


**exactly
yours**

Tool technology 4.0
Intelligent tools
for the Smart Factory

Powered up
Proficiency for E-mobility

The thrill of speed
New CARBFeed High Feed Cutters



Evolution for more applications

The most economical chamfering solution becomes even more versatile: Even gear shafts and internal gears can now be deburred with the ChamferCut-CG and the ChamferCut-IG.

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The thrill of speed

Quicker into shape: The new CARBFeed high feed-rate cutters ensure marked improvements in performance, opening the way to further, complex applications.

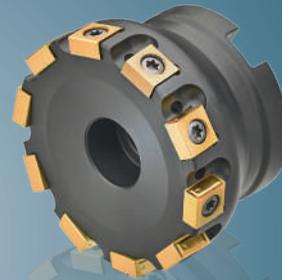
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Specialist for steel machining

Optimum chip removal, outstanding thread quality and exceptionally long tool life: The new Rasant® Steel tap drill is in a class of its own. Thread depths of up to as much as 3xD can be produced in a reliable process.

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Individuality is key

Individual body systems, application-optimized inserts, high-precision special tools: Individuality is of importance on the new MultiFit tangential indexable inserts. The result: maximum efficiency.

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Tools get smart

Efficiency through innovation: The intelligent tool systems with digital communication technologies from LMT Tools allow for integration into the production process, raising process reliability to a new level.

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Perfection made-to-measure

Strictest requirements for precision, materials and efficiency. The key to successful machining of motor components for electric vehicles? Custom-fit tools from LMT Tools that ensure minimum tolerances, high surface qualities and maximum productivity.

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Dear readers,

In developing the Center-of-Competence for the EMEA region at the beginning of this year, we took an important step toward providing our customers with the best possible access to our innovative products and our global networks of expertise. This rounds off a standardized international infrastructure standard with the goal of aligning our global market presence in a customer-oriented manner.

It is a matter of great importance to me that we adapt to dynamic business development in the markets by establishing agile sales processes and having close proximity to the customer. At the same time, we want to use our technical know-how to offer the optimal solution to the respective machining task. That is why we encourage continuous transfer of knowledge and exchanges between application technology and product development. I am delighted to hear from the markets about the outstanding success arising worldwide thanks to the innovative strength of LMT Tools. We would like to present a few highlights of these innovations in this customer magazine.

As a long-term partner to the automotive industry, we support our customers during the transformation of mobility. The sector faces the challenge of aligning production toward electric powertrain technologies and alternative vehicle components. There is more demand for the efficiency and performance of precision tools than ever before. With our customized tools and comprehensive machining strategies, we want to continue to grow and make a decisive contribution toward driving improvements in manufacturing processes for electric vehicles. Read about e-mobility on pages 12 and 13 to find out what this looks like in practice.

At the same time, we will be developing our milling tools portfolio in a target-oriented way. We now supply users in the area of die and mold with a new and high-performance generation of high feed cutters covering an extensive range of applications (pages 8 and 9). And we have also developed new tool solutions for the aerospace industry which comply with the special requirements of lightweight construction (pages 20 and 21).

As a competent partner, we are committed to our customers worldwide. Together, we will meet the challenges of the present and focus on our innovative strength.

I hope you enjoy reading this edition!

Daniel Ehmans

CEO LMT Group

Division President LMT Tools



Tool technology 4.0



Intelligent tool systems that connect and exchange process data create new ways of optimizing manufacturing flows and of increasing productivity. As a leader in innovation, LMT Tools brings along the necessary development know-how and application knowledge for digital transformation, and is developing smart solutions with notable advantages for customers. Uwe Kretzschmann, Global Head of R&D at LMT Tools, and David Szillat, Global Head of Product Lines at LMT Tools, talk about the new world of tool technology.

What part do intelligent tool systems have to play in Industry 4.0?

Kretzschmann: Tools are the interface between the machine and the workpiece, so they have an enormous potential for optimizing manufacturing processes. When we integrate the tool into digital, networked systems, entirely new possibilities for process monitoring and analysis open up. This brings incredible chances for considerable improvements in terms of efficiency and process reliability. Intelligent tools are therefore an essential element in future-oriented production processes.

Szillat: It follows that digitization will be making even greater advances, most importantly in the field of complex tool systems.

What are tools for the Smart Factory actually like?

Kretzschmann: Intelligent tools communicate and interact with the machine controller, with measuring systems or with other mobile devices. They collect, save and analyze data on the process and its status, as well as supplying both the user and production control with important information for further action. The advantages of smart tool systems can be seen clearly when fabricating holes with tight tolerances. One feature of our fine boring tools is their cutting elements, which are adjusted automatically by means of electronic components. As a result, the edges can be set digitally, making them absolutely precise and – if so desired – any wear that occurs can be compensated for fully automatically.

Szillat: Our EVOline tangential rolling heads are another example. They are fitted with a sensor for measuring force. The standard curve is measured as the tool is run in, and saved on a chip as a benchmark for the subsequent rolling processes. The saved data provides important information for optimizing the rolling process when the tool is in use. Our service staff can read out the data with an app, and can discuss improvements to the process with the customer.

Challenge accepted

The patented ChamferCut technology from LMT Fette has revolutionized the chamfering and deburring of gears. The new ChamferCut-CG (Collision Gear) and ChamferCut-IG (Internal Gear) now make it possible to use the ChamferCut principle on nearly all components with interference contours as well as with internal gears.

Modern gearboxes are becoming ever-more compact, lightweight, quiet and efficient. Every detail of gear manufacturing is gaining more importance. This leads to a stronger focus on the chamfer, since the design of the chamfer directly affects properties such as wear and smooth running. Some years ago LMT Fette raised the chamfering and deburring of gears to a new level with the chip-cutting ChamferCut process.

Precise, reliable, economical

ChamferCut generates an accurately defined chamfer with a constant chamfer depth right down to the root of the gear. Maximum precision and process reliability are the result. High tool life quantities and low reconditioning costs, short process times and positive effects on the subsequent processes also lower the component costs considerably.

Evolution for even more applications

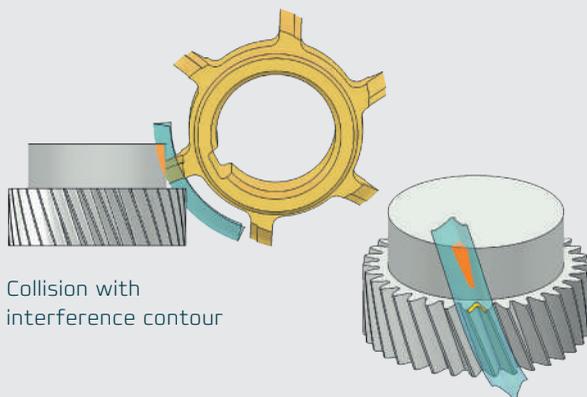
"In the past there had to be enough space for the envelope of the ChamferCut in order to avoid collisions with the workpiece", explains André Bollow, Product Manager Gear Cutting at LMT Tools. "That puts limits on the application." With the latest evolutionary step, single-flank chamfering, users can now exploit the advantages of the successful process for all components, such as gear shafts, with interference contours.



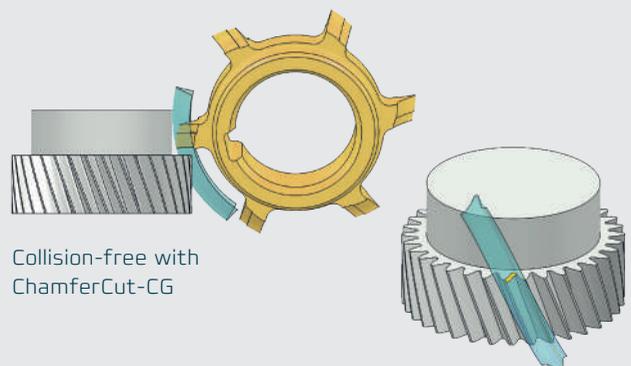
Deburring in spite of interference contour: ChamferCut-CG

Collision-free, thanks to ChamferCut-CG

Two individual ChamferCut-CG are used, which chamfer both sides of a tooth gap to the usual quality one after another. "The split into two process steps offer a lot more freedom to the process. Thanks to the single-sided cutting of the gap, the setting parameters of the tool can be adjusted in a way that collisions are avoided and still the proven ChamferCut result is achieved", explains Bollow.



Collision with interference contour



Collision-free with ChamferCut-CG



André Bollow

Product Manager Gear Cutting
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Internal deburring with ChamferCut-IG

Bollow's summary of the market situation to date is that, "The few available deburring processes for internal gears are mostly either not precise or not economical. Manufacturers of planetary gears, for example, had to stick to less profitable chamfering solutions for the internal gears." Now for the first time, internal gears can also be deburred and chamfered with cutting methods using the ChamferCut-IG (Internal Gear). This means all the cost and quality advantages of the established ChamferCut process can be used for the manufacturing of internal gears.

Strong partnership

More than 1000 different chamfered components provided the basis to LMT Tools and Liebherr-Verzahntechnik for developing the two new methods in partnership. As a result, ChamferCut-CG and ChamferCut-IG are used exclusively on Liebherr-machines. The experienced team from LMT Tools and Liebherr focus on meaningful customer-orientation in process design and implementation, and develops the best manufacturing strategy together with the customer.



Deburring internal gears:
ChamferCut-IG

ChamferCut: The most economical chamfering solution for series production

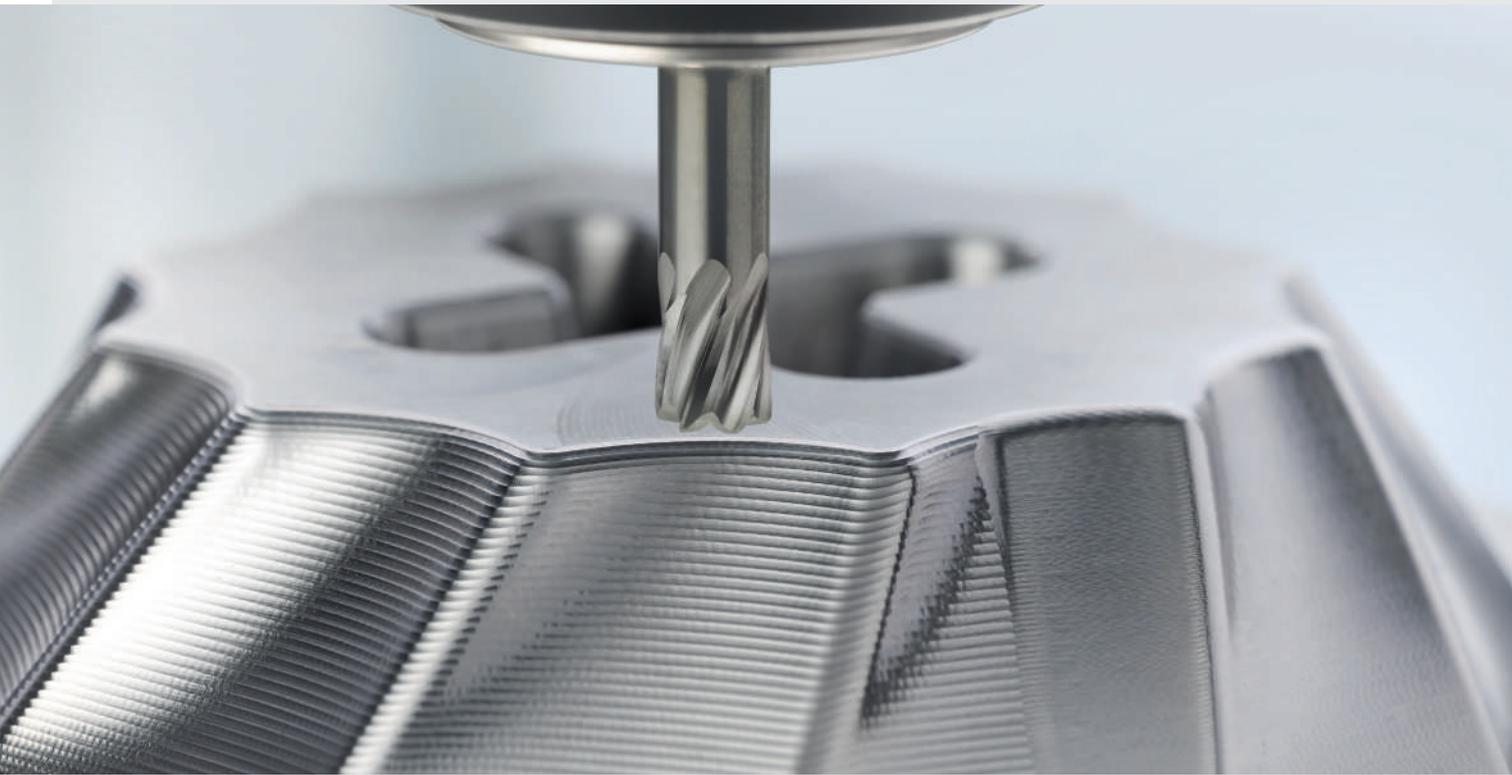
Chamfering and deburring gears with the ChamferCut continues its success story. Hardly a surprise, since it offers its users many advantages such as outstanding chamfer quality, short

machining times with high process reliability, as well as low component costs. The uncomplicated reconditioning also contributes to high profitability; the ChamferCut tools can be reconditioned easily.

Unlike forming processes, the cutting process using ChamferCut does not

change the material microstructure, and there are no problematic material build-ups. This is not only a benefit to the finishing process after heat treatment (e.g. honing), but also removes the necessity for a second hobbing cut to remove the material build-ups.

The thrill of speed



Roughing processes with intensive chip removal, for example those in die and mold making, as well as in general engineering are calling for powerful tools that remove large volumes of chips within a very short time. The key to success? High feed-rate cutters. As a tool specialist, LMT Tools has one of the widest ranges on the market in this sector. The portfolio includes solid carbide and indexable insert cutters, and extends over diameters from 1 up to 160 mm. The latest additions to the range ensure marked improvements in performance, opening the way to new, complex applications.

The strategy of high feed-rate cutting (high feed with low axial advance) allows for high volume chip volume removal rates; that lowers the lead times, and finally the manufacturing costs – high performance that can only be achieved with custom-fit tool solutions. Regardless of the material, the diameter or the component: through the comprehensive range of tools for high feed-rate cutting, the cutting specialist offers every customer the perfect solution for any application, even for highly complex cutting tasks.

Quicker into shape

In terms of tool life and productivity, the new solid carbide high feed-rate cutters are setting high standards in machining steel and cast iron (CARBFeed Steel), stainless steel and hard-to-machine alloys (CARBFeed Inox), as well as hardened materials (CARBFeed Hard). Hanjo Gissler, Product Manager Cutting at LMT Tools, emphasizes that, "New performance peaks, lying well above the market standard, have been achieved in tests." This jump in performance has been achieved through optimal adjustment of macro- and micro-geometry to the application field of each tool.

High feed rate, short machining times

Cutter geometry, substrate, coating and treatment of the cutting edge – these have been specially developed for the materials to be processed and are optimally coordinated. "The peeling geometry is characteristic. We are breaking new ground with high feed-rate tools with this geometry," explains Gissler. Thanks to the positive rake angle, the cutters do their work in a significantly softer manner than their predecessors. This conserves the machine spindle and increases the tool's service life. The number



Hanjo Gissler
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of cutters has also been adapted, resulting in a further increase in cutting capacity: Thanks to the four cutting edges (ISO-P, ISO-M) or, depending on the diameter, six to eight cutting edges (ISO-H), the new flagship tools increase the feed rate by up to about 50%, while the tool life is also affected positively.

Small cutter, big results

The modular MultiEdge 2Feed mini cutting system, used primarily for machining smaller and medium-sized components, can also celebrate growth. With a new cutting material for machining stainless steel and super-alloys, another application field can be efficiently and reliably processed. "Machining ISO-M and S materials is highly complex work. Our customers are therefore permanently searching for even more efficient techniques," says Korvin Michalak, Product Manager Indexable Insert Hobbing. LMT Tools have a powerful answer with these new tools. The positive position of the indexable inserts (WSP) leads to a softer cut, and that reduces the cutting forces. This guarantees maximum machining volumes – even on modern machining centers which are often less powerful.

The optimum tool for each application

"All the indexable inserts have the same size, regardless of the diameter of the cutter body. That lowers both investment and inventory costs," stresses Michalak. The outstanding combination of carbide and coating also guarantees a high degree of process reliability and long service lives. This new cutting material is also applied on the tried-and-tested indexable insert geometries: while the indexable insert with a negative protective chamfer (ER geometry) displays a particularly stable cutting edge, the geometry featuring a chip-breaker groove (SR geometry) is distinguished by a softer cut.

Faster processes, high process reliability and maximum feasibility: with these new tools, LMT Tools is starting a new chapter in the area of high feed-rate cutting and extending its innovative lead even further.



Solid carbide high feed-rate cutter CARBFeed Steel



Solid carbide high feed-rate cutter CARBFeed Inox

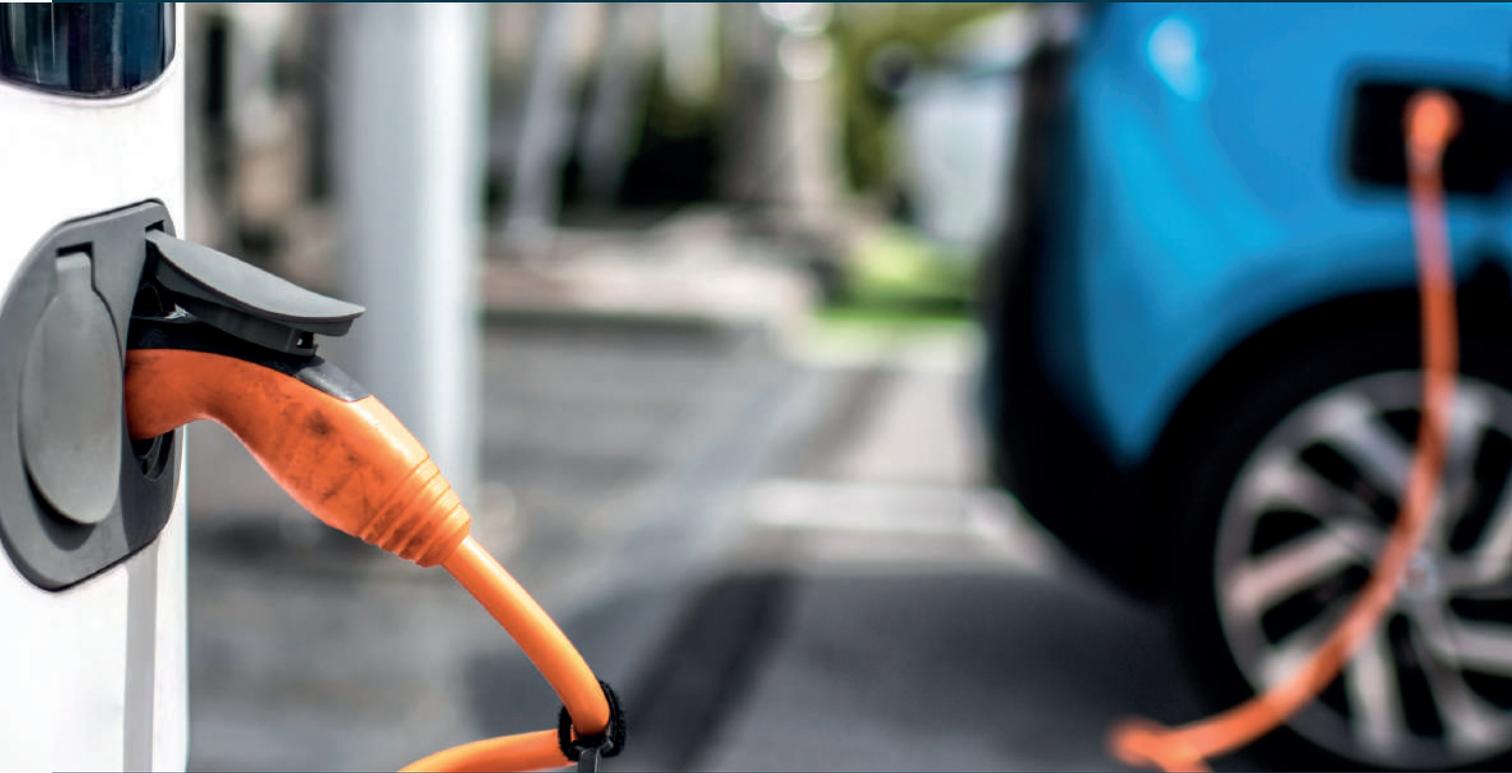


MultiEdge 2Feed Mini



Solid carbide high feed-rate cutter CARBFeed Hard

Powered up



The importance of electric mobility is growing. More and more electric cars and hybrids are taking over the streets. There can be no question: the drive of the future is electric. This also presents particular challenges to the tool industry. Complex geometries, accompanied by weight reduction and maximum demands on precision and surface quality, make machining tasks even more sophisticated. LMT Tools is a renowned and long-term partner to the automotive industry, and supports technological development in the sector through engineering know-how, comprehensive machining strategies, and efficient tool systems.

LMT Tools: Proficiency for e-mobility

- Famous, long-term partner to the automobile industry
- Comprehensive development and application know-how
- Highly innovative
- Flexible tool concepts for maximum efficiency and minimum costs
- Individually customized, custom-fit tool solutions
- Integrated manufacturing and machining strategies



Jürgen Richter

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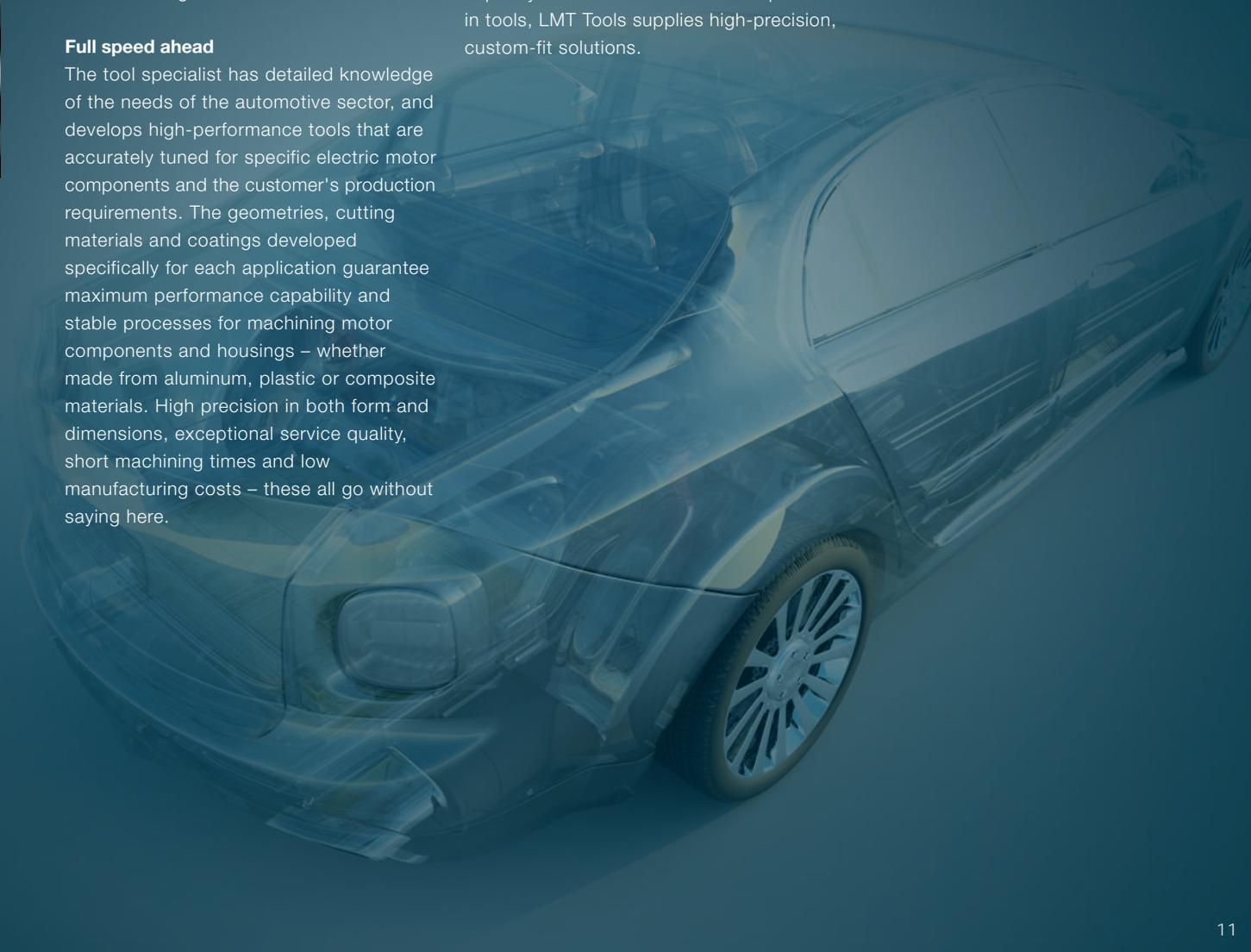
The changeover from the combustion engine to the electric motor continues to change the tool industry. There are two main reasons for this: The number of components that require cutting is altogether lower with electric drive technologies. And in addition, the performance capacity, functional density and complexity of the components is increasing significantly due to modern, lightweight construction and the trend for downsizing (in hybrid drives). Whether boring, milling, threading, rolling, reaming or gear cutting: With its varied range of tools, its future-oriented technologies and its integrated engineering skill, LMT Tools is ideally prepared for the challenges of the electric age.

Full speed ahead

The tool specialist has detailed knowledge of the needs of the automotive sector, and develops high-performance tools that are accurately tuned for specific electric motor components and the customer's production requirements. The geometries, cutting materials and coatings developed specifically for each application guarantee maximum performance capability and stable processes for machining motor components and housings – whether made from aluminum, plastic or composite materials. High precision in both form and dimensions, exceptional service quality, short machining times and low manufacturing costs – these all go without saying here.

New challenges

While the volumes of chip removal required for electric drives does fall, the combustion engine, and its need for conventional chip-removal work, will continue to justify its existence in the future. Hybrid variants thus continue to contain most of the components of conventional drives, even though in a partially modified form. What is more, electric mobility, with its new components such as the stator housing, and with special requirements for precision (such as tighter tolerances) and materials (including fiber-reinforced plastics and hybrid materials) is creating new challenges that demand special machining solutions and special tool versions. With its high capacity for innovation and its competence in tools, LMT Tools supplies high-precision, custom-fit solutions.



Perfection made-to-measure

The machining of the thin-walled and highly complex stator housing demands maximum precision and process reliability, as the efficiency and smooth running of the electric motor depend to a large extent on the quality and dimensional precision of the manufacturing method. Whether roughing, smoothing or finishing: LMT Tools' wide range of tools covers the full spectrum. The engineering experts have a mass of know-how when it comes to the design and manufacture of special tools, and develop the optimum solution for every challenge. This means that high surface qualities and minimum tolerances can be achieved at the same time as maximum productivity and profitability.

Faster processes, lower costs

With the HPF Max forming tap from LMT Fette, M8 and M10 internal threads can be manufactured at high speed. In one concrete application, the HPF Max needed no more than 9 seconds per component – and was therefore able to halve the machining time in comparison with the tool (HSS Former) that was in use previously.

And in terms of tool life, its 50,000 manufactured threads leave the competition far behind. The secret of success? Andreas Möller, Product Manager Threads at LMT Tools explains that, "The HPF Max combines the resistance to abrasion of a carbide thread-forming head with the toughness of a steel shank. This allows for high cutting speeds and increases the tool life of the tool." Its modularity is a special performance feature: At the end of the tool life, only the carbide head is changed, not the whole tool. Tool changing is therefore quicker, and resources are saved. And another plus-point: Since the thread is created by forming, no chips are produced. This has a beneficial effect on process reliability, on repetition accuracy, and on the strength of the thread. The HPF Max is therefore significantly better than one-piece HSS forming tap in terms of quality, efficiency and profitability.

Aluminum cutting made easy

Tools with PCD cutting materials are the first choice when it comes to cutting aluminum. "Cutting edges made of polycrystalline diamond (PCD) are characterized by high hardness and high resistance to abrasion," explains René Seger, Product and Project Engineering at LMT Tools. "This is an advantage for machining thin-walled components, because thanks to the sharp PCD edges

with special edge preparation, the cutting runs with extremely low vibrations." As recognized specialists in PCD tools, both LMT Kieninger and LMT Belin develop and manufacture customized, high-tech solutions that are 100% tailored to the demands and production of the customer. "High efficiency and easy tool handling are the most important considerations here," says Seger. The PCD tools allow for very high cutting speeds, and guarantee maximum geometrical quality as well as dimensional precision, along with a first-class surface quality. The high resistance to abrasion also gives the tools long service lives. PCD tools demonstrate their special strengths as cutters, step drill rods, and reamers, amongst others.

Accurate to the micrometer

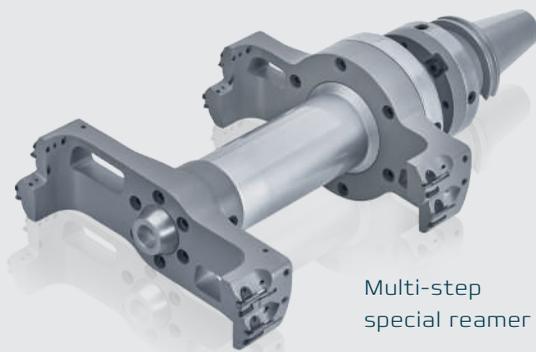
The finish-machining of the main bores is a question of micrometers. In order to achieve the maximum precision and quality, LMT Tools develops custom-fit tools that meet the tightest requirements for tolerance and at the same time ensure reliable processes. The multi-stage special reamers, developed by LMT Belin for the final processing of bores with diameters greater than 200 mm, are an example of this. According to Florent Mathieu, Product Manager Reaming at LMT Tools, "The application called for tools that were particularly stable and yet lightweight, allowing for chip cutting that is both extremely precise and low in vibration." In the course of development, the vibration behavior while reaming was simulated in order to optimize the design.

The result is a stable design with reduced weight, consisting of a base body with exchangeable supporting pieces. "The reamer is made even lighter through the use of aluminum," added Mathieu. "We are happy to implement this to meet customers' wishes." The PCD cutters can be set with a precision in the micrometer range. They guarantee minimum shape and length tolerances, high cutting speeds, and an exceptional surface quality. The customer also benefits from the long tool service life, very reliable processes, and lower manufacturing costs.

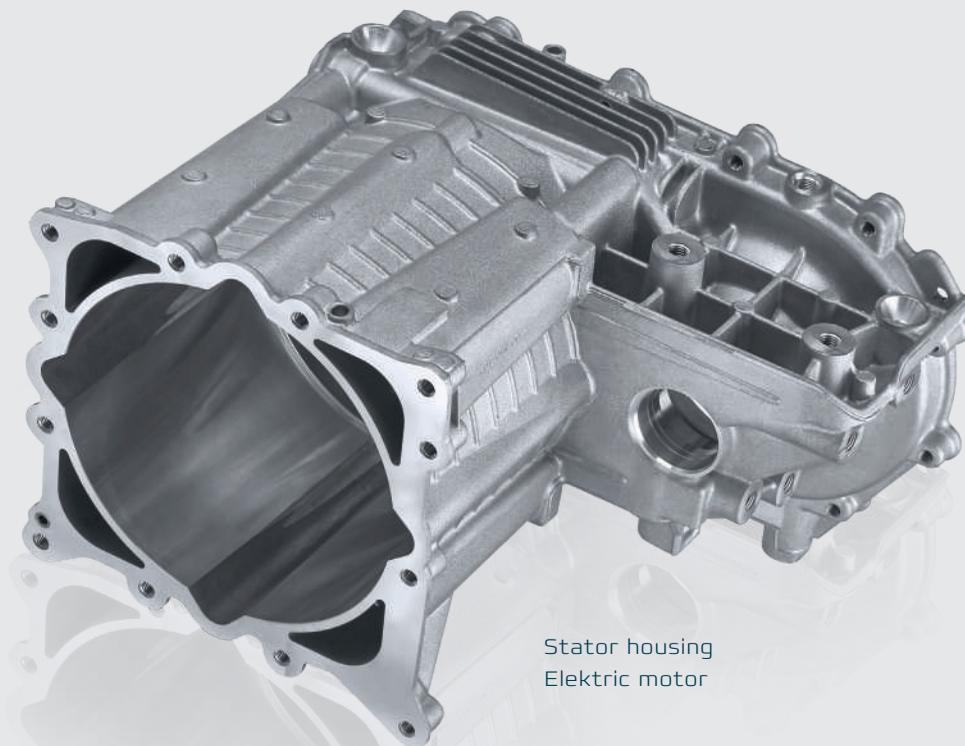


Jürgen Richter

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Multi-step
special reamer



Stator housing
Elektric motor

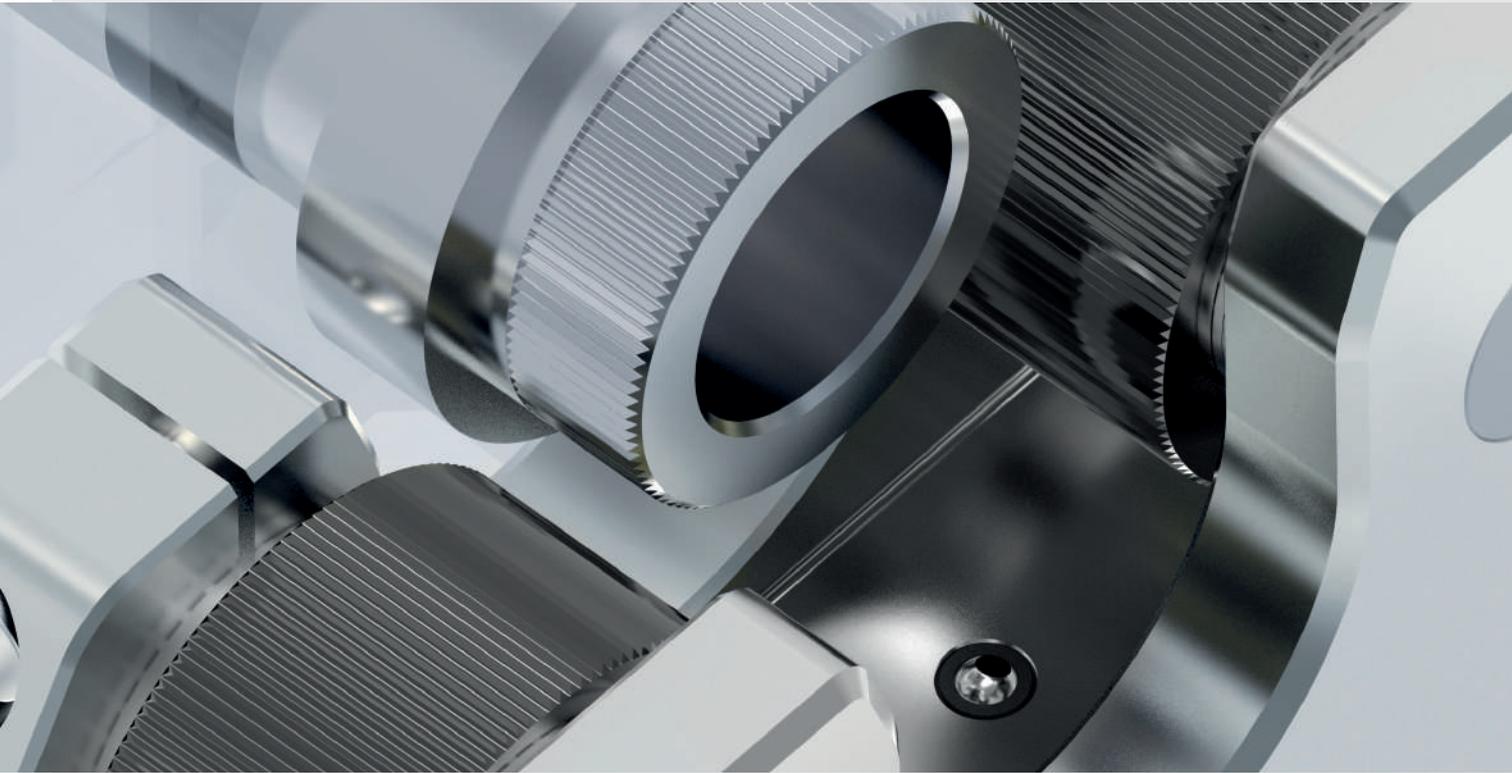


PCD reamer



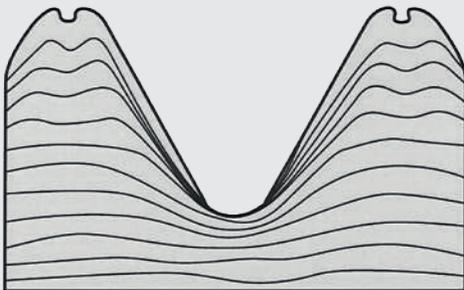
HPF Max
Forming tap with internal
radial cooling (ICR)

Rolling to success



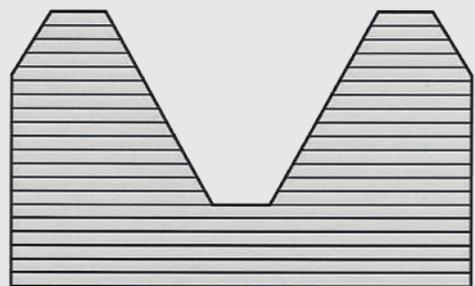
Short machining times, high process reliability and the best component quality: Knurl forming offers a large number of advantages over cutting methods. The spline on the end piece of the driveshaft in the new electric sports car from a German car manufacturer were also produced by rolling. The AC5R axial rolling system from LMT Fette, with knurling rolls specially designed for the component, is used.

Forming process



Material fibers are displaced by pressure and permanently reshaped

Cutting process



Material fibers are cut



Stefan Möller

Product Manager Rolling Systems
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For force to be transferred between the motor and the wheel of a vehicle without problems, the knurl at the end pieces of the driveshaft must be manufactured with high precision and high stability. "The technology of chipless forming with rolling systems has been proven for these jobs round the world", explains Stefan Möller, Product Manager Rolling Systems at LMT Tools. "This applies in particular to serial production and – due to the growing importance of electric mobility – increasingly to components in electric drive systems as well."

The perfect knurling in seconds

Knurling involves the material being permanently reshaped by pressure that take it beyond the elastic limit. Unlike cutting processes, the material fibers are not cut, but only displaced. "Cold forming of the solid material allows us to achieve high component strength as well as a constant dimensional stability," stresses Möller. "The user also benefits from the high profitability provided by short production times and long tool lives, as well as high process reliability."

The most profitable process

In the application mentioned, the AC5R axial rolling system is fitted with two knurling rolls that are customized precisely to the customer's component geometry. Infeed rolling is used, and requires only a few seconds for knurling with a diameter of 53 mm. And one more thing: The initial diameter required for knurling is not the outer diameter (as it is when cutting), but rather the pitch diameter. This means that there is a potential for saving material, in particular in the case of large components. The absence of chips is a further advantage.



AC5R axial rolling system

Knurling: Fast, reliable & economical

- High productivity with low cost per part thanks to short production times
- Optimum component quality with high process reliability
- Long tool service lives
- Chipless forming process

In a class of its own



The fabrication of tapped blind holes places high demands on process reliability, precision and profitability. With the new Rasant® Steel tap, LMT Fette is presenting an absolute specialist for steel machining whose chip evacuation, thread quality and tool life sets new standards – and does this for thread depths as large as 3xD.

Efficient thread fabrication with the Rasant® Steel

- Process reliability even with deep threads up to 3xD
- Optimum chip evacuation
- Very good surface quality
- Long tool life
- Reduced manufacturing costs

Internal thread production is amongst the most demanding of fabrication methods. And the fact is this: Tapped blind holes are more difficult to machine than through holes. "This is quite simply because the chip that is created must be carried away upwards – in the direction to the shank. And because this is totally enclosed by the walls of the bore, it's hard for the chips to escape," explains Andreas Möller, Product Manager Threading at LMT Tools. Creative solutions that combine knowledge of materials, comprehensive application expertise and experience with tools are called for. The thread specialists at LMT Fette create efficient solutions that guarantee a maximum degree of process reliability and that can handle every aspect of the rising demands for quality and production parameters.

Goodbye, chip problems!

The new Rasant® Steel sets new scales. The HSS-E-PM tap drill has been specifically tuned for the challenges of steel machining (ISO-P1 and ISO-P2), and brings a large number of innovations together. According to Möller, "Reliable chip transport was among the important factors in the new development." A cutting edge geometry specially developed for the process, a wear-resistant multi-layer coating, and an improved HSS-E-PM substrate are what make the difference here. The treatment of the cutting edge after grinding is also optimally configured

for machining steels with a tensile strength of up to 1100 N/mm². The result is a very good chip evacuation, while problematic tangled chips are largely avoided. An improved surface quality in the thread is also achieved, and the tool life is significantly lengthened.

Tap drills with depth

The 45° helix is a special design feature of the Rasant® Steel. Very deep tapped blind holes up to 3xD can therefore be fabricated reliably.

Exactly yours

The tool experts at LMT Tools can also satisfy individual customer requirements such as other tolerances, lengths or chamfer forms.



Andreas Möller
Product Manager Threading
amoeller@lmt-tools.com



Rasant® Steel tap in use



Rasant® Steel tap

Genuine multi-talent



MultiEdge T90 PRO4: Reliable chip removal

The MultiEdge T90 PRO4 tangential milling system from LMT Fette stands for maximum productivity and profitability. The latest expansion of the portfolio includes an indexable insert with chip breaker geometry, a cutting grade for reliable machining processes in stainless steels (ISO-M), as well as a helical version for the cutter bodies.

Korvin Michalak, Product Manager Indexable Milling, summarizes these new features in the following words: "With this expansion we are widening the range of possible applications of this popular shoulder milling system, and opening the way to improved efficiency." The indexable insert with chip breaker geometry offers a plus in performance when machining steel materials (ISO-P). The chips are being shredded by the special geometry, and this represents an important factor for successful roughing in steel operations (long chips). Higher productivity, greater process reliability and longer tool life are the results. The helical version of the cutters also create a significant performance increase. Due to the design of the indexable inserts in multiple rows, maximum chip removal rates are achieved, and the time required for the machining process is reduced to as little as a quarter.



MultiEdge T90 PRO8: Profitability plus

With the MultiEdge T90 PRO8 milling system, LMT Fette is continuing the trend for profitable machining with tangentially mounted indexable inserts. A new cutting grade for efficient cutting of stainless steels extends the range of applications.

The indexable insert, which has 8 cutting edges, was specially developed for roughing and finishing applications in stainless steels (ISO-M). It is particularly useful for 90° corner milling and convinces by a high chip removal rate, stable processes as well as long tool lives. "Thanks to our high-precision press-to-size method, we can waive the grinding from the manufacturing process. This generates an enormous profitability advantage at the customer – without any sacrifices in the milling process," underscores Korvin Michalak. The soft-cutting indexable insert geometry reduces the cutting forces, and therefore guarantees a highly reliable process safety. Thanks to the design and its unevenly divided body, the vibrations arising during machining are reduced to a minimum.

At a glance:

- Indexable milling system with 4 cutting edges per insert
- Indexable insert with chip breaker geometry for ISO-P
- Depths of cut up to $a_{p \max} = 11.5 \text{ mm}$
- Also available as helical milling

At a glance:

- Tool system with 8 cutting edges per insert
- Soft-cutting geometry to reduce cutting forces
- Depths of cut up to $a_{p \max} = 10 \text{ mm}$



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MultiFit tangential: Individuality is key

The right solution for every milling application: With the new tangential indexable inserts from LMT Fette, LMT Tools is underlining its position as an integrated supplier of solutions. Working closely with its customers, the tool specialist develops high-precision special tools that are exactly aligned to the requirements and the process.

MultiFit tangential: The name says it all. With individual solutions for the body type and optimized inserts for the particular application, a solution can be found for special material requirements and an enormous range of machining tasks – from pump housings through to the ship's engine. "In our design work, we work closely with users and machine manufacturers, and we take plenty of time to understand the customer's needs and processes. That means that we can adapt every tool perfectly to the particular machining task," explains Korvin Michalak the tool solution from LMT Tools. The universal insert geometry makes the new indexable inserts extraordinarily versatile. Whether corner or face milling is involved, or when used for side or plunge milling: Thanks to as many as eight cutting edges per insert, as well as to a sophisticatedly designed micro-geometry, they guarantee the highest possible chip removal rates as well as outstanding surface qualities. Highly complex mixed machining jobs can also be carried out reliably.

Performance advantages with tangential indexable inserts

The tangential installation orientation allows for a larger number of teeth than a comparable milling system with radially mounted indexable inserts. A higher chip removal rate is thus achieved with the same cutting data. The large insert seat for the indexable insert, as well as the solid design of the body, also ensure high stability when milling. Furthermore, another plus: The cutting forces are absorbed over the full profile of the insert. This brings a significant improvement to tool life.

At a glance:

- Tangential indexable inserts for special tools
- Universal indexable insert geometry for a wide range of applications
- Materials: ISO-P, ISO-M and ISO-K
- Sizes: 9, 12 and 15 mm

When chips fly



Raise tool performance, lower machine costs: What this looks like in practice is proven impressively by the two special tools developed by LMT Onsrud for a top-tier supplier to the aerospace industry. These custom-fit tool solutions process aluminum honeycomb in record time thereby enabling huge advantages in productivity and savings in costs.

Every gram counts in the air, which is why the aerospace industry is dominated by light-weight designs and materials. Components made from aluminum honeycomb offer particularly high degrees of strength and rigidity at comparably low weight. But processing this complex honeycomb structure is anything but easy. “Customer-specific tool solutions are needed if we are to achieve a high cutting capacity as well as optimal surface quality,” explains Jennifer Neubauer, Product Manager at LMT Onsrud. As a specialist for tools for machining fiber composite and honeycomb materials, LMT Onsrud develops efficient solutions which raise metal cutting of the honeycombs in sandwich panels to a new level. Based in Waukegan (Illinois, USA), the manufacturing company, which belongs to LMT Tools, has developed two special tools for a top-tier supplier which reduce machining time by 50 %. At the same time, tool life has been extended by 50 %.

Machining time halved, tool life doubled

“The customer wanted more efficient tool solutions for machining the interior linings of engine nacelles”, explains Neubauer. Two honeycomb tools produced by a competitor have been used to date. 2,736 internal linings were machined each year. With the newly-developed solutions from LMT Onsrud, it has been possible to improve cutting data such as rotation speed and feed rate significantly. “Our cutters machine the workpieces twice as fast as the tools used to date. And we have doubled the life of each tool”, adds Neubauer. For the customer, this means a productivity advantage of 500 hours and cost savings of 300,000 dollars a year. Thanks to faster machining, the customer was also able to dispense with the purchase of a new, additional machine.

Higher productivity thanks to larger radii

This enormous increase in performance was achieved by a combination of honeycomb tool geometry and innovative radial cutting technology. “Unlike ballnose end mills which tend to only use the front part of the tool cutter during machining, radial milling cutters work with the peripheral cutting edge”, explains Neubauer. The large radii increase interlacing by the individual machining passes. This results in higher material removal rates



Jennifer Neubauer

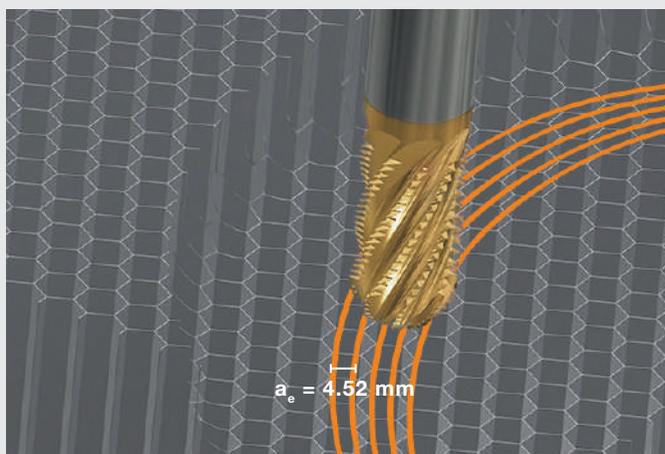
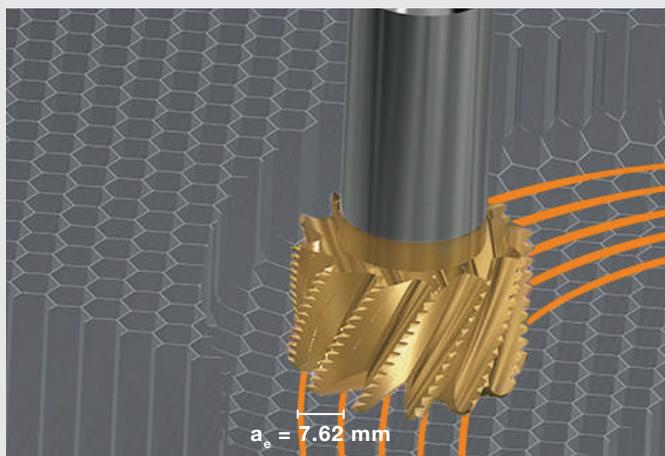
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per cycle while simultaneously reducing machining times. In addition to this increase in productivity, material vibrations are minimized, and this creates a very good workpiece surface. And means that reworking is no longer necessary. Thanks to the special geometry, fewer forces are exerted on the tool, something that also has a positive impact on tool life. A chip breaker ensures short chips while improving process safety.

remarkable efficiency potentials can be tapped for unprecedented levels of improved productivity and feasibility.

Efficient honeycomb machining

Longer tool life, shorter processing time, better surface quality – the tailored cutters offered by LMT Onsrud for honeycomb machining show that when tools and applications are coordinated optimally,



Tool 1: Ball nose end mill

Old	New
v_c : 83 m/min	v_c : 125 m/min
n : 10002 min ⁻¹	n : 15001 min ⁻¹
f_z : 0.0254 mm	f_z : 0.0254 mm
v_f : 2032 mm/min	v_f : 3050 mm/min
a_p : 2.54 mm	a_p : 2.54 mm
a_e : 7.62 mm	a_e : 7.62 mm

Tool 2: Ball nose copying mill

Old	New
v_c : 133 m/min	v_c : 200 m/min
n : 10000 min ⁻¹	n : 15000 min ⁻¹
f_z : 0.01778 mm	f_z : 0.0178 mm
v_f : 2032 mm/min	v_f : 3050 mm/min
a_p : 2.54 mm	a_p : 2.54 mm
a_e : 4.52 mm	a_e : 4.52 mm



Pooled knowledge

With its innovations in technology and services, LMT Tools helps its customers all round the world to increase the efficiency and profitability of their production. In pursuit of a further improvement in customer services, the tool specialist is now building a new Center of Competence for the EMEA region at the Lahr and Schwarzenbek sites.

The user-specific design of complex solutions is one of LMT Tools' core areas of expertise. To be able to take on its customers' individual requirements and

provide what they want even more efficiently, the globally active tool specialist founded the Centers of Competence a few years ago. Specialists from research & development, application engineering and customer support work here in a tightly focused, competent manner to develop individual customer solutions quickly. "What we do in our Centers of Competence is to bring together expert teams at technology sites in our biggest markets. In that way we give our customers access to globally networked knowledge," explains Daniel Ehmans, CEO of LMT Tools.

Ideal use of knowledge

The model has already been successfully established for the markets of China, India and the USA. Ehmans adds that, "With the Center of Competence for Europe, the Middle East and Africa (EMEA) we are offering our customers the best possible service, and we are closing the gaps in our uniform, global infrastructure standard." The new EMEA Center of Competence will be developed at the existing production sites in Lahr and Schwarzenbek, where it brings technical expertise and services together.

Innovation of the year

The intelligent tool system with automatic wear compensation for precision boring applications from LMT Tools has been awarded the Ringier Technology Innovation Award 2019.

The Ringier Technology Innovation Award is given to companies whose outstanding ideas have advanced the development of the sector. Launched in 2006, the award soon developed into the one of the most influential industry prizes in China. This year the competition for the metal-processing industry was once again very fierce. In the end, the intelligent fine boring tools with electronic wear compensation from LMT Tools made the strongest impression on the jury, which consisted of representatives from the industry. Following a strict selection process, the tool specialists finished once again in first place.

Joe Lu (CoC Advanced Tooling) and Carol Huang (Senior Marketing Manager) of the Chinese subsidiary LMT China accepted the prize. The event was organized by the Ringier Trade Media media company and by the industry Association in China.



Prize-winning

As a leader in innovation, LMT Tools places great store by the latest technologies and the most modern production processes. The company was honored with the "VOGEL Innovative Product" award for the use of 3D printing in the manufacture of its tangential rolling head at the China International Machine Tool Show (CIMT) 2019.

LMT tools has made use of additive fabrication technologies for the first time in the manufacture of the EVOLine tangential rolling head system. The rolling head hinges are produced using a 3D printing process. The company has now been rewarded by the "VOGEL Innovative Product" award in recognition. The award ceremony took place in the course of the China International Machine Tool Show (CIMT), which took place in Beijing in the middle of April 2019. CIMT is one of the largest trade fairs in the world for the machine-tool industry, and provides a platform every two years for the latest trends in the sector and the most advanced manufacturing technologies. Stefan Möller, LMT Tools Product Manager



Rolling Systems, who accepted the prize together with Jimmy Zhu, Manager CoC Milling & Threading at LMT China: "We are delighted by this special award. With EVOLine we have taken a great step in the direction of the future. 3D printing technologies are playing a growing role in manufacture, and have a key part to play in the smart factory. 3D printing also has great potential as tool manufacturers like ourselves."

Advantages thanks to 3D printing

It is 3D printing that has made it possible to integrate adjustable cooling and flushing nozzles into the hinge of the EVOLine rolling head. They assist the rolling process with an optimized volume flow rate, directly at the active zone. The tool's breaking strength also rises, because the component structures that are made are oriented more accurately to the force distribution pattern, and they have a generally improved topology.

We are committed to you worldwide!
Contact us and our experts:
www.lmt-tools.com

