

Your Partner for **Toolmaker Solutions**

2017.V1 US



CERATIZIT is a high-tech engineering group specialized in tooling and hard material technologies.



Tooling the Future

www.ceratitis.com

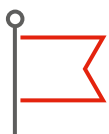
The CERATIZIT Group

For over **95 years**, CERATIZIT has been a **pioneer** developing exceptional hard material products for cutting tools and wear protection.

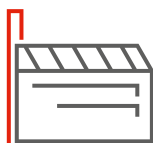
The privately owned company, based in Mamer, Luxembourg, develops and manufactures highly specialized carbide cutting tools, inserts and rods made of hard materials as well as wear parts.

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

Facts and Figures



1 headquarters
Mamer / Luxembourg



27
production sites



50
sales subsidiaries



6,000
employees



> 90,000
different products



> 600
patents and utility models



> 100
employees in R&D



> 100
innovation awards



30%
new products created
in the last 5 years

Production Site

Reutte (Austria)

The CERATIZIT center of excellence for cutting tool products, rods and preforms can be found at the Breitenwang/Reutte site in Austria. CERATIZIT Austria GmbH currently has around 730 employees, making it the second-largest site of the CERATIZIT Group.

From preparing powder to producing rods and preforms and recycling carbide – all production processes are located in Reutte. The CERATIZIT Group continues to focus strongly on this successful production site and in 2013 extended the production surface by more than 4,000 square metres.



Warren (USA)

The CERATIZIT USA Headquarters center of excellence provides localized manufacturing support and international warehoused products to the North American market. CERATIZIT supports the industry's requirements for cutting tool products, rods (solid and coolant) along with the capability for complex preforms for rotary cutting tools.

CERATIZIT USA controls the process from the beginning of powder production to producing finished rods and preforms, all made in the USA. Our international inventory of coolant rods, solid carbide long rods and Economy line are warehoused in our Michigan facility for quick delivery to the North American market.



Mamer (Luxembourg)

The CERATIZIT Group has its headquarters in Mamer in Luxembourg. Today the plant in Mamer has more than 1,150 employees and concentrates on industrial wear protection, wood and stone machining as well as inserts and tools.



Carbide – A Composite Material with Valuable Properties

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 optimization 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 $.2 \mu\text{m}$ up to several micrometers (μm). The cobalt fills the gaps between the carbide grains. When extremely high toughness is required, the cobalt content can

amount up to 30%, whereas, for maximum wear resistance, the cobalt content is reduced and the grain size decreased to the nano-crystalline range of $< .2 \mu\text{m}$.

CERATIZIT produces far more than 100 different carbide grades particularly for wear parts and cutting tools, thus offering a customized solution for every application.



Carbide production

Carbide production at CERATIZIT started in 1929. Last but not least, thanks to long-standing experience CERATIZIT handles 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, forming, sintering and finishing.

Tungsten carbide production

The APT (ammonium para-tungstate) 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 carburized under inert atmosphere at high temperatures. The production parameters are decisive for the WC grain size in the sintered carbide.

Powder preparation

The tungsten carbide is intensely mixed with the binder metal cobalt, nickel or iron, various grain growth inhibitors and materials, which promote compaction, by wet grinding 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.

APT (ammonium para-tungstate)



Yellow tungsten oxide



Blue tungsten oxide



Tungsten



Tungsten carbide



Metal Forming – Pressing – Machining

Metal forming

The objective of the forming process is to obtain a near net shape sample. Pressing is normally carried out at room temperature with pressures reaching up to several tons per square centimeter.

There are several ways of pressing blanks:

During isostatic cold pressing the powder is filled into an elastic flexible hose and pressed into a compacted form 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 applied.

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 so called green carbide, which is ejected from the pressing die.

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

Metal Injection Molding (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.



Pressing

Machining

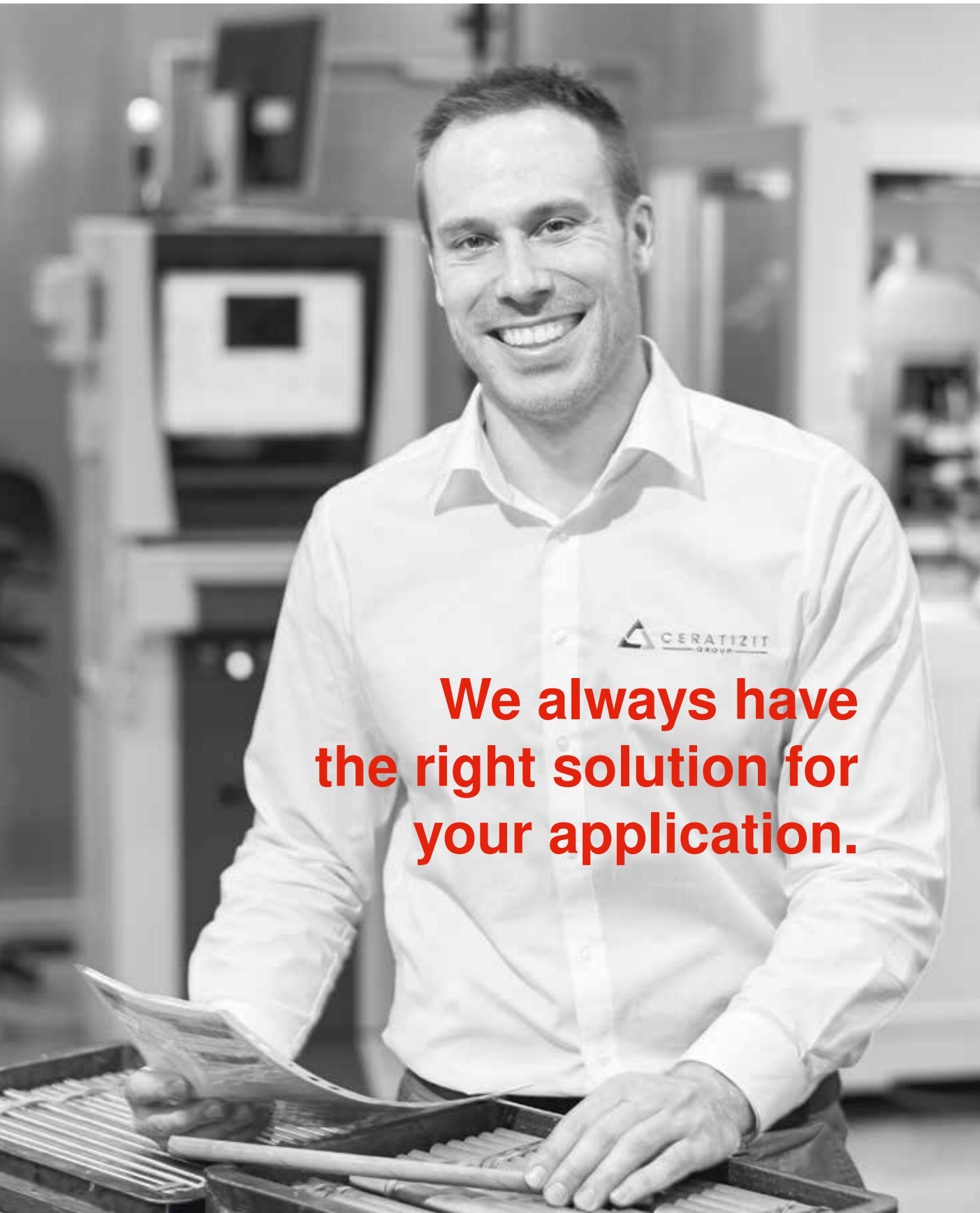
Sintering

Sintering process

The sintering process converts the blank into a homogeneous and dense 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).

Sintering





**We always have
the right solution for
your application.**

Your Choice – 2 Product Lines for Solid Carbide Rods

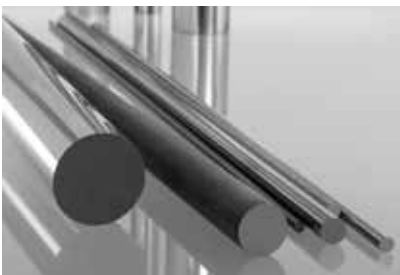
We offer the choice of two different product lines for solid carbide rods for tool production depending on the requirements and desired price range. Use the p-line (Premium) range for high-performance tools: This offers the widest selection of grades and designs for maximum performance


in any application. Within the p-line, we have products made in the US as well as in Europe. Our e-line (Economy) range offers recognized industry quality with an excellent price-performance ratio.

Choose the Most Suitable Solution – the Largest Standard Program Range

Toolmaker Solutions by CERATIZIT offers one of the largest ranges of standard solid carbide rods. Ultrafine, submicron or fine grain grades, CERATIZIT offers the right grade with

the right properties to match your application. We also hold an extensive range of designs with and without coolant holes and of various different tolerances and dimensions in stock.



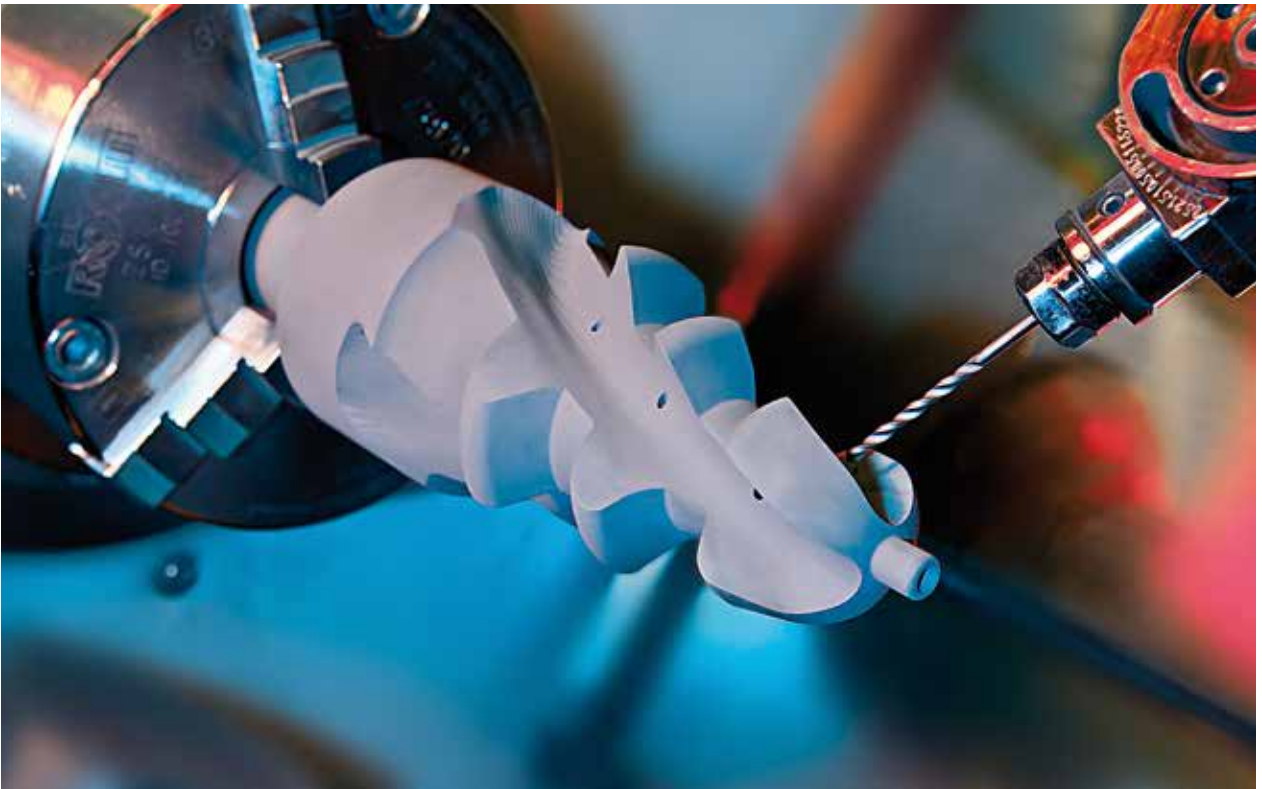


Our customers are not just customers. You are our partner. Therefore we do not only sell you a product. We are here to support you with our highly skilled knowledge.

Always There for You

Highly skilled technical experts offer personal advice from the initial inquiry through to order processing, including providing answers to application questions or problems in tool production (such as with grinding and soldering).

We also use our research facilities to optimize tool design using the latest methods and examination procedures; from FEM simulation to damage analysis.



Decide for Yourself – Tailored Preforms

Benefit from tailored preforms and semi-finished products for the production of rotary cutting tools such as solid carbide and PCD tools. Thanks to years of experience in machining green compact blanks and state-of-the-art manufacturing

facilities, we can produce these specifically to your drawings. We produce even complex geometries precisely near net shape and deliver them in a very short time applying smart lean management techniques.



We are continually developing our carbide grades to ensure that you are ready for the future.

Ready for Your Next Challenge

We are continually developing our carbide grades to complement the product portfolio, ensuring that your products are always at the cutting edge of technology and become even more efficient. We perform not only basic research and modelling, but also optimize production processes to reduce process costs and ensure the highest quality and environmental compatibility.

Trust in an interdisciplinary team of materials scientists, chemists, mechanical engineers, design engineers as well as manufacturing, environmental and process engineers that cooperate closely with you, our project partners as well as universities and research institutions.





**Sophisticated logistics
processes is your
guarantee of fast and
reliable delivery.**

Quickly and Reliably in Your Hands

Rely on our extensive and flexible production capacities for storage products, custom-made products or large quantities. Our well-stocked warehouse always guarantees the fast and reliable execution of your order. Simply order

stock products and seek advice from our technically competent office and field staff. With more than 50 branches in Europe, America and Asia, we can be contacted at any time worldwide.



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