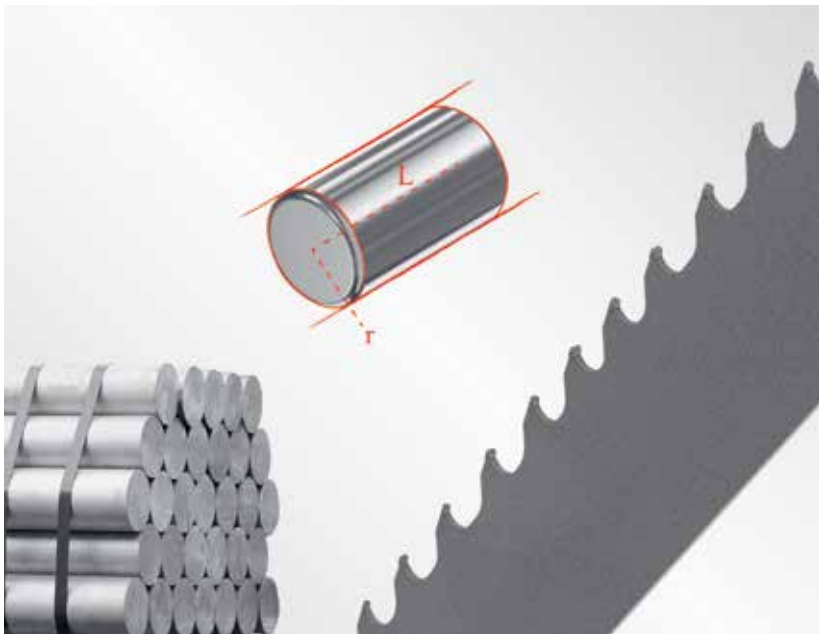
The right blank for every cut
Requirements for hard metal materials are very high in the precision tooling industry. Our tooling blanks guarantee a long tool life, good parallelism and reliable concentricity. Thanks to our wide range of grades, we offer the optimal solution for every application.

Perfectly prepared to your needs
During our creation of the tooling blanks we place great value on your ability to further process the products efficiently with marginal effort: we guarantee precise finishes with low tolerances, a repeatable flatness as well as low grinding allowances.

Tips for band saws

Tips for band saws
Our product range for band saws is suitable for the sawing of hardwood, softwood, and metal. In addition to our conventional dimensions, we can meet special requests on demand.

Grade recommendation
For an even higher performance, we now also offer segments and cylinders for wood band saws in our chrome grades.



Strobe blanks

Conventional and 7° side angle
All our strobe blanks are available in a large range of sizes. You will also find pre-tinned articles which help you save cost and reduce your production time.

Optimised product geometry for more economic efficiency
Thanks to the new geometry with a 7° angle on both sides, you will save material costs and grinding time, thus optimising your internal processes.

In addition to our standard strobe blanks which are also available pre-tinned, we offer an innovative design with a 7° side angle which allows a crucial material reduction.

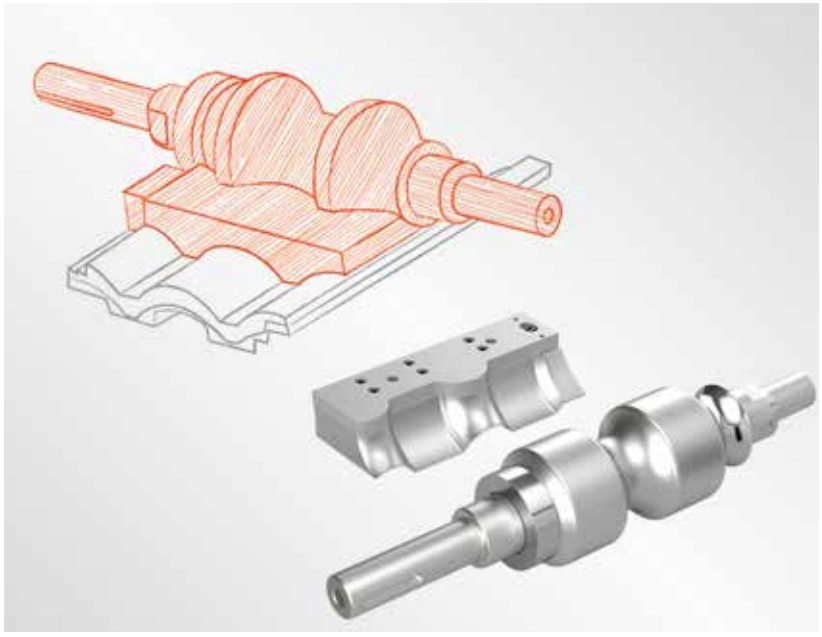
All our carbide grades for strobe blanks can be surface-treated to simplify your brazing process, thus offering faster and easier further processing.

Bricks and tiles

Our carbide tools are used whenever abrasive components are machined. They are wear-resistant, extremely hard and tough at the same time. Carbide tools and tips from CERATIZIT offer the toolmaker and end-user a material combining abrasion resistance with toughness to prolong tool life and save production downtime and cost.

Whether you need single components, complete assemblies or customer-specific design solutions for bricks and tiles production, our engineering team give your tools a new lease of life.

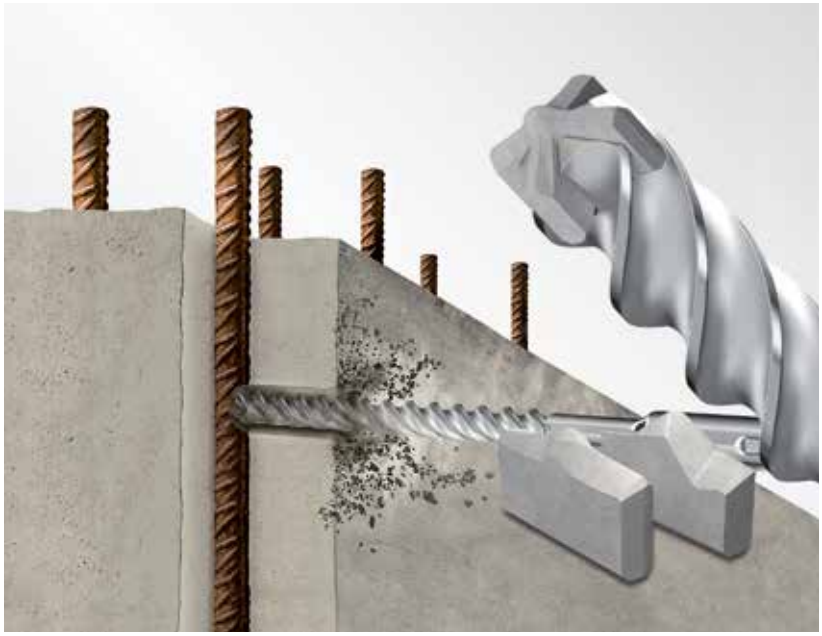
Brick industry
- ▲ As sintered
- ▲ Partly or completely ground
- ▲ Individual components or complete assemblies
- ▲ Corrosion-resistant materials can be provided at customer request



Concrete roof tiles industry
- ▲ As sintered
- ▲ Part or completely ground
- ▲ Ready-to-use
- ▲ Individual components or complete assemblies

Tips for stone working

With decades of experience in developing solutions for the machining of concrete, ferro-concrete, stone, masonry and other materials, we provide a wide standard range and customised solutions in various geometries and grades. These solutions include sophisticated masonry drill tips, hammer drill tips and core drill tips that are available semi-finished and with a ready-to-braze coating. Our bespoke carbide grades are characterised by both impeccable impact strength and wear resistance resulting in long tool life. Finally, all our products are to PGM standards (Prüfgemeinschaft Mauerbohrer – Masonry Drills Testing Association).

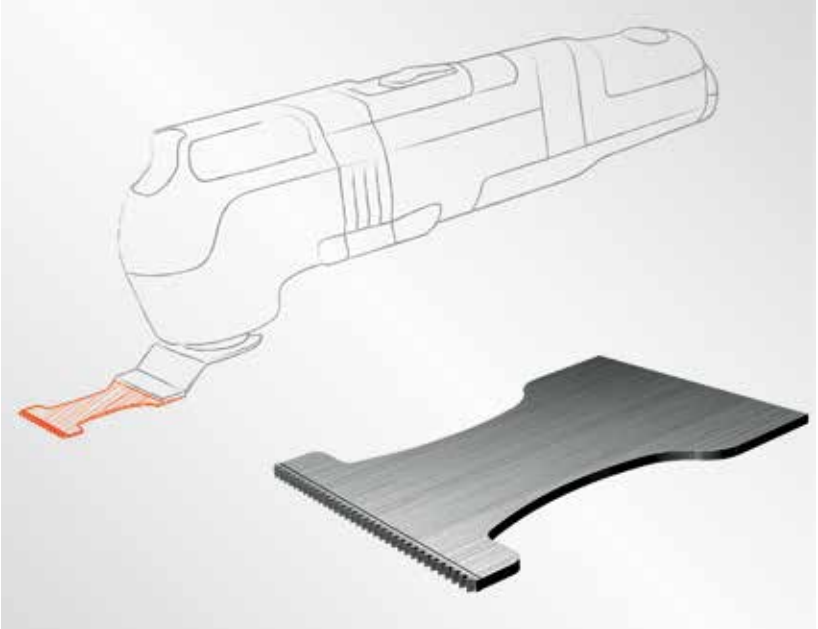


For more information please refer to our catalogue ‘Solutions for stone working’

Oscillating tool blades

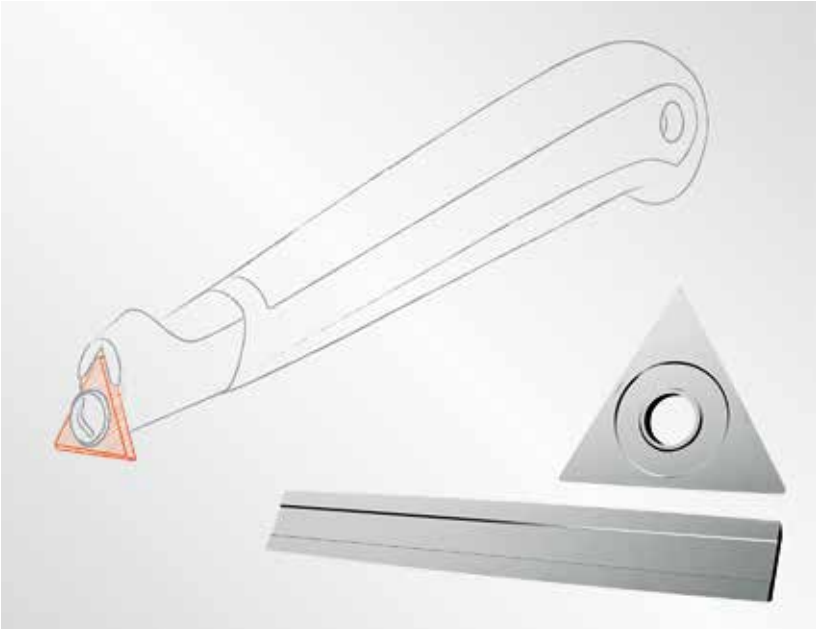
Oscillating power tools are a useful addition to any professional or DIY toolbox. They can be used to perform many functions like grinding tile adhesive, flush-cutting door jambs, cutting nails, bolts, metal, wood, plastic, fibreglass and many other applications.

CERATIZIT offers toolmakers carbide-tipped oscillating tool blades to improve the tool life.



Scraper tool blades

Scraper tools for DIY application are used to manually remove paint, glue, varnish and rust on any surface. Abrasion-resistant hard metal blades maximise the tool life and performance.



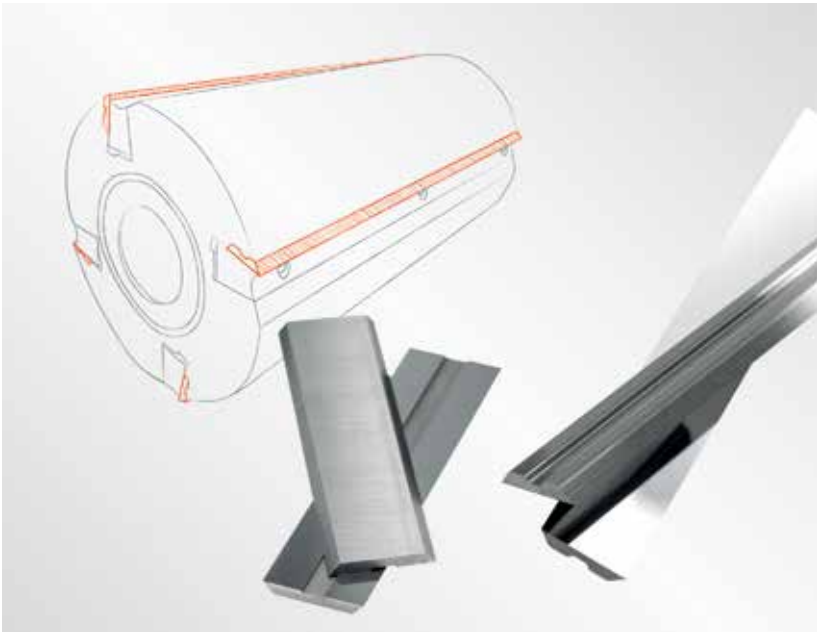
Planing & profiling

As one of the first wood working operations, the planing process is used to produce flat surfaces on wood and wood-based products. Surface planing and thicknessing machines are used for this operation. We offer various semi-finished and finished carbide solutions for the profiling and planing of various materials such as solid wood, boards like MDF or other materials like plastics. Thanks to our comprehensive selection of grades and executions, you can be sure to find the optimal product that best fits your requirements. For all kinds of cutter heads, we provide the best solution.

Planer blades

Economic design
Available in our innovative KCR18+ carbide grade that guarantees a higher process reliability thanks to corrosion and oxidation resistance.

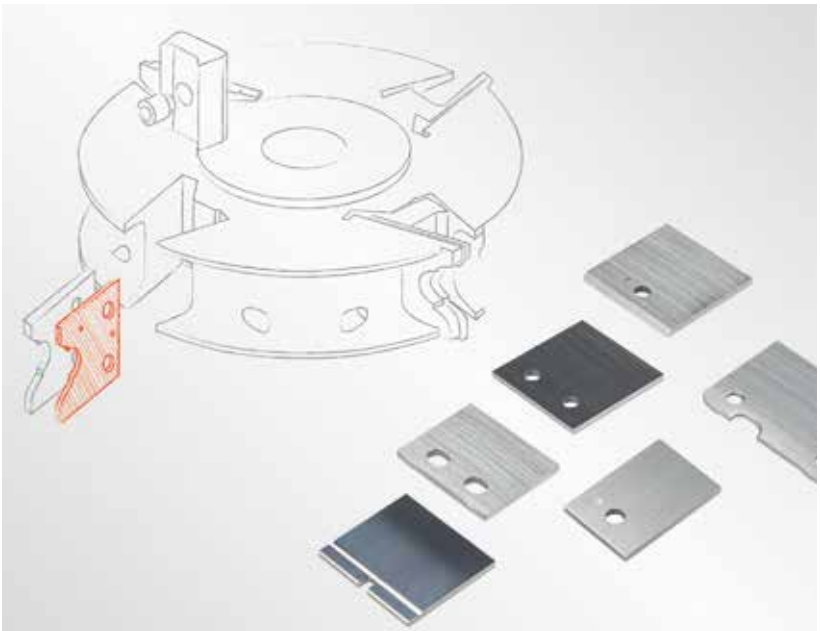
Higher performance potential thanks to the improved ratio of hardness to fracture toughness



Blanks for profiling

Premium quality
Our customers appreciate the premium quality and long tool life of our blanks for profiling. Our record as the exclusive supply and development partner to market leaders in the tool manufacturing industry for many decades speaks for itself.

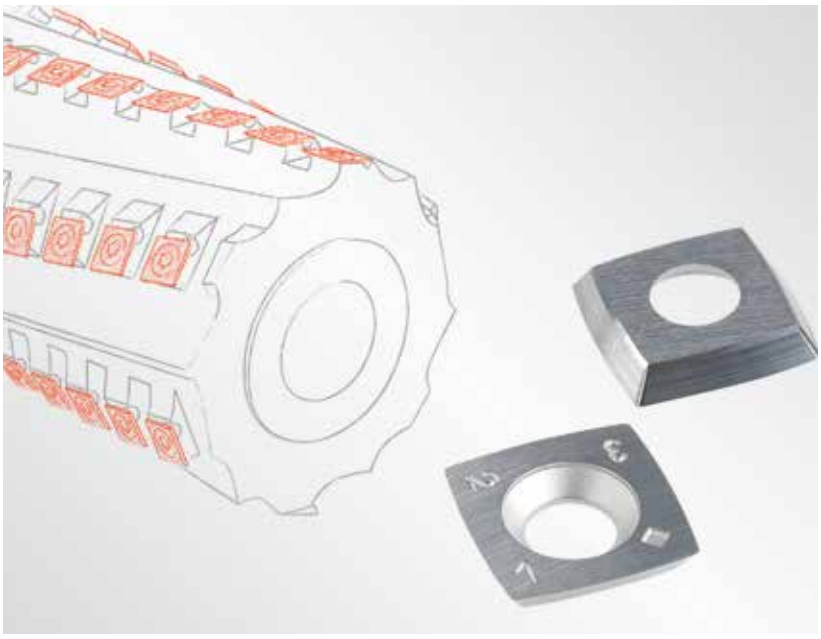
Comprehensive range
We offer you a blank for every application – our comprehensive assortment consists of various product types, with many carbide grades and geometries available. Whether you are looking for a standard product from stock or a customised solution, you can always count on us as your premium partner for blanks.



Planer knives

Spiral cutter head knives
Our spiral cutter head knives are smaller and have a lower weight compared to the standard planer blades. The planer knives can be turned three times before they have to be changed, so tool life is very long. You can change the knives one by one, leaving you with a great flexibility.

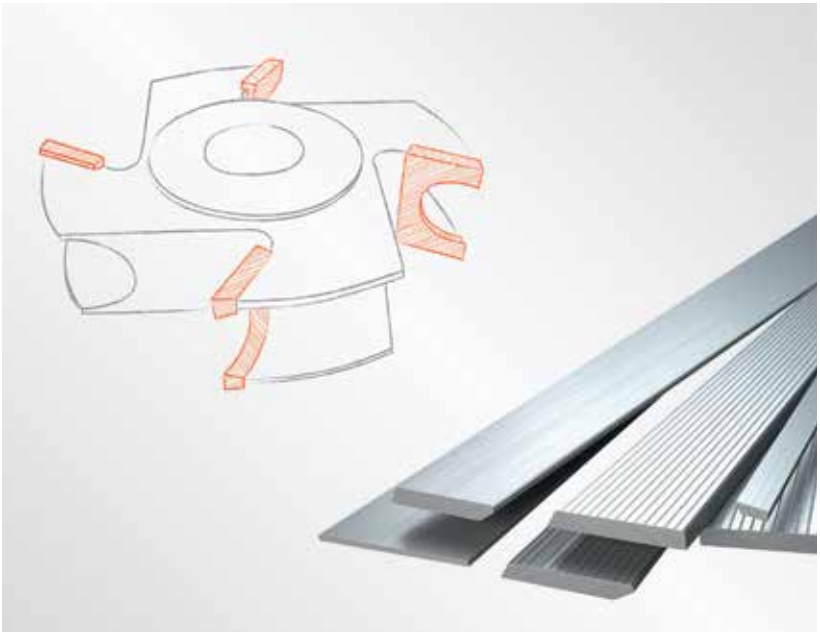
High quality surface
When working with our spiral cutter head knives, the surface of the wood will have a very high quality: extra polishing of the surface is not necessary anymore, so you save time and money in the further processing.



Strips

Perfect results
Our rectangular strips are highly wear-resistant even at high cutting speeds, providing ideal conditions for the production of high-quality wood machining tools.

New carbide grade KCR18+
We are now offering our strips in the recently developed carbide grade KCR18+, combining corrosion resistance with higher performance: thanks to its toughness, you can even work on non-homogeneous parts without chipping.



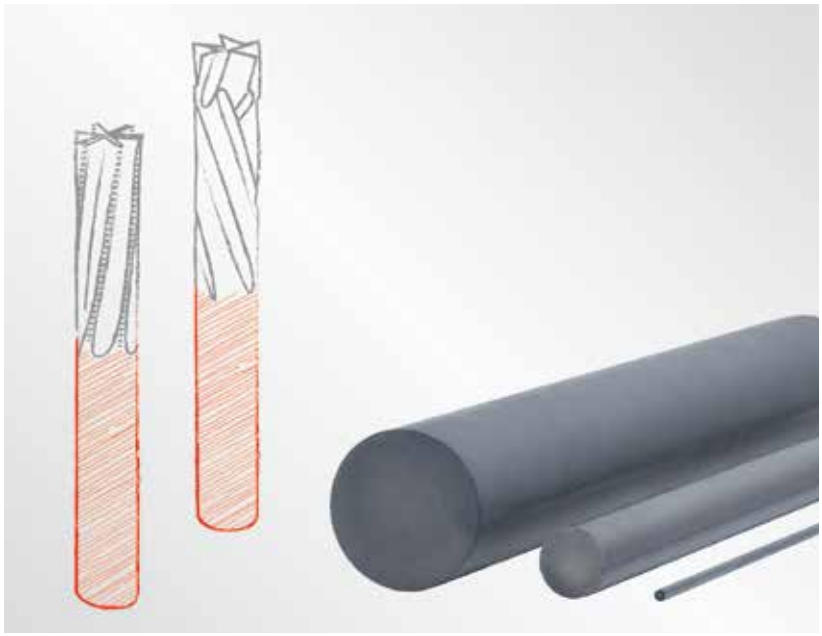
Routing

For routing wood or composite materials, we offer numerous blanks, semi-finished and finished tools made of carbide. It goes without saying that our production capabilities are not limited to the products described on our website. We are always ready for a challenge to help you find the best solution for your requirements. Check out our services to see how we can assist you. Choose from our large standard portfolio of carbide rods, contact us to create a customised blank for profiling together or discover the outstanding tool life of our indexable knives for wood machining.

Rods

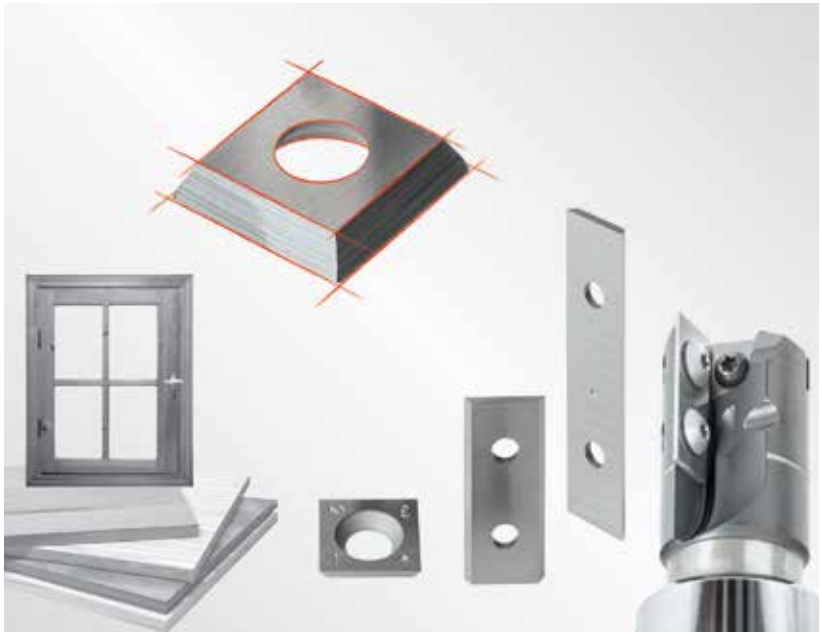
Tailored grades and surface finish for high performance in wood working
We offer a wide range of solid carbide rods for the manufacturing of milling cutters and drills for wood working. Rods made of submicron grades which were specially developed for wood working are able to achieve high cutting speeds along with maximum wear resistance. Whether it is for machining hard-wood, softwood, chipboard, MDF or HDF – we can help you choose the most suitable grade for your application.

Maximum security
All rods are ground with a matt finish. This finish reduces the risk of tool slippage from the collet holder even at high rotational speeds.



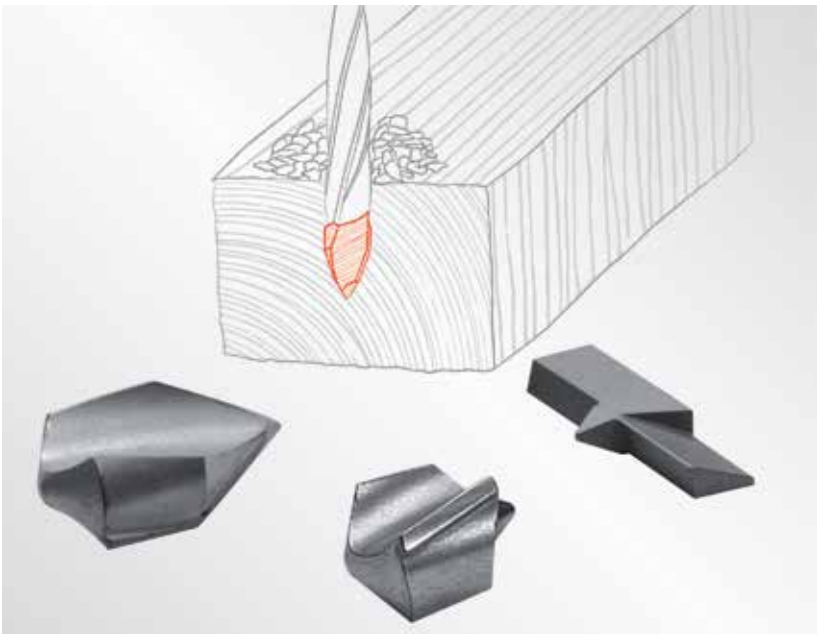
Indexable knives

Our indexable knives have a worldwide reputation for high geometrical precision, resulting in an outstanding surface quality for the workpiece in a short space of time.



Wood working drill tips

Efficient. Cost-saving. Competitive.
Blanks for drill tips are available in our market-leading special drilling grades, which are also fully impact and wear-resistant. You can benefit from easier and faster brazing with our new cobalt surface treatment. The extensive product portfolio includes customised blanks with simple as well as very complex geometries, enabling our customer to match their products perfectly to market requirements.




PLAN

Continuous development and innovation

As a market leader, we are at the forefront of technological development. Our use of the most up-to-date technologies and materials ensures that you will be even more profitable in future.

Work with us to set new market trends – together, we can develop new products that are perfectly suited to your application. We have a number of long-standing confidence-based partnerships with customers, project partners and universities. Decades of experience in producing carbide inserts for wood and metal working have enabled us to accumulate a vast amount of knowledge in these fields. To ensure an optimal performance on all levels, we always consider the carbide properties, the manufacturing of the finished tool and the requirements of the end-user.

Our strengths:

- ▲ Ongoing development of carbide grades and expansion of the product range
- ▲ Modelling and fundamental research for the products of the future
- ▲ Benefit from synergies: all the resources of the CERATIZIT Group's fundamental research programme are at our disposal
- ▲ Development of specific solutions for various applications – always in line with current market requirements
- ▲ Experienced and well-trained carbide specialists
- ▲ Vast experience in advanced development techniques, e.g. joining technologies like laser beam welding or brazing
- ▲ We are your innovation specialist: 35% of our products are younger than 5 years

A good example of joint product development with a customer is the Armoth Professional CTE band saw, for which QSGS Technology has received the Polish 'Gold Medal Award'. The band saw was developed in collaboration with CERATIZIT Hard Material Solutions, and features carbide saw tips with various custom geometries.

For this project CERATIZIT recommended the carbide grade KCR10. The wear-resistant saw tips can be brazed to the saw band, re-ground and easily replaced, thereby reducing the maintenance costs and increasing the service life of the band saw.

Online shop

Conveniently shop online all around the clock.

Our online shop is your 24/7 online access to CERATIZIT products: an intuitive and user-friendly design, with clearly structured categories and filter functions, makes it easy to search and find the products you are looking for.

Your advantages

Our online shop is available 24/7 for you!

Availability
Shop our large assortment of over 25,000 products online. You will get instant information about availability and real-time stock updates from our warehouses all over the world.

Support
You won't be left on your own. Our customer service and sales teams are always here to answer your questions before, during and after your purchase. All details of your personal contact at CERATIZIT are just one click away.

Configurator
If you are looking for a customer-specific piece that you can't find in the standard range, our online product configurator makes it easy to design a broad variety of tools and components to meet your needs.

Documentation
Find all your on- and offline transactions in one place (quotations, orders, invoices etc.) with tracking and tracing of your shipment history.

Information
Get detailed information about our products, including CAD data, technical drawings and images, with filters for an easy product search.

User management
Benefit from a multi-user system where you can decide which level of authorisation a user should have, depending on the role within your company.

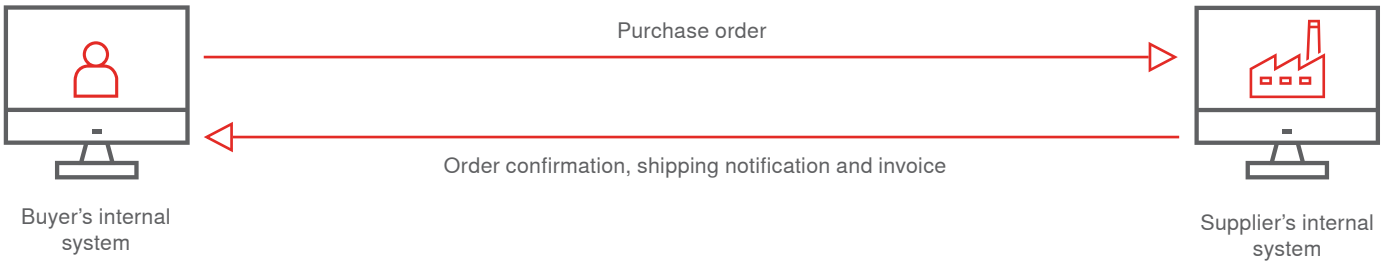
EDI connection

your direct line to reach us

If you order products frequently, electronic data interchange (EDI) offers you the possibility of accelerating the ordering process by means of direct, encoded communication between the ERP systems of both companies. This also minimises the administrative workload and excludes errors caused by manual input. As EDI is based on industrial standards, the outlay involved in a one-off set-up is quite manageable. In the long run, however, you will benefit by reducing the time and cost of ordering from us.

Traditional manual process

Automated EDI process



Supported features

- All common message formats, e.g. XML IDoc (native), EDIFACT, VDA and ANSI X.12
- All common transmission channels like HTTPS (native), OFTP/OFTP2, AS and X.400
- Various message types (orders, order confirmations, delivery schedules, shipment notifications, invoices etc.)

Your benefits

- Order faster via your own ERP system
- Reduced administrative workload
- Avoid mistakes caused by manual processing
- 24/7 safe, encoded data interchange between you and us
- The electronic data can be further processed on your ERP system

Cemented carbide

Cemented carbide is a powder-metallurgical composite consisting of one or more hard material phases (e.g. tungsten carbide) and a binding material (e. g. cobalt). It is an extremely hard material, characterised by high wear resistance and thermal stability. It is used in various fields that require tools or components to be particularly wear-resistant.

Cemented carbide improves the quality of tools and components, gives them a longer service life and ensures a constant performance.

By varying the grain size of the tungsten carbide, binder content and alloy components, the performance characteristics of the cermented carbide, such as hardness, transverse rupture strength, fracture toughness or corrosion resistance can be optimised according to the application.

Cemented carbide – a composite material with valuable properties

Cemented carbides are composite materials consisting of a hard material and a comparatively soft binder metal, like cobalt (Co). The performance characteristics of carbide are determined by hardness, transverse rupture strength and fracture toughness. With regard to their application, important parameters for the optimisation of these characteristics are the cobalt content and the grain size of the metal binder phase. The tungsten carbide grains have an average size of less than 0.2 µm up to several micrometres (µm). The cobalt fills the gaps between the carbide grains. When extremely high toughness is required, the cobalt content can amount to as much as 30%, whereas, for maximum wear resistance, the cobalt content is reduced and the grain size decreased to the nanocrystalline range of < 0.2 µm.

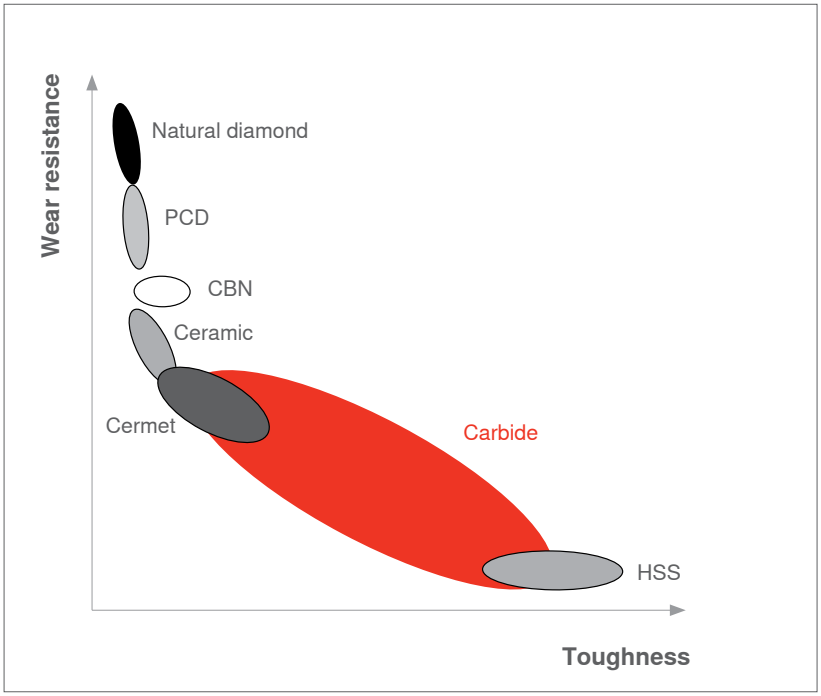
APT (ammonium para-tungstate)

Yellow tungsten oxide

Blue tungsten oxide

Tungsten

Cemented carbide properties



Cemented carbide covers the widest application range.

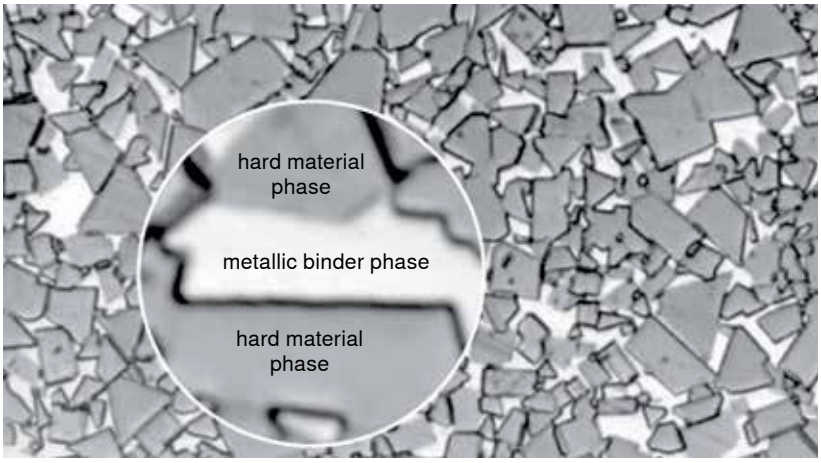
Cemented carbide is a hard material with mechanical properties that can be adjusted within a very wide range, given its composition and microstructure. The hardness and toughness range of the CERATIZIT grades includes everything from wear-resistant tool steel to super-hard ceramic materials.

Criteria relevant for the choice of application

- ▲ Wear resistance, hardness
- ▲ Compressive strength
- ▲ Impact strength
- ▲ Transverse rupture strength
- ▲ Tribological properties
- ▲ Specific weight
- ▲ Magnetic properties
- ▲ Modulus of elasticity, rigidity
- ▲ Thermal properties
- ▲ Corrosion resistance, resistance to oxidation
- ▲ Toughness

Grain size classification		CERATIZIT
Average grain size	Classification	Code
< 0.2	nano	N
0.2 – < 0.5	ultrafine	U
0.5 – < 0.8	submicron	S
0.8 – < 1.3	fine	F
1.3 – < 2.5	medium	M
2.5 – < 6.0	coarse	C
> 6.0	exta-coarse	E

The classification of carbides according to grain size corresponds to the recommendations of the Powder Metallurgy Association. The standard ISO codes for carbides which were developed for fine to medium grain sizes no longer correspond to today's state of the art. In order to choose the correct grades, only the application data are relevant.



Micrograph of WC-Co carbide

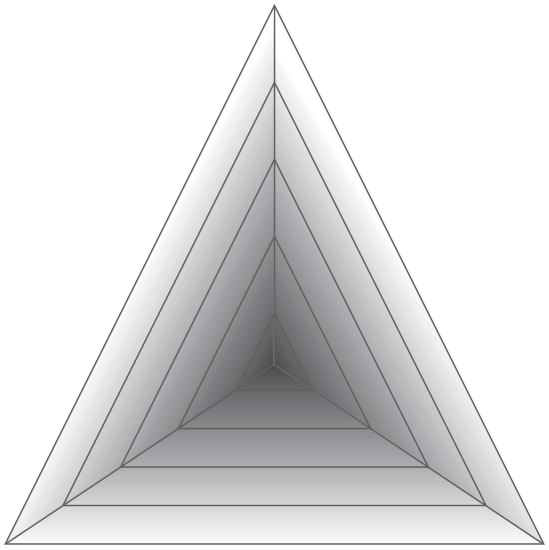
WC-Co carbide

The hard material provides the necessary
- ▲ hardness
- ▲ wear resistance

The metallic binder provides
- ▲ toughness

Hardness

Cobalt content ▼
Grain size ▼



Transverse rupture strength

Cobalt content ▲
Grain size ▼

Toughness

Cobalt content ▲
Grain size ▲

Hardness (wear resistance)

Cemented carbide grade (extreme example):

- ▲ Very high hardness: 2650 HV_{30}
- ▲ Small grain size: < 0.5 µm
- ▲ Low Co content: 0.4%
- ▲ Corrosion resistance when adding Cr_3C_2

Transverse rupture strength

Cemented carbide grade (extreme example):

- ▲ T.R.S.: > 4000 MPa
- ▲ Small grain size: < 0.5 µm
- ▲ Low Co content ~ 8.5%
- ▲ High wear resistance: 1930 HV_{30}

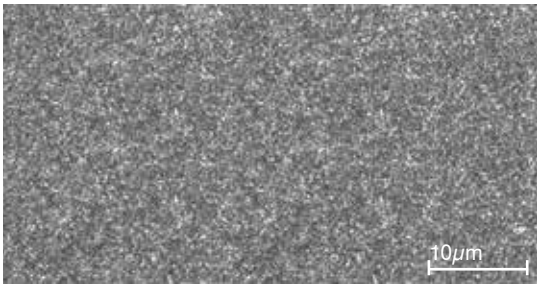
Toughness

Cemented carbide grade (extreme example):

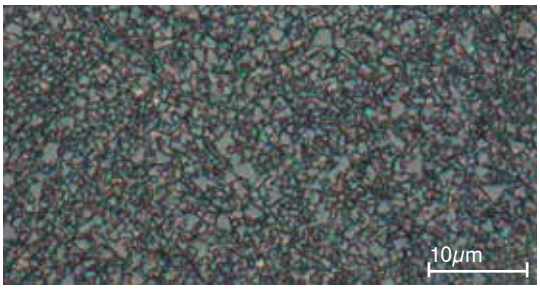
- ▲ Sufficient fracture toughness: Co content 20%
- ▲ Good wear resistance: 1030 HV_{30}
- ▲ Medium grain size coarse or extra-coarse

Grade examples – properties

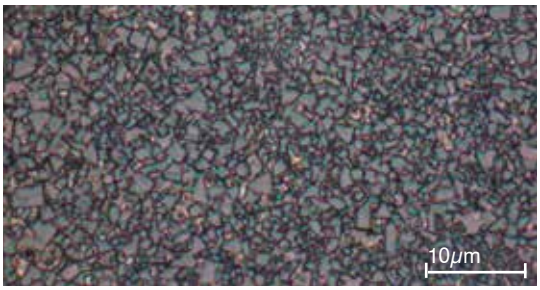
The graphic illustrations below show that the mechanical properties of the carbide mainly depend on the binder content (Co) and the WC grain size. Hardness, i.e. wear resistance, increases inversely proportional to the fracture toughness. This means that the harder the material the more it reacts to notch tensions and impact stress (the 'impact resistance' parameter, which cannot be precisely defined, correlates with the fracture toughness of the material).
On the other hand, the transverse rupture strength does not directly depend on the hardness but rather on the WC grain size and the cobalt content. The adhesive wear (tendency to stick), however, decreases with the grain size and the cobalt content of the carbide used. The list of the mentioned interdependencies, which could be extended at will for other wear and failure mechanisms, show that it is only possible to choose the correct carbide grade following a systematic procedure and/or based on experience with similar applications.



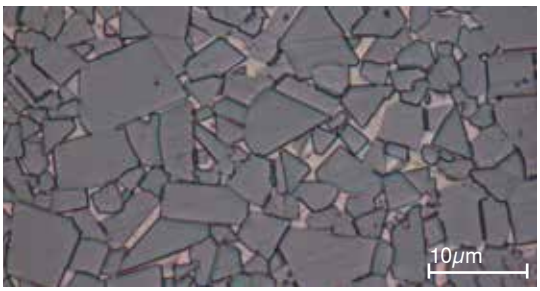
Ultrafine grain



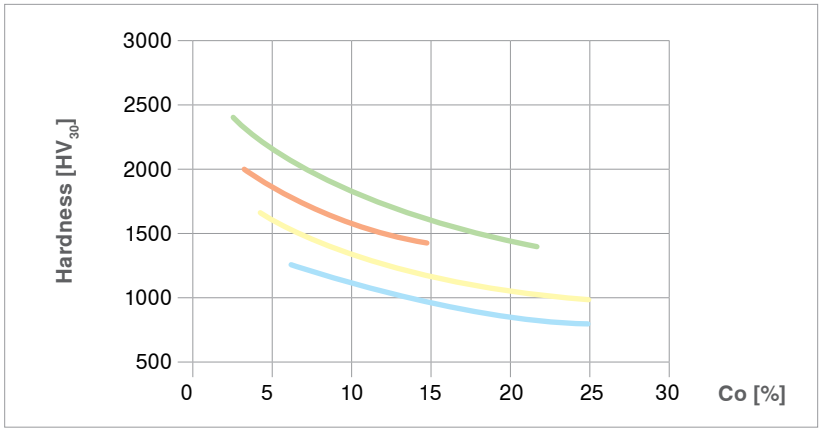
Submicron grain

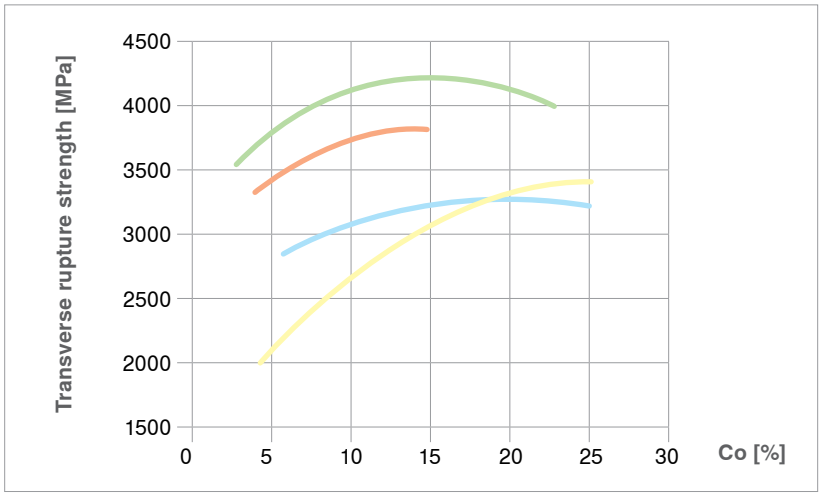


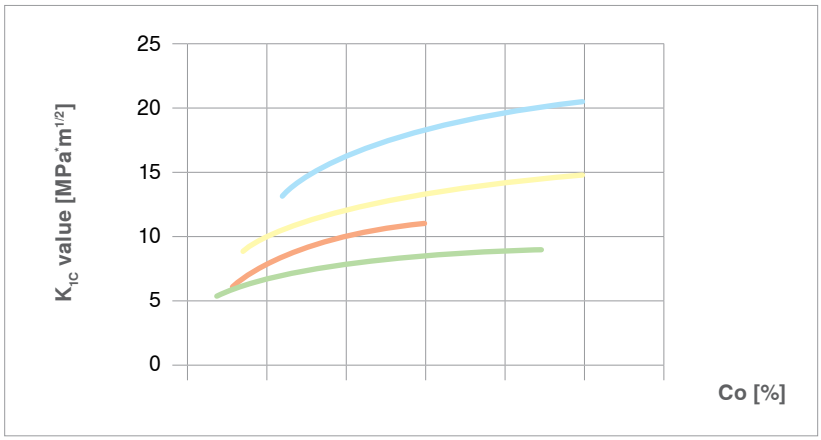
Fine / medium grain



Coarse grain







Ultrafine grain
Submicron grain
Fine / medium grain
Coarse grain

Passion for cemented carbide

From the ore to the ready-to-use-tool

CERATIZIT is one of the few carbide manufacturers who manages the entire process chain single-handedly: from ore extraction to the ready-to-use product. In the different areas that are involved, our highly qualified experts are familiar with every single step of the production process. With our ultra-modern machine park and great manufacturing depth, we guarantee that you will be able to count on a strong partner.

To ensure the high quality of our products and the environmental friendliness of our production methods, our processes are certified to DIN ISO 9001 standards. What this means for you is that you will find the sum of all the skills of the entire CERATIZIT Group combined in each one of our products.

We manage the entire process chain

Mineral extraction

Worldwide extraction of scheelite and wolframite ore with selected business partners to ensure responsible raw material sourcing

Preparation and mixing of the raw materials

Powder and grades manufacturing, management & control

Forming / pressing

All existing shaping technologies available (extrusion, injection, direct pressing, isostatic pressing, rotary pressing, hand-shaping)

Sintering

Several decades of experience in calculating the exact material properties ensuring high quality of the final product

Surface treatment

Different finishes available including tumbling Co/Ni plating, pre-tinning, CVD, PVD, grinding, lapping, EDM

Quality assurance

All products are subject to strict quality control by experienced professionals

Dispatch

Automated high-tech shuttle warehouse

Recycling (optional)

We organise the entire process for you and also provide free, quantity-specific collection containers and transport solutions.

Carbide production

Carbide production at CERATIZIT started in 1929. Thanks to long-standing experience CERATIZIT manages the entire process chain, from the raw material to the dispatching of the finished products to customers. The production process of powder-metallurgical products basically includes the four steps of powder preparation, shaping, sintering and finishing.

The ammonium para-tungstate (APT) is calcined into tungsten oxide under high temperature. Subsequently the oxide is reduced to tungsten metal in a hydrogen atmosphere. The metal powder is then mixed with carbon and carburised under inert atmosphere at high temperatures. The production parameters are decisive for the WC grain size in the sintered carbide. The tungsten carbide is mixed by wet grinding with the binder metal cobalt, nickel or iron, various grain growth inhibitors and special alloys as well as materials which promote compaction, so that a homogeneous suspension is created. Afterwards, the suspension is dried in a spray tower to produce a granulate with good flow characteristics. This granulate represents the basis for all forming processes.

Mixing / milling

Tungsten oxide

Reduction

Tungsten

Carburising

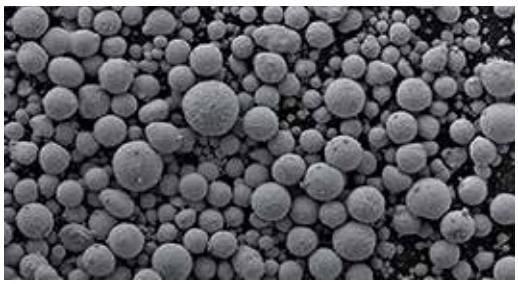
Tungsten carbide

TiC, TaC, NbC

Cr_3C_2, VC, MoC

Granulation

Carbide powder granulate



Pressing – shaping – machining

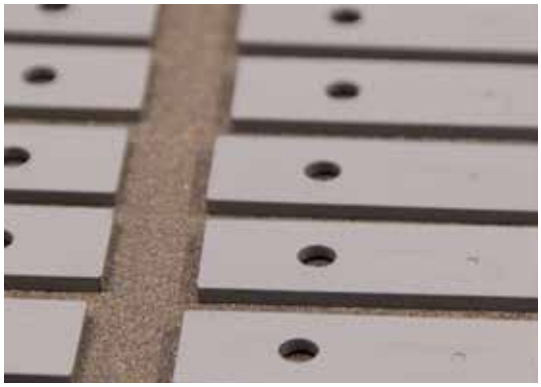
The goal of pressing is to densify the powder before it can be further processed. Pressing is normally carried out at room temperature with pressures reaching up to several tons per square centimetre.

There are several ways of pressing blanks:
During isostatic cold pressing the powder is filled into an elastic flexible lining and pressed into a compacted from through high liquid pressure. The powder blocks which are produced in this way can then be processed mechanically. All common machining methods like milling, cutting, drilling or turning may be used.

In uniaxial pressing the pressing tool consists of a die and an upper and a lower punch. The carbide powder is filled into the die and then compacted to create the ‚near-net-shape' green geometry, which is ejected from the pressing die.

Extrusion pressing is mainly used to produce rectangular bars or cylindrical rods, with or without axial hole(s). A plastifier is added to the powder. The resulting paste is pressed through an extrusion nozzle. Before sintering, the plastifier must be evaporated in special drying furnaces.

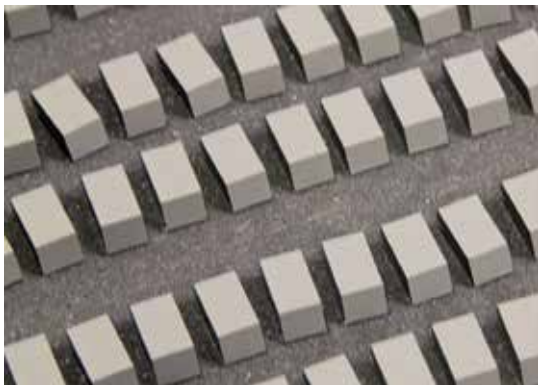
Metal Injection Moulding (MIM) is a process used to produce more complex forms which cannot be produced by direct pressing. The paste preparation is similar to the extrusion process.

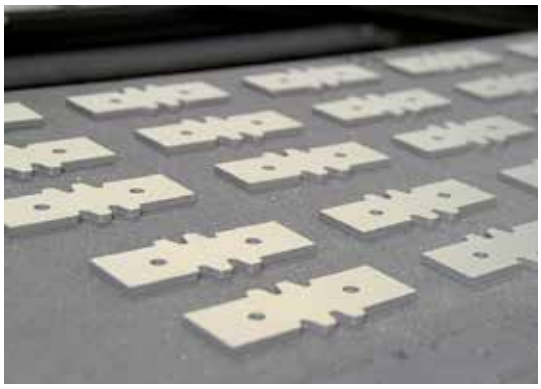


Sintering

The sintering process converts the blank into a homogeneous and dense cemented carbide with a high level of hardness. The material is sintered at temperatures between 1,300 and 1,500°C (liquid phase sintering) and sometimes also at high pressure (up to 100 bar). The volume is reduced by up to 50% during this process.

Consequently, a lot of expertise is necessary for the production of the blanks so that the final products will have the correct dimensions. CERATIZIT's carbide experts have several decades of experience in calculating the exact sinter shrinkage, ensuring high quality of the final product.

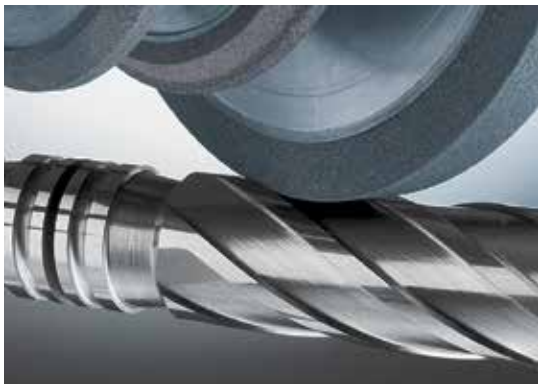




Finishing – grinding

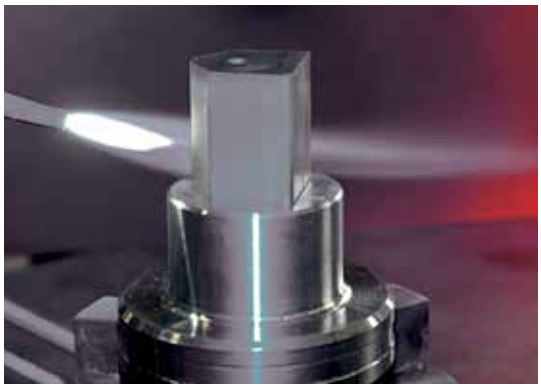
In order to achieve the final requirements of surface finish, tolerances, etc., carbide parts can be subjected to a series of finishing processes such as grinding, spark erosion and coating.

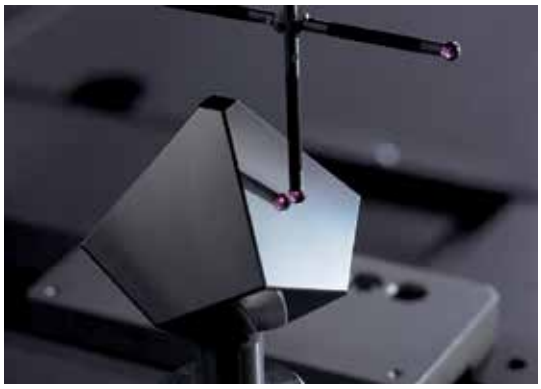
Cemented carbide machining by spark erosion meets the highest technological standards. Wire erosion and cavity sinking by EDM guarantee high precision. Long-standing experience combined with carbide grades that are specially adapted for erosion guarantee optimum machining results.



Joining – erosion – quality check

In many cases it is not optimal to manufacture the entire component in cemented carbide. The use of cemented carbide is then limited to the area in which the special properties of cemented carbide are needed. Materials with appropriate wear resistance are used for the tool. They are easier to machine than cemented carbide. Numerous tried and tested technologies, such as brazing, gluing, clamping, connections with screws and shrinking are applied to combine cemented carbide with other materials.





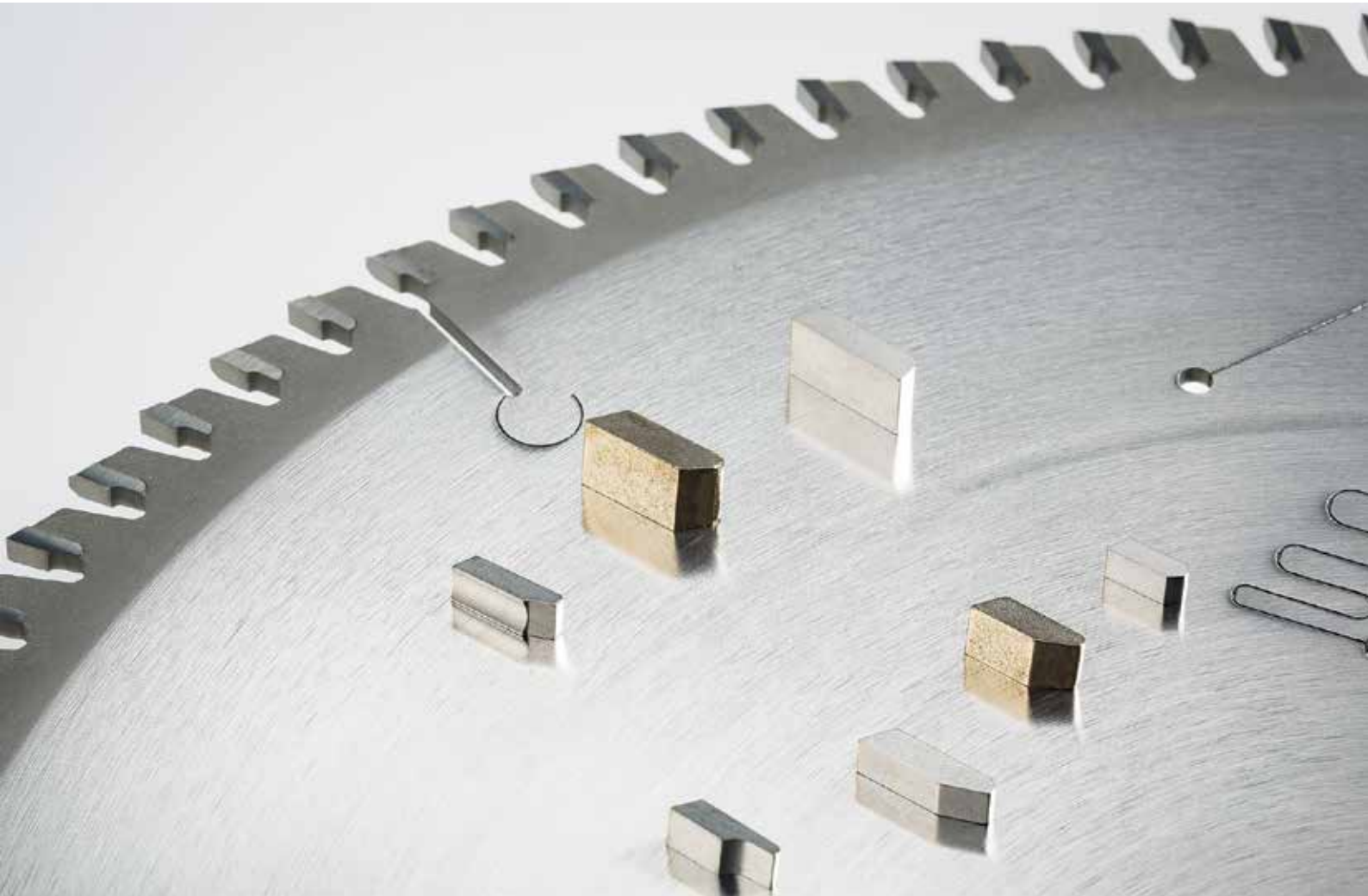
Surface treatment

CERATIZIT is continously working to provide the best solutions for toolmakers. From the raw material to the finished products, details matter. That is the reason why we provide several surface finishes for our cemented carbide products.

Nevertheless we highly recommend a cobalt layer on every brazed product, and a nickel layer for welded parts. For any questions or special requests, please do not hesitate to contact our SA (Sales Administration).

Surface treatment designation	Process description
TSR1	Tumbling – polishing
TS42	Tumbling – sandblasting – cleaning in aqueous media
TS43	Sandblasting – tumbling – polishing – cleaning in aqueous media
TSN	Tumbling – nickel deposition
TSX = TS8* = TS90*	Tumbling – cobalt deposition

* We apply different designations to the same surface treatments because they relate to different product families.

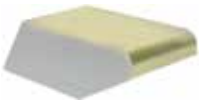


Pre-tinning

If you are looking for a way to save time and reduce your production costs, CERATIZIT provides you with pre-tinned saw tips and strobe blanks. Most of our standard saw tip designs can be pre-tinned. Two different kinds of brazing material are available. Wherever you need tri-foil (silver/copper/silver), named ‘DA’, or silver braze known as ‘PT’, CERATIZIT can deliver material in all carbide grades.

For technical feasibility, please refer to the table below:

Saw tips



Minimal dimensions			Maximal dimensions		
Length [mm]	Width [mm]	Thickness [mm]	Length [mm]	Width [mm]	Thickness [mm]
6.5	2.5	2.0	16.0	11.0	4.0

Strobe blanks

Minimal dimensions			Maximal dimensions		
Length [mm]	Width [mm]	Thickness [mm]	Length [mm]	Width [mm]	Thickness [mm]
20.0	2.0	2.0	80.0	6.0	2.0

CERATIZIT square strobe blanks are only available with the tri-foil brazing alloy ‘DA’.

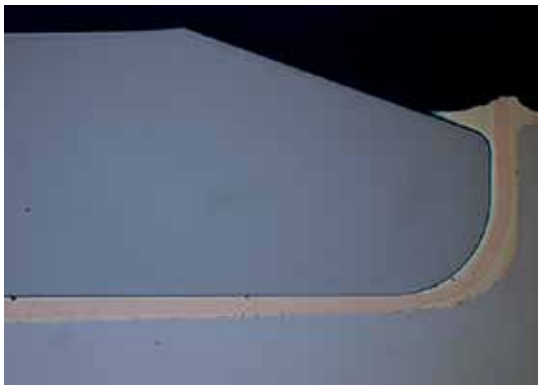
Joining

Most common joining techniques can be used for cemented carbide. They can be divided into three categories: material joints, power joints and shape joints. However, the design of a joint has to comply with the specific characteristics of carbide:

- ▲ Carbide is a brittle material
- ▲ Edges have to be protected (use radii, chamfers, …)
- ▲ Fits and guides need to be adapted to carbide (centring, angles, clearances, …)
- ▲ The combination of various materials may cause stress close to the joint depending on the thermal expansion and rigidity of the material

Brazing

Brazing doesn't have to be stressful! Over decades, the CERATIZIT R&D team have acquired a wealth of expertise in connection with the brazing process. Thanks to 3D simulation, cooperation with universities and various internal tests we are familiar with the root causes of the most frequently found brazing failures.



Optimal brazing gap

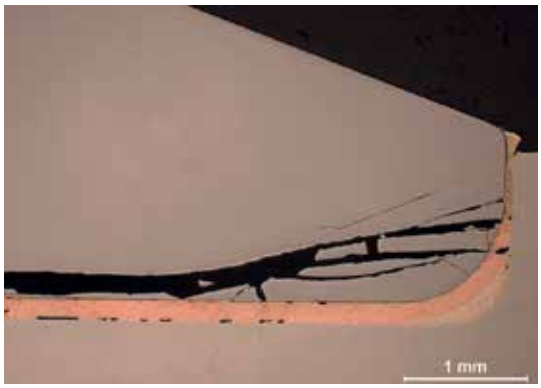
Troubleshooting

Conditions in the brazing gap have a major influence on the stresses within the carbide parts and the possibility of breakage. Thus an insufficient brazing gap, or contact between steel and hard metals, could generate cracks. In the light of this the position of the brazing material is one of the main issues here. Total or partial absence of the copper (Cu) layer at the top or bottom of the brazing gap is critical and leads to generation of high internal stresses.

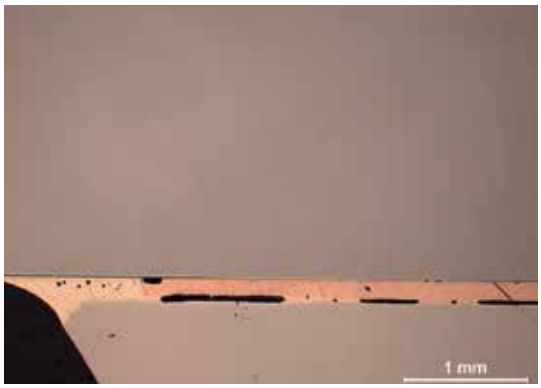
With the use of a massive brazing filler metal a uniform brazing gap thickness of approximately 0.1 to 0.2 mm is recommended. With the use of tri-metal brazing alloy (sandwich braze), the standard thickness of the copper interlayer is 0.15 mm. Increasing this layer thickness reduces stresses in the tungsten carbide and therefore the risk for breakage.

During the brazing process, temperature control is too often neglected. We strongly recommend the use of a pyrometer out of the direct light. Excessive or inaccurate temperature can generate porosity. Temperature should be adjusted depending on the brazing filler metal and fluxes used.

Typical stress-related crack shape



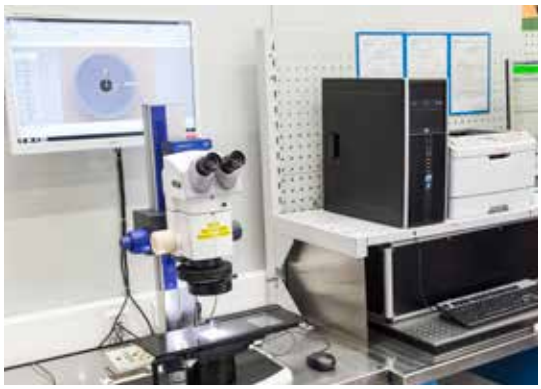
Insufficient brazing gap



High porosity

Welding

In the field of saw tip production, we have long-standing experience and are known for pioneering innovations in the world of metal cutting. For our band sawing tips, a galvanic coating plays an essential role in the weldability of the carbide tips on the steel body. We offer cobalt and nickel coating suitable for the welding process.



Thanks to a prototype welding machine, CERATIZIT is able to support your development of a new product and the optimisation of your current process and production.

With this technology and our deep process knowledge we can:

- Carry out tests on your product to help you develop innovations.
- Combine welding with mechanical testing and metallurgical analysis to improve your production quality.

Grinding

Cemented carbide is exclusively ground with diamond grinding wheels.

Diamond

Diamond types
▲ Synthetic
▲ Natural

Properties

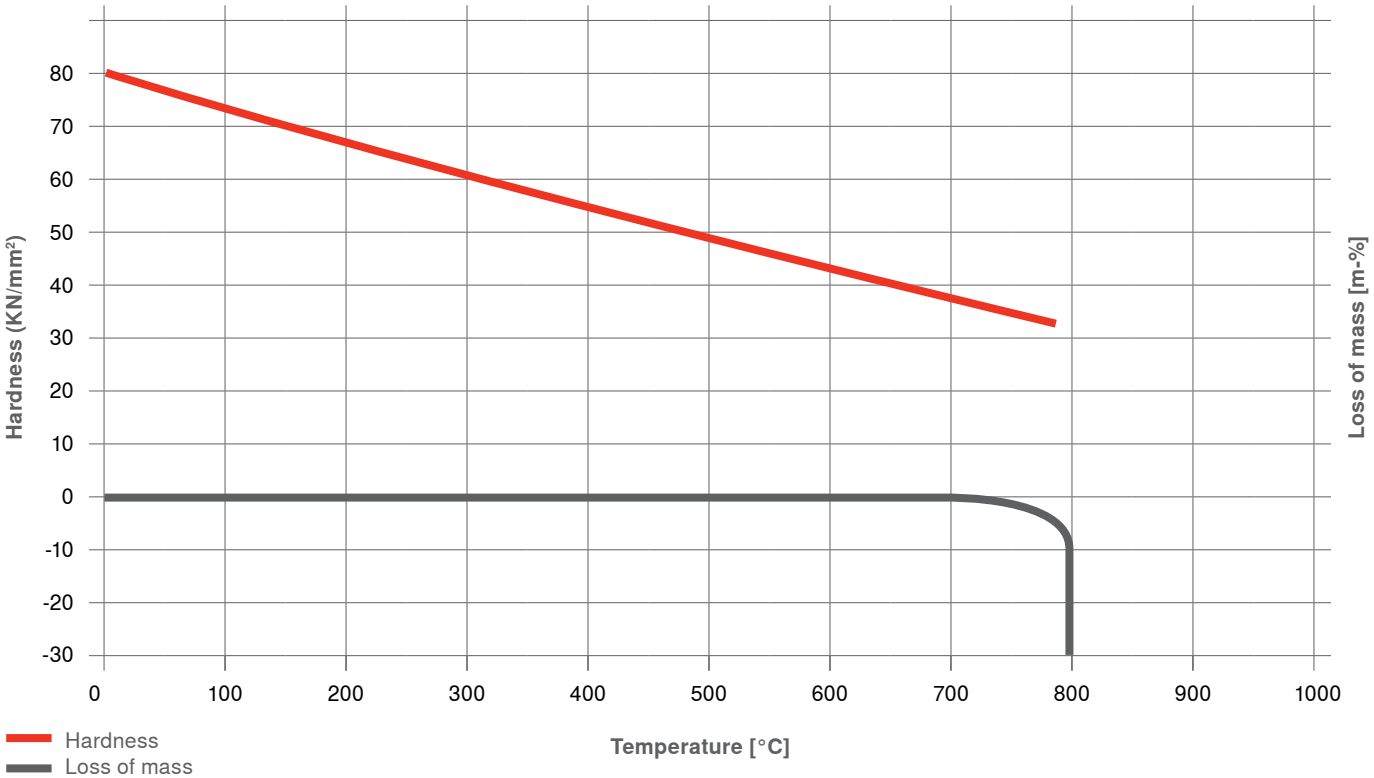
Hardness:	80 kN/mm²
Density:	3,520 kg/m³
Thermal stability:	up to approx. 700°C
Colour:	transparent to green-yellowish

Highly reactive regarding the formation of carbides

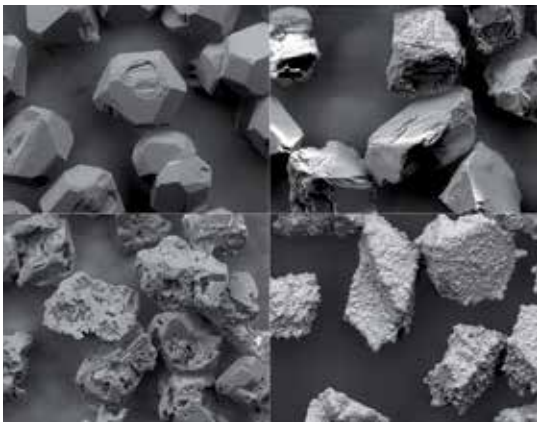
Application fields
Machining of carbides, ceramic, cermets, PCD, PCBN (polycrystalline cubic boron nitride), glass, extremely hard steel

Application in grinding wheels
▲ In all types of bonds
▲ But mainly in synthetic resin and metal bonds

Thermal stability



Diamond abrasive grit



Types of grit:
- ▲ Block-like
- ▲ Micro-crystalline
- ▲ Splintering
- ▲ Grit with coating

Coated abrasive grit:
- ▲ Lightly or strongly covered
- ▲ Mostly with metal cover
  - abrasive grit with a metal cover achieves longer tool life and better thermal conductivity
  - abrasive grit without metal cover cuts better and is smoother

Grit size designation and grit size comparison for diamond grit (1)

	FEPA grit sizes					Mesh	JIS		Medium grit size
D...	% >	µm	% between	µm	% <	(USA)	(Japan)	grits/ct	[mm]
251	8	271	90	213	8	60/80		8,000	
213	8	227	90	181	8			17,000	
181	10	197	87	151	10	80/100		25,000	
151	10	165	87	127	10	100/120	100	50,000	0.151
126	10	139	87	107	10	120/140	120	80,000	0.126
107	11	116	85	90	11	140/170	140	130,000	0.107
91	11	97	85	75	11	170/200	170	240,000	0.091
76	11	85	85	65	11	200/230	200	400,000	0.076
64	11	75	85	57	11	230/270	230	800,000	0.064
54	15	65	80	49	15	270/325	270	130,000	0.054
46	15	57	80	41	15	325/400	325	200,000	0.046

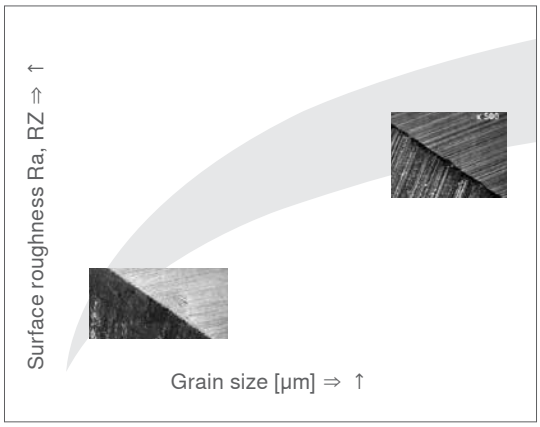
< 46: micron -> no screening

Grit size designation and grit size comparison for diamond grit (2)

Macro-grit size (screened)		
Europe (metric) D...	mesh size [µm]	USA [mesh]
1,180	1,180–1,000	16/18
1,001	1,000–850	18/20
851	850–710	20/25
711	710–600	25/30
601	600–500	30/35
501	500–425	35/40
426	425–355	40/45
356	355–300	45/50
301	300–250	50/60
251	250–212	60/70
213	212–180	70/80
181	180–150	80/100
151	150–125	100/120
126	125–106	120/140
107	106–90	140/170
91	90–75	170/200
76	75–63	200/230
64	63–53	230/270
54	53–45	270/325
46	45–38	325/400

Micro-grit size		
Designation	FEPA [µm]	US [mesh]
MD40	27–53	500/600
MD25	16–34	600/800
MD16	10–22	800/1,200
MD10	6–14	1,200/1,800
MD6,3	4–9	1,400/3,000
MD4,0	2.5–5.5	3,000/8,000
MD2,5	1.5–4	8,000/12,000
MD1,6	1.0–2.5	12,000/13,000
MD1,0	0.5–1.5	

Influence of grit size on ground surface and edge quality



Selection of diamond grit size is important when considering the final surface quality that needs to be achieved.

Coarser grit mesh sizes reduce the achievable surface quality and finer granularity will improve the surface.

Influence of grit size and concentration

fine	⇐	grit size	⇒	coarse
↘		lifetime		↗
↘		cutting performance		↗
↗		grinding pressure		↘
↗		surface quality		↘

low	⇐	concentration	⇒	high
↘		lifetime		↗
↗		cutting performance		↘
↘		grinding pressure		↗
↘		surface quality		↗

Grit		Concentration				
USA [mesh]	FEPA	C50	C75	C100	C150	C200
325/400	D46	2481	3721	4962	7443	9923
270/325	D54	1534	2300	3067	4601	6134
230/270	D64	921	1382	1842	2763	3685
200/230	D76	550	825	1100	1650	2200
170/200	D91	320	481	641	961	1282
140/170	D107	197	296	394	591	788
120/140	D126	120	181	241	362	482
100/120	D151	70	105	140	210	280
80/100	D181	40	60	81	120	160
60/80	D252	15	23	30	45	60

= grit volume/mm³

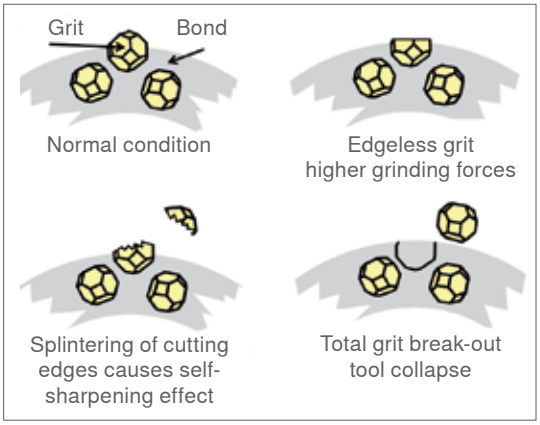
Types of bonds in grinding wheels

Advantages and disadvantages	Metal	Ceramic	Resin	Galvanic
Cutting performance	●●	●●●	●●●	●●●
Deformation resistance	●●●	●●	●●	●●
Thermal stability	●●●	●●●	●●	●●
Conductivity	●●●	●●	●●	●●●
Dressing characteristics	●●	●●●	●●●	●●

●●● optimal
●● good suitability
● not suitable

Metal (Cu, Co)
Ceramic
Galvanic
Resin
in addition the bond is characterised by filler materials and porosity

Wear mechanisms on grinding wheels



Grit wear

- ▲ Grit flattening > Grinding pressure ↑
- ▲ Grit splintering > Self-sharpening effect
- ▲ Grit chipping > Tool failure

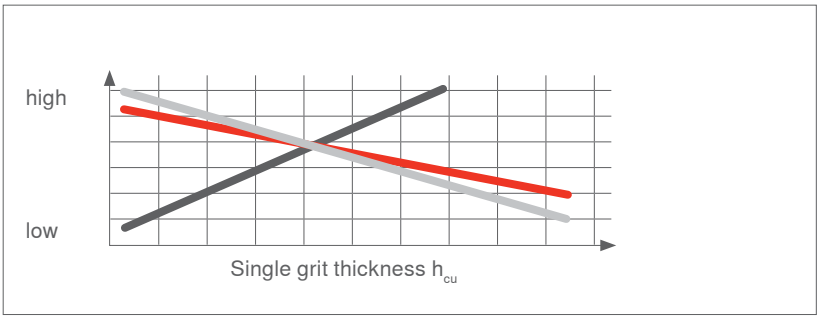
Bond wear

- ▲ In materials with chip formation/cutting materials > Wear of the bond
- ▲ In chipless materials/ workpiece materials > Powdery abrasion of the work-piece (very low wear of bond)

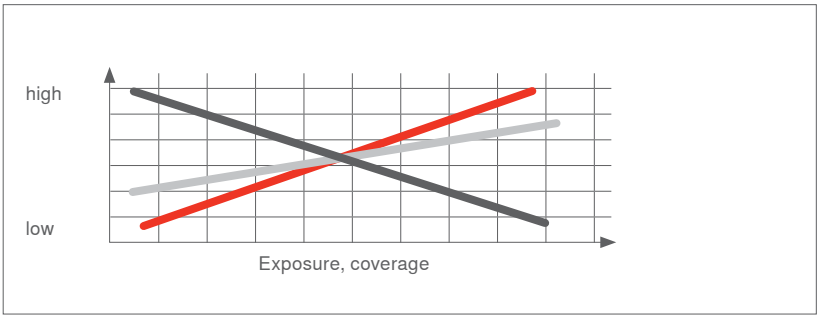
Influence of modifying grinding parameters

	Modifying parameters						
	Machine and operation parameters			Grinding wheel		Cemented carbide	
	Cutting speed	Metal removal rate	Coolant	Grit size	Concentration	Hardness	Fracture toughness
	v_c [m/s]	Qw [mm³/s]	[oil content]	[µm]	[grit volume/ cm³]	[HV]	[MPa*m$^{1/2}$]
Grinding force F	↘	↗	↘	↗	↗	↗	↘
Wear rate G	↗	↘	↘	↗	↘	↗	↘
Roughness Ra	↘	↗	↘	↗	↘	↗	↘
Temperature ϑ	↗	↗	↘	↗	↗	↗	↘

Influence of cutting conditions on grinding result



$$\frac{Q'w,\ \text{grit size}}{v_c,\ l_g}$$



$$\frac{l_g}{v_w}$$

- Internal pressure and tension
- Surface quality
- Cutting edge quality

Cooling lubricant for grinding

Applying a cooling lubricant when grinding is extremely important:

- ▲ It influences the removal of the heat generated during the grinding process and the evacuation of the chips produced

Therefore, the use of the coolant has to be adapted with regard to:

- ▲ The type of coolant (oil, emulsion)
- ▲ The viscosity of the coolant
- ▲ The flashpoint of the coolant
- ▲ Pressure, flow rate, speed and direction of the coolant jet

The coolant achieves an optimal effect only when it is correctly filtered:

- ▲ Without filtering the fine abrasive material can be recirculated and become re-attached to the grinding wheel
- ▲ The abrasive material from grinding refuse sticks to the workpiece and to the grinding wheel
- ▲ Blocks the grinding wheel, generates excessive heat and destroys the bond of the grinding wheel and the carbide part which is to be ground
- ▲ Leads to early wear of the wheel
- ▲ Contaminated coolant decreases the service life and precision of the machine

Influence of cooling lubricant

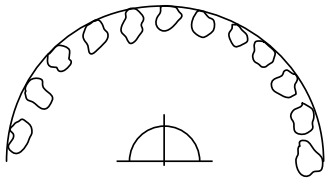
Potential properties of cooling lubricants

	Grinding oil	Emulsion
Lubricating effect	↘	↗
Thermal conductivity	↘	↗
Thermal capacity	↘	↗
Viscosity	↗	↘
Costs	↗	↘

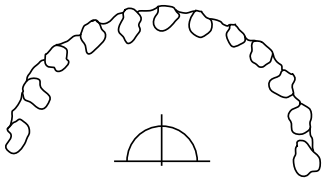
Comparison of potential process influence of cooling lubricants

	Grinding oil	Emulsion
Heat generation	↘	↗
Heat removal	↘	↗
Tool wear	↘	↗
Cleaning effect	↗	↘
Costs	↗	↘

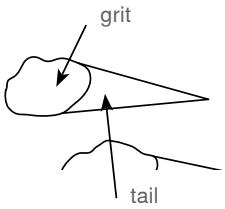
Dressing of the grinding wheel



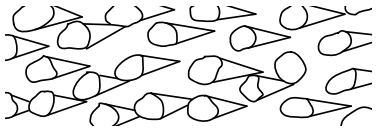
The surface of the grinding wheel is smooth and closed



The surface of the grinding wheel is open with exposed abrasive grit, prepared for an effective grinding impact



(the bond supports the grit)

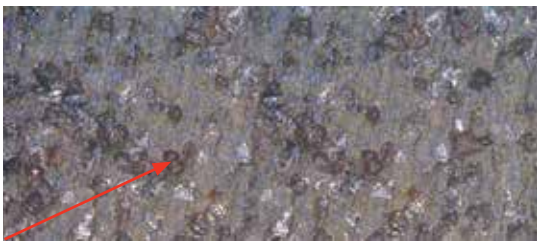


The passageways connect the tail of the diamond abrasive and assist in coolant transportation and chip evacuation.

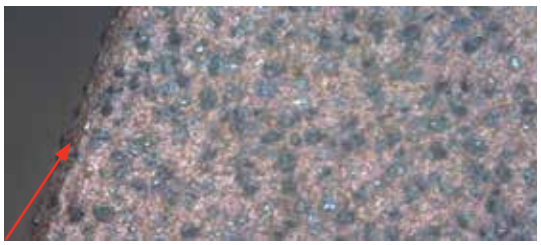
When dressing the grinding wheels the following has to be considered:

- Hardness and grit types of the dresser and grinding wheel sharpening stick
  - dressing stick must be approx. 1 to 2 grit sizes finer than the abrasive grit size of the grinding wheel
  - medium grit is good for resin-bonded grinding wheels
  - For metal bonds the same grit size or 1 x class coarser than the grinding wheel
  - ceramic bonds generally do not require wheel dressing
- Rotation speed of the grinding wheel during the dressing process
- Material of the dressing stick (SiC, Al_2O_3)
- Procedure
  - dressing and ‚sharpening' of the grinding wheel,
- The surface of the grinding wheel is smooth and closed.
  - sharpening of the rim
  - the grinding wheel surface is open with exposed abrasive diamond grit, prepared for an effective grinding impact.
- Verification method of the grinding wheel's sharpness after dressing

How to establish if grinding wheel is correctly dressed



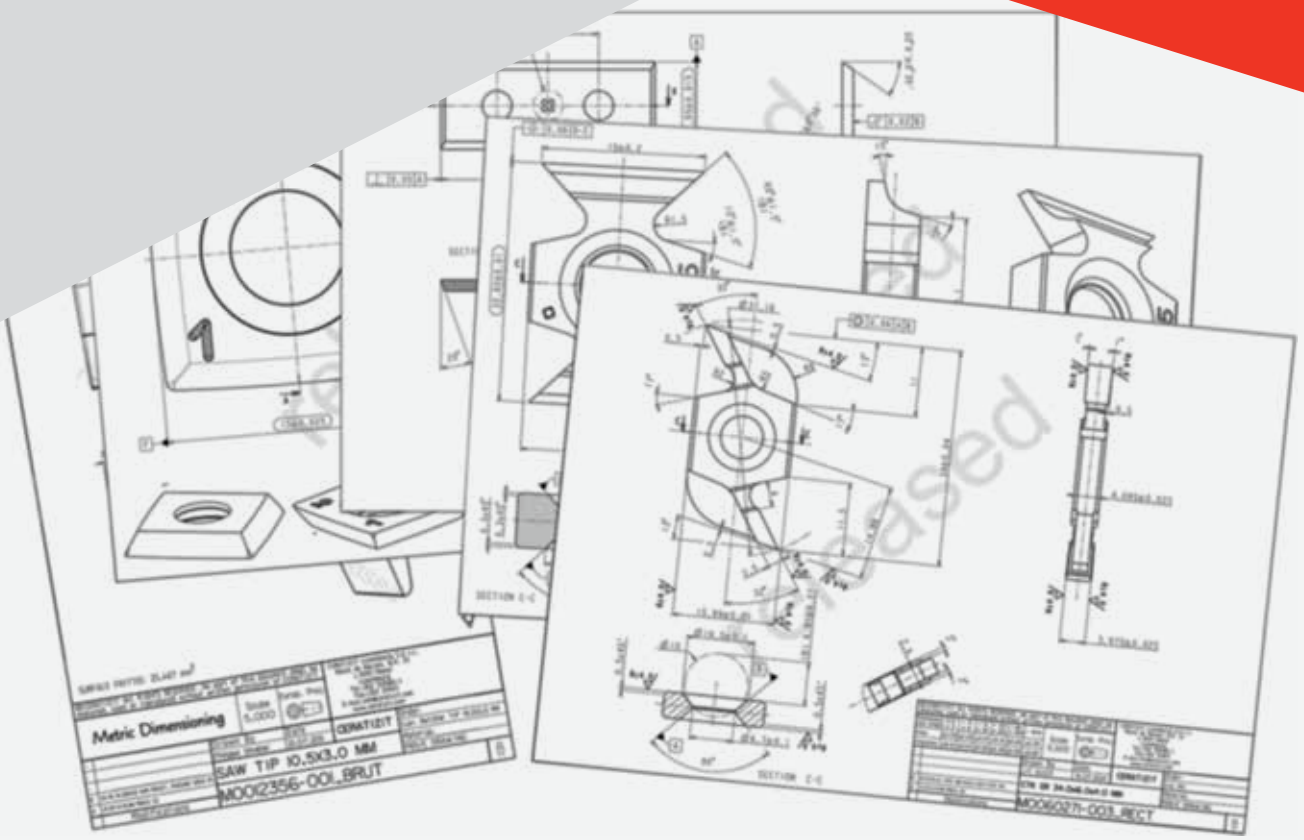
Diamond grit loss



Exposed diamond grit (free cutting)

Design guidelines

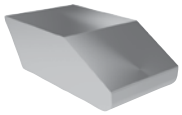
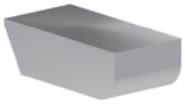
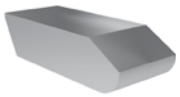
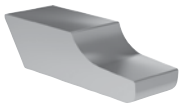
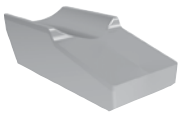
If you cannot find the specific product you need in our large standard range, we are happy to manufacture a customised product to your requirements. Simply specify the properties you require on the following enquiry templates and send it to your personal contact person at CERATIZIT to receive an offer in no time.



Circular saw tips (wood)

Design:

☐ Straight ☐ US ☐ Canadian ☐ 60000 ☐ Hollow ☐ Your drawing

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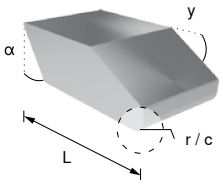
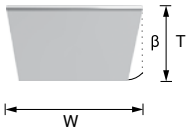




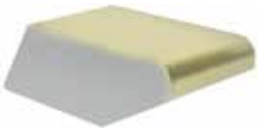
L =
W =
T =
α =
β =
γ =
r / c=

Surface treatment:

☐ TS90 ☐ TSN ☐ TS43 ☐ TS42 ☐ TSR1

Pre-tinning:

☐ DA ☐ PT ☐ None




Grade:

☐ KCR02+ ☐ KCR05+ ☐ KCR06 ☐ KCR10 ☐ KCR18+

☐ KCR32 ☐ GC32 ☐ CTOPP10

Please indicate your application and we will suggest the best grade for your requirements.

Quantity:

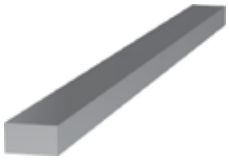
Number of parts to be quoted:

Annual volume forecast:

Strobe blanks

Design:

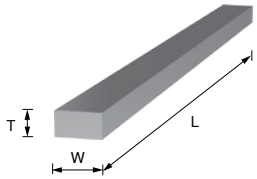
☐ CT SB00



☐ CT SB02

☐ Your drawing

Dimensions:



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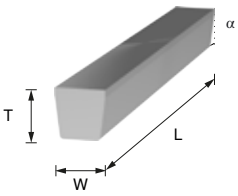
W =
T =



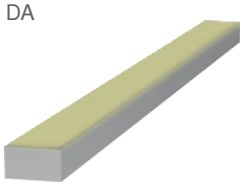
L =
W =
T =
α =

Surface treatment:

☐ TS8 ☐ TS42

Pre-tinning:

☐ DA



☐ None

Grade:

☐ CTOPP10

Please indicate your application and we will suggest the best grade for your requirements.

Quantity:

Number of parts to be quoted:

Annual volume forecast:

Band saw tips

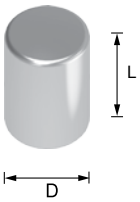
Design:

☐ Ball ☐ Cylinder ☐ Segment ☐ Your drawing

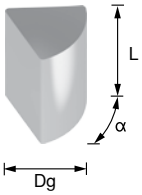


Dimensions:

D =



L =
D =



L =
α =
Dg =

Surface treatment:

☐ TSN ☐ TSX

Grade:

☐ KCR10 ☐ KCR32 ☐ CTS18D
☐ CTS22D ☐ CTU24L

Please indicate your application and we will suggest the best grade for your requirements.

Quantity:

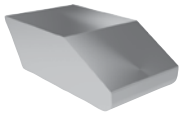
Number of parts to be quoted:

Annual volume forecast:

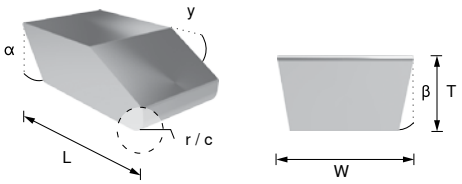
Circular saw tips (metal)

Design:

☐ Block ☐ Straight ☐ Net shape ☐ Your drawing


Dimensions:



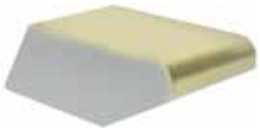
L =
W =
T =
α =
β =
γ =
r / c=

Surface treatment:

☐ TS90 ☐ TSN ☐ TS43 ☐ TS42 ☐ TSR1

Pre-tinning:

☐ DA ☐ PT ☐ None




Grade:

☐ S25T ☐ S40T ☐ SMX ☐ CTS18D ☐ CTS22D
☐ CTS24D ☐ KCR10 ☐ CTF34T

Please indicate your application and we will suggest the best grade for your requirements.

Quantity:

Number of parts to be quoted:

Annual volume forecast:

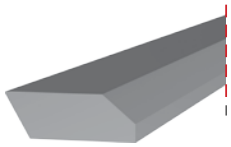
Strips

Type:

- ☐ Rectangular
  - ☐ With groove lines
  - ☐ Without groove lines

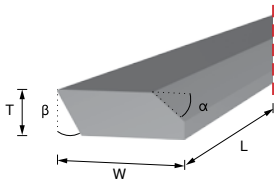
- ☐ One bevel
  - ☐ With groove lines
  - ☐ Without groove lines

- ☐ Two bevels
  - ☐ With groove lines
  - ☐ Without groove lines



☐ Your drawing

Dimensions and tolerances:



L = ±

W = ± α =

T = ± β =

Surface treatment:

☐ Ground ☐ Unground ☐ Surface treatment (sandblasting) Please specifiy:

Grade:

☐ CTOPP10 ☐ KCR06 ☐ KCR18+

Please indicate your application and we will suggest the best grade for your requirements.

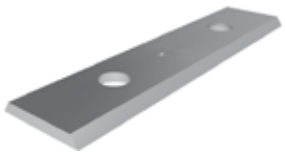
Quantity:

Number of parts to be quoted: Annual volume forecast:

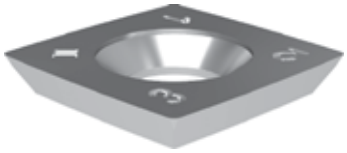
Knives

Design:

☐ Straight knives



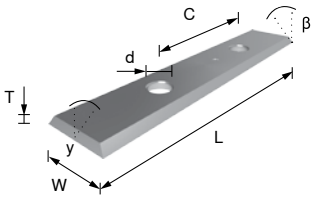
☐ Scorer knives



☐ Your drawing

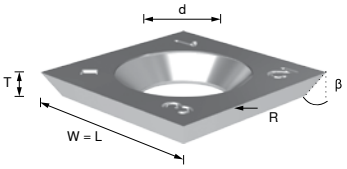
Dimensions:

Straight knives



L =
W =
T =
d =
C =
β =
γ =

Scorer knives



L =
W =
T =
d =
R =
β =
Edge radius

Grade:

☐ KCR08 ☐ CTOPP10 ☐ KCR02+ ☐ KCR18+

Please indicate your application and we will suggest the best grade for your requirements.

Additional requests:

Please specify if you have any additional requests like polishing or special screw angle/diameter:

Quantity:

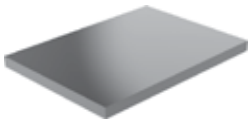
Number of parts to be quoted:

Annual volume forecast:

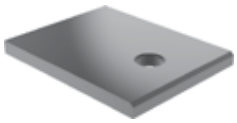
Profiling blanks

Design:

☐ No hole



☐ One hole



☐ Two holes

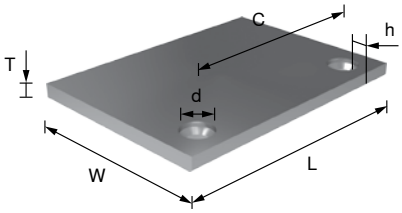
☐ No angle

☐ One angle

☐ Two angles

☐ Your drawing

Dimensions and tolerances:



L =
W =
T =
C =
d =
h =

Surface treatment:

☐ Ground ☐ Unground ☐ Microfinish

Grade:

☐ KCR08 ☐ CTOPP10

Please indicate your application and we will suggest the best grade for your requirements.

Quantity:

Number of parts to be quoted:

Annual volume forecast:

Rods

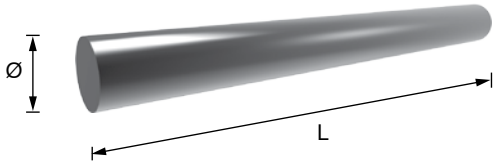
Design:

☐ Standard length

☐ Fix length

☐ Your drawing

Dimensions and tolerances:



Ø =

L =

Chamfer =

2nd Ø (optional)

2nd L (optional)

Tolerance:

☐ h6

☐ h5

☐ h4

Surface treatment:

☐ Ground ☐ Unground ☐ Microfinish

Grade:

☐ CTOPP10 ☐ KCR06 ☐ KCR05+

Please indicate your application and we will suggest the best grade for your requirements.

Quantity:

Number of parts to be quoted:

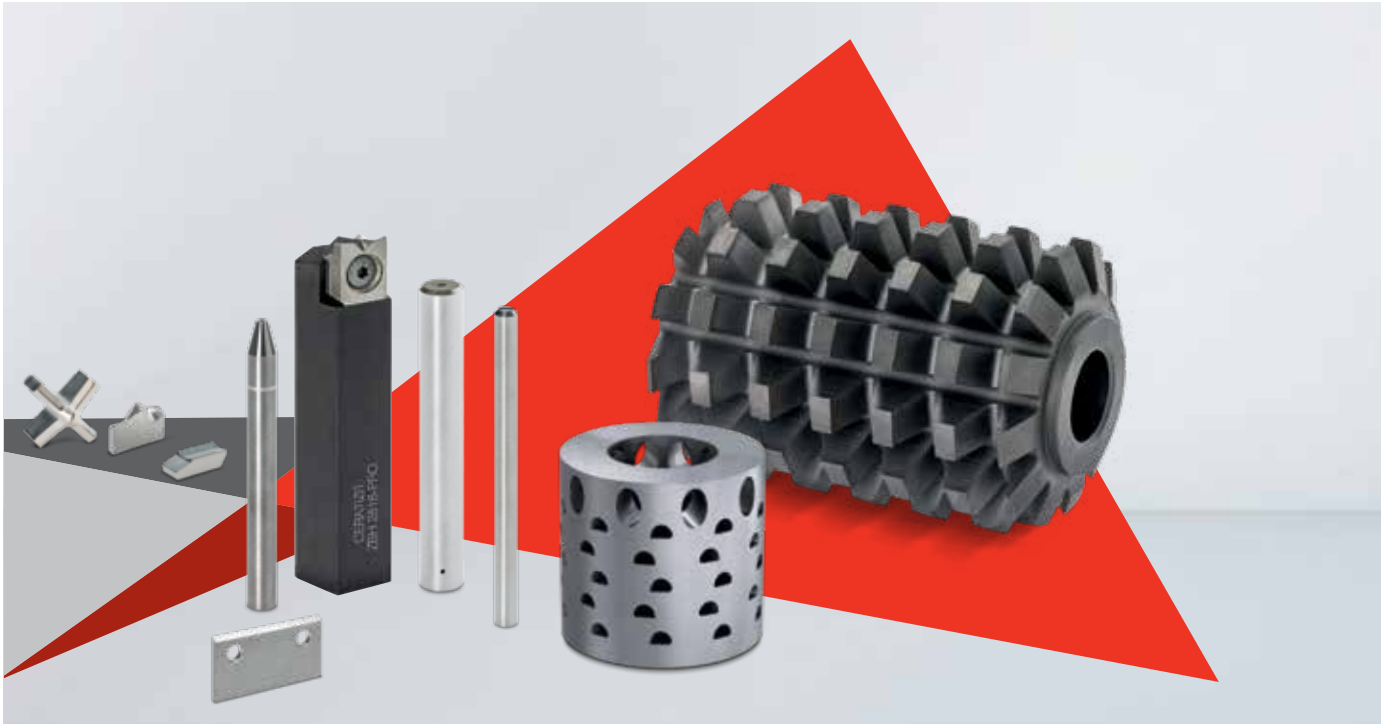
Annual volume forecast:

Hard Material Solutions

Hard cases are our speciality

We are your ideal partner when it comes to high-quality hard materials for production processes, tool manufacturing and wear protection. From standard products to tailor-made solutions, from massive components to minute parts, from the blank to the fully finished product – a product that meets the highest standards of precision, surface treatment, and user-friendly assembly – our carbide and ceramic solutions ensure improved efficiency and outstanding total cost of ownership. This is the case in a variety of application fields and industrial sectors.

Precision, hardness, reliability: these are the characteristic features of our Hard Material Solutions for processes ranging from sawing to casting and drilling. Wherever they are used, our cemented carbide solutions combine resistance and wear protection to ensure reliable, optimised and stable processes. This enables us to guarantee you the high productive performance you require for all your applications. Beside our carbide solutions, we offer many standard and customised services that match your individual needs in the best possible way.



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