



IMPULSE

MAPAL TECHNOLOGY MAGAZINE | EDITION 75



Cover story:
Electronic actuating tool makes
milling-turning centre an all-rounder

**Dear business partners,
dear readers,**

I would like to seize the opportunity to give you an insight into the MAPAL Group's economic situation and future prospects. It has been a difficult year for MAPAL as well as the entire precision tool manufacturing sector. The economic crisis, the technological change in the automotive industry and the coronavirus crisis led to a decline in sales to 460 million euros for the MAPAL Group in 2020. Presently, we assume that in 2023, MAPAL will again achieve a sales volume similar to that before the coronavirus crisis. For the year 2021, we are expecting an increase in sales of ten to 15 percent from today's perspective.

Why am I optimistic in my predictions? I am optimistic because we focus on what we are, what we have been and what we want to remain: your reliable partner for machining production with innovative, productive and high-quality solutions for your success.

We join you on your path. For example, we are developing further towards electric mobility together with you – with comprehensive solutions for machining the parts that are now required. We tap into further areas of machining production. In the aerospace industry, we support our customers in the final assembly, parts production and machining of structural parts with a profound process understanding and optimum tool solutions. We have also intensively studied the customers' requirements in the die & mould sector and can make a real difference as your partner. Moreover, we have raised very interesting potential in the general machining industry as well.

We acquire our knowledge at the grassroots level, keep learning more about the specific requirements of the market segments and accordingly expand our offer in a sustainable way. We have been doing this successfully for

the last few years in the areas of cutting materials and coatings, and now, we are using this expertise in the ranges of tools with indexable inserts for boring and milling.

Basically, it's about understanding your requirements as well as your processes and finding solutions for them. We take great care in doing this, as e.g. the new hydraulic chucks of the UNIQ series show.

Dialogue with you is at the heart of everything we do. Requirements arise from dialogue; solutions arise because of dialogue.

That's why I very much look forward to talking to you in person at the EMO in Milan in October.

Yours sincerely,

Dr Jochen Kress



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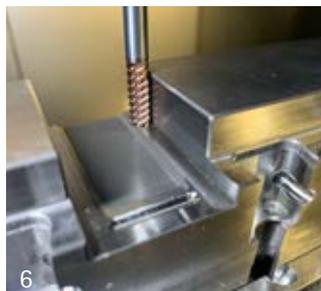
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Guest article: Victoria Sonnenberg
Layout and design: Alexander Rückle

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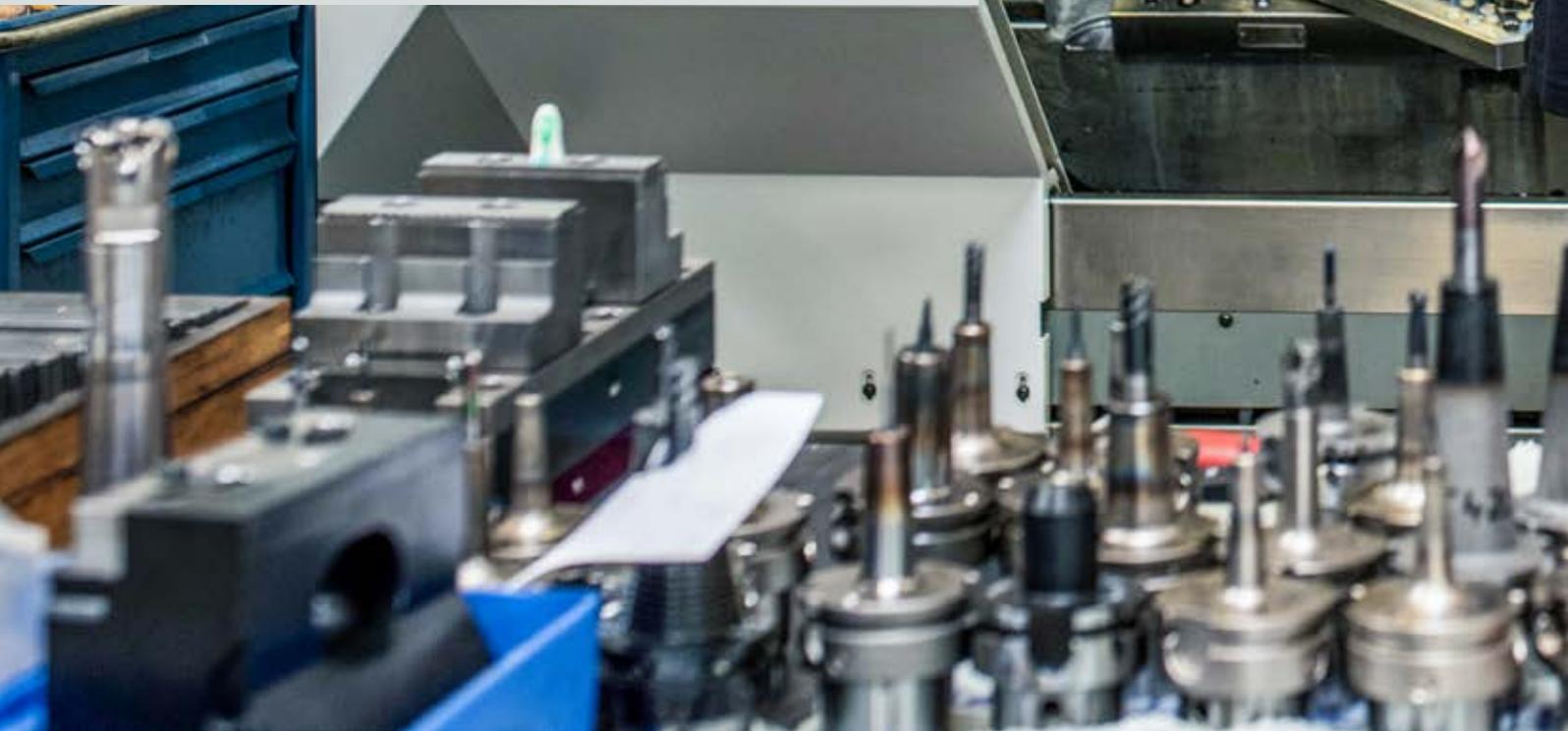
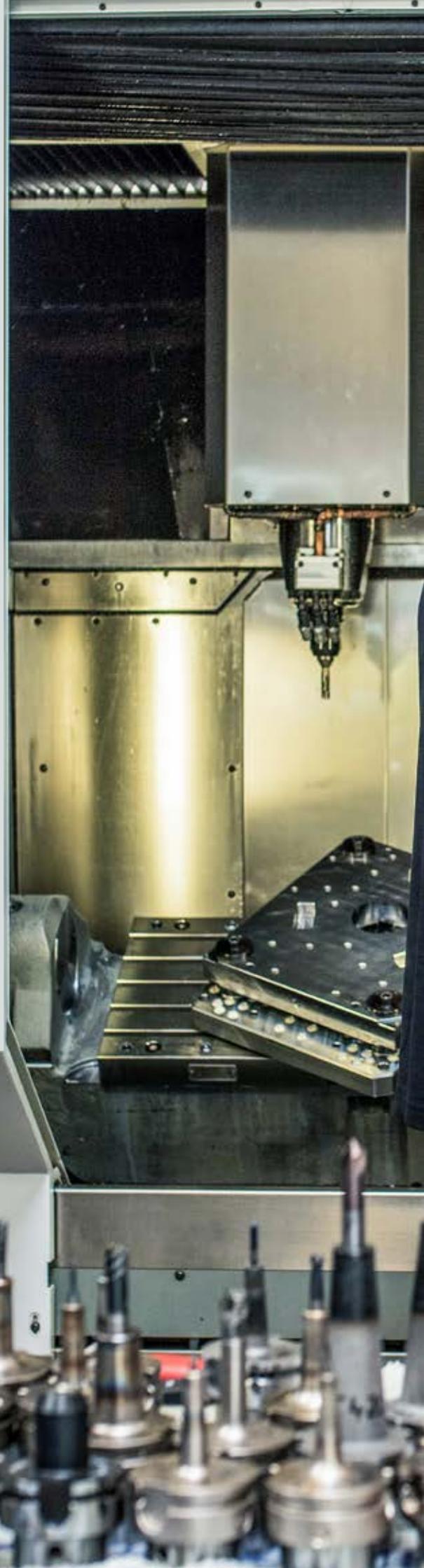
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Flexibility and productivity with
solid carbide tools

OPTIMISATION IN MOULD MAKING

In the space of six years, Marco Schülken has thoroughly transformed the Thuringian toolmaking company he took over in 2015. With his 30 employees, he was able to attract customers in various sectors and enter new markets, including the ones abroad. MAPAL came into play when looking at optimising production processes. →

Despite a wide variety of manufacturing requirements, Schülken Form strives to handle everything with a standardised tool list capped at 300 different types. (Source: Schülken Form)





The predecessor company Ralf Grübel Werkzeugbau GmbH was a third-generation owner-managed company from Walterhausen in Thuringia, which Marco Schülken was able to take over as part of a regulated succession. By changing the company name to Schülken Form GmbH, the new owner made it clear that the new brand would also bring a breath of fresh air to this long-established die and mould making company.

In the past, Grübel supplied more than 90 percent of its products to the automotive industry. Marco Schülken has successfully abandoned this lopsided focus. The automotive share is currently less than 25 percent. Today, Schülken Form's main clients are companies in medical technology and packaging industries. In the medical sector, the Thuringians boast a strong position in the area of injection moulds for pipettes and blood lancets. Lancets are lancing aids for diabetics. However, now they're also being used for coronavirus tests.

„We achieve high production quantities for our customers in the shortest time possible,” says Marco Schülken, explaining his company's expertise. With high-speed moulds that have up to 128 cavities, Schülken Form is at the very high end of die and mould making. This was also recognised with their selection as „Toolmaker of the Year” in 2016, 2018 and 2020. Schülken has increased its export share to over 60 per cent in recent years. The company currently supplies Poland, Russia, Belarus and Switzerland. It is currently preparing to enter the markets in Singapore and Vietnam. In Russia, the Thuringians founded a subsidiary in 2016.

PUTTING EVERYTHING TO THE TEST

In addition to the focus on new markets, Schülken Form also underwent extensive internal restructuring. “We've looked at almost every machine and every process in the company and have invested a lot in this”, the Managing Director reports. Manufacturing Manager Marcus Vogt was involved in this restructuring process from the very beginning, and he is constantly asking himself how the company's performance can be further improved. While there are always new developments in wire eroding or die-sinking eroding, milling is the fastest-moving machining technology. “You have to be constantly searching for ways to change and improve things”, says Vogt.

The Grübel company had already realised the importance of good machines and used only Hermle machining centres for milling. However, this classic tool shop still operated more like a craftsman's establishment. The employees created

their programmes directly on the machines themselves. Vogt saw an urgent need for action here: “Before we tackled the milling tools, we revised the entire process chain. We set up programming workstations and switched the whole manufacturing process to a new system.”

HARD MILLING ADDS FLEXIBILITY

The next step was to approach the actual technology with the key question of how the parts could best be machined. “The classic way in toolmaking is, after all, either pre-milling, hardening and subsequent grinding or die-sinking EDM”, says Vogt, describing the initial situation. In order to make production more flexible depending on the manufacturing workload, Schülken has added hard milling. Although parts are still manufactured using the traditional method in Waltershausen, starting the milling process



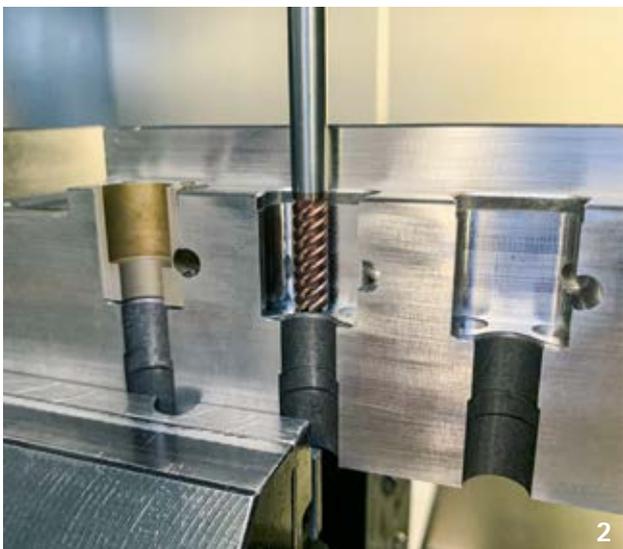
1 After initial tests for roughing a slide, Managing Director Marco Schülken and Manufacturing Manager Marcus Vogt inspect the tested MAPAL NeoMill-4-HighFeed-90 high-feed milling cutter.

2 With the MAPAL OptiMill-Hardened-Finish, Schülken Form mills pockets for mould cores on the slide for a 64-compartment tool. The left side of the picture shows a mould core already fitted in the pocket.

3 With a hardness of 56 HRC and cross holes, the frame insert to be machined places very high demands on the deep hole drill.

4 With the MAPAL deep hole drill, Schülken Form succeeds in drilling deep bores in hardened steel with cross bores.

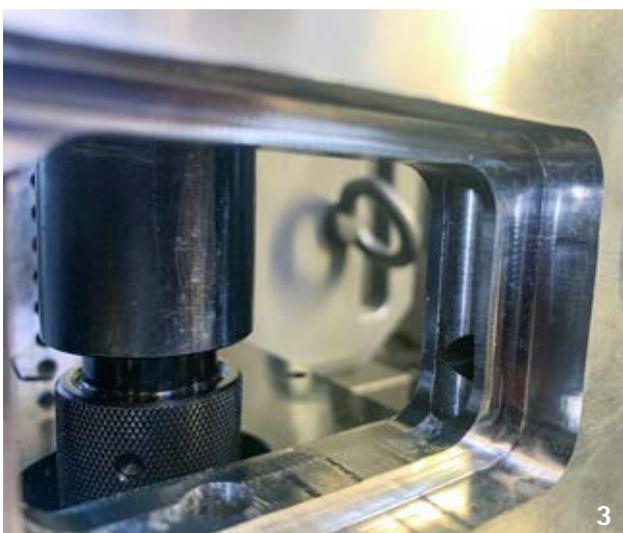
5 MAPAL product specialist Felix Wendler explains the special features of the deep hole drill to machine operator Riccardo Pfeifer at Schülken.



immediately after hardening no longer poses a problem, especially when things have to move quickly. "Today, we've reached the point where we can choose a lot of machining operations according to the workload of the individual departments," Marcus Vogt enthuses.

This was not the end of the optimisation measures, though. When Schülken Form was looking for new milling tools for high-feed roughing, it was around the time that MAPAL began to enter the Die & Mould sector. Similar to Schülken, the precision tool manufacturer from Aalen had set itself the goal of reducing its dependence on the automotive industry by exploring other sectors.

In the future, MAPAL has set a clear focus on market segments, explains Uwe Rein, Sales Director Die & Mould MAPAL. Besides the traditional Automotive sector, he particularly cites the segments Aerospace, Die & Mould sector and General Machining. "We operate very selectively and systematically in the Die & Mould sector", says Rein. For three years, the company has been working towards market entry in September 2020 and has developed a product range especially for this segment. The result is a specialist catalogue with around 6,500 articles. →



TOOLMAKING IN TRANSITION

Unlike the automotive industry where MAPAL has been very successful for many years, particularly with custom tools for large quantities, the requirements of the Die & Mould sector initially appear to be quite different. The focus here is always on individual pieces or small batches, which need to be machined with standard tools as far as possible, so that the companies can process a wide range of orders with these. However, a change has also begun in classic toolmaking, and this is already clearly visible at Schülken Form.

"The trend is towards industrial toolmaking", Marcus Vogt sums it up. "In the past, all we cared about was releasing a decent part. Nowadays, we also have to look at the times." Digitalisation and automation are also filtering into the Die & Mould sector. Vogt schedules the manufacture of all parts for each department with a specific time in advance. It may not be a matter of seconds, but it is still a matter of minutes. Process reliability plays an increasingly important role when it comes to achieving the specified times.

The materials that have to be machined are becoming more and more challenging. Today, stainless steels with a chromium content of 13 percent are common, resulting in increased tool wear. The ductility of new powder-metallurgical steels also imposes a challenge. Here, dimensional accuracy and surface finish are important aspects.

COMPARISON DELIVERS CLEAR RESULTS

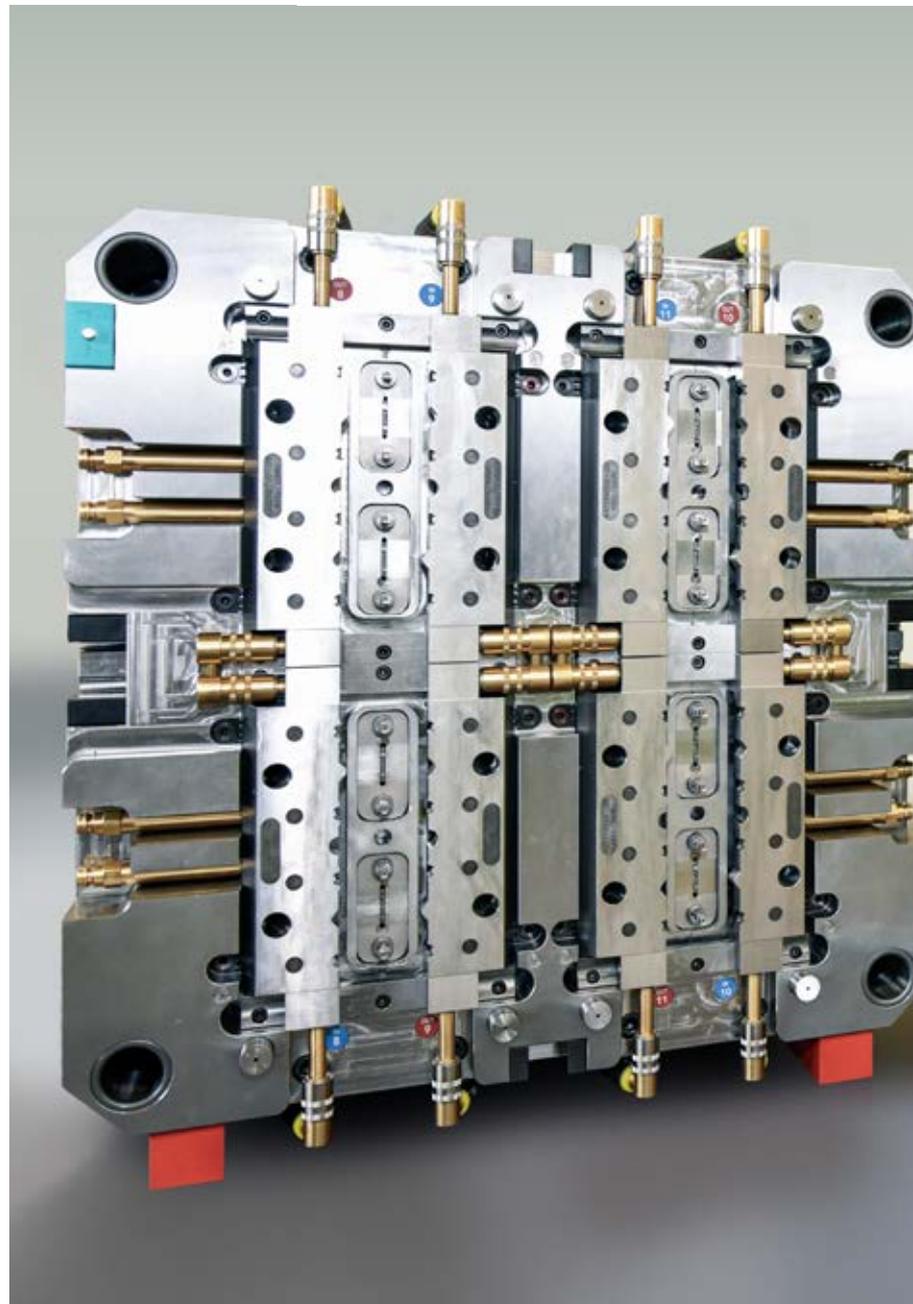
The bar was already high when Schülken tested the OptiMill-3D-HF-Hardened, the first MAPAL tool. Due to its special lens head geometry, this high-feed milling cutter made from solid carbide is suitable not just for roughing, but also for high-gloss finishing of planes in hardness up to 68 HRC. This matched Marcus Vogt's requirements: "We don't want a special tool for a special machining operation. I always choose tools that allow me to tackle several areas. These are exactly the kind of solid carbide tools that allow me to do both hard and soft roughing."

The results achieved with the solid carbide high-feed milling cutter were immediately impressive, resulting in this roughing tool with its higher performance being included in Schülken's standardised tool list instead of the previously used tool from another manufacturer. The Manufacturing Manager limits his tool set to 300 different types and claims to be able to meet all requirements with it – even though no two parts are the same. "From now on, we don't use any other tool than MAPAL's milling cutter for the corresponding applications," says Vogt.

This also applies to the next tool Schülken subjected to a comparative test: the finishing milling cutter OptiMill-Hardened-Finish, which can finish up to 68 HRC surfaces with a $3 \times D a_p$ material removal rate in one cut. Vogt describes how enthusiastic the machine operators are: "When it comes to finishing hardened high-alloy tool steel 1.2083, the milling cutter impressed greatly with superior surfaces and a long tool life. Among other things, small pockets are milled to fit

6 *Guideways for the slide of the 64-compartment tool are cleanly finished with the MAPAL Opti-Mill-Hardened-Finish.*

7 *Dimensional accuracy is crucial for Schülken Form. CNC milling specialist Jens Kornhaas inspects the manufactured parts. (Source: Schülken Form)*



A finished injection mould. (Source: Schülken Form)



with this tool." After the two solid carbide milling cutters, Schülken is currently testing a high-feed milling cutter with indexable inserts: MAPAL's NeoMill-4-HiFeed-90, whose positive cutting edges produce a soft cut.

THE FINAL FRONTIER HAS BEEN CROSSED

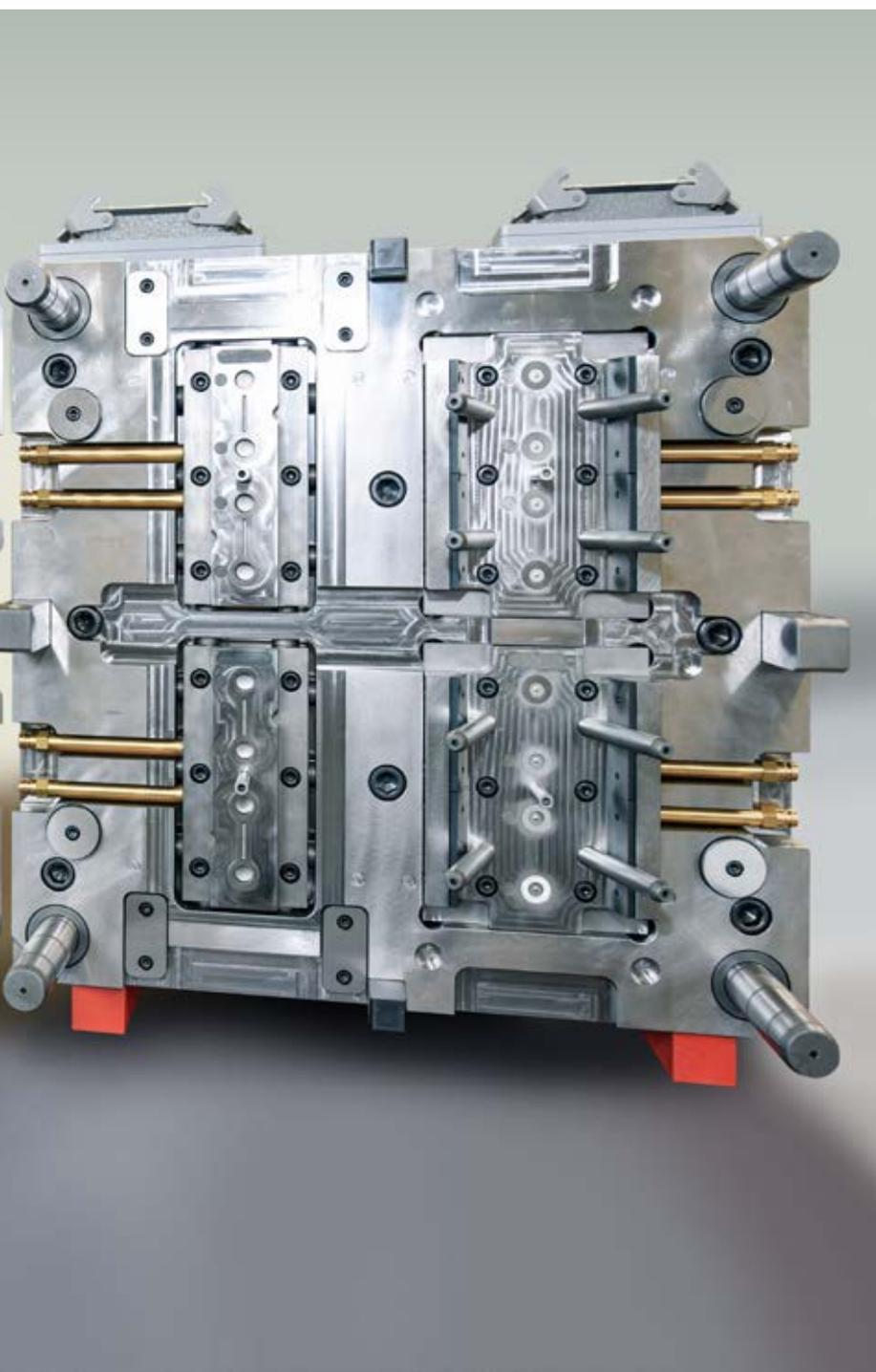
In close cooperation with MAPAL, Schülken is also venturing into areas that were previously considered extremely problematic, e.g. deep hole drilling in hardened steel with cross bores. With this, the company from Thuringia is crossing the final frontier to produce a completely hardened mould insert. Thanks to several saved machining steps, Schülken has now halved the machining time for these mould inserts to two weeks. The drill is a good example of MAPAL's customer-oriented tool development.

With a diameter of 8 mm, it achieves depths of 20xD and has some special features. It has a specially shaped chip flute that supports the drill against twisting and makes the tool very stable. The flute gives the chip a very unique shape, which aids in chip removal. The pyramid tip provides significant support for the spot drilling behaviour after the cross bores have been broken through. The tool supports itself in the bore using four guiding chamfers and takes over the guidance when the tip is in a cross bore. The only downside is that this drill is currently still a custom tool. Nevertheless, if there is sufficient demand, MAPAL is considering including it in its standard range.

AVAILABILITY OF THE TOOLS MAKES ALL THE DIFFERENCE

Schülken demands performance in more than just machining, as Vogt explains: "When it comes to selecting tool suppliers, we want the tools to be available immediately, and that if a problem ever arises, I want to have a contact person who knows what they're talking about." This contact person is Product Specialist Felix Wendler, who is responsible for the Die & Mould sector and is based at the MAPAL site in Meiningen. He considers it important to be on site with the customer, especially when testing new tools: "I like to hear how the tool sounds during machining. One can deduce a lot from that. When I see and feel surfaces, I can tell what needs to be changed to make it work better."

MAPAL's logistics concept ensures that the standard tools are quickly replenished. Of around 6,500 items that are in the catalogue for the Die & Mould sector, the majority are available within 24 hours. Somewhat more specialised dimensions can be delivered within five days. This is very convenient for Schülken Form, which has less and less time to produce its complex injection moulds. ■



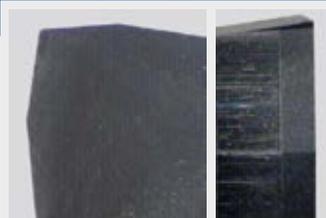


WHY RECONDITIONING IS WORTHWHILE FOR YOU!

If regrinding costs 20 percent of the price of a new tool and complete reconditioning costs around 65 to 70 percent, then the reconditioning of tools is an economic alternative to buying new ones. Victoria Sonnenberg, Editor of the trade magazine MM Maschinenmarkt, spoke to Carsten Lehmann, Managing Director of Sales, Product Management and Development at the MAPAL Centre of Competence for PCD tools. →



New – intact



Slight wear

→ **Regrinding**



Chipping of the cutting edge

→ **Retipping**



→ **New cutting insert required**

A PowerMill PCD milling cartridge in a new condition and with various stages of wear. Specially trained staff at the Centre of Competence for PCD tools assess the type and severity of the wear and then determine what repair is required.



Carsten Lehmann is Managing Director of Sales, Product Management and Development at the MAPAL Centre of Competence for PCD tools.

Mr Lehmann, how long has MAPAL offered the option of reconditioning and why?

Our tool systems with PCD cutting edges soldered onto cutting edge supports provide the optimum conditions for being used multiple times. It therefore made sense from the very beginning to recondition worn tools to provide repeatable benefits for customers. Consequently, all our PCD tools can be reconditioned, with the exception of the ECO and ECO Blue PCD standard milling cartridges, which are specifically designed for single-use.

What challenges come with the process?

The type and complexity of reconditioning depends on the condition of the supplied tool on a case-by-case basis. Work ranges from simple regrinding to partial tipping with new cutting edges and complete tipping, to reconditioning or modification of damaged tool bodies. A fast response time must always be guaranteed, irrespective of the actual effort involved.

Does it make sense economically to recondition PCD tools right from the first milling cutter?

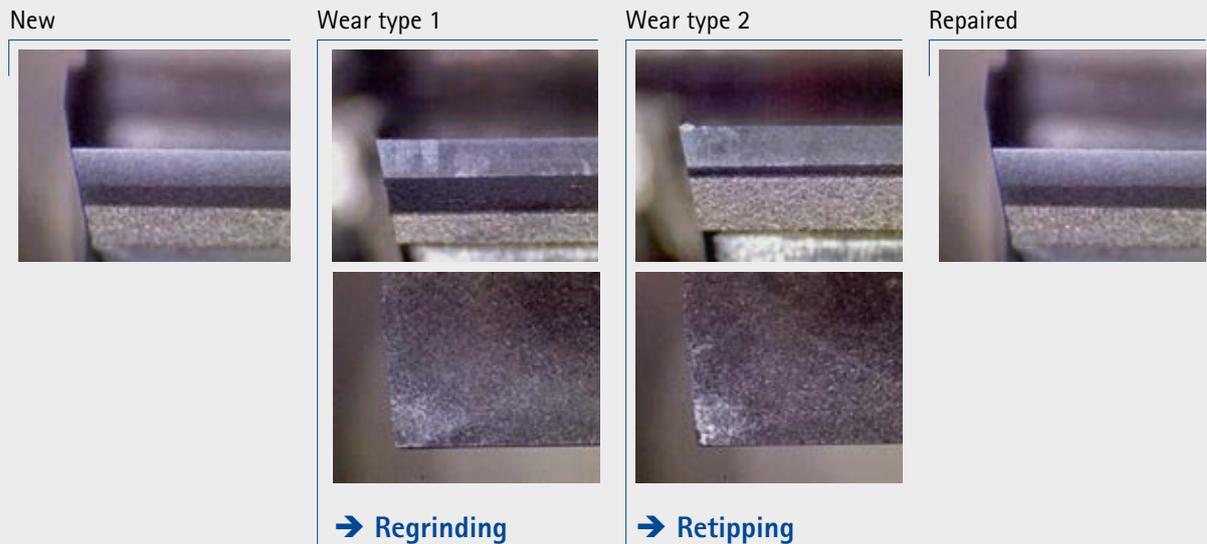
Yes, absolutely.

Up to what degree of wear is reconditioning possible?

Since reconditioning comprises several stages, the tool life of PCD tools is in theory very long. Depending on the application and the correspondingly defined cutting edge overhang, we regrind, erode or laser the worn cutting edges. In this case, retipping the cutting edges is not (yet) necessary. Regrinding like this can be carried out up to five times.

Close-up of a cutting edge of a PCD boring tool with brazed cutting edges. The cutting edge is either reground or retipped depending on the type of wear.





If regrinding isn't possible, there is, as mentioned, the option of retipping the PCD cutting edges. If the tool body is in a perfect condition mechanically, this process can theoretically be repeated almost indefinitely. PCD tools can therefore be continuously reconditioned until the tool breaks or the tool body is damaged in a way that impairs safety.

What are the advantages for customers?

The biggest advantage is cost savings. Depending on the degree of reconditioning, regrinding costs approximately 20 percent of the price of a new tool and complete reconditioning costs around 65 to 70 percent. It's therefore absolutely worth it financially to have your tools reconditioned. On top of this, there are time savings thanks to the shorter reconditioning time compared to the time it takes to produce a new tool. The customer doesn't have to compromise on quality in any way. When the PCD cutting edges are completely retipped, the customer receives the tool back in a geometrically new condition.

Is a reconditioned milling cutter the same as getting a new one?

Yes. The tool even looks almost like a new tool, provided it has been reconditioned to manufacturer quality.

How would you describe the process of reconditioning?

We receive the tools in our goods receipt department. Specially trained technical staff carry out a detailed assessment there. They determine what kind of repair is required, whether that's regrinding, partial or complete tipping or, in some cases, repairing the tool body. Incidentally, the prices of the various standard repairs are already fixed. They are generated and saved

directly when the new tools are priced and can be transferred directly to the order and confirmed to the customer after determining what repair is required.

Once the customer has approved the repairs, the tools undergo the repair process. For this, we have our own production line where the same manufacturing equipment and methods are used as for new tools. The quality inspection is carried out during production. Here too, we consider it very important to work with exactly the same inspection processes and methods as we would with new tools.

Before the tool is returned to the customer, a final check is carried out where all functionally relevant dimensions are logged.

Do you also offer reconditioning for third-party tools and for markets outside of Germany?

Yes, both. In order to recondition third-party tools, we just need details of its application, component tolerances and main tool dimensions. We provide the reconditioning service worldwide. More than ten MAPAL production sites around the world are equipped with identical machine equipment and production and quality assurance processes. ■

ACTIVE IN THE VDWF (GERMAN DIE AND MOULDMAKING ASSOCIATION)



The VDWF association sign in the foyer of the MAPAL headquarters in Aalen. In front, Andreas Enzenbach, Vice President Marketing and Corporate Communications.

MAPAL has consolidated its membership of the VDWF (German Die and Mouldmaking Association) and is now present as an entire company in the association.

MAPAL became an official member of the VDWF on 1st February, 2021. The company is thus reaffirming its previous commitment through WEISSKOPF Werkzeuge, the MAPAL Centre of Competence for solid carbide tools in Meiningen. „We've come to appreciate the association's work in recent years and we're now excited to expand the network. As a new player in the die and mould sector, VDWF is an excellent venue for us to target new customers," says Andreas Enzenbach, Vice President Marketing and Corporate Communications. MAPAL wants to use contact with members of the association to exchange experiences and information as well as to contribute in the area of precision tools and process solutions with its broad expertise. The company is also involved with presentations at themed and specialist conferences organised by the association as well as in research projects.

INTERNATIONAL NETWORK

The VDWF was founded in 1992 and is headquartered in Schwendi. The concern of the association is to strengthen the German die and mouldmaking industry. Members include service providers, contract manufacturers, suppliers and machine manufacturers as well as universities and research institutes. The VDWF has been a member of the International Special Tooling and Machining Association (ISTMA) since 2019 and is thus part of a global industry network. Representing the interests of die and mouldmaking companies around the world, the ISTMA has around 8,300 members. ■

PARTICULARS



MARK THUM | CSO | MAPAL USA

On 1st May, Mark Thum (54) joined MAPAL in the USA in the position of CSO (Chief Sales Officer). In this role, Mark is the executive leader for the sales activities of MAPAL in the United States and Canada. Mark will provide the executive leadership and strategy to achieve market share growth in line with MAPAL's vision and values. He will lead the management of the entire sales department, is accountable for the overall sales department performance, and the alignment of the business's strategy. Mark will work with John B. Hoy II who now leads the Global initiative for Trade and Distribution. John's focus will be on the indirect sales channels areas, which have

become increasingly more important. Mark and John will work together to continue the growth of new market segments and to extend the core business with the automotive industry and suppliers.

Mark Thum brings along 20 years of experience in the area of sales and marketing of precision tools. He completed his studies in Industrial Engineering at Oregon State University. Thum: „I'm looking forward to my new job. One of my main tasks will be making users and customers even more aware of the added value that our tools and machining solutions offer.“

In the USA, MAPAL is present with two sites for production, sales and service in Port Huron (Michigan) and Fountain Inn (South Carolina) and employs around 200 team members.





"I'm very satisfied with the progress made with UNIBASE-S. For the future, even further expansion is conceivable by adding a larger drawer system for tools with tool holders" Dr Alexander Ludwig

Photos: Klaus Vollrath



Compact, easy to use and connected to the ERP system

PRACTICAL STORAGE SYSTEM FOR TOOLS AND ACCESSORIES

In modern production departments that are equipped throughout with IT connections to the machines, those responsible have a constantly updated overview of the most important processes in production. A central, IT-supported management of operational resources and processes (Enterprise Resource Planning, ERP) optimises the process. However, there are often still shortcomings in the management of tools. They are often scattered throughout production in various drawers and containers. Due to the insufficient overview, order processes are partly random. A storage system such as UNIBASE-S can redress this situation.

"We are a European technology and market leader in the manufacture of sophisticated electric drive systems for wheelchairs, stair lifts and push aids and even for agriculture", explains Dr Ing. Alexander Ludwig, Managing Partner of AMT Schmid GmbH & Co. KG in Sauldorf-Krumbach. As is often the case in this region, a resourceful entrepreneur founded a workshop here in what was formerly a farm forty years ago which has since developed into a high-tech company with around 150 employees. The basis of this success story is the perfectionism with which the founding family, Schmid, kept pushing the development of their products. They produced drive systems with properties that are perfectly adapted to the very specific requirement profile of the respective fields of application. In the case of wheelchairs, criteria such as speed, range and power reserves for overcoming obstacles, such as kerbs, play an important role, not to mention other aspects such as robustness, space requirements, weight and noise. This means there are differently designed wheelchair drives for specific user groups such as young people or the elderly which are precisely adapted to the respective requirement profile. These kinds of customised solutions are what the wheelchair manufacturers are looking for for their end customers. The systems produced in Sauldorf-Krumbach are therefore in demand all over the world. →

PERFECTION LEADS TO MORE IN-HOUSE PRODUCTION

"The uncompromising optimisation of our drive systems means that nearly all essential components are custom-made", adds Dr Ludwig. Apart from a few standard parts such as screws and washers, everything is constructed and also manufactured in-house, with a few exceptions such as cast parts. In this area, around 40 employees operate around 20 modern, CNC-controlled machine tools such as gear-milling machines, milling machining centres, automated lathes as well as grinding and honing machines. On the one hand, the high level of in-house production is cost-intensive. On the other hand, the comprehensive competence on the design and manufacturing process side gives rise to cost advantages, for example through the integration of functions in component design. This also benefits the customers as AMT Schmid can almost always respond to enquiries with suggestions of technical improvements that have significant advantages in terms of function and product features compared to the originally requested design. Customers very much appreciate this consulting expertise.

COST OPTIMISATION REGARDLESS OF SMALL LOT SIZES

"As far as our manufacturing costs are concerned, we have the disadvantage of small lot sizes because of the high number of around 1,000 different products or product variants", Dr Alexander Ludwig explains. In accordance with the company's philosophy, they only manufacture what is ordered by the customer. This means that on the machines, the lot sizes typically get into a mid-range of two or three figures. This entails a correspondingly high changeover requirement. In order to still be able to produce at reasonable costs, the entire area was optimised with iron consistency. This also includes the efficient use of space and the workflow. In

doing so, the company is guided by the world's very best forms of organisation after having carefully adapted them to its own conditions. Quality assurance is also an integral part of this strategy.

THE "BLACK HOLE" OF TOOLS

"Our production with its complex machining and frequent changeovers requires the use of a very large number of different tools, right down to the indexable insert", reveals the AMT-Schmid Managing Director. Precisely such components are often stored directly at the machine by the employees after collection from the central distribution point. This saves lots of walking and workers have the material quickly at hand again when needed. However, if another worker requires the same tool in the meantime, it's not there and they have to take a new one out of the package. This can quickly get on top of you, so you're unclear about the stock situation. Although individual employees are aware of what's happening, the situation was confusing from the point of view of those responsible for ERP. It was also contrary to the company's strict optimisation philosophy and led to the search for a suitable solution.

THE DECISIVE HUMAN FACTOR

"In 2019, Dr Ludwig came to our stand at a trade fair and saw the UNI-BASE-S tool dispensing system", recalls Alexander Schuh, responsible for Business Development Machines and Services at MAPAL. The customer was particularly impressed by the fact that this compact, easy-to-use storage unit for tools, indexable inserts and small parts such as clamping screws can be set up near the workstation in a decentralised manner. This saves employees unnecessary trips. The units only require a 220V connection

There are numerous CNC-controlled systems such as automated lathes, milling machining centres, gear cutting machines or cylindrical grinders in the machine hall.



Photo: Klaus Vollrath

and communicate with the master system either via data connection or wirelessly via WiFi. Another advantage is the option to re-log tools after use, therefore making them available to others. This is an important factor in establishing confidence that there will always be sufficient availability. It also means workers can resist the urge to hoard a certain "emergency supply" of tools at the machine. Therefore, the management pursues the goal of minimising stocks without there being shortages. To achieve this, however, the employees must first be convinced of the new solution. The user-friendliness of UNIBASE-S is very helpful in winning over employees.

STEP-BY-STEP OPTIMISATION

"After appropriate consultation and clarification of any remaining questions, in spring 2020 we acquired two UNIBASE-S units together with the associated master system for our production", explains Dr Alexander Ludwig. Following installation and staff training, the learning and start-up phase began. A few "teething" problems were resolved through remote control software updates. The system was then gradually started up. During the process, the experiences gained in operational practice as well as resulting suggestions for improvement were addressed to the MAPAL developers and gradually integrated into the software. The data of all trans-

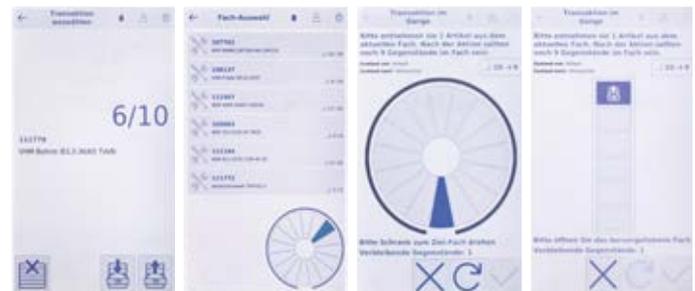
actions land centrally in the ERP system and enable stocks to be properly tracked and optimised. Access is enabled with the same chip that staff use to record attendance time or to pay for food in the canteen. Each employee can be assigned certain authorisations. The aim is to have no tool left at the machines once a job has been completed. Now, the staff are happy with the system. "I'm very satisfied with the progress made with UNIBASE-S in tool management. For the future, even further expansion is conceivable by adding a larger drawer system for tools with tool holders", Dr Alexander Ludwig sums up. ■



AMT Schmid is a technology leader in drive systems for assistance systems such as wheelchairs, stair lifts or push aids as well as for means of transport in fields such as horticulture and agriculture (Photo: AMT Schmid)



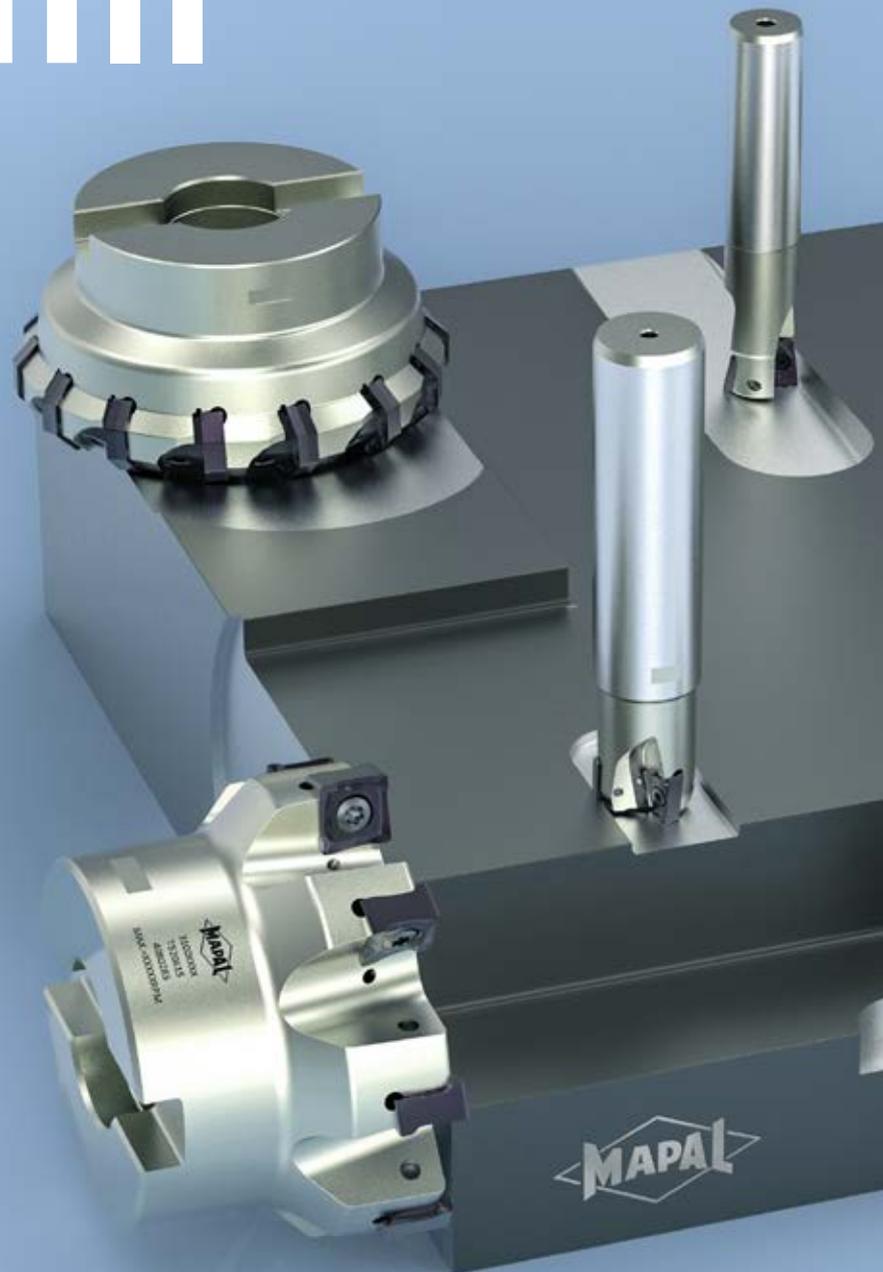
"The proximity of the UNIBASE-S system to the workstation saves staff inconvenient trips, and re-logging the tools after use reduces the tendency of hoarding tools in drawers" Alexander Schuh, Business Development Manager Machines Et Services at MAPAL (Photo: Alexander Schuh)



Easy to use: After the desired transaction has been selected, the drum position is shown. After turning the drum by hand, the compartment is marked with a blue light bar and can be opened. Finally, the transaction must be acknowledged.

PRODUCTIVITY AND COST-EFFECTIVENESS
WITH INDEXABLE INSERT
MILLING CUTTERS

NeoMill



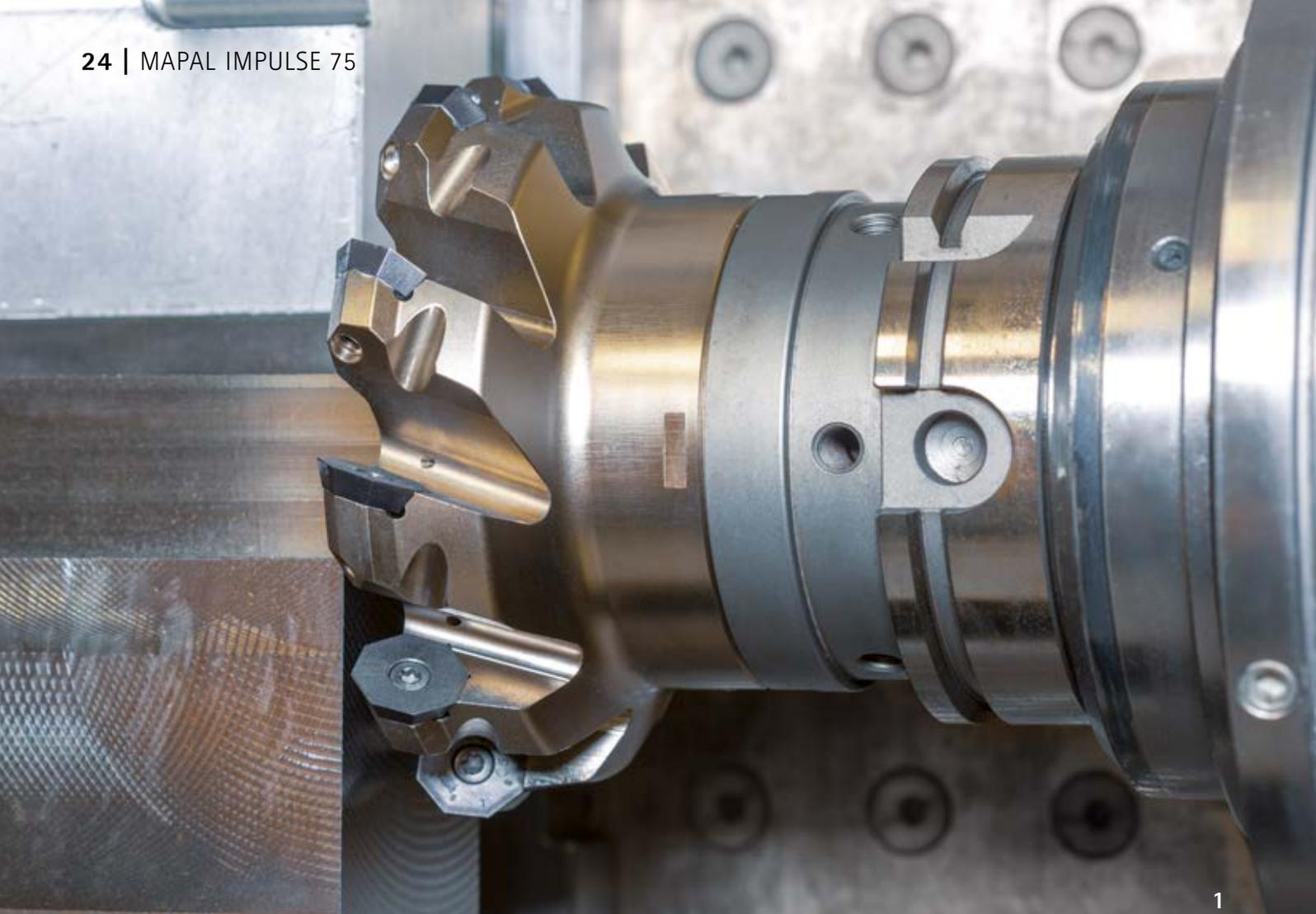


The standard radial milling cutter range NeoMill from MAPAL with its face, corner, slot, shell end and high-feed milling cutters stands for maximum productivity and cost-effectiveness, particularly in series production. During development, the machining specialists were able to draw on their many years of experience with custom tools, which the industry uses very efficiently to produce large quantities at a consistent quality.

What is the smartest way for a tool manufacturer to close a gap in its portfolio? Thanks to close contact with its customers, MAPAL was able to take a closer look at a wide range of milling processes. And developed specific milling tools for these processes which met the highest technological requirements. When the range was introduced in 2018, it laid the foundation stone of the standard milling cutter series NeoMill, which now represents a full portfolio for all milling applications in the roughing and semi-finish areas. With innovative CVD and PVD coatings, MAPAL is able to adapt optimally to the situation on site with the customer.

„Custom tools have become standard tools that offer the highest productivity and cost-effectiveness“, says Heiko Rup, Product Manager for tools with indexable inserts. Application examples prove that, regardless of the component, in cast iron, steel, stainless steels and heat-resistant cast steel, the costs per part could be reduced by 20 to 50 percent compared to standard tools from other manufacturers. →





1



2



WITHOUT vibration damper



WITH vibration damper

A COMPREHENSIVE RANGE OF INSERTS WITH SPECIAL ADVANTAGES WHEN IT COMES TO COST-EFFECTIVENESS

MAPAL offers the indexable inserts for all milling cutters in a positive and a negative design. Added to this are cutting edges with a wiper component that achieve good surface qualities even without adjustment. This effect is particularly evident in semi-finish machining.

The negative inserts have no clearance angle and can thus also be furnished with cutting edges on the contact surface. As a result, using the same basic shape, negative inserts have twice the number of cutting edges compared to their positive counterparts. This makes the negative inserts particularly cost-effective in combination with the long tool life of MAPAL's indexable inserts. During development, the machining specialists attached great importance to the fact that the negative indexable inserts have an extremely positive cut due to the latest pressing technology. This makes it easy for them to cut at low cutting depths, and the effective rake angles are comparable to positive indexable inserts.

In a specific application case, MAPAL was able to reduce the costs per part by 64 percent for a customer working on the series production of pump housings by using the NeoMill shoulder milling cutter with eight indexable inserts, which was also helped by the lower cutting edge wear. Another user has also benefited from this in its housing production. With the new face milling cutter, it achieved a 112 percent longer tool life, which led to 60 percent lower costs.

The positive inserts are recommended for vibration-prone parts or high-alloy steels: „For particularly difficult applications and high demands on process reliability and cycle time at the same time, the positive inserts are to be recommended because they generate lower cutting forces“, explains Heiko Rup.

OPTION: VIBRATION DAMPENING SYSTEM REDUCES VIBRATIONS AND INCREASES PROCESS RELIABILITY

Milling operations are generally susceptible to vibrations, with results in overstressing of the tool and the machine, as well as in greater noise generation. As a result, users often reduce the cutting parameters and accept long machining times. Even with increased requirements or particularly difficult machining operations, the potential machining values are often not utilised. This is where MAPAL's vibration dampers can make a real difference. Available in standard lengths or customised designs, they ensure quiet and stable machining through vibration dampening. Increased material removal rates of up to 50 percent and up to 60 percent better surface finishes are measurable advantages. In addition, the overall process reliability is increased, as cutting edge chipping is avoided.

OUTLOOK: NEOMILL PRODUCT LINE TO BE EXPANDED

MAPAL is certainly not the only company on the market with radial milling cutters, and yet the company was able to increase its sales of this product group during the coronavirus pandemic. According to Heiko Rup, the bestsellers in the range are face milling cutters with indexable inserts with 16 cutting edges and shoulder milling cutters with negative indexable inserts with four or eight cutting edges, which can rarely be found in the product portfolio of any other supplier.

In 2021, MAPAL is broadening its NeoMill range even further by adding chip guiding stages especially for stainless materials and heat-resistant cast steel materials, as well as additional radii. ■

1 Continuous standard milling programme for highest productivity and economic efficiency.

2 Optional vibration dampers can make a real difference: An up to 50 percent increased material removal rate and up to 60 better surface finishes.



- 1 Brake caliper
- 2 Swivel bearing
- 3 Turbine wheel
- 4 Turbocharger
- 5 Compressors
- 6 Hydraulic pump
- 7 Engine block
- 8 Valve housing
- 9 Transmission



Enhanced turning functions for standard machine tools

ELECTRONIC ACTUATING TOOL MAKES MILLING-TURNING CENTRE AN ALL-ROUNDER

Pictures: Klaus Vollrath



1 The Reiden RX18 is a versatile 5-axis milling machining centre that can be supplemented with a driven rotary table to become a milling-turning centre. (Photo: Reiden)

2 Energy supply and data transfer are contactless by means of an inductive carrier mounted beneath the spindle.

3 Daniel Lustenberger (Head of Marketing and Sales, Reiden, left) and Andreas Mollet (MAPAL Area Sales Manager Switzerland) with the installed TOOLTRONIC.

The Swiss milling and milling-turning centre manufacturer Reiden brought tool manufacturer MAPAL on board in order to meet a specific customer requirement. An actuating tool that meets high standards was required for the demanding internal machining of bores with variable shapes.

"Our machining centres are designed for maximum flexibility for a variety of tasks", says Daniel Lustenberger, Head of Marketing and Sales at Reiden Technik AG in Reiden, Switzerland. In the case of one project in the pipeline, however, the customer's specific requirements were so demanding that Reiden would have found it difficult or even impossible to fulfil them with the usual machining processes. In principle, the task involved creating special inner contours with undercuts. This kind of machining requires the use of actuating tools which have an additional internal axle and can be extended laterally. Users can therefore cut out an annular groove for a seal from the inner wall of a cylinder, for instance.

CONVENTIONAL ACTUATING TOOLS

"There are tried and tested designs for actuating tools, each with specific features", explains Andreas Mollet, MAPAL Area Sales Manager in Switzerland. For example, there are solutions that use the pressure of the cooling lubricant supplied axially via the spindle on a piston to ex-

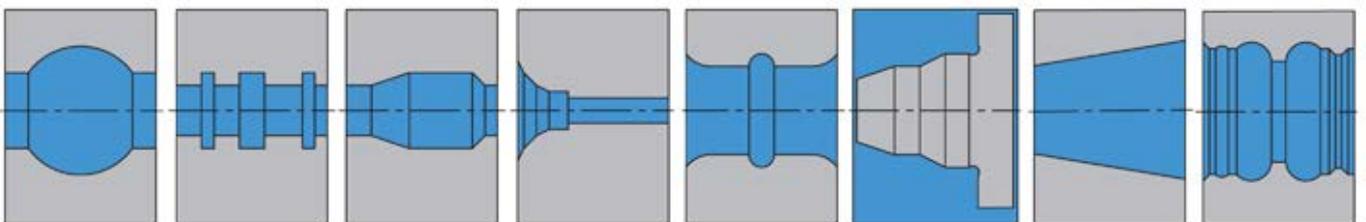
tend the slide or slides. The retracting movement is carried out by a tensioned spring after the controller has switched off the cooling lubricant. Both movements are uncontrolled. There is no feedback if the respective end position has been reached. This means the programmers must provide a correspondingly long dwell time in the NC programme after the corresponding command. An alternative to this involves actuating tools with drawbar operation. The drawbar passes through the spindle axis. The machine controller controls it hydraulically or as an additional NC axis. However, this additional equipment requires a specially designed machining centre with corresponding limitations in terms of the machine manufacturer and cost-effectiveness.

MAPAL TOOLTRONIC - A FULLY-FLEDGED NC SOLUTION

"As an alternative to classic actuating tools, we have developed TOOLTRONIC with complete NC connection", explains Andreas Mollet. The unit, which is equipped with sensors and drives, is supplied with power via an inductive coupling unit on the lower side of the spindle and can transmit data bidirectionally. It represents a fully-fledged additional NC axis in the machine control. Functions of modern CNC control systems, such as indexing, interpolation of different axes or the correction of tool wear can therefore be fully utilized. The energy transmission enables high dynamics of the integrated drives. Bidirectional data transmission also opens up the possibility of new machining and control concepts. Thanks to integration into the machine control →



Bilderquelle: Klaus Vollrath



A selection of contours that can be created with TOOLTRONIC.

system, users can use TOOLTRONIC to create contours which are not radially symmetrical to the main axis of the bore or cylinder. Another advantage of the solution involves the many MAPAL mounting tools that can be used with TOOLTRONIC.

THE REIDEN RX18

"The RX18 is an extremely robust and at the same time precise 5-axis milling machining centre that can be supplemented with a driven rotary table to become a milling-turning centre", explains Daniel Lustenberger. Users clamp the spindle for turning operations. It then functions as a toolholder. The rotary table is 1,800 mm in diameter and reaches a maximum spindle speed of 250 rpm. This configuration enables turning operations up to a maximum workpiece diameter of 2,600 mm. This eliminates time-consuming workpiece changes between the lathe and milling machine. At the same time, machinists thus avoid the otherwise inevitable alignment deviations that occur during reclamping. At the customer's request, Reiden has supplemented the RX18 for use with TOOLTRONIC with an LAT facing head (linear actuating tool). The tool is mounted on a radially movable slide, which achieves a maximum stroke of 56 mm. This means it's particularly suitable for applications requiring a large radial stroke.

A FULLY DEVELOPED CONCEPT FACILITATES INTEGRATION INTO THE MACHINE

"MAPAL TOOLTRONIC is a complete package with comprehensive documentation, whose fully developed concept made the successful integration into our machine tool considerably easier for us", explains Daniel Lustenberger. This included mechanical and electronic connections to the spindle as well as space to house the TOOLTRONIC controller in the control cabinet. The modern Siemens controller of the Reiden RX18 made it possible to integrate the unit as its own axis. During mechanical integration, those responsible had to pay particular attention to making sure the tools could be exchanged in a straight-forward manner, as tool restrictions had to be taken into account in the inductive carrier below the spindle.

On the control side, the machine experts directly accessed the functions of the Siemens controller. The inductive carrier could be seamlessly integrated into the mechanics thanks to the integration into the controller. Furthermore, no difficulties arose in the control cabinet thanks to the small, compact control unit. "The TOOLTRONIC unit can be automatically changed from the magazine to the HSK A100 connection of the spindle like a normal tool", explains Andreas Mollet.

"MAPAL gave us comprehensive advice before we chose the TOOLTRONIC", explains Daniel Lustenberger. The subsequent cooperation between those responsible at Reiden and MAPAL from the fields of construction, electrical engineering and control technology went off without a hitch. MAPAL employees supported the commissioning of the system, so this process also ran smoothly, only taking three days. In the final machining tests, the system achieved the best results. "Thanks to this additional solution, we're able to enhance our systems' functions for our customers without impairing their versatility in the process", Daniel Lustenberger sums up. ■

4 TOOLTRONIC with a linear actuating tool is changed via the HSK 100 connection to the spindle.

5 The turning tool is mounted on the slide.

6 The small compact controller can be easily housed in the control cabinet.





ROBOT CELL –

An upgrade by two apprentices

Without robots, nothing will function in the factory of tomorrow. Trained professionals to operate the smart helpers are essential as well. At MAPAL, the next generation is already getting their qualifications today. Two apprentices have converted and expanded a robot cell for the factory's own training centre.

The MAPAL training centre is now home to the new robot cell. For Marvin Schuster (18) and Philipp Raab (19), both of whom are training to become mechatronics engineers, it is the perfect device to learn from. This is because a robot combines all the disciplines they will need to master in their future profession: mechanics, electrical engineering and computer science.

The machining cell arrives at the training centre as early as the beginning of 2020: a large glass box standing on a mobile trolley. The cell contains the robot as well as various components that a robot needs to carry out certain tasks. The device cannot be put into operation right away though, since, shortly after its arrival, the first lockdown due to the coronavirus pandemic takes place, and the team at the training centre has to teach all of the trainees in digital form for several weeks.

THE ROBOT SYSTEM IS EXAMINED

Martin Ernsperger works at MAPAL in the area of production technology and automation. He's been heavily involved in robotics for five years and supervises Philipp and Marvin in this area of training. Tobias Dambacher is also participating in the „Robots in Training“ project. Tobias has already completed his training as an industrial mechanic and gained his first professional expe-

rience over the past three years. When a training appointment with the robot manufacturer Fanuc is scheduled, the four finally get the opportunity to take a closer look at the robot cell for the first time. The 6-arm robot is a training cell intended for training centres, schools and other teaching facilities. It can be used to teach basic skills in programming and how to operate robots. „In terms of training, the cell was perfect, but our internal manufacturing processes, such as a tool change on machines or laser measurement, could not be simulated with it,“ Ernsperger explains. „There just wasn't enough space for that.“

PLANS COME TO LIFE

The team decides to upgrade and rebuild the cell: it should be possible to simulate company-specific processes in tool production in preparation for the future use of robots in individual production areas. The robot should be also so easy to operate that even beginners without any previous knowledge can manage it.

It was a good year later before Marvin and Philipp, together with Martin Ernsperger, Tobias Dambacher and Uwe Hessler, Head of Training and Further Education at MAPAL, got to present the result of their work. For this purpose, they invited the representatives of the companies involved in the project as well as the teachers of the technical school to an on-site meeting. Marvin and Philipp had first dealt with the instructions for operating the robot cell. They added their own texts as well as explanatory pictures to make it easier to handle. „This gave us a good understanding of the subject matter.“ In the next step, they doubled the size of the robot cell's housing. Now, there was room inside for new components: a mountable machine door with collision detection, small format zero-point clamping systems, storage systems for grippers and tools, a tool change adapter, a laser measur-

ing system, a second control cabinet as well as buttons and switches to complement the control panel.

Marvin and Philipp manufactured the mechanical parts themselves at the training centre. For the electronics and the programming of the software as well as for selecting additional components, the team worked closely with the Technical School of Aalen and the companies Fanuc and Mössner. Mössner is a supplier of special solutions in the fields of general machining, automation technology and robotics.

MECHANICALLY, BY CONTROLLER AND AUTOMATICALLY

The individual process steps in the machining of a tool can now be easily displayed with the help of the built-in buttons and switches, which is therefore ideal for beginners. During the presentation, Philipp first controls the process via a special control panel – from opening the machine door to connecting the tool to be machined to inserting it into the spindle. After the simulated machining, the tool is being measured. The gripper then sorts it back into the built-in shelving system. On top of this, everything can work in automatic mode and at high speed, which Philipp demonstrates afterwards.



They have expanded a robot cell: Philipp Raab (l.) and Marvin Schuster, mechatronics technicians in their 3rd year of training.



The converted robot cell is presented for the first time: From left: Christian Kunz (Mössner KG), Jens Kinzler (Technical School Aalen), Jens Mühlegg (Fanuc Deutschland GmbH), Thomas Dietrich (Technical School Aalen), Marvin Schuster, Philipp Raab, Martin Ernspeser, Tobias Ernspeser, Tobias Dambacher and Uwe Uwe Heßler (all MAPAL Dr. Kress KG)

A WORTHWHILE PROJECT

Marvin and Philipp are proud of what they've achieved and were able to acquire a lot of knowledge about robots thanks to this project. The experts know how important this is. Automation and the use of robots will change production in the long term. This makes it all the more important to invest in preparing the next generation for this at an early stage. The topic must become more of an integral part in schools and training. „MAPAL has demonstrated how it can be done," said Jens Mühlegg, Technical Sales Support Universities and Education Centers at Fanuc. Thomas Dietrich, Director of Studies, and Jens Kinzler, teacher in the metal department, both of whom teach at the Technical School of

Aalen, described the collaboration as a prime example of a successful learning cooperation. „This is real hands-on learning," Christian Kunz, Head of Research and Development at Mössner, commented on the successful modification.

The upgraded robot cell will be in widespread use now: all the trainees – whether they are training to become cutting machine operators, industrial mechanics or mechatronics engineers – are introduced to this innovative technology at MAPAL's training centre.

Meanwhile, Philipp and Marvin are about to take their final exams. Their training period was shortened by half a year to three years because

of their good performance. Tobias Dambacher wants to advance his qualifications. In autumn, he will commence his training to become a technician in mechatronics and automation technology. He's already been accepted by the school. ■

