

# GÜHRING

2024  
**BEST  
PRACTICE**



## MILLING FROM SOLID MATERIAL YOURSELF

Assa Abloy Sicherheitstechnik GmbH has no choice after the prices for an important cast steel blank rose by 130 percent. The solution? A completely new machining concept for steel milling consisting of 24 different Gühring tools. This does not only make the company independent, but also produces the component in better quality – and more cost-effectively.



**9** genuine success stories



**15** cutting values and parameters for you

### Our new general catalogue

Everything you need for success: All the tools for your manufacturing including accessories and cutting data. Whether online or in print – you will have an overview of everything in one place.

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### New drills from the specialist

Although our product portfolio has covered all machining operations for many years, drilling is our life. Three drills to make your life easier.

p. 6/7

### ISO-compliant measuring equipment management

Uncalibrated measuring equipment, chaos in the documentation, and an audit coming up? Not with Gühring's measuring equipment management.

p. 18/19



**Dear valued customers and readers,**

We cannot ignore digitalisation. This is clear from service, where you can reach us via all digital channels such as WhatsApp or the expert chat. It is also reflected in our digital learning platforms, where we share our machining knowledge with you in multimedia online training courses or practical YouTube videos (see page 32). However, this is also evident with our customers, who can automate their processes and thus produce more efficiently with the help of our Gühring Tool Management Software (GTMS). For example, Lange & Haasis currently manages hundreds of measuring instruments digitally using the Gühring software and can rely on adherence to all expiry dates in an audit-compliant manner (read their success story on pages 18/19).

And yet, especially in these digital times, we long for something tangible. We want information that has not been calculated by artificial intelligence based on probabilities, but comes from real machining experts who understand something about the craft and draw on years of practical experience. This is our motto: Use AI to improve processes while always keeping the human touch. In times of anonymous referrals, you can also read the stories of real customers who talk about our joint success and put their names and faces behind those stories.

This is exactly why we have decided to print a 1,600-page catalogue in times of digital transformation. When it is in your production room or on your desk, you don't have to google anything – everything you need for your success is inside: all tools for your machining tasks, including accessories and cutting data (more on pages 4/5). And if you have any questions, our sales team will be happy to help you. This is how we can master all the challenges of the future together. I wish you a successful 2024 and lots of fun with this edition!

**” Use AI to improve processes while always keeping the human touch.**

Oliver Gühring

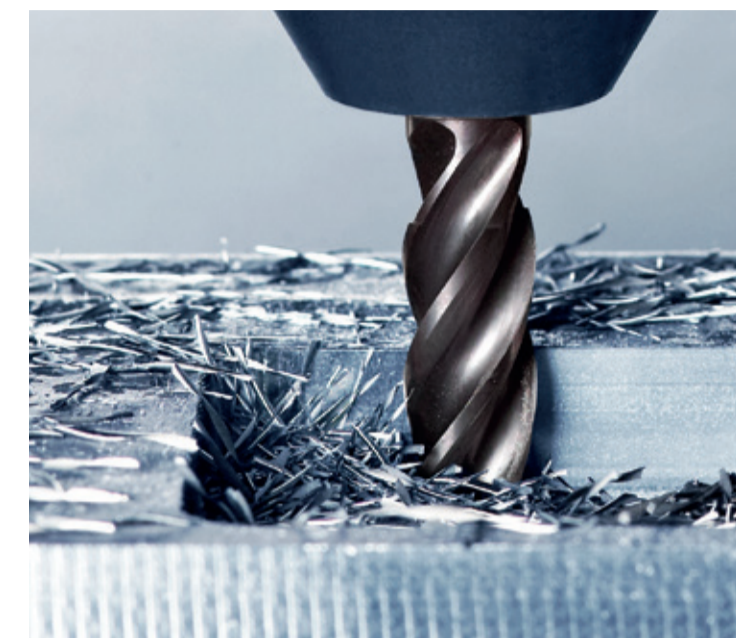
Yours sincerely,



**Oliver Gühring**



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The new Gühring General Catalogue

# THE SWISS POCKET KNIFE FOR YOUR SUCCESS

**One for all, all in one – Meet the new General Catalogue from Gühring. It contains everything you need for success: All tools for your machining tasks, including accessories and cutting data.**

Looking for the perfect tool for your application in a wide range of brochures and parts catalogues? A thing of the past. Over 1,600 pages, our new General Catalogue guides you through the entire Gühring universe. And if you have any further questions, our experts will be happy to advise you on site. Make your life easier with our powerful combination of your personal field service team and the new Gühring General Catalogue.



**Here's everything you need to succeed!**

## Bespoke support for your corporate success

Your quality and economic efficiency come first. That's why Gühring has a worldwide network of more than 900 experienced sales representatives who can provide you with local support. Regardless of whether you want to solve your machining problems or optimise your processes: We help you to boost your output and work more efficiently.

## Tried-and-tested cutting data directly from the manufacturer

The machine is running, the tool is in the magazine, but you aren't sure how to use it? You can find the optimum cutting data for all our tools at the end of each chapter in the catalogue. There will be no need for time-consuming calculations in the future, as you can simply check our cutting value tables to find out the feed rate, speed, in-feed, etc.

## Find the right tool

Can't see the forest for the trees? Our new catalogue includes the Gühring QuickFinder: This intuitive product overview guides you directly to the right solution for your very specific application.

## Always the right contact

As a tool manufacturer with a service guarantee, we are always by your side when things get tough: Whether you're using the expert chat, the free service hotline or WhatsApp – if you need help quickly, we offer immediate technical support on all digital channels.

Request the catalogue now from your tool field sales team or contact us on the service hotline: 00800 2607 2607

## Your complete tool supplier

Sometimes more is more: As a manufacturer, we guarantee high stock availability and fast delivery for over 100,000 standard items. This means you get everything from a single source – and from one catalogue. Over seven chapters, you will find all tool information and available dimensions for our product categories: Drilling, milling, threading, reaming, countersinking, clamping and grooving. An extra handy feature: The products are classified according to the machining tasks for which they are most frequently used.

 **5.6 cm**  
thick

 **3,700 g**  
heavy

 **1,600**  
pages

 **110,000**  
tool items



Your way to the online shop!

Three new material specialists

# FROM DIFFICULT-TO-MACHINE TO ALUMINIUM

**Introducing three new drilling specialists with a few common features: its polished flutes and extra-smooth tool surfaces prevent material from sticking to the cutting edges and built-up edges during drilling. Thanks to effective internal cooling, the temperature in the cutting zone is also lowered and chips are flushed out of the hole.**

Be it a deep hole, micro hole or blind hole – reliable chip removal is often a critical issue when drilling. And some materials make machining even more difficult.

For example, aluminium or stainless steels create built-up edges or, in some cases, particularly long chips during machining. Both create a risk of the cutting edges breaking off or chips clogging the hole.

Added to this is the high heat development in stainless steels and titanium alloys. If this heat is not dissipated properly, it can lead to problems such as tool wear. These factors make machining titanium and special alloys as well as non-ferrous materials a complex task that requires special tools to be selected.

## Micro-precision drilling in difficult-to-machine materials



**2.5x**  
the feed rate

Special alloys, titanium and stainless and high-alloy steels can be easily machined with the stainless steel version of the ExclusiveLine micro-precision drill. This is made possible thanks to its newly developed flute profile with a concave main cutting edge, which promotes more aggressive cutting behaviour. In this way, it also produces short chips that can be easily removed in long-chipping materials such as aluminium, brass or copper. As a result, drilling depths from 3xD to 15xD can be achieved with the micro-precision drill. In addition, the Perrox coating provides excellent protection against abrasive alloy components and

prevents built-edges, resulting in long tool lives and high feed rates. The tool is available from a diameter as small as 0.5 mm and has coolant ducts from 1 mm.

### ExclusiveLine micro-precision drill for stainless steel

Art. no. 6488  
Material: X6CrNiMoTi17-12-2 (1.4571)  
 $\varnothing = 2.05$  mm  
 $v_c = 80$  m/min  
 $f_z = 0.0615$  mm/rev.  
 $a_p = 30$  mm



## High feed drilling in stainless steels



**50%**  
higher drilling performance

The new RT 100 InoxPro has been specially designed for the production of precise holes in stainless steels and titanium materials, and promises the highest cutting values. Thanks to its wide range of diameters from 3 to 20 mm, it can be used flexibly. Thanks to the improved combination of hardness and toughness, the carbide substrate ensures that the cutting edge does not break, even under high loads. A new drill geometry has been developed with the same aim in mind: The optimised sickle-shaped cutting edge and the stronger taper of the tool minimise the tendency

to jam in stainless steel. The result: Maximum process reliability even with deep holes up to 7xD and large diameters.

### Solid carbide drill RT 100 InoxPro

Art. no. 8514  
Material: X46Cr13 (1.4034)  
 $\varnothing = 3.00$  mm, 7xD  
 $v_c = 100$  m/min  
 $f_z = 0.09$  mm/rev.  
 $a_p = 17.5$  mm



## Deep hole drilling without material adhesion



**30%**  
longer tool life

Gühring's new specialist for deep drilling in aluminium is used for machining a wide range of components such as cylinder heads, hydraulic blocks and various moulded parts. The deep hole drill's strengths really come to the fore in aluminium with a silicon content of less than nine percent. Four guide chamfers ensure the necessary stability. This results in high hole accuracy and a very low deviation from concentricity. Its polished surfaces with the lowest  $R_z$  values

for flute and web thinning decrease the adhesive effect of the aluminium.

### RT 100 T AL deep hole drill

Art. no. 6517  
Material: AISi9 (3.2573)  
 $\varnothing = 5.00$  mm, 25xD  
 $v_c = 120$  m/min  
 $f_z = 0.25$  mm/rev.  
 $a_p = 125$  mm



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Title story: machine and save

# MILL MATERIALS YOURSELF INSTEAD OF BUYING EXPENSIVE ONES



**50%**  
cost saving per component



RF 100 Diver



RT 100 U



HR 500

**A price increase of 130 percent for a cast steel blank is a challenge for the Albstadt-based security engineers of Assa Abloy. The solution? Do-it-yourself – with a brand new machining strategy and tools from Gühring. The result? A 50 percent cost saving per component is not the only benefit for the company.**

Whether it's a cucumber in the supermarket or a steel component in an industrial company: War and pandemic have made shopping expensive. This was also felt by Assa Abloy, a manufacturer of security technology in Albstadt. The company usually purchases the housing for its electric strikes from a steel precision casting manufacturer. But about three years ago, it increased its prices by a full 130 percent. "Suddenly it was no longer economical for us to offer these products," recalls Patrick Matysiak, Deputy Product Cell Manager at Assa Abloy.

#### **New concept – much more affordable**

An alternative needed to be found. Would it be possible, for example, to reduce prices with cheaper injection moulding from China? Patrick Matysiak had a better idea: "I had a thought: Why don't we switch to free-cutting steel and machine the entire component in-house?" The plan is clear: A new machining cen-

tre will be purchased and a new machining strategy developed. "And of course, I needed the right tools for this," says Patrick Matysiak.



*Machining instead of buying: Patrick Matysiak (Assa Abloy, left) and Jürgen Knorr (Gühring, right) have together made this possible.*

The fact that we were in very close contact with this customer for many years meant that it landed on my desk," recalls Jürgen Knorr, a Gühring sales representative who advises Assa Abloy. "So, we took a look together: What solutions can Gühring offer here?" The considerations resulted in a complete offer with a total of 24 different Gühring tools. Patrick Matysiak created the programming using a mix of CAD/CAM and a special macro program. In this way, up to 346 components can be manufactured automatically without any personnel, which represents a runtime of around 92 hours. The offer is rounded off by quality moni-

ring using a 3D probe and a tool breakage check, which involves measuring the components during production, adjusting dimensions fully automatically and replacing worn out tools with new sister tools. The concept was technically adapted on site and a sample component was produced. "We knew straight away that our solution was vastly less expensive – even compared to a cheap steel precision cast component from China," confirms Matysiak. "Of course, that made our decision easy."

#### **Focus on process reliability**

Gühring has access to a very wide range of standard tools for tool selection. "We put together the best tools for a process that really works," sums up Jürgen Knorr. Different solid carbide drills are used for pre-drilling, for instance: From the Gühring classic RT 100 U to a range of NC spotting drills and pilot drills to the Exclusive-Line micro-precision drill with a diameter of 1.8 mm. When it came to milling, the challenge was to cut the high machining volume as quickly as possible. This is no simple task, as the housing has a number of radii, which calls for a semi-wrap

or even full wrap of the milling cutter. Due to thin-walled areas, clamping of the component is also difficult. This leads to vibrations during milling, which must be absorbed by the tool. The RF 100 Diver has proven particularly successful for applications that require a high degree of flexibility. The solid carbide milling cutter covers five operations with a single tool: Drilling, ramping, slotting, roughing and finishing. The RF 100 Diver scores points with a high metal removal rate and guarantees running smoothness and process stability despite high feed rates. And thanks to its special geometry, it even impresses under unstable conditions. This is because the unequal pitch reduces power consumption compared to conventional milling cutters and thus lowers vibrations. With these high chip volumes, it is also important that chips are cut as short as possible and transported away safely. This is precisely where the strengths of the Gühring HR 500 high-performance reamer lie. It enables perfect reaming in all diameters from 1.97 to 150 mm. It ensures absolute process reliability, a significant reduction in process time and maximum tool lives. But a solution was also quickly found for work steps for which Gühring cannot provide an effective standard solution. The cross holes that needed to be

drilled into the housing presented the machining experts with a challenge. Jürgen Knorr remembers: "Together, we had to tinker a little on an axis hole, because this required a tool that met the high standards of tolerance and dimensional accuracy of the holes." But here too, a customer-specific special tool ensures a reliable process.

#### **"We are better all around"**

As the customer now mills the component from solid material it is around 50 percent less expensive than buying in steel precision cast housing, including any rework. In terms of quality, too, the machined component is the clear leader, especially in terms of surface precision, the dimensional accuracy of the product, the tolerances of the holes and, ultimately, product functionality. For the customer, this means that significantly fewer products are rejected during quality control. "We are better all round – not only in terms of costs, but also in terms of quality," concludes Patrick Matysiak.

The new solution is also better for the environment: The component no longer needs to be transported and shipped, as in-house production enables short transport routes. The Albstadt-based company is also independent of foreign markets and

their pricing policies. "And in the event of changes, we can immediately intervene in the process and react flexibly," says Matysiak happily. These successes also motivated the company to switch to machining for two other types of electric strike housing. At the moment, these are still made of metal powder injection moulding, but the chips will soon be flying on a second new machine. Gühring tools have already been ordered for this.

In collaboration with:

**ASSA ABLOY**  
Opening Solutions

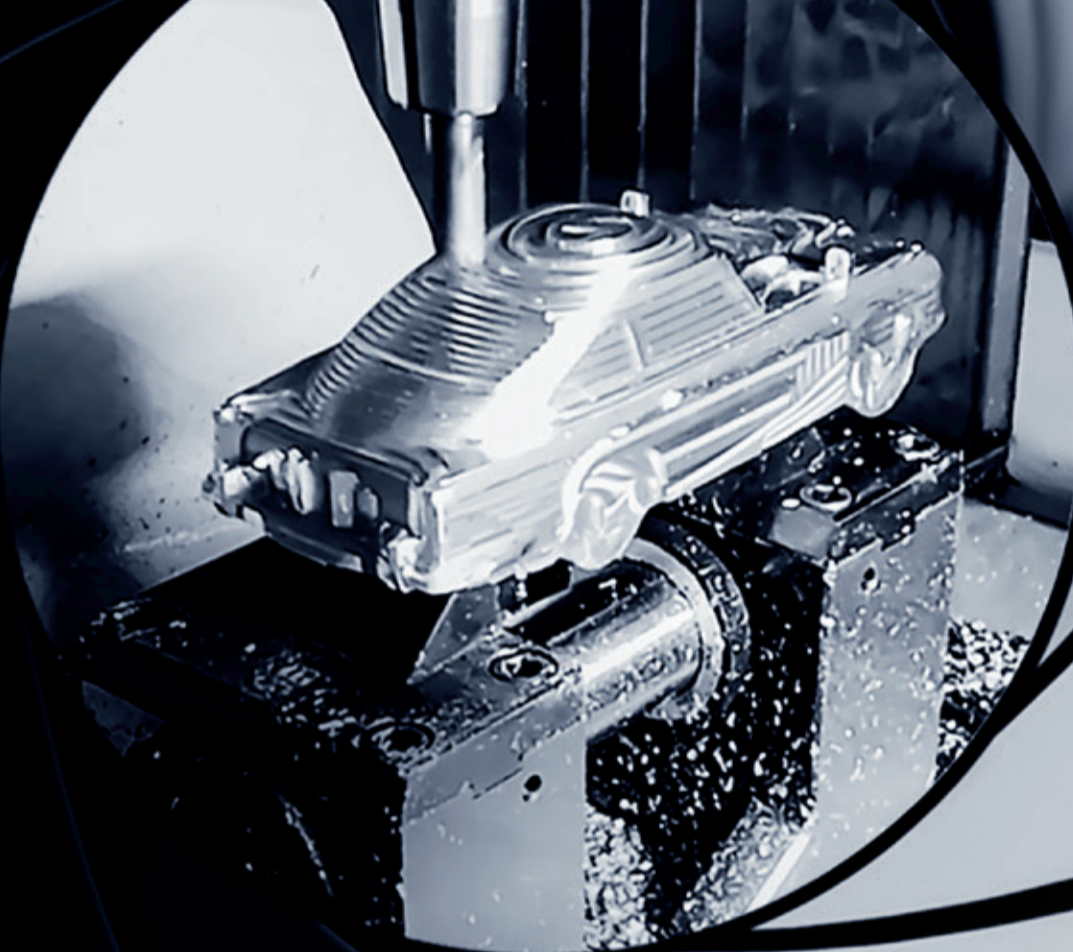
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007 "License to mill"

# BOND CAR MILLED FROM SOLID MATERIAL



The entire machining process is available on Gühring TV

#### RF 100 A

- Art. no. 6982 16.020
- Material: AlMg1SiCu (3.3214)
- MQL oil: "Blaster Vascomill FA2"
- nano polished cutting edges
- low vibration milling
- micro-support chamfer for maximum running smoothness and best workpiece surfaces
- extra smooth carbo-coating for best chip removal & long tool lives

**When you bring together the three best products, you get the perfect process. Gühring and Blaser have combined a high-quality MQL oil with a solid carbide corner radii milling cutter for aluminium machining and an MQL tool holder. The result is engineering at its finest.**

Perhaps the most legendary car in the world is the Aston Martin Silver Birch DB5. In 1964, Sean Connery raced away from his enemies in the silver sports car in "Goldfinger". Pierce Brosnan and Daniel Craig did the same in five other films. It is not just its elegant curves that make the Bond car an icon, but the special gadgets that Quartermaster Q builds in for 007: Buttons for nails, smoke and machine guns in the centre console, an ejector seat, tyre shredder and pile driving device. The value of the original car, which has since disappeared and hasn't been seen for 25 years, is now estimated at 25 million US dollars. Blaser is also a very big fan of the Aston Martin DB5. This gave rise to the idea of reproducing the iconic sports car in detail – in paperweight size and made of solid aluminium.

Based in Rüegsau (Switzerland), the company benefits from its expertise as a global technical leader in the field of cooling lubricants: Blaser has been producing lubricant solutions that are kind to people and the environment and have measurable added value since 1936. With a wide range of cooling lubricants, Blaser helps its customers to fully exploit the potential of their machines and tools. And this was the case with the Aston Martin, too, because perfect cooling would be the only way to produce surfaces that matched the mirror-like polish of the original. However, this also called for tools that safely conveyed this high-quality coolant to the cutting edge through internal coolant ducts. So, Blaser turned to Gühring, with whom the company has a long-standing, close working relationship. Previous projects had already shown that: "The coolant ducts in our tools have the perfect cross-

sections to allow the oil to be transported well", says Michael Gnatkowski, Sales Manager for the Automotive Industry at Gühring.

#### Gühring specialist for aluminium: the RF 100 A

So, it didn't take long to find the perfect tool for manufacturing the Aston Martin: The solid carbide corner radii milling cutter RF 100 A (item no.: 6982 16,020) with axial and radial internal cooling from Gühring's specialist range for aluminium machining. Its internal coolant ducts and coolant exits ensure a precise supply of lubricant to the cutting edge. A particularly important factor for the machining of the Aston Martin: The nano polished cutting edges of the RF 100 A enable low-vibration milling thanks to their micro-support chamfers, thereby creating the ideal surfaces. This combination of polished cutting surfaces, a carbo-coating and targeted MQL internal cooling is the ideal prerequisite for machining even sticky aluminium alloys.

#### MQL cooling: economical & sustainable

In order to get the perfect performance out of this tool, the experts at Blaser defined the ideal interaction between air pressure and oil quantity for the cooling lubricant. This mix is transported through the tool's internal coolant ducts directly to the cutting edge and workpiece surface, where machining takes place. Only as much oil as necessary is used here. This is where the benefits of MQL technology come to the fore: The application is very clean and cleaning is kept to a minimum. By saving oil, disposal processes are also eliminated, resulting in sustainability and cost savings. In MQL technology in particular, the tool holders also play a decisive role as the interface between the tool and the machine. So, for the Aston Martin, Blaser used an MQL clamping chuck for single-duct systems from Gühring's GM 300 range.



**40%**  
of the blank volume machined

#### The best products combined

The success of the mini Aston Martin reflects Gühring's philosophy: to offer its customers everything they need for an optimal process. This includes cutting tools, but also tool holders and cooling lubricants. Michael Gnatkowski firmly believes: "If we bring the perfect products together – a reliable tool with a high-quality cutting oil – then we can optimise processes." Aleksej Wahnsiedler, Head of Industrial Partnerships at Blaser, also sees the project as proof of the perfect symbiosis of tool and cooling lubricant: "We are combining the advantages of both systems, thereby enabling us to generate a much greater benefit." This advantage is reflected particularly in better surfaces and longer tool lives. In this technological incentive, Wahnsiedler sees the common ground between the two companies: "Together we generate the added value that the customer is looking for."

In collaboration with:

**Blaser.**  
SWISSLUBE

**GÜHRING**

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\*MQL: Minimum Quantity Lubrication

One component, four tools

# HARD MACHINING IN MOULD MAKING

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**In tool and mould making, there is a trend towards increasingly harder and therefore more difficult-to-machine materials. The reason? The demand for consumer goods continues to increase, and with it the batch sizes of products manufactured with moulds and tools.**

To meet these increasing demands, Gühring has developed a special range of high-

performance cutting tools for mould and die. Thanks to adapted geometries and a harder, finer-grained carbide substrate, these tools are particularly reliable in hard machining. For example, a reference customer machined a contour on a mould insert for an injection moulding tool made of high-quality tool steel (1.2343 ESU) with a hardness of 53 HRC. We will show you which tools are used for this here.

## Roughing and finishing pockets with the G-Mold 65 U in 53 HRC

The G-Mold 65 U solid carbide end mill with a diameter of 8 mm (Art. no. 6943 8.000) is used to mill a pocket directly into the solid material. The four-fluted ratio end mill can be used to create slots in components with a hardness of up to 65 HRC. Thanks to its neck clearance, the tool is also ideally suited for milling deep cavities.

Its special flute profile with a thicker core improves stability, while a particularly hard Signum coating makes it temperature-resistant for longer tool lives. This means that the tool can be used universally in hard machining, even for dynamic GTC milling with a low lateral infeed.



$v_c = 90 \text{ m/min}$   
 $n = 3,581 \text{ rpm}$   
 $f_z = 0.035 \text{ mm}$   
 $a_e = 0.3 \text{ mm}$   
 $a_p = 15 \text{ mm}$

## First-finishing contour surfaces with the G-Mold 55 B in 53 HRC

The G-Mold 55 B ball nose end mill with a diameter of 6 mm (Art. no. 6848 6.000) is used. The solid carbide ball nose end mill is ideally suited for profile milling and finishing moulds and mould inserts made of hardened steel up to 65 HRC. Thanks to its high-precision full radius geometry, it ensures maximum shape accuracy and an exact tolerance of the radius con-

tour. While the majority of competitors offer only two-fluted profile cutters, the tool's four cutting edges extend to the centre, which enables significantly higher speeds for first-finishing. The result is a time saving of at least 30 percent. A two-fluted variant is available for finishing, which ensures high precision.



$v_c = 264 \text{ m/min}$   
 $n = 14,000 \text{ rpm}$   
 $f_z = 0.08 \text{ mm}$   
 $a_e = 0.3 \text{ mm}$   
 $a_p = 0.3 \text{ mm}$

## Finishing with the G-Mold $\mu$ 65 B in 53 HRC

The micro-precision milling cutter G-Mold  $\mu$  65 B with a diameter of 2 mm (Art. no. 6817 2.000) is used to finish the contour. The two-fluted finishing tool enables detailed machining down to the smallest

detail and is  $\mu$ -precise in diameter, concentricity and roundness. The radius tolerances are even in the range of  $\pm 5 \mu\text{m}$ . The GühroJet peripheral cooling integrated into the shank perfects chip removal.



$v_c = 125 \text{ m/min}$   
 $n = 19,894 \text{ rpm}$   
 $f_z = 0.020 \text{ mm}$   
 $a_e = 0.020 \text{ mm}$   
 $a_p = 0.020 \text{ mm}$

## Thread milling with the MTMH3-Z in 53 HRC

The micro thread milling cutter MTMH3-Z (Art. no. 4002 5.000) is used to insert M5 threads into the component. The tool facilitates circular drill thread milling in solid material without any pre-drilling up to a depth of 10 mm. Both unhardened and hardened materials up to 66 HRC can be

machined. By creating a core hole and thread in one step, the tool ensures significantly shorter cycles and calibration times. The special geometry of the thread milling cutter and the integral cooling grooves guarantee a very high level of process reliability and true-to-gauge threads.



$v_c = 70 \text{ m/min}$   
 $S = 5,863 \text{ rpm}$   
 $f_z = 0.016 \text{ mm}$   
 $P = 0.8 \text{ mm}$

Small tool – big success

# POSITIONALLY ACCURATE DRILLING IN THE MICRO-PRECISION RANGE

EXCLUSIVELINE®



**70%**  
less machining time



**2.5x**  
higher feed rates in stainless steel

## ExclusiveLine micro-precision drill for stainless steel

Art. no. 6490  
Material: 18CrNiMo7-6 (1.6587)  
Ø = 1.50 mm  
v<sub>c</sub> = 56.5 m/min  
n = 12,000 rpm  
f<sub>z</sub> = 0.058 mm/rev  
a<sub>p</sub> = 15 mm  
v<sub>f</sub> = 700 mm/min

Be it in mould and die or for engraving, dressing and grinding: The IBAG Group, headquartered in Zurich, has made a name for itself as a leading manufacturer of high-frequency motor spindles. With the ExclusiveLine micro-precision drill for stainless steel from Gühring, IBAG overcomes micro-precision range challenges – and can reduce machining times by up to 70 percent.



A good team: Niki Hörner (IBAG) and Marcel Horn (Gühring)

In the technology and demonstration centre at the German Lindlar site, IBAG specialises in the analysis, optimisation and implementation of customer requirements in addition to manufacturing parts for its precision spindles. "We have the highest quality requirements for our components, including when it comes to positional tolerances", explains Niki Hörner, CNC specialist at IBAG. "Some components require small holes, which are used for air transmission, for example. These holes must be manufactured with precise positioning – there is hardly any room for tolerances."

### A case for the ExclusiveLine micro-precision drill for stainless steel

"In order to manufacture its high-performance spindles, IBAG needs reliable micro-tools that work very precisely even in the smallest range – and even in demanding materials", says sales representative Marcel Horn.

### The micro-precision drill as problem solver

The spindle manufacturer from the Rhineland region is also confronted with these high requirements when manufacturing air rings made of high-alloyed steel. An air ring has the important task of generating overpressure of 1 bar for sealing air in the front section of the spindle. This overpressure prevents external influences – such as grinding sludge, chips or other impurities – from entering the spindle and damaging it. For this protection mechanism to work, several holes with a diameter of 1.5 mm are needed. And they have to be in exactly the right position.

But this seems easier said than done: With a conventional HSS drill that IBAG used to use, the hole exits were anything but positionally accurate despite pre-centring. "The holes were partly tapered, and we also had to accept some tool breakage at the hole exit due to the incline", explains Hörner. For sales representative Marcel Horn, it was clear: The ExclusiveLine micro-precision drill for stainless steel would be better at this.

The tool is used in the 10xD design with a diameter of 1.5 mm (Art. no. 6490) and is an immediate success:

With its solid carbide micro-precision drill, Gühring offers a specialist for high machining performance in special alloys as well as in stainless and high-alloyed steels. Thanks to its innovative geometry, users do not have to worry about chip removal: The newly developed flute profile with a concave main cutting edge facilitates an impressive cutting response. In addition, the Perrox coating ensures extremely high levels of protection against wear and adhesion. In combination with geometry and coating, the carbide guarantees high process reliability and unbeatable tool lives – even in material groups that place high demands on the tool.

**With the micro-precision drill from Gühring, we were able to drill precise holes.**

Niki Hörner, IBAG



reliability and precision. IBAG now also saves valuable time previously needed for pre-centring.

### Reduction of processing time by over 70 percent

IBAG also achieves unbeatable time savings in another component made of high-alloyed case hardened steel. A total of five holes with a drilling depth of just under 15 mm need to be drilled for each component. IBAG used to use an HSS drill for this too, which required around 90 seconds for completion with an infeed of 1.5 mm per stroke per component. When IBAG tests the micro-precision drill here too, an impressive time saving is achieved right away: "With the solid carbide micro-precision drill, we were able to reduce the machining time per component by 60 seconds", says Hörner happily. This is due to the high cutting data that can be achieved with the solid carbide micro-precision drill: The hole is piloted at a feed rate of 500 mm/min and then drilled in one stroke at a feed rate of 700 mm/min, so IBAG processes all 150 components saving a total of over 70 percent pure machining time. In addition to reduced tool wear, there is also the saving of additional centring tools.

"With the carbide micro-precision drill, we were able to make precise and straight holes in the air rings", says Hörner with praise. In addition to the properties specially designed for machining high-alloyed steels, the internal cooling of the selected tool design also promotes optimum chip removal. But the ExclusiveLine micro-precision drill for stainless steel does not only impress in terms of its process

### Secured stock level and optimum cutting data: the Gühring online shop

Perfect machining results require optimum cutting data. Here, too, Niki Hörner sees a major advantage of working with Gühring: "Via the online shop, we can easily and conveniently access cutting data. This makes it easier for us to get to grips with different machining processes and new tools." And that's not the only benefit: In the online shop, prices and stocks can be checked with just a few clicks and orders placed around the clock.

In collaboration with:



**GÜHRING**

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Let the music play

# GÜHRING MILLING CUTTER ELIMINATES VIBRATIONS



**25%**

more components with just one tool



**20%**

higher feed rate

#### Information on the machining setup:

- vertical machining centre
- Tool holder: BBT 30 Power Milling Chuck
- Cooling: External emulsion cooling
- Workpiece clamping: vice with a clamping depth of just 6 mm

Experiencing vibrations during milling? This was a huge problem for a Japanese manufacturer of guitar parts: The long protruding tools started rattling during machining and led to a poor component finish. Gühring had the solution: The RF 100 Speed does not only stand out thanks to its high running smoothness, but also thanks to 25 percent longer tool lives.

Heartache, regret and a bed full of roses – this is Jon Bon Jovi lamenting his love life. Meanwhile, an electric guitar is screaming in the background: The notes are vibrating, resulting in quite a painful sound. Guitarists create this special lamentation effect by pulling a metal lever on the instrument's lower tailpiece. This small movement changes the tension of the guitar strings, thereby adjusting the pitch. So the aim of the component known as the vibrato arm is to make the music vibrate.

**Our tool immediately ensured a reliable process.**

Yoshiyuki Yamada

Quite in contrast, vibrations are the last thing that are wanted during the production of this vibrato system. However, they were precisely the reason why Gotoh Gut Co. in Japan were experiencing problems. Since its creation in 1960, the company has made a name for itself on the global market. Nowadays, metal parts for string instruments are produced on eight machining centres and 28 CNC lathes. One of these products is a steel (SS400) vibrato block.

At Gotoh, the component's lateral contour is finished on a vertical machining centre with external cooling, requiring a very high cutting depth of 42 mm. This can only be achieved with a long protruding tool – but this presents its own problems: During machining, the tool starts rattling, resulting in a poor component finish. A competitor relied on a five-fluted milling tool, but the rattling was too strong and machining had to be stopped. "The surface quality was not good due to the long tool length and the slight occurrence of rattling marks", recalls Yoshiyuki Yamada, a Gühring sales representative. "The customer asked us to solve this problem."

#### 25 percent longer tool life thanks to optimised geometry

Gühring has the perfect solution to vibrations during milling: the RF 100 Speed. The solid carbide end mill is particularly well known for its high rigidity, which Gühring achieves through a coordinated flute profile with a high core factor. This enables the milling cutter to absorb the vibrations when milling. The RF 100 Speed also features a high helix of 48° and an unequal blade pitch – both of which promote a smooth, quiet cut. Because only four cutting edges are used, there are fewer cutting edges in contact with the workpiece than in the competitor's five-fluted concept; this significantly reduces radial forces and thus the creation of vibrations. The long design of the tool features chip breakers to cut the chips down to short lengths, ensuring smooth chip removal during high-performance machining. Working in collaboration with Gotoh,



vibrato-system

our technical sales team opted for high-speed cutting with the RF 100 Speed, as this is the best way to produce the best surface finish. More than twice the cutting speed and a 20 percent higher feed rate are now achieved when machining the vibrato block. At the same time, the RF 100 Speed impresses with significantly longer tool lives than the competitor's tool: Using a Gühring milling cutter, the customer is now able to produce 25 percent more components than before. This was made possible by an innovative combination of optimised micro-geometry and the high-temperature-resistant SuperA coating, which has an excellent combination of hardness and oxidation resistance. With the RF 100 Speed, Gühring has succeeded in bringing stability into the machining process. And, most importantly: The surface quality of the manufactured components is very high. Yoshiyuki Yamada is satisfied: "Gotoh was facing problems that could not be solved with competitors' tools. However, the tool we proposed immediately ensured a reliable process."

#### TOOL PERFORMANCE REPORT

Tool	RF 100 Speed	Competitor
Number of cutting edges	4	5
Diameter (Ø)	10 mm	10 mm
Component	Vibrato block	Vibrato block
Material	SS400 (JIS G 3101)	SS400 (JIS G 3101)
Cutting speed (vc)	270 m/min	120 m/min
Speed (n)	8,600 rpm	3,822 rpm
Feed (f <sub>z</sub> )	0.055 mm	0.1 mm
Feed rate (v <sub>f</sub> )	1,892 mm/min	1,528 mm/min
Lateral infeed (a <sub>g</sub> )	0.2 mm	0.2 mm
Cutting depth (a <sub>p</sub> )	42 mm	42 mm
Tool life	250 parts	200 parts

25% more components possible with one tool at 20% higher feed rate

In collaboration with:



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Passed the test

# ACCURATE SOFTWARE STAYS ON TOP OF THE MEASURING EQUIPMENT

433

measuring instruments at a glance

### Your advantages in measuring equipment management with GTMS:

- simple, ISO-compliant management
- complete and audit-proof documentation
- avoid production downtime thanks to constant availability
- transparent stock and circulation

## GTMS

Gühring Tool Management Software

**Wherever components are manufactured with high precision, regularly calibrated measuring instruments are essential. But how do you stay on top of things? Lange & Haasis has switched from handouts to digital measuring equipment management from Gühring – and is saving a lot of time in this way.**

Measuring screws, limit gauges, thread gauges – the machinists at Lange & Haasis always have their measuring equipment at hand to check the quality and dimensional accuracy of the construction parts. Although the products produced by the company for CNC metalworking in Albstadt differ greatly, they all have one thing in common: highest precision down to the  $\mu$  range. "No order is processed without measuring instruments", notes founder and co-owner Jens Lange. And that's why there are so many of them in Lange & Haasis' production.

The problem: Measuring instruments have an expiry date and must be recalibrated before expiry. Uncalibrated measuring instruments must not be used for measurement. But how do you keep track of all the measuring equipment in everyday production? Jens Lange had to find out in his company that management using handouts is not the perfect solution: "That was a huge source of error when it came to calibration cycles",

he recalls. In addition, employees were never able to trace who had taken which measuring instruments and spent a lot of time searching for them.

Plus, the company is certified according to the ISO 9001 international standard, which stands for process-oriented quality management. "In order to maintain this certification and expand the associated processes, we need measuring equipment management", says Patrick Maier, who is responsible for measuring equipment management at Lange & Haasis.

"We wanted a quick and simple solution that would give us more structure and control in our measurement equipment management." The simple solution is just a few kilometers away: Lange & Haasis has been working very closely with Gühring for 20 years. So it was clear for Patrick Maier: "The regional aspect and the ability to quickly ask questions and solve problems were very important to us, which is why we did not need to look at other software solutions."



### Never miss an expiry date again

The Gühring Tool Management Software (GTMS) can cover all production and logistics-relevant areas in companies. GTMS offers a way to manage measuring instruments and the corresponding calibrations. Test dates are permanently monitored digitally and internal calibrations are created, carried out and documented in accordance with an audit based on a stored test plan. In addition to ISO 9001, which is so important for Lange & Haasis, IATF 16949 and QSF-A 1998 are also covered by the GTMS.

Anyone who combines the software with a Gühring tool cabinet can also specify that only calibrated measuring instruments are removed from drawers and all others are blocked. All of this ensures that sufficient measuring instruments are always available in production and

that documentation gaps during customer audits are avoided. "GTMS is perfect for all customers who do not want to lose track of their testing and operating resources", summarises Christoph Schönhaar, who manages the company as a Gühring software expert.

### Self-explanatory & easy to use

This is exactly what Lange & Haasis wanted: "First of all, we wanted to digitalise measuring equipment management so that we could minimise search efforts and establish traceability of the measuring equipment withdrawal", explains Patrick Maier. It was particularly important to them that the new system be simple to use and self-explanatory and could be used quickly and error-free by all employees. After Christoph Schönhaar showed him the possibilities of GTMS, he quickly realised: "With Gühring, we have found the perfect partner!" Schönhaar says that the planning and implementation of the project then went quite quickly and smoothly: "There was always honest and direct feedback, which helped us find the right solutions." This is what Patrick Maier thinks: "No matter what problem we had, a targeted solution was always found immediately!"

**The time saved on measuring equipment management is simply huge.**

Patrick Maier, Lange & Haasis

### Measuring instruments are just the beginning

Where is the measuring instrument or who has it? How often was it used? When is the next calibration interval? Thanks to GTMS, Lange & Haasis employees can now answer all these questions at a



Patrick Maier (left) and Jens Lange (centre) from Lange & Haasis are delighted with their TM cabinet together with Christoph Schönhaar.

glance. Since Lange & Haasis now manages its measuring equipment centrally, employees can compile everything they need for an order much more quickly. "The time savings associated with measuring equipment management are enormous", says Patrick Maier. But that's not all: "The long-term goal is for us to implement our complete production, tool and warehouse management with the GTMS from Gühring and use the software to the fullest extent possible", says Jens Lange. Further GTMS modules are to be built up gradually in order to further digitalise manufacturing. "Thanks to GTMS, many functions can be covered with a single software solution", explains Schönhaar. "The next steps could now

be towards warehouse management and machine connection." The new measuring equipment management is therefore only a first important step on the road to digital manufacturing.

In collaboration with:

**Lange & Haasis**  
CNC - TECHNIK

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Micro-precision milling cutter impresses in the medical sector

# SUPER MATERIAL ON THE ROPES



**1,100 min**  
tool life in grade 5 titanium



**2x**  
the feed rate for reduced machining time

## RF 100 Micro Diver

Art. no. 6808  
Material: grade 5 titanium Ti6Al4V  
 $v_f = 1,000$  mm/min  
 $n = 9,000$  rpm  
Tool life: 1,100 min



**Grade 5 titanium (Ti6Al4V) is considered a super material par excellence: Implants made from this material are sturdy, but also lightweight and biocompatible, do not trigger reactions or allergies, do not corrode, and are not magnetic. However, grade 5 is also something else: difficult to machine. For the medical device manufacturer hg medical, the Micro Diver from Gühring cut through all the difficulties.**



Gühring Product Manager Christian Sieker (left) introduces Mike Stutenz from hg medical to the RF 100 Micro Diver.

Hg medical from Raisting (Upper Bavaria) manufactures 95 percent of its components from grade 5 titanium. These include various bone plates, bone screws and implants for orthopaedic and general surgery. And yet, however impressive grade 5 titanium is in practice, it is also extremely challenging to machine: Due to the high toughness of the material, high cutting forces occur during chip formation and there is also a risk of chips sticking to the cutting edge. In addition, titanium has extremely poor thermal conductivity: The temperatures up to 1200°C that occur within the cutting zone are also conducive to tool wear.

### Cutting edge chipping on a bone plate

These were the problems facing hg medical in the manufacturing of a grade 5 titanium bone plate: Chippings began appearing on the cutting edges of the milling cutters used after just a short amount of time.

So, head of the milling workshop Florian Lukats contacted his tool supplier, who has been advising hg medical on machining problems for 20 years: "Gühring is a good partner and has a broad portfolio of products in the tooling sector," Lukats confirms. "Even when we need solutions quickly, we can always rely on Gühring to deliver."

Gühring has greatly expanded its expertise in the field of medical technology in recent years, especially with regard to the design of tools and processes for tricky components. Tools are individually

tailored to the customer and tested at the in-house test centres. "This allows us to prepare the process to achieve the best results for the customer and provide them with both tools and an individually adjusted machining strategy so that they can get started right away," explains Daniel Laqua. As a Gühring application technician, he is in charge of designing products in the micro-precision tools group – including for hg medical. When he heard which material needed to be processed in this case, a specific Gühring tool immediately came to mind: "The RF 100 Micro Diver is our top tool for special alloys in the micro range," says Laqua. "Grade 5 titanium is a real challenge, but the Micro Diver meets it with the right geometry and its high substrate and coating hardness." He had already achieved very good results with the micro high-performance milling cutter, especially in the field of medical technology.

### Effective cooling in the micro range

With the RF 100 Micro Diver, Gühring offers a high-performance tool for machining challenging materials in the micro range. One of the most impressive features of the micro-precision milling cutter is its innovative internal cooling: The shank contains internal coolant ducts arranged in a pitch circle around the cutting wedge. During milling, they supply the flow of coolant into the cutting zone. Cooling as effective as this is

indispensable, especially for grade 5 titanium, as it is needed to reduce the high temperatures during milling and thus extend the tool life. Another key criterion for tools used to machine titanium is reliable chip removal. As Christian Sieker, Gühring product manager for micro tools, points out, the RF 100 Micro Diver also scores points here: "The optimised tool surfaces ensure that chips do not stick in the flute, but are removed safely." To achieve this, the tools are provided with an extra-smooth layer. "In addition to protecting against abrasive wear, this has the advantage that the tension between the chips and the tool is significantly lower, which also reduces the thermal load on the cutting edges," says Sieker.

### Customer-specific carbide from Gühring

However, although the RF 100 Micro Diver achieves excellent results in most applications, it was not able to fully showcase its strengths in a specific application. Why was that? The component in question is a small, very thin plate that cannot be optimally clamped. As the milling cutter travels along it, the plate begins to vibrate, causing small impacts that the carbide cannot absorb. The milling cutter starts to chip.

But in this case, Gühring has a clear advantage over many other tool manufacturers, as Laqua explains: "We produce the carbide for our tools ourselves and can therefore adapt the individual components perfectly to suit the machining job." As such, the experts at Gühring designed a carbide substrate that gives the tool a high level of toughness and heat resistance – ideal, even when under high dynamic cutting forces. Complemented by a Gühring coating for good gliding properties and additional wear protection.

### Double the tool life, hardly any wear

The Micro Diver was tested for approximately 1100 minutes until it showed initial signs of wear on the cutting edges and had to be replaced. The feed rate was also more than twice as high with the new tool, which has a significant impact on the machining time per component. For hg medical, this means lower set-up costs with consistent quality and, as a result, considerable cost savings. At the same time, the surface quality has even been improved in some areas. Florian Lukats from hg medical is impressed: "Titanium is known to be a material that is hard to machine, but thanks to the excellent

cooperation with Gühring, we were able to stabilise the milling process." For him, this is further proof of the good working relationship with Gühring: "As our tool supplier, Gühring has been involved in the growth of hg medical from the outset, as we have an advantage over competitors thanks to such stable milling processes."



In collaboration with:



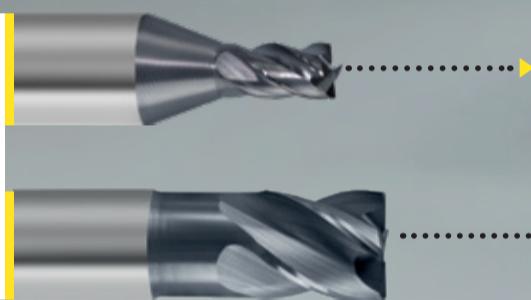
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RF 100 Sharp in all variants

# LENGTH SELECTION MADE EASY

## RF 100 Sharp extra short

- short dimension ensures high stability and running smoothness
- machining with up to 40% higher feed rate
- cutting edge length of 1xD, 2xD the reach
- micro range dimensions from  $\varnothing$  0.8 mm



## RF 100 Sharp medium length

- extended reach suitable for the bridging of interference contours at greater depths
- cutting edge makes up more than 50% of the reach
- micro range dimensions from  $\varnothing$  1.0 mm



## RF 100 Sharp DIN+

- flexible use at different depths, requiring fewer milling cutters and making it possible to regrind more often
- based on "DIN 6527 long", but + 12% more cutting length (with  $\varnothing$  16.0 mm)
- dimensions from  $\varnothing$  1.0 mm



## RF 100 Sharp ER

- standard design according to "DIN 6527 long"
- dimensions from  $\varnothing$  3.0 mm
- corner radii available from 0.2-4 mm



Discover how choosing the right length when milling with the RF 100 Sharp not only improves the quality of your work, but also relieves your budget. This is because in the world of construction and manufacturing, the right length selection means not only precision, but cost-effectiveness as well. Make it easy for yourself – choose the right length, the right tool and optimise your workflows for maximum efficiency.

Your contact partner:

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Using diamond to make electric motors

# WE GET THINGS MOVING



**20x**  
longer tool life

#### Information on the machining setup:

- horizontal machining centre, 2 machining spindles
- tool holder HSK-A 63
- Cooling: external emulsion cooling
- workpiece clamping: 2 clamping positions



Thanks to Gühring, Dynacast can say goodbye to production downtimes due to missing tools. How? Check it out here!

**All you hear is the chirping of the birds and the noise of the electric bike on the trail. When cycling in nature, one thing is extremely annoying: engine noise. To avoid this, the manufacturing of components in electric motors requires the highest precision – and this in series production. At 1,000 units per week, stable processes are essential.**

With around 450 employees at its Austrian location south of Vienna, Dynacast manufactures parts made of die-cast zinc, magnesium and aluminium. Dynacast parts are used in industries where

precision, durability and lightweight construction are critical. "That's why high quality is so important", says Markus Beier, Production Manager at Dynacast. This also applies to housing parts for electric motors the size of an A4 sheet. The focus is on lightweight construction – a trend that relies on special materials such as magnesium. But casting and machining magnesium is challenging, especially when large batches of more than 1,000 pieces per week are produced, as is the case with Dynacast. This is where stable processes are fundamentally important. The good thing is that Dynacast has a strong partner at its side: "Ever since

we have been manufacturing magnesium housings, we have been working with Gühring", notes Markus Beier. "Whenever we have a problem, Gühring is there and we tackle the issue together."

#### Wear due to magnesium dust

This was also the case when Dynacast reached its limits when machining a stator hole on an electric bike motor housing. The die-cast part made of magnesium was pre-cast close to the final shape. Despite the stock removal of only approx. 1 mm per side, the wear on the PCD reamer was enormous: "For some tools, it only took us two to four weeks to send them for refurbishment", recalls Markus Beier. "Such short tool lives are not satisfactory for us." The wear also affected the surfaces on the stator bore. When looking into the machine, the reason was also quickly found: A white construction film was visible in the machine area and on the tools. After investigations at the University of Leoben, it was determined that this was magnesium dust.

*The new PCD reamer is the result of a fruitful collaboration between Gühring and Dynacast.*

This microdust is released during machining and deposited everywhere – including on the cutting edges of the PCD reamers. Here, the fine dust particles acted like small sand grains that rub the material off the cutting edges. As a result, the otherwise wear-resistant PCD cutting edges rounded off within a very short time, which is why the tool lives were significantly shorter than planned: After about 150 m, it was already over. In addition, this wear on the cutting edge generates such a high cutting pressure that the diameter in the component was 0.1 millimetres smaller than the diameter on the reamer.

#### Gühring delivers the special solution

A special solution was needed here and Gühring was able to deliver this thanks to its high level of expertise in the special field. "In two optimisation rounds, we converted the tool in such a way that its geometry counteracted excessive wear", explains Matthias Helbig, Application Manager for E-Mobility at Gühring. Instead of developing completely new tools, the aim here was to conserve resources so that the basic body of the reamers could be reused. The solution is a wear compensation cutting edge: Five adjustable cutting edges can be moved via an expansion joint. This means that the customer can quickly and easily

readjust the diameter if the diameter falls below the specified value.

#### Ready for the future

The result is impressive: "Thanks to the joint development, we have managed to get to a tool life of around twelve months from two to four weeks", says Markus Beier happily. "And this improvement in tool life has had a very positive impact on us financially." Because Dynacast now has massive savings in tool costs and saves machining time thanks to fewer tool change cycles, the company's manufacturing can be much more cost-effective. In addition, the revised Gühring tools ensure greater process reliability and consistently high quality. Thanks to this success, Markus Beier has a positive outlook on the future: "I believe Dynacast will remain a major player in the housing market because

**” This improvement in tool life has had a very positive impact on us financially.**

Markus Beier, Dynacast

we are far from finished with our innovations and die casting technology."

He wants to continue working closely with Gühring in the future, because "this collaboration has proved to be very fruitful so far, and together we have developed great ideas and technical solutions."

#### PCD reamer (special tool)

Material: Magnesium AZ91  
Ø = 90.05 mm  
Z = 5+1, adjustable via expansion slot  
N = 2,475 rpm  
v<sub>f</sub> = 1,190 mm/min  
v<sub>c</sub> = 700 m/min  
F<sub>u</sub> = 0.48mm/rev  
Machining time = 1.2 sec/component  
Tool life = 4.500 m

In collaboration with:



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Hard machining shortens processes

# NO DETOURS TO THE FINISHED MOULD



**3 weeks**  
savings in process time



**Full**  
savings on process steps

Speed is important in all industries, but the competitive pressure and thus the time pressure are especially great in mould and die. Vogt AG Verbindungstechnik, which specialises in the manufacture of punched and plastic parts as well as fine tube and wire articles for the electrical industry, is experiencing this too. The company produces over two billion parts a year in Lostorf, Switzerland (canton of Solothurn), including standard items and custom-made products.

Vogt AG also manufactures the injection moulding tools and fixtures for the production of these articles within its own toolmaking – at least in part. Previously, all components were soft-machined, then externally hardened and finally finished at Vogt AG. However, this approach led to very long throughput times. “Our main goal was to shorten this throughput time and reduce the effort involved in reworking”, explains Ronny Herrmann, who heads toolmaking at Vogt AG. His vision is to make everything – from the hardened blank to the finished injection moulding tool – in-house and in one process step. This would save the company weeks in toolmaking and enable

them to start producing the actual products sooner. “If the complete machining is done as hard machining, this is a higher expense, but the processing times are shortened overall”, says Rolf Ehler, Product Manager for Milling Tools at Gühring.

## From the steel block to form insert

Vogt AG is perfectly equipped for this with a modern 5-axis milling centre and automation. But turning a hardened steel block with a hardness of 54 HRC into a finished mould insert for an injection moulding tool is only possible with high-performance tools. So when Ronny Herrmann learned from his Gühring sales representative about the new G-Mould range – a milling cutter range specially for mould making – he was all ears. The new tool range has been specially designed for applications

in tool and mould making and offers innovative solutions especially for hard machining. Gühring does not only supply the right tools for this purpose, but also always a functioning process including cutting data.

Rolf Ehler and Ronny Herrmann put together all the necessary tools for machining and discussed the machining strategy

and possible problems during the production of the mould insert. For example, the machinists faced challenges with two deep drilled holes with an eight-millimeter diameter and a depth of 137 millimeters as well as several deep and narrow cavities.



Explaining the process together: Albert Kodraj (Gühring) and Ronny Herrmann (Vogt).

## Top tools for hard machining

Vogt AG relies on a milling cutter from the new Gühring mould making tool range for roughing the pockets and slots in the form insert: The G-Mold 65 U solid carbide end mill is the perfect choice for this type of component with hardnesses up to 65 HRC and is used here in the 12 cm diameter design. Even deep and narrow cavities are no problem for the four-fluted ratio end mill, which has a neck clearance. It also gives Vogt AG a real time advan-

tage, as the tool is particularly suitable for dynamic GTC milling with low lateral in-feed. Its special flute profile with a strong core increases stability, while a particularly hard Signum coating ensures temperature-resistant performance and longer tool lives.

The cooling holes in the form insert are made precisely with the EB 100 single-fluted gun drill with a diameter of eight millimeters. The powerful tool effortlessly masters this drilling process to the desired depth of 137 mm and is characterised by particularly tight drilling tolerances. This performance results from the optimal combination of carbide, geometry and the high-quality SuperA coating, making the drill ideal for demanding hard machining. The solid carbide design of the EB 100 reduces tool vibration while ensuring excellent stability during the drilling process. The brazed version of the EB 100 offers outstanding concentricity values.

Gühring tools were also used for milling the M6 fastening threads and for hard reaming. These tools had very long tool lives and surface finishes.

## Process cut by three weeks

By manufacturing its tools and moulds in hard machining now, Vogt AG was able to significantly reduce the throughput time and thus shortened the process by as

much as three weeks. In addition, there are no entire process steps, such as grinding in reworking. The time saving in subsequent, cost-intensive process steps is also particularly relevant. This means that the effort required for countersink eroding is significantly lower, because Gühring tools enable pre-milling close to the contour during hard machining. Thanks to Gühring, Vogt was even able to improve the quality and accuracy of the component – an important aspect, because only a perfectly manufactured mould insert can ultimately produce high-quality products.

For Ronny Herrmann, the hard milling pilot project fully met all expectations, and one thing is clear to him: “Hard machining will be expanded even further in the future, and Gühring will continue to be our partner in tool procurement.” The project showed that “as a tool manufacturer with a great deal of expertise, Gühring also offers solutions for problems one does not encounter everyday.”



## G-Mold 65 U

Art. no. 6944 12.000  
Material: Hardened steel (1.2347), 54 HRC  
 $v_c = 120$  m/min  
 $f_z = 0.06$  mm  
 $a_e = 0.6$  mm (0.05xD)  
 $a_p = 17.0$  mm  
 $n = 3,180$  rpm  
 $v_f = 760$  mm/min



## Solid carbide deep hole drill EB 100

Art. no. 5638 8.000  
Material: Hardened steel (1.2347)  
52-54 HCR  
Flute length: 160 mm  
 $f_z = 124$  mm  
 $v_c = 20$  m/min  
 $F = 0.008$  mm/rev

In collaboration with:



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Trochoidal milling in high-alloyed stainless steel

# GÜHRING MILLING CUTTER IN THE MIX



## RF 100 5 Speed

Art. no. 6858  
Material: Austenitic chrome-nickel steel  
(1.4404 / X2CrNiMo17-12-2)  
Ø = 16 mm  
 $v_c = 180$  m/min  
 $f = 3,340$  mm/rev  
 $f_z = 0,21$  mm/z  
 $a_e = 21$  %

When milling wing supports made of highly abrasive austenitic chrome-nickel steel, milling cutters at ystral gmbh fail after just one component. A solid carbide milling cutter from Gühring ensures the necessary process reliability thanks to its two-fold tool life.

Chipped coatings and high cutting edge wear – when milling wing supports, milling cutters at ystral gmbh quickly reached their limits. “After one component, it was over”, recalls Deputy Production Manager Marco Wissmann. “That’s simply not a reliable process.” This high level of wear is due to the material to be machined: 98 percent of the components manufactured on the state-of-the-art milling machines of this attractive employer in the Markgräflerland region are made of stainless, austenitic chrome-nickel steel.



After tests by Tim Zorawski (left) and Andreas Krumnack (right), the result is impressive.

This highly tough stainless steel is resistant to chemicals and therefore perfectly suited to the wing supports installed in large mixing tanks for the pharmaceutical and chemical industries. But at the same time, the material is highly abrasive and difficult-to-machine. Gühring sales representative Oliver Mattes also noticed the many worn milling cutters during one of his regular customer visits to ystral. “When I asked, I learned that many suppliers found this material a hard nut to crack”, he recalls. He knows the challenges of stainless steel processing: Heat causes the material to warp. To ensure that a component with perfect threads and fits is created in the end, the milling cutter must exert only a little pressure on the material. In addition, manufacturing at ystral also runs automatically at night and at weekends – so process reliability is paramount. Confidently, Oliver Mattes offered ystral to start a trial with a Gühring milling cutter – and had just the right one in mind: the RF 100 5 Speed.



Working together to find a solution: Marco Wissmann (ystral) and Oliver Mattes (Gühring).

## Gühring milling cutter puts an end to chip nests

“The speed is optimal for this application because it is particularly strong in V4A”, says Oliver Mattes. The solid carbide milling cutter from Gühring ensures extreme metal removal rates even in difficult-to-machine materials with the highest process reliability. With five teeth and a large helix angle of 38°, it is perfect for roughing. The RF 100 5 Speed is also equipped with a 9° back rake angle and offset chip breakers – a major advantage, as Wissmann explains: “When we used tools without chip breakers, chip nests were constantly formed in the machine as chip removal was not possible.” The machine had to be stopped constantly for chip removal. “We save this time now because the much shorter chips are simply flushed out”, says Wissmann happily.

## Overcoming all the hurdles

The wing supports with 200 to 230 mm diameter are manufactured as turned parts. The wings, which later serve to disperse the liquids in the tank, are then milled out on the milling machine. This milling operation is carried out in the trochoidal process. The milling cutter moves in an elliptical circular motion and plunges into the material with its entire cutting edge length. This highly dynamic milling technology means that process reliability, tool life and time savings are particularly high – and the RF 100 5 Speed is perfect for this, as it enables up to 10 percent lateral infeed.



**2x**  
tool lives with the same  $v_c$



**5**  
milling cutters less per series

The contour is then finished with the same tool. The surface quality plays an important role here, as the finished wing supports must have an Ra value of 0.8 mm.

In terms of cutting values, Gühring is guided by the previously used tool of a competitor. Marco Wissmann explains: “The average values set the times that we have to keep achieving, because we didn’t want to work slower.” The production manager explains that the count began immediately: “Old milling cutter out, new one in; once it is up and running, we buy it.” After extensive tests by Tim Zorawski and Andreas Krumnack, the result was convincing. The high-quality SuperA coating of the RF 100 5 Speed breaks off significantly later, so that instead of the previous one component, the Gühring milling cutter can be used to produce two components. “I was also impressed by the fast delivery time”, explains Wissmann. “Whenever we need something, an application technician is always there quickly. This service is simply very good.” Oliver Mattes is also satisfied with the result: “There are always a few hurdles with such a material, but they were all solved in a very reasonable time.”



In collaboration with:



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Be it ceramic or carbide

# DIAMOND NOZZLE HAS BEEN PRINTING WITHOUT WEAR FOR THREE YEARS



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**AIM3D develops and distributes granulate extruders for serial 3D printing. But when customers want to print carbide or ceramics, the company had a long period when it was unable to guarantee reliable processes. The problem: The printer nozzles could only withstand the abrasive materials for a short time. This meant that the size of the piece-printed components made of this wear-inducing material was also restricted due to the nozzle. A new diamond nozzle from Gühring changed everything.**

The company was founded in 2017 as a spin-off from the University of Rostock, and today has 500-square-meter head-quarters near the port of Rostock. What makes these printers so interesting, especially for series production, is their unique extruder technology: Each printer has at least two granulate 3D printer heads. In this way, several materials can be printed at the same time with just one printer. This dual printing process is interesting for many sectors that use 3D printing as a forming process, e.g. the production of green parts made of metal or ceramic. The components are then sintered, leaving the metal or ceramic parts. Well-known customers from the automotive industry already use AIM3D printers in prototype production and testing, with the aim of one day transferring 3D technology to series production.

### Material eats through standard nozzles – but not Dianoz

"The initial inquiry from our customers is normally: 'I have a material and a problem – can we sort this out with your 3D printers?'" says Tim Weidner, who is in charge of process development at AIM3D. The materials to be printed are wide-ranging and, in addition to carbide and ceramic, also comprise all engineering plastics, including high-performance plastics such as Ultem or PEEK.

But although the AIM3D printers can easily print serial materials like these, the sticking point is often caused by a rather inconspicuous yet important part of the printer: The nozzle. "When printing carbide and ceramic, we work with hardened steel nozzles at the very least, but even they aren't enough for the highly abrasive field", Weidner says. "Here we tried a range of solutions on the market, but unfortunately we didn't have the best experience." He often found that the hardened steel and ruby nozzles were simply not produced to a high standard of quality. As a result, some customer concerns could not be met: "If I am given a very challenging material by my customers, my printer is only as reliable as the printer nozzle", says Weidner.

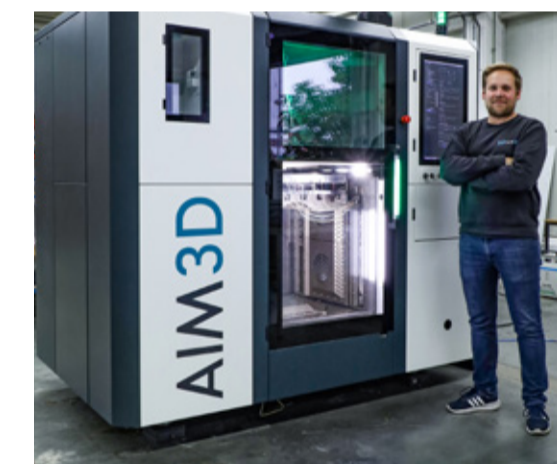
### Diamonds are 3D printers' best friends

The solution revealed itself to AIM3D at a trade fair in 2019 when Gühring presented its new "Dianoz nozzle". The world's first diamond-tipped printer nozzle promises almost infinite printing without any wear because, as the hardest natural material in the world, diamond offers the best wear protection – including as an insert in the nozzle tip. At the same time, it conducts heat extremely well, ensuring even material extrusion and smooth surfaces. AIM3D received a prototype of the diamond nozzle to test it in its 3D printers. Four years later, Tim Weidner's conclusion is: "The thermal

conductivity is indisputably high and the wear resistance simply cannot be beaten." First and foremost, it is this resistance to wear that makes all the difference when printing. For example, the printing time for very large and complex components is up to 24 hours and sometimes even several days. Depending on the material, it may not be possible to finish printing this component with one standard nozzle in cases like this. Theoretically, the printing process could be stopped and the nozzle could be replaced. In practice, however, this is rather impractical, because the new nozzle must then be screwed back into the exact same position so that the height on the component is not offset. Even the smallest deviations in nozzle positioning and assembly may subsequently be visible on the component and may even impair its stability and functionality under certain circumstances.

### 10 kilograms of printed glass fibre-reinforced plastic

The importance of this wear resistance has also been demonstrated, for example, in the printing of a high-strength and extremely wear-resistant ceramic silicon carbide: A steel nozzle was so worn out after just two hours that the nozzle outlet had expanded from 0.4 mm to 0.6 mm. In these circumstances, it was not possible to finish printing the component.



Tim Weidner is in charge of process development at the printer manufacturer AIM3D.

"The problem of wear with ceramic printing is as old as our company itself", says Weidner. In contrast, the Dianoz nozzle showed no changes after printing the silicon carbide – even after several weeks of use. The Dianoz nozzle also showcases its strengths when printing other extremely abrasive materials: For example, it can print 10 kilograms of plastic, which is 30 percent filled with glass fibre, without any wear. For AIM3D, whose customers often print precisely this type of glass fibre-reinforced plastic, this is a real hit. Weidner sums it all up: "If a nozzle does not manage to withstand printed material, we have to switch to a better one; that's always when we reach for the Dianoz nozzle. Dianoz was the first nozzle that enabled us to print certain component sizes reliably."

### Consistent quality guaranteed

At the moment, AIM3D uses four nozzles in different diameters. The oldest nozzle has been printing for over three years – and can handle any material. However, the company also recommends the Dianoz nozzle to its customers when they purchase a printer to be used to print carbide or ceramic, for example. "Then we offer Dianoz as a standard nozzle", says Weidner. "After all, customers expect our product to always deliver the same quality, and that's only possible with the right nozzle."

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About 110 years ago, Henry Ford introduced the assembly line into his factories – changing the entire manufacturing industry as a result. Today, there is a new technology that also has the potential to change everything: 3D printing. Will 3D printers soon be lining up in production halls and printing complex components made of carbide and steel in series production? This, at the very least, would be possible with the 3D printers from AIM3D.



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### Machining Wikipedia: the Gühring Academy

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