// QUANTUM LEAP IN TOOL PREPARATION

- Customised high-tech coating
- Innovative coating removal
- Effective microfinish

Müller

Hochleistungswerkzeuge

Werkzeugaufbereitung

By using the innovative coating and decoating method from Müller Präzisionswerkzeuge solid carbide special tools

- perform significantly better than new tools conventionally coated
- can be prepared for as long as the tool geometry allows
- can achieve exactly the same performance as a new tool, even after preparation

POTENTIAL FOR SAVINGS IN HIGH-VOLUME PRODUCTION

Across the industry, high-volume production is constrained by the need to reduce costs. This is particularly the case for businesses in the metalworking, automotive and automotive supplier industries, as they are subject to constant price and cost pressure in the global market. When it comes to manufacturing components that require large amounts of machining, special tools made of solid carbide are a major cost factor. They are used in a variety of ways to drill and mill a wide range of materials, and they are inevitably subject to wear that is related to production.

Müller Präzisionswerkzeuge has developed a completely new method for providing solid carbide tools with a customised, high-tech coating to meet the increasing demands for precision, tool life and reducing costs. In combination with our innovative decoating process, **Müller Präzisionswerkzeuge** is offering new opportunities to gain massive savings when using new and used special tools.

IMPROVING EFFICIENCY BY OPTIMISING TOOL LIFE

It's extremely difficult to make a visual distinction between new and prepared tools in the production process. When using conventional preparation methods, tools only have a fraction of a new tool's original performance. Assumptions are made based on experience in relation to the minimum tool life for tools that have been re-sharpened several times. This is to ensure you're on the safe side in terms of machining quality. This means that the performance potential of brand-new tools or those that have been prepared once or twice remains largely unused, which greatly increases production costs.

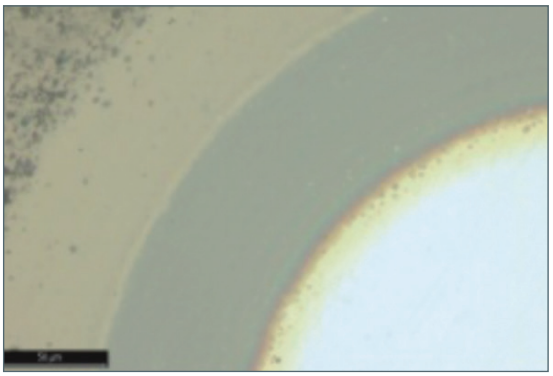
The innovative coating and decoating process from **Müller Präzisionswerkzeuge** offers a completely new approach in this regard. This is because used tools prepared with this method can achieve exactly the same performance and tool life of an original. Due to the fact that, when these tools are used, assumptions can be made about the performance potential of a new tool, tool lives can be extended by 200 to 300 percent for used tools, and tooling costs can be reduced to the same extent.

Solid carbide special tools can be coated to suit the application by combining various coating methods.

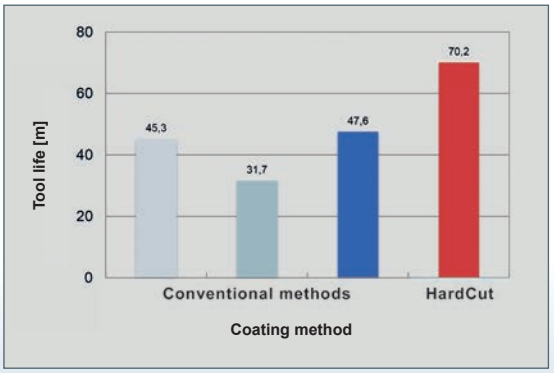
HIGH-TECH COATING REDUCES COSTS

When it comes to coating precision tools, there are two methods which are used in practice. The first is the sputter method, which is designed to achieve very smooth surfaces, but but it has limited suitability for tools due to reduced coating adhesion. The second is the ARC method, which achieves outstanding coating adhesion, but with a slightly rougher finish.

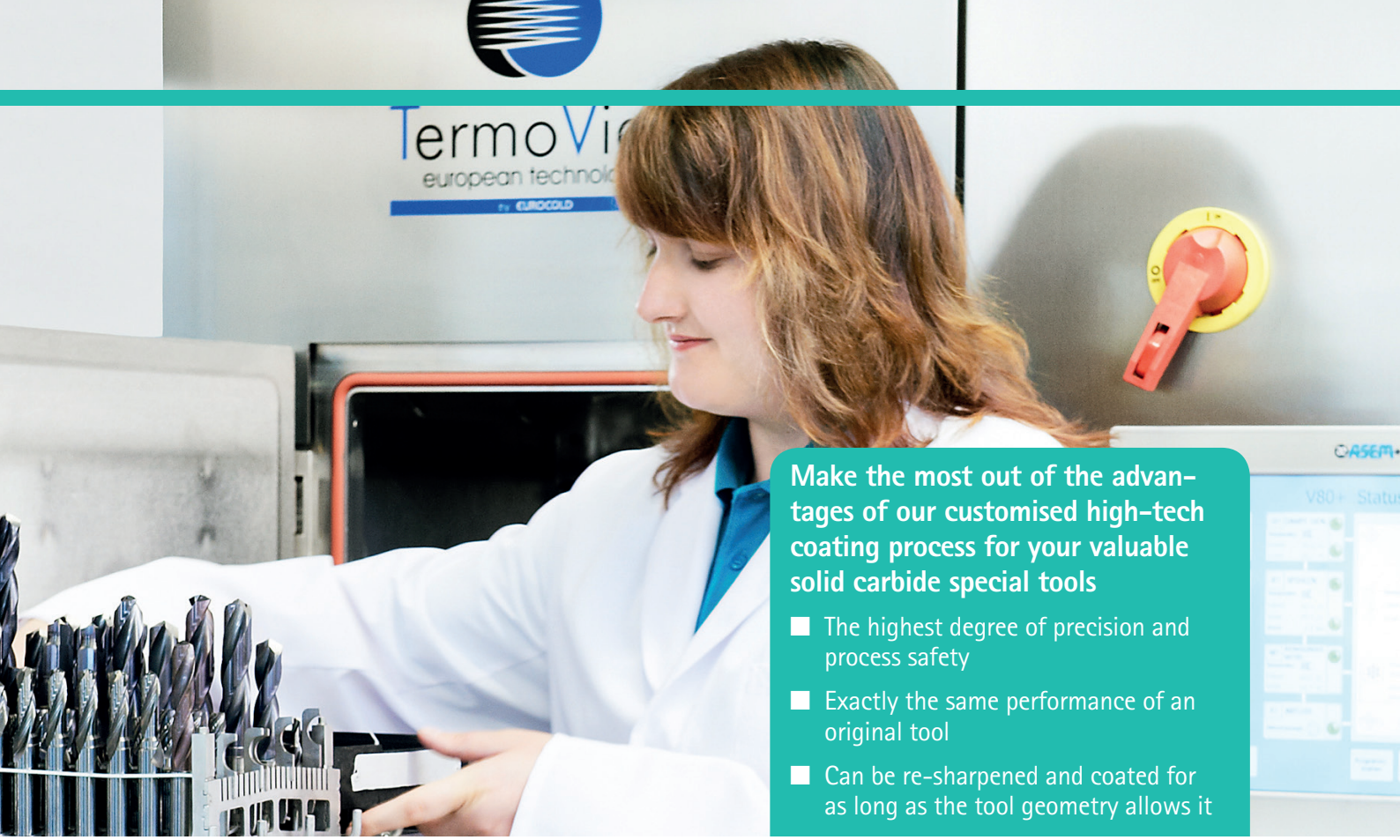
Müller's state-of-the-art coating system combines the advantages of both methods. 4 different cathodes (quad coating) are used to ensure the optimum coating profile when processing a wide range of materials and alloys. You could say that this represents a quantum leap in tool coating, both in terms of layer composition and structure. Completely new, customised coatings can be created which greatly exceed existing requirements in terms of performance, precision and tool life. These coatings combine various adhesion and interface layers with multi-base and hard top layers. Therefore special tools from **Müller Präzisionswerkzeuge** can achieve significantly longer tool lives than tools coated using conventional methods (see accompanying graphic).



The complex structure of customised high-tech coating (see example of the HardCut coating option) can be seen clearly under microscope.



Special tools with customised HardCut coating last much longer than conventional coatings when drilling into high-strength steel.



Make the most out of the advantages of our customised high-tech coating process for your valuable solid carbide special tools

- The highest degree of precision and process safety
- Exactly the same performance of an original tool
- Can be re-sharpened and coated for as long as the tool geometry allows it

Fully automatic tool cleaning, degreasing and drying creates the optimum conditions for a final coating.

ENHANCED CONTRACT COATING
AS PART OF A COST REDUCTION MODEL

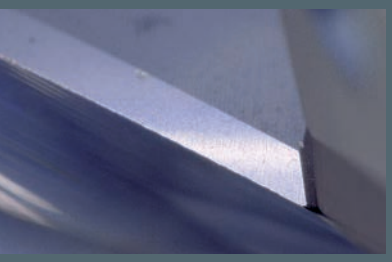
The customised high-tech coating method that is used for manufacturing and preparing Müller precision tools can also be applied to third-party products. You could say your valuable tools are "in good hands" with **Müller Präzisionswerkzeuge**. As we are a developer and manufacturer of high-performance tools and a specialist in regrinding drills and milling cutters, we know what really matters when it comes to coating and preparing special tools.

Client tools are professionally prepared to their specifications in our production facility, from regrinding to preparing cutting edges, coating to suit the required application, as well as polishing and smoothing. In doing so, the coating quality of each individual batch is tested using a test plate, which was coated alongside the tools. The layer structure, layer thickness and layer adhesion are documented in the test logs. The test logs with the representative results of each batch are stored, which ensures the required level of process safety is achieved in high-volume production. Our customised, high-tech coating process and final blast polish ensure that third-party products can also achieve tool lives in series production that exceed the performance level of a new tool. This presents a compelling case for third-party product contract coating from **Müller Präzisionswerkzeuge**.

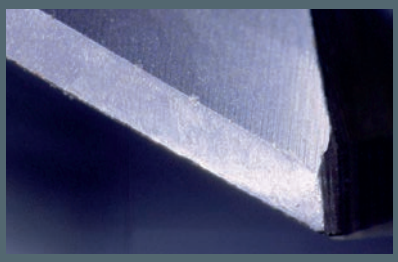
In-house developments and third-party products can be prepared with the customised, high-tech production method at **Müller Präzisionswerkzeuge**.

Special client tools get their original performance back in **Müller Präzisionswerkzeuge's** state-of-the-art coating plant.

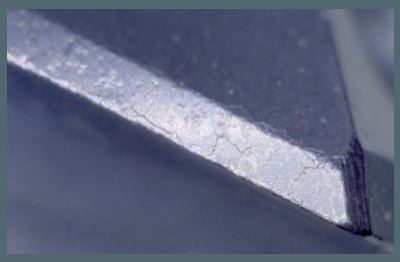
CONVENTIONAL PREPARATION METHOD



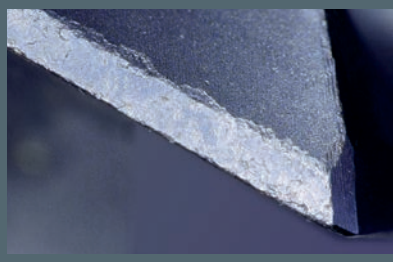
New tool



1. Regrinding process

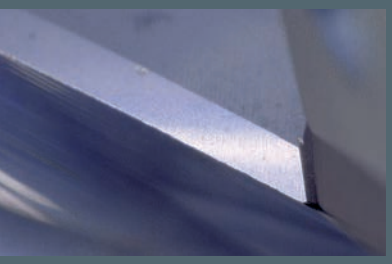


2. Regrinding process



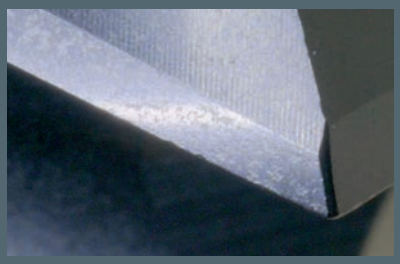
3. Regrinding process

MÜLLER HIGH-TECH PREPARATION METHOD

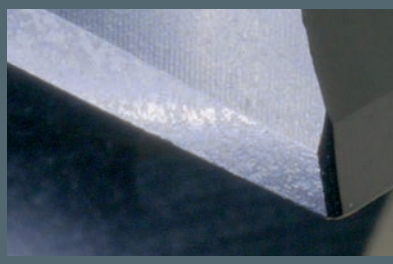


New tool

1. Regrinding process



2. Regrinding process



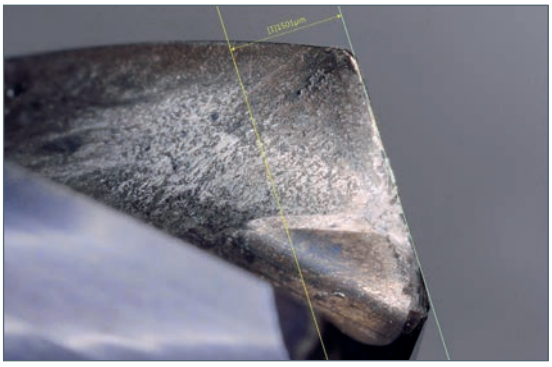
3. Regrinding process

The illustrations show the condition of a special tool's margin when using a conventional preparation method compared with the high-tech preparation method from **Müller Präzisionswerkzeuge**.

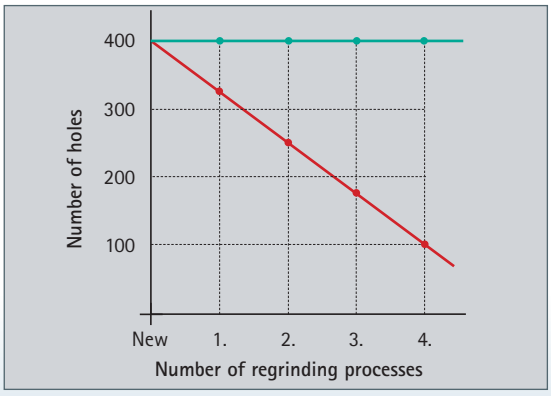
COATING AND DECOATING PROCESS FOR TOP PERFORMANCE

The lubrication and welding build-up that occur during the machining process are only slightly eliminated when conventional processes are used. The tool surface roughens up due to "overcoating", which reduces layer adhesion and encourages built-up edge formation. The lubrication and welding build-up are completely removed by our innovative decoating process to prevent this effect before the tool is regrinded and recoated.

On average, a tool can be re-sharpened and re-coated 3-5 times when using conventional methods. The innovative coating and decoating process from **Müller Präzisionswerkzeuge** ensures that this limit no longer applies. The preparation process can be repeated for as long as the tool geometry allows. Exactly the same performance and tool life of an original is achieved by combining a customised coating and innovative decoating process. In a practical test (turbocharger housing series production), the performance potential of a new tool designed to drill 400 bores declined by approx. 100 holes after each preparation when using conventional methods. The tools also partially broke off during the last test run. Tools that were prepared using the innovative process developed by **Müller Präzisionswerkzeuge** achieved the tool lives of the original after each stage of preparation with the same application (see accompanying graphic).



Lubrication and welding build-up can be detected over the entire tool surface after using special tools.



Tool life in a practical test (turbocharger housing)

Müller decoating process and high-tech coating

Conventional preparation method

The advantages of our innovative decoating process

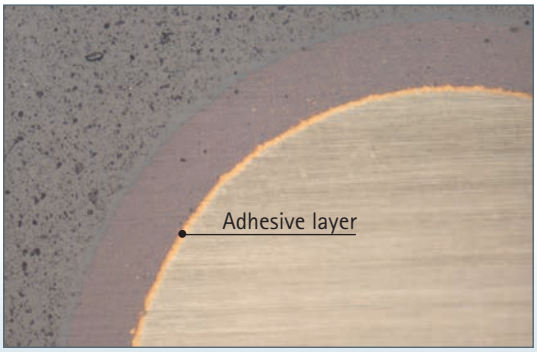
- Only the main layer is removed
- The adhesive layer remains intact
- No cobalt leaching
- Carbide surface is not being damaged

Our innovative decoating process is computer-controlled. The results are documented as part of the quality management process.

INNOVATIVE DECOATING PROCESS
WITH NO COBALT LEACHING

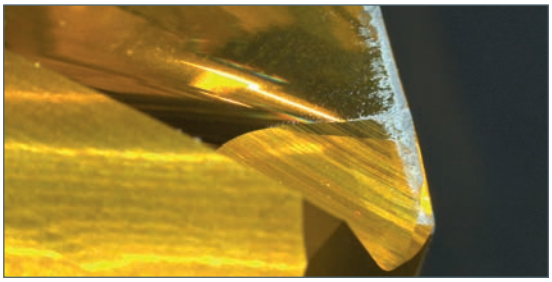
Unwanted cobalt leaching occurs when using a conventional decoating process, as cobalt is released from the surface. Tungsten carbide grains are no longer firmly bonded in their structure, which means the subsequent coating is inadequate, or doesn't adhere to the tool surface at all.

The innovative coating method from **Müller Präzisionswerkzeuge** ensures that the adhesive layer (interface layer) remains intact and the tool's carbide surface is not being damaged. A 0.3 µm layer (1/10 of the original layer) still remains on the tool after the coating and during regrinding tool to protect the carbide surface underneath. This allows the coating to be removed without any cobalt leaching taking place.

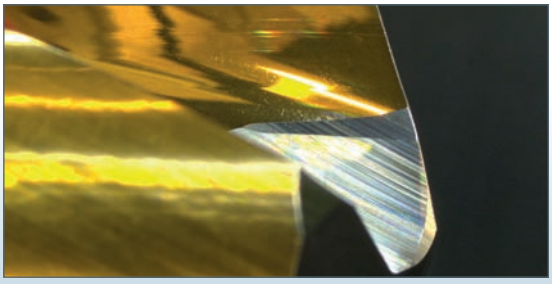


The image shows a calotte grind of a coated surface. The adhesive layer (TIN) required for coating removal is easy to detect.

Tool cutting edge before decoating process



Tool cutting edge after decoating process



Tool cutting edge after regrinding

Improved performance due to microfinishing

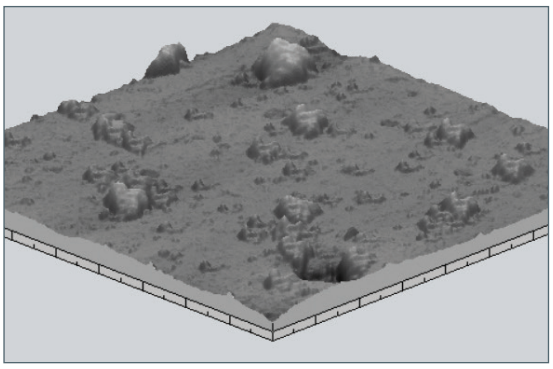
- High degree of process safety
- Longer tool life
- Lower production costs

The tool life of high-performance tools is extended by 20 % to 30 % compared to tools with untreated, coated surfaces by using the newly developed microfinish method.

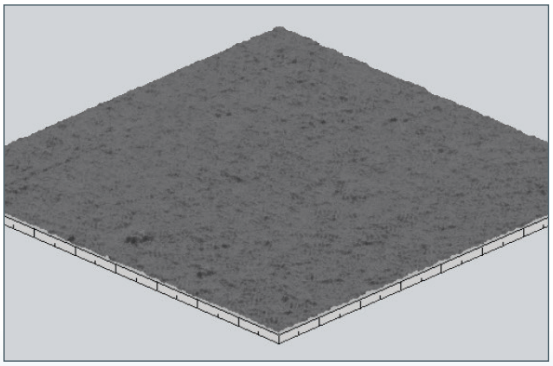
BEAUTIFUL SURFACES
AS A RESULT OF EFFECTIVE POLISHING

Müller Präzisionswerkzeuge's manufacturing and preparation process for solid carbide tools is optimised with a final polish. The newly developed microfinish process applies an even quantity of polishing agent onto the tool surface. This outstanding effective polishing method was developed in collaboration with Birkenfeld Robotics Academy and ensures a unique surface quality. Any droplets that may have been produced during coating are removed and a homogenous tool surface is achieved.

Experience gained from use in high-volume production has shown that these extremely smooth surfaces have a hugely positive effect on precision and machining quality of special tools. In addition, using tools with a polished surface showed extended tool live by an average of 20–30 percent. This means even greater process safety, even better performance, and lower costs when using special tools in high-volume production.



Untreated coated surface



Surface after polishing

EXPERTISE
AND A CUSTOMER-FOCUSED APPROACH

Müller Präzisionswerkzeuge continually sets new standards in developing, designing, producing and preparing innovative solid carbide high-performance tools. Better tools and preparation methods are constantly developed in close collaboration with universities and research institutes, which offer optimum efficiency and cost effectiveness in terms of cutting force, cutting speed and tool life.

Since 1981, we guarantee outstanding "made in Germany" quality for our clients at our state-of-the-art machine production plant in Sien. Our success in Germany, Europe and worldwide results from our capability to offer max. flexibility regarding meeting of client requirements, based on years of expertise and efficiency.

Müller
Hochleistungswerkzeuge
Werkzeugaufbereitung

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ausgezeichnete Qualität

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