



world^{of} tools

THE CUSTOMER MAGAZINE FROM HORN



TOPICS:

- Special feature on grooving
- New building in Tübingen

- Technology Days 2015
- HORN Academy



Dear Readers,

Ever since the company was founded more than 45 years ago, there has always been an emphasis on grooving tools at Paul Horn GmbH. They are still very much part of the landscape today and remain a central part of our product range. Grooving tools also feature heavily in this issue of world of tools. However, this is not the only area that HORN has focused on over the years and decades since its inception. Rather, it has grown constantly by launching innovative products. Several years ago, HORN became known as the specialist for “machining between two flanks”. That still holds true today. However, this label is no longer fully adequate to describe HORN, which is now making its mark on the market as a provider of high-tech cutting solutions. Products such as the DAH high feed rate milling cutter or the 409 and 406 tangential milling cutter systems are perfect illustrations of this.

We will also be showcasing this aspect of our work at our Technology Days in June. During this three-day event, we will be offering visitors an insight into the company, our manufacturing technology, and our products and applications. And, of course, we will also introduce them to our employees – both those who are customer facing and those who work behind the scenes.

On top of all that, we are also in the process of expanding our premises. The third plant is currently under construction in Tübingen and should be ready for us to move into in 2016. Once again, this demonstrates a clear commitment to growth, technology, innovation and the region itself.

I hope you enjoy reading the 20th issue of world of tools and that you make lots of interesting discoveries.

A handwritten signature in black ink that reads "Lothar Horn". The signature is written in a cursive, flowing style.

Lothar Horn
Managing Director,
Hartmetall-Werkzeugfabrik Paul Horn GmbH
Tübingen



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THE CUSTOMER MAGAZINE FROM HORN

Special feature on grooving

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Internal cooling is becoming increasingly important during grooving operations.

GROOVING – KING OF CUTTING TECHNOLOGIES

Machining between two flanks

Grooving – with its various machining operations such as parting off, groove cutting and groove turning – is an extremely sophisticated technology and is now used in many industries. Straightforward grooving applications were possible even before industrialisation and the arrival of modern machine tools, but it was the development of CNC machine tools that really led to major technological advances in this area.

Grooving bears certain similarities to the turning process found in the wood working industry. Carpenters and joiners used to guide their tools by hand and, with the aid of simple supports, would create certain structures in the wood. At the start of industrialisation, grooving within the metalworking industry was a relatively simple affair. Workers would, for example, use specially ground steel to make grooves in turned parts or to part off finished workpieces. It was only with the advent of modern mechanical engineering that real advances were made in the area of grooving as the capabilities improved and it became more widespread. These advances were driven by the numerically controlled machines that were developed in the 1960s and 70s. These machines also enabled metalworkers to achieve more sophisticated machining processes – reliably and with consistently high levels of repeatable quality. As a result, demand grew for professionally made special tools. Further

technological advances were triggered by the CNC machine tools that began to conquer the market in the mid-1980s and completely redefined the requirements placed on tools.

From revolution to evolution

Something was happening that would also have implications for grooving technology: computer-controlled processes were enabling increasingly complex applications to be achieved. Metalworkers no longer had to waste time and energy grinding the necessary tools, which was a highly laborious process. Instead, they suddenly had access to indexable inserts made from ground, formed steels with all kinds of geometries. These could be produced cost-effectively, to a consistent standard of quality and in sufficient quantities. The development of grooving tools went hand in hand with machine tool development.

Out of all the cutting work performed in Germany, grooving – in its pure form – accounts for around three per cent. Nevertheless, grooving (like any operation that involves machining between two flanks) is an application that requires a high standard of quality. Customers demand excellent surface results and maximum reli-

ability from the processes concerned, which are often automated. The tools must be designed to ensure optimum chip removal. Substandard chip forming behaviour can result in downtimes and generate considerable costs. The key to overcoming this is to use special cutting edge geometries. Other challenges facing modern grooving tools are the need for high cutting performance and the requirement for long tool lives.

Widespread use

Grooving applications can now be found in virtually every industry – with particular emphases. Within the automotive industry, a broad range of applications is developing due to the demand for machined gearbox, engine, chassis and steering components. Within the aviation industry, turbine construction is the key area where grooving tools come into play. The final sectors that make up this landscape of industries are medical technology and general mechanical engineering. Today's precision tools are used to machine every kind of metallic material. Although the list is still dominated by various grades of steel,

plastics and new materials (such as composites) are opening up new areas of potential.

The core business of HORN

HORN pioneers the development and production of state-of-the-art precision grooving tools. Paul Horn founded the company in 1969 under its original name of "Paul Horn Einstechtechnik" (= "Paul Horn Grooving Technology"). Right from the start, HORN was a producer of high-precision grooving, longitudinal turning and slot milling tools for demanding metal machining applications. The company has always thought of itself as a competent and innovative problem solver in the field of cutting technology. Today, its customer base includes automotive manufacturers and their suppliers, aerospace technology companies, medical technology firms, and makers of tools and moulds. Its main business area is groove turning and milling. Groove turning currently accounts for around 60 per cent of the company's production volume. Grooving – King of Cutting Technologies.



HORN's first ever tool case from the year 1972. This case was used to present the products of the time to customers at their own premises.

SPECIAL FEATURE ON GROOVING



A selection of products from the modular 960 grooving system range with internal cooling and 845 system interface.

MODULAR GROOVING SYSTEMS WITH INTERNAL COOLING FOR STAR TURRETS

The HORN modular grooving system for grooving cartridges, based on the 845 system interface comprises the following:

- ▶ Base plate for turrets with BMT connection or VDI holder
- ▶ Height-adjustable grooving tool holder
- ▶ Matching cartridge range with different grooving widths and grooving depths

The modular system kit has a selection of base plates for turrets with BMT connections, based on standard machine types. Alternatively, VDI basic holders are available in various sizes. The matching grooving tool holders with integrated coolant supply allow the cartridge heights to be adjusted and their fastenings to be set in a normal or overhead position, on the left or on the right of the grooving tool holder.

The cartridge system with system interface 845 serves as the holder for the S100 grooving insert system with a range of geometries and substrates. Grooving widths of 2.5, 3 and 4 mm (0.0984", 0.1181" and 0.1575") are available with grooving depths of 22 to 105 mm (0.8661" to 4.1339"). The cartridges are equipped with an integrated coolant supply in versions for clamping finger and support cooling. The system offers a higher level of rigidity compared to cut-off blades and enables planar parting-off surfaces, even with large material diameters. The flat design prevents unnecessary interfering contours.



It is during parting off, in particular, that the clamping of the cutting edge assumes a very important role. If the cutting edge is supported in a highly rigid manner, it immediately improves the parting-off results, the surfaces and the flatness. Therefore, the aim when developing cartridge 845 was to ensure optimum

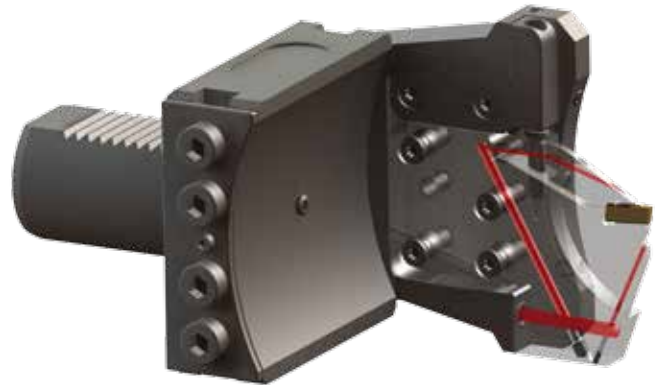


845 cartridge with internal cooling via the clamping finger and support cooling from below.

guidance of the cutting edge during contact by making the substructure as big as possible. Consequently, the risk of vibrations during cutting was eliminated from the very outset. This was achieved by putting broad and extensive support in place outside of the parting-off area so that it extended right under the cutting edge. To supplement this measure, the cartridge features a support element on the basic holder so that the resulting cutting forces can be diverted directly into the grooving tool holder. This support element clearly differentiates the system from cut-off blade technology.

What's more, cooling via the clamping finger and the extensive support measures also increase the tool life. Cooling via the clamping finger keeps the area around the chip surface cool, reduces crater wear and cools down the chip itself while influencing the chip breaking behaviour. At cooling pressures above 80 bar, this means that the formation of vapour bubbles in the area around the chip surface can be avoided and that the coolant can act directly on the hot zone. Cooling via the support reduces flank wear and has a lubricating effect on the flanks of the grooving insert, resulting in surfaces with minimal roughness.

The cartridges can be combined with grooving tool holders of various lengths. The choice of possible combinations is constrained by the size of the counter spindle (longer cartridge throat depth required) or by the maximum possible swivel diameter (which limits the throat depths). The type 960 grooving tool



As the cooling lubricant flows through the channel system (shown in red), it passes via the VDI holder, the insert holder and the S100 insert.

holders are currently available with two different lengths for the external and internal versions. In the case of turret machines with no Y-axis, height adjustment is very important, as it allows the height to be adapted for the relevant application by turning an adjustment screw.

To cater for smaller machines, the type 842 cartridges have been standardised. These are more compact and offer the same beneficial features as the type 845 cartridges.

For a quick overview of which elements are suitable for specific machine types, please visit the HORN website:



www.phorn.de/en/products/grooving/960



Your selection

Manufacturer

 Machine type

Results for

Basic tool holder	Grooving tool holder internal	Grooving tool holder external
960....	960.I....	960.A....

**SPECIAL FEATURE
ON GROOVING**

NEW STANDARDS OF PERFORMANCE WHEN PARTING OFF

View inside the machine compartment of an Index C100, turret with 940 parting-off system from HORN.

Fassondreherei Hermann Blum GmbH (FHB), a turning company based in Gutach (Baden-Wuerttemberg), uses modern CNC lathes to produce precision turned parts for customers from various industries. To keep its customers happy, its service, flexibility and quality all have to be spot on. For the purpose of parting off the workpieces, FHB relies on the 940 and 960 systems from HORN. As a result, the company has managed to improve its production processes and increase the life of its tools considerably.

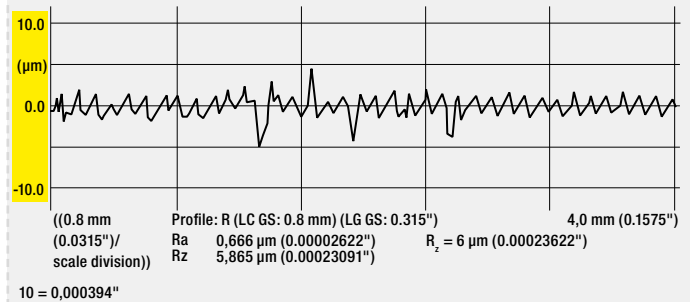
The company was founded by Hermann Blum in 1948 and it started out producing cylindrical and tapered pins. Over the years that followed, FHB never stopped expanding its production range. By constantly modernising its machinery and focusing consistently on precision, quality and flexibility, it was able to grow its customer base very rapidly. In 1996, Gutach industrial estate became home to the company's brand new office and production building. Today, the company occupies a surface area of 1800 square metres, employs around 40 people and produces turned parts for manufacturers of medical technology, the machine building industry, office furniture, sensors, motorcycles and commercial vehicles. FHB works exclusively with bars made from steel, stainless steel, aluminium, plastic, titanium and brass, which it processes on state-of-the-art CNC long and short lathes. Working on a three-shift basis, the Baden-Württemberg-based business uses a total of 36 CNC single-spindle machines to produce quantities of anywhere between 1,000 and 40,000 items.

Joining forces for success

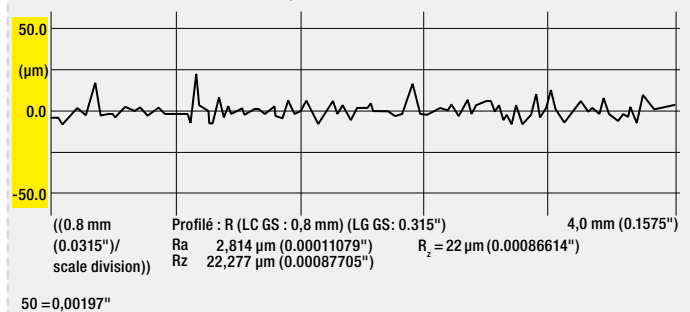
This is how Thomas Albrecht, the managing partner of the family-run firm, sums up the demands that a medium-sized supplier such as his currently has to meet: "Customers are outsourcing more and more of their activities, which means we have to be really flexible." On a fair number of occasions, they have got suppliers such as FHB on board as early as the planning and development phase because what customers want is affordable quality. As a result, FHB is finding itself actively involved in customer projects on a more frequent basis. It says that another challenge is the change in the order situation. According to the company, the blanket orders that were so easy to schedule are increasingly being replaced by short-term orders that involve smaller quantities and require a faster response. This has brought Thomas Albrecht to the following realisation: "We have got to optimise our production processes."

As part of the process of identifying better solutions, they also put their tool system under the microscope. It was then they realised that their existing parting-off solution was very cumbersome. FHB was a user of cut-off blades and knife tools. "Because of our immense diversity of variants, we were constantly having to change the tools. That took a lot of time," explains Martin Moser, Technical Director at FHB. In addition, the cut-off blades were

System 960 – Surface comparison



Cut-off blades – Surface comparison



subject to high levels of wear. They were not always cooled reliably, there was a risk of tool breakage and, in some cases, collisions even occurred within the work area. "What we needed was a flexible and reliable parting-off system," says Moser succinctly.

As a turning specialist, FHB has been successfully using tools from Tübingen for 25 years and so when they contacted HORN, they found exactly the right person to talk to in Karl Schonhardt. Schonhardt, who works in HORN's Technical Support and Sales department, suggested that they try HORN's 940 parting-off system featuring a direct holder for Index lathes. However, given that machines from other manufacturers were also in use at the Gutach site, the project partners decided on a different variant with an additional type of holder. They produced drawings and started conducting trials on the machines as soon as the first designs became available. Close collaboration between the lathe operators and the HORN development department ultimately led to a prototype in the form of the 960 system with a VDI or BMT holder for use on star turret machines.

Faster, safer and more reliable

Both systems comprise a basic holder, a grooving tool holder and a cartridge (the latter can be screwed from both sides). Depending on the application concerned, the cartridge can be used on either the left or the right. With the 940 variant, HORN offers parting-off cartridges ranging from 2.0 to 4.0 mm (0,0787"

SPECIAL FEATURE ON GROOVING

to 0.1575") in width and with grooving depths of 16 mm to 34 mm (0.6299" to 1.3386"). The 960 is available in widths of 2.5 mm to 4.0 mm (0.0984" to 0.1575") and with grooving depths of between 22 and 55 mm (0.8661" to 2.1654").

The cutting edges are clamped (using a screw) and cooled via the clamping finger. This ensures process reliability, even with large groove depths. In the event of wear, the cutting edges can be replaced with ease and without any need for corrections. Both variants feature a dual internal coolant supply with support cooling provided from below and clamping finger cooling provided from above. "As a result, the coolant jet acts directly on the cutting edge, thereby ensuring optimum machining results," says Karl Schonhardt. With its concept of providing broad and extensive support, the new design makes the parting-off system highly stable and wear-resistant. Not only that, but the HORN developers have managed to minimise interfering contours through its compact construction.

Since FHB started using both systems, it has seen considerable improvements in its processes, which are now faster, safer and more reliable than before. On average, the life of the cutting edges is two to three times longer than with the cut-off blades that they used to rely on. The specialists have succeeded in eliminating tool breakage entirely. Depending on the material concerned, the turning company uses feed rates of 0.1 to 0.25 mm/rev (0.0039"/rev to 0.0098"/rev) and cutting speeds of 200 m/min. The fact that there are no interfering contours between the grooving cartridge and the grooving tool holder means that even very short workpieces measuring 2 to 3 mm (0.0787" to 0.1181") can be parted off and gripped with a high level of process reliability.

By switching over to the new parting-off technology, FHB has managed to reduce the diversity of its tool variants considerably. This saves space and cuts storage costs. "We are now using Horn inserts for all our parting-off operations in short part turning applications," says Martin Moser. HORN carried out detailed

tests to verify the quality of the surface after parting off. They wanted to know how well the 960 and 940 systems performed compared with cut-off blades. When used to machine a steel workpiece (16MnCr5) at a feed rate of $f = 0.2$ mm/rev (0.0079"/rev) and a cutting speed of $V_c = 160$ m/min, the HORN cartridge achieved a roughness depth of $R_z = 6$ μ m. The previous value achieved by the cut-off blade was just $R_z = 22$ μ m. The flatness is also considerably better: 0.01 mm (0.0004") with the HORN cartridge compared to 0.055 mm (0.0022") with the cut-off blade. To an extent, these improved values eliminate the need for the additional face turning operation that is normally carried out after parting off. In light of the phenomenal results achieved at FHB, the 960 system was rapidly extended to accommodate all standard star turret machines with a BMT or VDI connection and was subsequently presented at the AMB 2014 exhibition. The best thing about the system is its complete flexibility: the cartridges can be used in both the normal and overhead positions on the same tool holder. The height adjustment feature ensures parting off without burrs and pips. Any combination of basic holder and grooving tool holder is possible. In the case of the VDI holder, this means that there is a choice of four different mounting options with a single holder.

The decision to use the 940 and 960 parting-off systems has really paid off for FHB. "This technology has proven extremely flexible and can even withstand extreme levels of stress without difficulty," explains Moser appreciatively. In unfortunate cases, the old cut-off blades had to be replaced once a month due to wear. Since it was put into operation in December 2013, the 940 system has been operating on a three-shift basis without any problems. The tool remains permanently in the turret and, in contrast to the cut-off blades, there is no risk of collisions. In the meantime, cooperation between HORN and FHB has reached new levels. The experts are busy testing the use of cutting edges with a smaller width. As far as Technical Director Martin Moser is concerned, there is a sound reason for this: "If we reduce the cutting widths, we will be able to get up to 20 more parts out of a three metre bar."

System 960



Grooving being performed on a prototype workpiece for a future Knorr-Bremse braking system.

EFFICIENT THREADING

Multi-start square threads for brake construction

The special version of the HORN 231 grooving tool is doing a great job at Knorr-Bremse SfS: CNC specialists at the development and testing workshop in Munich are using it to create threads in aluminium workpieces – quickly, and with high standards of quality and process reliability.

The Knorr-Bremse Group is the world's leading manufacturer of braking systems for rail and commercial vehicles. For more than 110 years, the company has been at the forefront of the development, production, marketing and servicing of state-of-the-art braking systems. Its other product lines for rail vehicles include intelligent entrance systems, air conditioning systems, power supply systems, control components and windscreen wipers, platform screen doors, friction material, plus driver assistance systems and control technology.

In addition, Knorr-Bremse offers driving simulators and e-learning systems for optimum train crew training. Alongside complete braking systems (including driver assistance systems), the product range of the Commercial Vehicle Systems division encompasses torsional vibration dampers and all manner of power train solutions, as well as gearbox control systems for improving efficiency and saving fuel. The Knorr-Bremse Group has around 21,000 members of staff based at more than 90 sites in 27 countries.

Efficient threading

The development and testing workshop is responsible for producing prototypes and special parts. Its "clients" consist of the various development and testing departments, centres of competence and sites within the Knorr Group. "The Design department gives us the drawings and we then check whether the workpiece can be produced cost-effectively with our existing tools," explains Head of Department Josef Klingl. That's exactly what happened when the department was asked to explore whether an aluminium part (AlMgSi1 F30) with an external diameter of 98.9 mm (3.8937") could be provided with a square thread for subsequent installation in a braking system. The designers had asked for a quadruple square thread – an extremely demanding machining operation that presented the Munich-based specialists with a major problem: "None of our standard tools were appropriate for this custom product," reveals Klingl.

HORN – First port of call

For advice, he turned to Michael Götz from the Technical Support and Sales department of Hartmetall-Werkzeugfabrik Paul

SPECIAL FEATURE ON GROOVING



The finished workpiece with a quadruple square thread.



The special tool with the type 231 insert is an impressive piece of equipment for threading.

Horn GmbH in Tübingen. As far as he was concerned, that was the only sensible option. "In tricky cases like this, we always like to draw on HORN's expertise. We have been working with them successfully for a long time, since the mid-1980s in fact, and what we particularly value about them is their excellent flexibility, the level of trust that has been built up over many years and the speed with which they respond to our requests," says Paul Grodotzki, who is in charge of tool planning at Knorr-Bremse in Munich. Michael Götze responded promptly, captured the relevant technological data on site and enlisted the services of the quotations department in Tübingen. Through close cooperation with the Knorr-Bremse employees, the 231 special insert was born, with the entire production and delivery process taking less than five weeks.

It's all about precision

The insert is used in a standard R221 tool holder milled from high-grade steel.

This holder, which was actually designed for axial grooving, was taken out of its original context and put to a new use:

- › The indexable insert is fixed in place with a wedge clamping element for the most stable and secure form of clamping that you could ever imagine.

- › The two-edged 231 insert is made from ultra fine grain MG12 carbide substrate.
- › The insert undergoes peripheral grinding to ensure an indexing accuracy of 0.02–0.03 mm (0.008" – 0.0012").

Once ground, the indexable insert is coated. In this case, a TiCN coating was chosen because this is Horn's preferred option for thread machining applications and unfavourable conditions. The special tool, which is produced entirely at HORN's headquarters in Tübingen, has certainly won over the experts at Knorr-Bremse. With this thread turning tool, the Munich-based specialists are able to provide each aluminium workpiece with a 40 mm (1.5748") thread pitch while working at a cutting speed of 100 m/min (3,937"/min) and to a thread depth of 6 mm (0.2362"). They also succeeded in meeting the surface quality requirements by achieving a roughness depth of $R_z < 16 \mu\text{m}$ (0.00062992").

When considering the process now used to cut the thread on the aluminium workpiece with the state-of-the-art CNC lathe, Martin Tepfenhart's response expresses the peace of mind it has given him. "Since we started using this tool, we have stopped running into problems with faulty threads; it all works perfectly. I am very satisfied with the solution from HORN," says the CNC expert. Although Josef Klingl and his colleagues do not always know whether test parts such as this will subsequently go into

series production, they do know it is always all about ensuring precision. "With this thread turning tool, we are able to achieve excellent machining results."

Flexibility combined with process reliability

From Knorr-Bremse's perspective, another plus point is the flexibility of the 231 system. "We can also use it to machine other materials, such as steel, with a high level of process reliability," says Klingl. On top of that, machine operator Martin Tepfenhart is also full of praise for the efficiency of the HORN solution. "I was the one who installed the tool as soon as it was first delivered and who produced the first threads with it. The dimensional accuracy and quality were spot on from the very first cut and the tool successfully met all requirements from the word go. The tool did not have to be rectified in any way." The process of changing the inserts does not pose any problems at all. "As soon as we have installed a new insert, we can carry on working straight away without any need for time-consuming corrections." Even the tool holder still looks as good as new after several insert changes, which is testament to the quality of the material used. And for Josef Klingl, one thing is certain: "If we need any more special tools in the future, Horn will definitely be our first choice again."



The dimensional accuracy and quality were spot on from the very first machining operation.

Together with HORN sales representative Michael Götze (centre), Paul Grodotzki (left) and Martin Tepfenhart (right) discuss the positive results achieved as a result of the collaborative process.





The type 842 cartridges offer a high level of rigidity and, when used in combination with the 940 system, considerable flexibility.

CARTRIDGE TYPE 842

Expansion of the modular grooving system range

HORN is expanding its grooving system by adding a type 842 cartridge system, which features smaller dimensions for machining smaller workpieces. The system is suitable for parting off various grades of steel and really stands out on account of its extremely high rigidity and efficient cooling concept.

The 842 cartridges form part of the 940 modular grooving system, which comprises a basic holder, a grooving tool holder and a cartridge. The key advantages for users lie in the flexible component combinations. The grooving tool holders – which are available in different lengths according to the type of machine and application – are connected to the basic holder.

Thanks to its compact design, the grooving tool can be easily integrated into different types of machine. HORN initially developed the new product with special connections for lathes made by Traub and Index. In combination with the S100 cutting insert range, type 842 provides a cost-effective solution for parting off free-cutting, high-strength and stainless steels.

Specially designed for use on lathes with smaller work areas, the cartridge can be screwed from both sides. The type S100 cutting edge is available with different widths, geometries and

coatings to suit the machining task concerned. The screw clamping device of the cutting edge makes it easy to perform tool changes with a high level of repeat accuracy.

The grooving tool features an internal coolant supply with support cooling provided from below and clamping finger cooling provided from above. As a result, the coolant jet acts directly on the cutting edge, thereby ensuring optimum work results. Compared with conventional external cooling concepts, this type of cooling improves the cutting parameters and leads to longer tool lives. As a result, users of the system benefit from its cost-effectiveness.

The type 842 cartridges were developed with a particular aim in mind: maximum rigidity. In comparison to blades, this offers advantages in terms of flatness and surface quality. There is no longer any need for the additional face turning operation to be performed on the parting-off surface. After machining with the 842 system, the workpiece surface exhibits a very flat parting-off surface with minimal roughness. HORN offers the grooving tool with grooving depths of $T_{max} = 22 \text{ mm}$ (0.8661") and $T_{max} = 34 \text{ mm}$ (1.3386"). The strengths of the system particularly come to the fore when machining bars in the context of series production.

409 TANGENTIAL MILLING CUTTER SYSTEM

Main body with a wide tooth pitch introduced

HORN has enhanced its proven 409 tangential milling cutter system by adding extra 90° milling shanks as well as cutter heads with a wide tooth pitch.

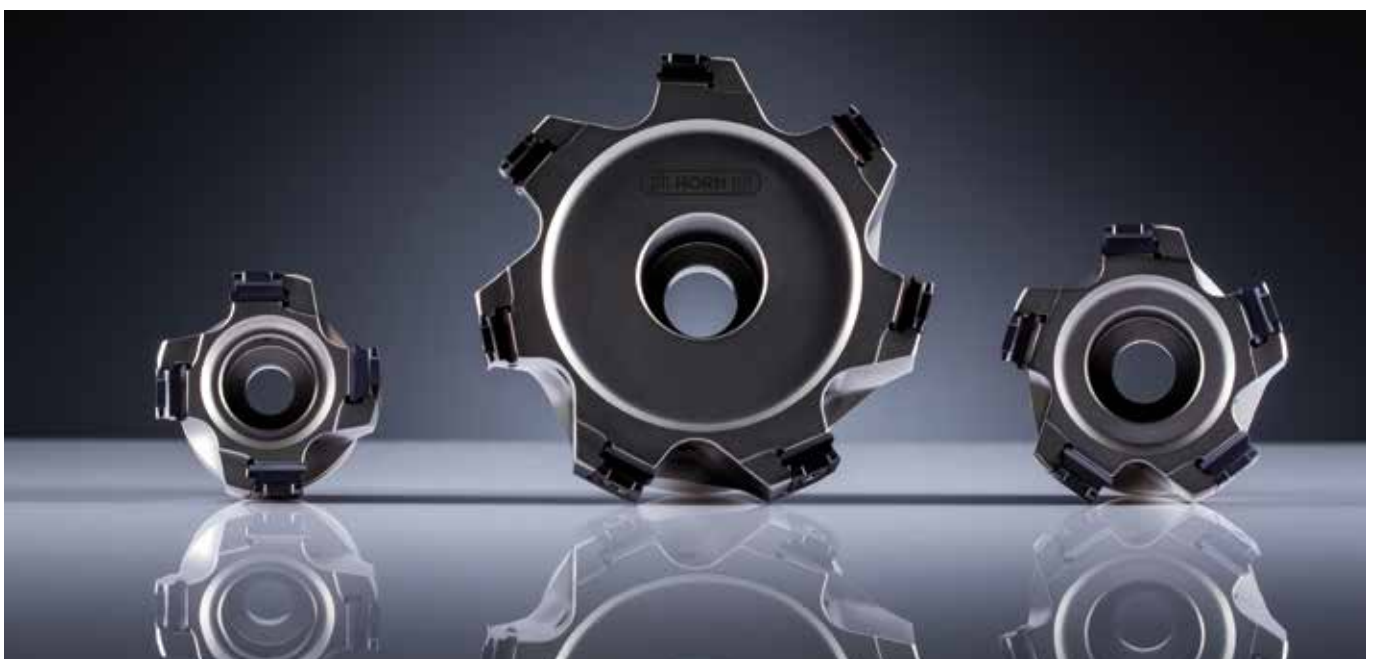
The new end mills are available with cutting edge diameters of 32 and 40 mm (1.2598" and 1.5748") in accordance with DIN 1835-B. Arbor milling cutters in accordance with DIN 8030-A are available in diameters of 40, 50, 63 and 80 mm (1.5748", 1.9685", 2.4803" and 3.1496"). The 90° milling shank and the cutter head with wide tooth pitch provide users with greater feed rates per tooth and increased infeeds. These additions from HORN also come into their own when machining long-chipping materials. The 409 tangential milling cutter system is equipped with rhombic indexable inserts. They are precision-ground and achieve high levels of accuracy combined with excellent standards of surface quality. The system – which features new, additional holders – also includes 45° and 60° milling cutters, as well as indexable insert end mills and side milling cutters.

The 45° variant is capable of achieving cutting depths of $a_p = 6.2$ mm (0.2441") and the 60° version a cutting depth of $a_p = 7.7$ mm (0.3031"). They can both be used with the same R409 indexable inserts.

Both milling cutter types are available as arbor milling cutters with DIN 8030-A holders in cutting edge diameters of 40, 50 and 63 mm (1.5748", 1.9685" and 2.4803"). The 90° milling cutter from the 409 system is available in cutting edge diameters of 32, 40, 50, 63 and 80 mm (1.2598", 1.5748", 1.9685", 2.4803" and 3.1496"). The milling cutters have an internal coolant supply, which provides efficient cooling and optimises chip flow. The 45° and 60° versions are available with five, seven or eight teeth.

HORN is also expanding its range to include five-row indexable insert end mills with a cutting depth of $a_p = 43.2$ mm (1.7008") and DIN 8030-A holders. These also use the R409 indexable inserts. The holders with internal cooling are available in diameters of 40, 50 and 63 mm (1.5748", 1.9685" and 2.4803"). Side milling cutters with DIN 138 driver slots also form part of the 409 system. These milling cutters are available with cutting edge diameters of 100 and 125 mm (3.9370" and 4.921") and have cutting widths of 14 and 18 mm (0.5512" and 0.7087").

HORN's 409 tangential milling cutter system is particularly suitable for general steel machining. When used with alloy steel, for example, the tools can achieve a cutting speed of $v_c = 150$ m/min (5,905.5118"/min), or with high-alloy steel a speed of $v_c = 70$ m/min (2,755.9055"/min).



The new basic holder with wide tooth pitch for the 409 tangential milling cutter system was unveiled in February at the Intec exhibition in Leipzig.

HORN – THE PERFECT FIT FOR THE JOB



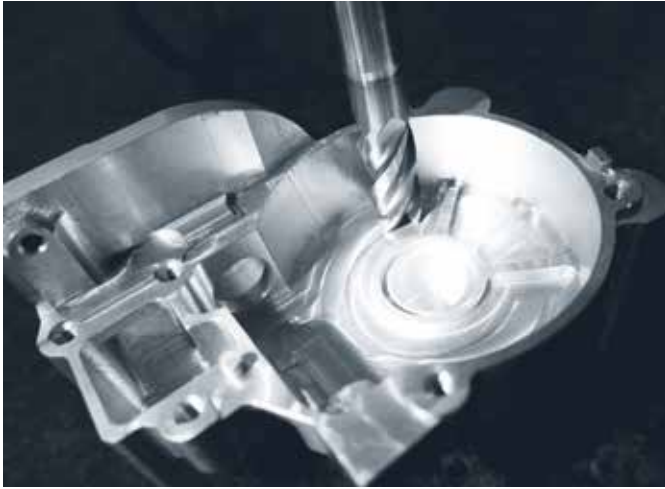
WMH in Wiesloch (Baden-Wuerttemberg) specialises in the small-scale production of highly precise aluminium, steel, brass and plastic parts with high machining rates and demanding geometries.

WMH opts for HORN milling cutters

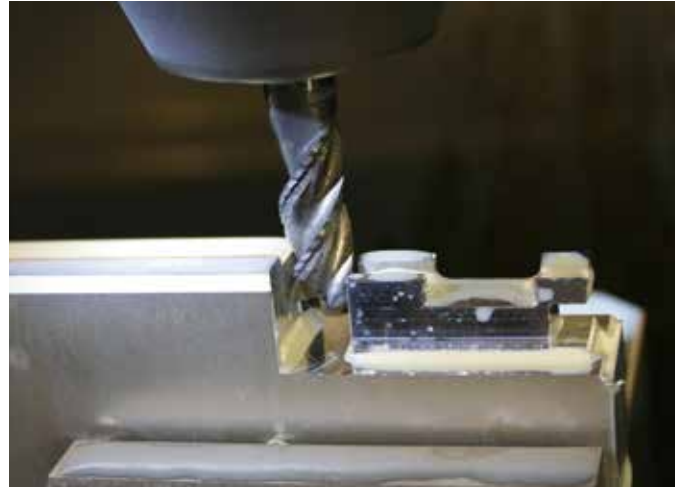
In keeping with the outsourcing concept, Werkzeug & Maschinenbau Heidelberg (or WMH for short) likes to think of itself as a sturdy “extended workbench” that its customers can rely on. Its strengths lie in processing orders as quickly as possible, and ensuring on-time delivery and high quality. At a company with this kind of focus, universality and flexibility are major factors, which explains why it is also geared towards universal machines and tools. In tool specialist HORN, WMH has found a partner that fits the bill perfectly thanks to its range of milling tools. It will come as no surprise, then, to discover that 90 per cent of the tools used at WMH bear the HORN brand name.

WMH in Wiesloch (Baden-Wuerttemberg) is still a relatively young company. Although it was only founded in 2009, it has two very experienced heads at the helm in the form of Volker Maempel MD and his son Ralph. WMH specialises in milling. It machines all common materials in three or five axes up to a maximum cube size of 900 x 630 x 600 mm (35.4331" x 24.8031" x 23.622"). The materials include aluminium (soft to high-strength), all grades of steel (including stainless), copper and bronze alloys, and a multitude of technical plastics (including the filled and fibre-reinforced varieties). The installed machinery consists of universal milling machines from Hermle and Mikron – hardly the bottom end of the market.





DSFA triple-edged solid carbide milling cutter with uneven helix angle. Easy cutting, with internal cooling and NE2K coating, a high feed milling cutter for aluminium.



DSFRA solid carbide milling cutter with internal cooling and helix angles ranging from 36° to 40°. With its positive easy cutting action, this milling cutter supports truly impressive feed rates, is centre cutting and has a balance quality grade of G2.5.

Its customers from the medical technology, chemical engineering, automotive, optics, astronautics and defence industries value WMH for its high standards of quality. It does everything from the production of casings with deep cavities and undercuts, guides, drive components and welded assemblies right through to finite surface treatment. Every year, its list of orders is packed with between 500 and 800 different parts, with some manufactured as individual parts, others in small batches of up to 100, and others still as prototypes. The drawings typically arrive in DXF file format, which it then uses to generate the programs for its machines. The level of precision required is sometimes extraordinarily high, as are the geometry and surface requirements. If its own measuring machine is not large enough for the job, it is free to call on the precise and sophisticated climate-controlled measuring technology of its neighbour whenever it likes. The spacious workshop has been designed with expansion in mind.

Reliable, universal and flexible

Master precision engineer Ralph Maempel has no problem at all giving a logical account of why he swears by cutting tools from HORN: "After 15 years, I know what HORN tools can do and I also value Thomas Massinger (a HORN technical consultant) as a highly competent partner. When it comes to meeting my requirements, HORN milling tools fit the bill perfectly, particularly now that the milling range has been expanded. My jobs have very short lead times. Day-to-day production work is dominated by deadline pressures and stringent quality standards. Therefore, I have to be able to respond quickly. HORN helps me with this in lots of ways. When a new enquiry comes in, I can use the online shop to put together the costs of the cutting tools for my quote in next to no time. If I get the job and order the tools by 5:30 p.m., I can set to work the very next morning. HORN milling cutters

offer high performance and reliability, are suitable for universal use and are very flexible. I am familiar with all the competitors in the tools market and although I have heard lots of promises made, the only tools that have so far managed to deliver what others could only promise are those from HORN – in fact, in most cases, the HORN tools far exceeded these claims."

The problems of the "extended workbench"

Maempel goes on: "Do you know, I have exactly the same problem as many of my colleagues who are involved in the 'extended workbench' outsourcing system; faced with an abundance of different parts – often involving individual parts with all kinds of different geometries and materials – I am forced to work with standardised clamping devices, usually a vice. When working on thin-walled parts that have to have large volumes of metal removed or have a small clamping surface, what I need are smooth-running, easy cutting tools that are still able to achieve high chip volumes. I need tools that will travel along their paths with a steady and cushioned cutting motion to prevent the workpiece from being deformed or forced out of the clamp, but that are still capable of achieving top-notch surface quality with a high degree of precision. I cannot invest umpteen thousand euros in specialist tools that have been optimised for specific materials or cutting operations. I want an aluminium milling cutter that is just as good at cutting copper, bronze or most plastics as it is at cutting aluminium itself. I need milling cutters that can tackle most steel grades equally well. For me, it's not about shaving off a few seconds. That would be important in the case of large-scale production, but what I need are directly accessible universal tools. That is what HORN – and nobody else – delivers. I find the cutting data tables in the catalogue immensely helpful for my various machining tasks. I know I can count on

them for absolute peace of mind. And if you want evidence of how Thomas Massinger has provided me with great advice that is in my very best interest, this recent example illustrates it perfectly: I needed to produce two parts, but the special tools required to create the specific geometry were going to cost me 600 euros. Thomas Massinger recommended that I could have this geometry created with eroding technology at a cost of 200 euros, meaning that he lost out on a sale.”

High feed rate milling cutters take centre stage

90 per cent of the milling cutters in WMH's tool magazine bear the HORN brand name. This means that 60 different items representing the entire breadth of HORN's milling cutter range are immediately accessible there all the time. To date, Maempel has been able to handle all his machining tasks using standard tools. The only one requiring special tools is the defence technology order that was recently placed with the company.

In the eyes of Ralph Maempel, HORN tools offer major advantages including, for instance, its milling cutters with an uneven tooth pitch and various helix angles. These reduce vibrations, enable easy cutting and are equally suitable for rough machining and finishing alike. By way of an example, he cites type DSFA, which features internal cooling and helix angles of between 36° and 40°. This milling cutter supports truly impressive feed rates, is centre cutting and has a balance quality grade of G2.5. It offers

superb dimensional accuracy and, when used for pocket milling in series production, the last pocket is just as good as the first. Further benefits include: sharp cutting edges, positive easy cutting and high-quality cut edges with virtually no burr formation. Other products that really stand out inside the magazine are the DAHM and DAH high feed rate milling cutters with indexable inserts. In the case of steel, these support a feed rate of up to 2 mm (0.0787") per tooth and an infeed of 0.7 mm (0.0276"), depending on the application concerned. Alternatively, there is the type M409 milling cutter featuring tangential indexable inserts. Not only is this equally well suited to aluminium and tool steel, but it can also be used with high-strength materials such as Inconel or Hastelloy, making it a true high-performance tool. Other milling cutters in use at WMH include the circular milling cutter types 328, 332 and 311, thread milling cutters in screw-on (type 311 or 328) or DC mono block versions, the DG modular milling cutter system, type M310 side milling cutters, type M101 slotting cutters, solid carbide end mills from the DP range and also the complete DSA solid carbide end mill range for aluminium, copper and plastics.

In addition to the technical benefits, Maempel also enjoys commercial advantages by working with HORN. Monthly invoices that are paid automatically by direct debit make for easier accounting, the universal nature of the tools enables cost-effective storage and the overview of tools in the online shop ensures cost transparency.

Thomas Massinger, a technical consultant at HORN, Ralph Maempel and Volker Maempel, Directors of WMH in Wiesloch (from left to right): 90 per cent of all milling tools bought from HORN based on absolute trust.





Selection of different die plates from the S117 system.

PROFILING: A TECHNOLOGY THAT OFFERS POTENTIAL SAVINGS

Profiling tools enable various contours to be created on workpieces with high levels of precision and process reliability. The S117 system from HORN meets the stringent requirements of customers in terms of both quality and productivity. This tried-and-tested technology provides users with all kinds of advantages. In various industries, it may be beneficial to combine die plates with a fast tool changing system. In a best-case scenario, grooving tools can even eliminate entire stages of production. However, in order for this to be achieved, the machining process and relevant parameters must first be analysed precisely. It is in the context of large-scale production, in particular, that the strengths of these special tools really come to the fore.

Within industry, there is constantly increasing pressure to reduce costs. In parallel with this, customers are demanding higher levels of quality and reliability from the tools they use to manufacture their serial and mass-produced parts. Even small reductions in the time taken to produce an individual part have the potential to generate substantial savings if production is taking place on a large scale. That is why today's companies do all they can to avoid the costs incurred by having too many production stages or unnecessary tooling times. Machines have to run reliably with long tool lives if they are to be economical.

Profiling tools are an efficient way of reducing tooling times and costs while at the same time increasing machine capacity.

They offer major process benefits compared to turning machining operations. This is particularly apparent in the case of large production quantities because of the cumulative effect of producing individual parts more quickly. Turning operations are performed in the axial direction while profiling takes place in the radial direction. The latter is more desirable because of the time savings involved. During copy turning, for instance, the tool has to follow the entire contour of the workpiece, which is very time-consuming. With a die plate, on the other hand, the profile can be fully completed in a single step.

The application is key

HORN is constantly developing its S117 die plates to ensure that they still satisfy the stringent requirements of the market in terms of quality and precision. The plates are an extremely cost-effective way to achieve workpiece profiling with complete contouring and angular accuracy. They are made from carbide or cermet, which means they are very tough. Depending on the application, a special coating may be applied. The plates are screwed securely onto tool holders made from tool steel to ensure a high level of process reliability. The integrated dovetail creates a pull-down effect in the insert seat. This increases the contact pressure and ensures that the plates are securely seated.

The tool is completely precise and results in high standards of surface quality on the component.

Replacing worn cutting edges couldn't be simpler. All the user has to do is loosen a screw, fit a new plate and then screw it tight again. The process is really quick and helps to prevent long changeover times. There is no need for any additional adjustment and the tool – with its indexing accuracy of 0.02 mm (0.0079") – is ready to use again in a flash. HORN offers the S117 tool system with numerous different profile and relief angle options. Shapes with small relief angles are also suitable for chip surface regrinding. However, users must make sure that they replace worn inserts in good time. This is because effective regrinding becomes impossible or too expensive if the tools are excessively worn. In addition, users should handle the tools with care to avoid damage (e.g. break-outs). Ultimately, the key factor when designing the cutting edge geometry is the nature of the application itself. HORN is able to produce custom tools quickly by working in close cooperation with its customers: as soon as the technical details have been clarified, the tool is usually delivered within one week of the drawing having been approved by the customer.

Pure flexibility

The S117 die plates are suitable for a large number of materials and are particularly efficient when used with high-strength steels, aluminium and brass. These precision tools are ideal for producing automotive accessory parts with different geometries and in large quantities. However, they can also be used to manufacture brass tap fittings reliably and with consistently good levels of repeatable quality. Consequently, profiling tools offer users excellent flexibility combined with the kind of process reliability that comes with a tried-and-tested technology.

Custom die plates for specific customer applications.



S117 inserts (5° insertion angle):

S117. 0010.00

Form width of up to 10 mm (0.3937"),
form depth of up to 3.5 mm (0.1378")

S117. 0012.00

Form width of up to 12 mm(0.4724"),
form depth of up to 4.5 mm (0.1772")

S117. 0014.00

Form width of up to 14 mm (0.5512"),
form depth of up to 6.0 mm (0.2362")

S117. 0016.00

Form width of up to 16 mm (0.6299"),
form depth of up to 6.5 mm (0.2559")

S117. 0018.00

Form width of up to 18 mm (0.7087"),
form depth of up to 9.0 mm (0.3543")

S117. 0020.00

Form width of up to 20 mm (0.7874"),
form depth of up to 9.0 mm (0.3543")

S117. 0026.00

Form width of up to 26 mm (1.0236"),
form depth of up to 9.0 mm (0.3543")

S117. 0032.00

Form width of up to 32 mm (1.2598"),
form depth of up to 6.5 mm (0.2559")

S117. 0045.00

Form width of up to 45 mm (1.7717"),
form depth of up to 6.5 mm (0.2559")

S117 inserts (0° insertion angle):

S117. 0010.02.00

Form width of up to 10 mm (0.3937"),
form depth of up to 6.5 mm (0.2559")

S117. 0012.02.00

Form width of up to 12 mm (0.4724"),
form depth of up to 7.5 mm (0.2953")

S117. 0016.02.00

Form width of up to 16 mm (0.6299"),
form depth of up to 9.0 mm (0.3543")

S117. 0020.02.00

Form width of up to 20 mm (0.7874"),
form depth of up to 12.0 mm (0.4724")

S117. 0026.02.00

Form width of up to 26 mm (1.0236"),
form depth of up to 13.0 mm (0.5118")

ABOUT US



In 2015, HORN will once again be opening the doors to its production facilities and offering insights into how precision tools are manufactured.

TAKE A LOOK BEHIND THE SCENES

HORN TECHNOLOGY DAYS, 17TH TO 19TH JUNE 2015 IN TÜBINGEN

Under the slogan “Take a look behind the scenes”, HORN will be using this year's Technology Days event to showcase the latest trends and developments from the world of precision tools. The event will take place between 17th and 19th June at its headquarters in Tübingen and will also include the first ever HORN Careers Day on Friday 19th June 2015. Customers, university students and school pupils will have a chance to find out all about the company's Academy programme. One highlight of the Technology Days will be the technical presentations by HORN specialists on hot topics – also delivered in English for the benefit of our international guests.



The visitors who came in 2013 gained valuable information from the presentations as well as directly from the individual departments themselves.

The presentations at a glance

Grooving and parting off stainless materials

The processing of stainless materials places extremely high requirements on the tool with respect to resistance and potential plastic deformation. Selecting the right carbide grade and geometry is crucial. Owing to its enhanced mechanical stability, machining this material presents a challenge with regard to heat generation, cutting forces and chip control. In this presentation, you will find out how to counteract wear mechanisms such as flank wear and what machining benefits can be achieved by selecting the right tool, particularly internally cooled tools.

Long part turning – Producing complex turned parts

State-of-the-art series production of small parts places high requirements on the tools involved. Due to the restricted space available in the work area of the Swiss-type lathes that are used, the tools need to have a small and compact design, yet still satisfy the stringent quality requirements of mass production processes. Tool systems from HORN are an impressive example of how this problem can be tackled.

Precision tools in the value-added chain

The requirements placed on precision tools as a technology carrier have increased considerably over the last few years. In addition to maximum productivity, other factors are increasingly

playing a crucial role when it comes to using them successfully. With the advent of virtual production processes – including data availability – and in light of the continued diversification of the materials being cut, tool manufacturers must constantly adapt their products and services to meet the demands of machining companies. This presentation sheds light on some of the challenges that will be faced by the machining industry of the future.

Trochoidal hard milling with coated solid carbide millers

Trochoidal milling involves routing the milling tool along a trochoidal path in a highly dynamic manner. The maximum pressure angle is defined in accordance with the material. This means that the milling cutter is only engaged for a very short time and the thermal load is significantly reduced. Small cutting widths and, in turn, smaller cutting forces allow high axial cutting depths so that large machining volumes can be achieved. This technical presentation will demonstrate the benefits of this milling method and provide important background information on the topics of wear, cutting data and applications.

Milling and slotting cutters – New opportunities for high-precision production

When it comes to cost-effective separation of the workpiece with high cutting values, milling and slotting cutters are the tools to use. They can be used in many ways and offer optimum results with even the most varied of materials. The benefits are their high repeat accuracy and how easy it is to change the screwed-in indexable inserts. What's more, the indexable inserts can be adapted to the material with respect to their carbide grade and chip shape geometry. This presentation will show you how using the right insert will enable you to achieve a reliable and cost-efficient machining process in a variety of applications.

Tangential milling – Effectiveness and quality

Tangential milling technology is a key addition to the area of rotating tools. In this technical presentation you will get an insight into the products from our standard range and the results that have already been achieved by using them. Key topics include the material removal rate, options for special solutions and the important combination of state-of-the-art machines and high-performance tools.

Forming tools and special tools in series production

Work processes can often be structured more economically and efficiently by using a special tool and there are a wide range of optimisation approaches available in such cases. For example, several machining operations can be carried out, without the need for long tooling times or tool changes. This presentation will show you the benefits and applications of forming/special tools as well as tool solutions have already been implemented successfully in various contexts, from small-scale to large-scale production.



A shuttle bus service will be operating between Paul Horn GmbH and Horn Hartstoffe GmbH.

Wear parts – Reducing costs through the use of high-performance carbide rods

Durable and high-performance wear parts form the focus of this presentation. A manufacturing process that is constantly being optimised and extensive new developments are the prerequisites for high quality and consistent reductions in costs. Whether it is a question of fully or raw sintered round rods, flat or square rods, the options and applications are extremely varied. High-quality carbide blanks and rods are the basis and guarantee for a high-performance final product.

Technology partners at a glance

- > DMG MORI SEIKI Europe AG
- > LT Ultra Precision Technology GmbH
- > CHIRON Werke GmbH & Co. KG
- > Carl Benzinger GmbH
- > TORNOS Technologies Deutschland GmbH
- > H10 technische Diamanten GmbH
- > Ernst Graf GmbH
- > Schunk GmbH & Co. KG
- > WF Fottner GmbH
- > Winterthur Technology AG
- > Tyrolit Schleifmittelwerke Swarovski KG
- > Wieland Werke AG
- > Boehlerit GmbH & Co. KG
- > Renishaw GmbH
- > Open Mind Technologies AG
- > HPM Technologie GmbH
- > Haimer GmbH



The third plant in Tübingen will be ready to move into at the end of 2016.

TWICE AS MUCH PRODUCTION SPACE

All set for growth

HORN, the tool and carbide specialist based in Tübingen, is doubling its capacity by adding 12,000 m² of new production space. By the time it is ready for occupation at the end of 2016, a total of 55 million euros will have been invested in the new site, which is located close to the existing production facilities – 30 million euros in the building and 25 million in state-of-the-art production technology. As a result, HORN (already the biggest industrial producer in the university town of Tübingen) will have created the biggest industrial building in the area.

Systematic growth

HORN, which was founded in Waiblingen towards the end of 1969 and originally had production sites in Gomaringen and Nehren, moved its headquarters and production facilities to Steinlachwasen (Tübingen) in 1981. In 1988, the new building at Unter dem Holz was completed and the subsidiary Horn Hartstoffe GmbH was founded. In 1999 and 2008, the amount of production space was increased in two construction phases, from an original size of 2,800 m² to 6,100 m² and then to 11,500 m². The final stage of this growth programme saw HORN invest more than 30 million euros in Steinlachwasen to create an ultra-modern plant for its subsidiary Horn Hartstoffe GmbH with a production area of 5,000 m². This meant that all the spare space at the company's headquarters had now been used up. To reinforce its leading

position on the global market and continue growing at the same rapid pace as in recent years, it needed to find enough new space to allow further expansion of production with a view to assuring the future of the business – in Tübingen. “Our plan is to grow significantly over the next few years as well,” stressed Lothar Horn, Managing Director of Paul Horn GmbH and Horn Hartstoffe GmbH, just as the planning phase for the new building was starting to get under way. That a company with these kinds of expansion plans would be able to remain in the same location was never a foregone conclusion. By constructing the new building in the Derendingen district of Tübingen just metres away from its existing production facilities in Steinlachwasen and at Unter dem Holz, HORN is erecting a two-storey production hall that will be 171 metres long, 50 metres wide and 18 metres high, and will cover a total surface area of 15,000 m².

Eyes set firmly on the future

Tool Holder Production, the Coating department and Logistics will occupy the additional space when they move into the new building at the end of 2016. The future logistics centre will offer three times the capacity of the existing one so that the fastest possible customer delivery lead times can be ensured. The production range currently includes more than 20,000 different types of standard tool. On top of that, more than 120,000

special tool solutions have been supplied to date. Every year, around 96,000 production orders are processed and approximately nine million inserts are produced in batches of 90 pieces (on average) with a 97 per cent degree of automation. Almost 50 per cent of orders are processed using the fast-track Greenline system with a maximum delivery time of just five working days from the time when the drawing is approved by the customer. Only last year, HORN took on 100 new employees. In anticipation of the new building's completion date and the extra capacity that it will provide, HORN plans to create further jobs on an annual basis. The company currently employs more than 850 people in Tübingen and Gomaringen, around 60 of whom are based at the 1,200 m² ultra-modern training centre as apprentices. Outside of Germany, there are another 400 employees working at the various international branches. In 2014, HORN turned over approximately 155 million euros in Germany and around 250 million euros worldwide.

Product range has grown by 50 per cent in four years

HORN, which is a renowned global leader for all types of grooving operation technology and for groove milling, slot milling and

slot cutting technology, has significantly expanded its range of products over recent years. When measured according to the number of products, the range has grown by more than half since 2010 – particularly in terms of additional production technologies and solutions for machining modern or ultra-hard materials. For example, its assortment of core products has been expanded to include high feed rate milling cutters, tangential milling cutters and modular grooving tools. To draw attention to this bigger range and its status as a technology leader while at the same time further strengthening its field sales force and the quality of its customer support in the marketplace, HORN increased the size of its field sales force in Germany by more than 50 per cent in 2014 – from 40 to 64.

As far as Andreas Vollmer (Sales Manager and member of the Management Board at Horn) is concerned “with its solution competence, our field sales force is the calling card of our company – not just in Germany, but worldwide. This highlights how strongly oriented we are towards customers and their requirements. Even the new building helps back up this claim. By undertaking this work, HORN is ensuring its long-term ability to build up and build on its competitive advantages of quality, speed and innovation.”



Boris Palmer, Mayor of Tübingen and Lothar Horn, Managing Director of Paul Horn GmbH at the signing of the construction permit.

ABOUT US



There is an Arab proverb that says:
The Maghreb is a holy bird. his body is Algeria,
his right wing Tunisia and his left wing Morocco.

MAGHREB: THE GATEWAY TO AFRICA

Via France to Algeria, Morocco and Tunisia

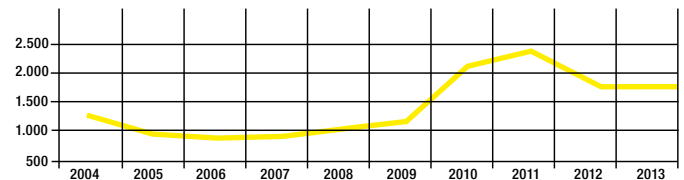
Strictly speaking, Maghreb is made up of three countries: Algeria, Morocco and Tunisia. However, there is a looser definition that includes Libya and Mauritania as well.

ALGERIA

The biggest country in the Maghreb region is Algeria with its capital city of Algiers. It has more than 39 million inhabitants and the landscape is extremely diverse. Running across the north from west to east there are two mountain ranges (the Tell Atlas and Sahara Atlas ranges) with chains such as the Dahra, Ouarsenis, and Hodna mountains, the Kabylei chains (Djurdjura, Babor and Bibans mountains) plus the Aurès mountains. The centre of the country is dominated by numerous forests while the east is home to expansive plains and the Sahara, which occupies 84 per cent of the nation's territory. Covering an area of 2,381,741 km² (which is four times the size of France), Algeria is the largest country in Africa by area. The most important industrial sites are located around Algiers, Constantine and Oran.

HORN partner

S.a.r.l. OCP in Algeria with a workforce of five: Distributes cutting tools, measurement products and products for the machine environment.



Germany-Algeria
Source: National Statistical Offices

Copyright: VDMA

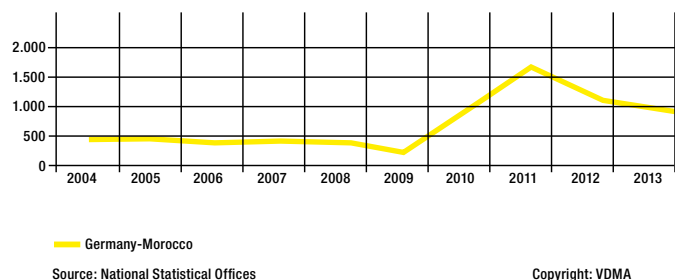
Germany – Exports to Algeria in millions of euros
Cutting tools

MOROCCO

This North African country, which is officially called the Kingdom of Morocco and whose capital city is Rabat, has a population of more than 33 million. Geographically, Morocco is characterised by its mountainous and desert regions. Together with Spain and France, it is one of only three countries that have both a Mediterranean and an Atlantic coast. Morocco covers a surface area of 446,550 km². The most important industrial sites are located around Casablanca, Tangier, Agadir and Rabat.

HORN partner

Technique Aciers for the Kingdom of Morocco has a total workforce of 30 people, four of whom are based in the sales department. This department distributes cutting tools, measuring equipment, lubricants and products for the machine environment as well as acting as a representative office for the sale of machine tools. In addition to distributing equipment, Technique Aciers handles part preparation work, owns ten sawing machines and has a department for flame cutting, laser cutting and bending operations.



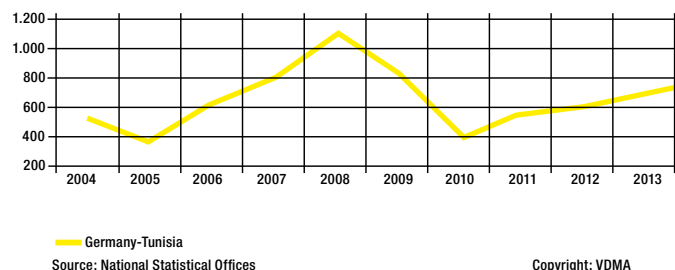
Germany – Exports to Morocco in millions of euros
Cutting tools

TUNISIA

Tunisia, with its capital city of Tunis and a population of around 11 million, is the smallest country in the Maghreb region. It lies on the northern edge of the African continent. It is separated from Europe by the Strait of Sicily, a stretch of water that is 140 km wide. Covering a surface area of 163,610 km², this country borders Algeria in the west (with which it shares a common border of 965 km), Libya in the south east (with a common border of 459 km) and the Mediterranean Sea in the north and east (with a coastline measuring 1298 km). The Sahara Desert occupies around 40 per cent of the nation's territory. The most important industrial sites are located around Tunis, Sfax and Sousse.

HORN partner

Technique de Coupe and AMT-AMI for Tunisia. Technique de Coupe has a workforce of five in charge of distributing cutting tools, measurement products, lubricants and products for the machine environment while AMT-AMI has a workforce of 11.



Germany – Exports to Tunisia in millions of euros
cutting tools

Current situation

It is now more than 15 years since HORN SAS France began opening up the Maghreb market with the help of Didier and Pascal Ortega, its directors. They were prompted to do this in response to enquiries from French companies that had set up branches in these emerging countries. There is already a culture of industrial mechanical engineering in the region and many Moroccans, Tunisians and Algerians have already gained experience in France.

If you were to visit the region today, you would come across a large number of companies from all kinds of sectors, such as the aviation industry, the automotive industry, medical technology, the crude oil and natural gas industries, automatic lathe construction and – of course – general mechanical engineering.

Seven years ago, HORN SAS France set up a special Maghreb department with Bruno Zmuda at the helm. Each of these countries is home to sales partners with stock on hand and the necessary business and technical contacts. The company is pressing ahead with its strategy of ongoing development by making direct contact with local customers. It is here that application engineers Mr Berson and Mr Ertlé have a particularly important role to play. The aim is to support customers in these countries as well as customers back in France.

Industries in Maghreb

Although these three countries are feeling the effects of the crisis in Europe, HORN has identified a clear pattern of major investment in new CNC machine tools over the past seven to eight years and that applies across all industries. In addition, there is striking evidence of strong growth in the aviation industry, which has been gleaned via the outfitters and suppliers that respond directly to enquiries from corporate groups with a presence in these countries (such as Airbus, Boeing, Safran, Bombardier and others too).

Within the automotive industry, the production units are busy assembling large numbers of vehicles and manufacturing sheet metal components for various manufacturers, including DACIA. In the medium term, automotive suppliers and manufacturers are to set up local production plants for engines, gearboxes and chassis. Automatic lathe construction and medical technology are areas of growth, both in terms of certain products destined for local markets and with regard to export products. It is important not to forget railway engineering, the crude oil and natural gas industries and general mechanical engineering, which represent other important sectors. The Maghreb countries are also equipped with appropriate training facilities for these various industries.



Harald Haug joined Paul Horn GmbH 24 years ago. Since 2008, he has been in charge of its international activities in his capacity as Export Manager.

UNLOCKING POTENTIAL

Growth markets and multi-layered requirements

Mr Haug, in your capacity as HORN Export Manager you are in charge of international sales. How is the company positioned at an international level?

We have customers in approximately 70 countries across the globe. In those countries that we have defined as key markets, we rely on branches, e.g. the USA, France, the UK, Hungary and China. We engage with the other markets through independent representative offices, whom we support exclusively. In other words, we only work with one representative per country. Nevertheless, it is very important to us that the focus and corporate philosophy of the representative office concerned matches up with our own.

In your view, what are the growth markets for 2015?

In 2015, I think that we will grow to a similar extent as in 2014. We are growing the most in the North American market and in Asia. However, there is still huge potential in Europe. We have established a new presence in Scandinavia to gain more direct access to our customers; in Poland, the automotive industry is growing; the Spanish market saw unprecedented growth in 2014 in spite of all the financial problems and is set to continue flying high in 2015. Our key markets, the United Kingdom and France, have concentrated intensively on the aircraft industry over recent

years and have created a strong position for themselves. Therefore, I anticipate growth in these markets as well. This situation contrasts strongly with that of Russia, where things are going to be difficult, mainly because of the weak rouble and the embargo. Switzerland, which is a very important market because it is so technologically demanding, is also going to be a challenge. Many of our Swiss customers rely heavily on export sales, which is going to become a very tricky area due to the high rate of the Swiss franc. Apart from that, I am approaching the new year with a great deal of confidence. We are well positioned.

More than 50 per cent of visitors who attended the last HORN Technology Days event came from abroad. Has there been a lot of international interest in this event for 2015 as well?

Yes, definitely. By mid-January, we had already seen more than 700 international guests register for our Technology Days. The event provides us with a unique communication platform. Customers find our Technology Days far more memorable than any exhibition or mailing campaign. Nowhere else would you find this combination of knowledge transfer, expertise and openness. In the course of my many business trips, people often bring up this event years later.

The fact we attended 46 exhibitions in 2014 sends a clear signal: HORN is international. At a global level, are exhibitions of similar importance to visitors and customers as they are in Germany?

The answer to that is a resounding “yes”. In 2014, we really did participate in 46 international exhibitions. That represents a huge investment of time and effort, but is extremely important to us as a way of establishing our name, our logo and our corporate colours on the international stage. Sometimes, international exhibitions are very different from the ones held in Germany. While attending them, we come across some visitors who have never even heard of us. We often find that we are presenting our Supermini® system to an audience that is witnessing this type of tool for the very first time. Some visitors come to the stand armed with workpiece drawings or workpieces so that they can discuss specific solutions with us. We collaborate with machine manufacturers such as DMG, INDEX, Manuhrrin or Miyano so that we can showcase live machining operations at the exhibition. That's something we started doing in Germany and is also proving very popular at an international level. We organise the exhibitions in conjunction with our subsidiaries and representative offices with a view to raising/strengthening their profile and highlighting their expertise on the market.

From machining between two flanks to high-tech applications. How well do you think this evolution of HORN is going down with customers?

We certainly still have a lot of groundwork to do on our foreign markets that's for sure. Often, making the switch from a brazed tool to a multi-edge exchangeable insert is something akin to a revolution. Nevertheless, we are also confronted with highly complex machining operations on a daily basis such as thread whirling, high feed rate milling or the milling of ball running tracks for drive shafts. Overall, we are faced with a market that is extremely multi-layered, which calls for employees and sales partners that are highly qualified and possess a vast amount of knowledge.

How do you see HORN developing at an international level in the future?

The future course of the company is very clearly geared towards growth. The development opportunities that are open to us internationally are enormous. If you want a crude analogy: we are barely even scratching the surface of most international markets. What this means is that we still only have a tiny share of our international markets, unlike in Germany. Even a very small amount of growth in the overall economy of the respective markets offers us considerable potential for expansion.

As Export Manager, Harald Haug feels at home all around the world.



CARBIDE FORMED PARTS

New product line now firmly established

One of the technical foundations on which HORN is built involves the development and production of high-quality carbide grades as a basis for creating proprietary tools and as a basic material for all kinds of constantly expanding industrial applications.

The Horn Hartstoffe GmbH plant, which was constructed in 2012, has the capacity to produce up to 300 tonnes of carbide annually. As a result, it is able to satisfy ever increasing demand from HORN for higher volumes while at the same time opening up new markets for wear parts and other such items. "Consequently, we are evolving from a pure manufacturer of precision tools into a supplier of wear part blanks as well, which means that we are able to appeal to brand new customer groups," explains Lothar Horn, Managing Director of Paul Horn GmbH. He has the following groups specifically in mind, among others: the automotive industry, manufacturers that produce technically sophisticated cutting and punching tools from carbide erosion blocks, the chemical and food industries with their need for corrosion-resistant carbide components and the electrical industry as a customer that requires high-precision inserts for use in electric tools (serial parts that HORN is now able to produce with a precision of half a micrometre).

All processes under one roof

The new building brings together all the operations involved in carbide production: design and construction of the precision tools, preparation and mixing of the powdered carbide alloys to create homogeneous mixtures suitable for pressing, the various

pressing methods, pre-sintering, sintering and surface treatment, and a seamless quality inspection process that is capable of detecting every single geometric or physical defect. HORN is the only carbide manufacturer with four different shaping processes: axial pressing, extrusion, isostatic pressing and injection moulding. As far as the last of these is concerned, HORN was a global pioneer. HORN was the first tool manufacturer to start using injection moulding processes to series-produce indexable inserts with a three-dimensional geometry. That was right back in 1992. The carbide parts from Horn Hartstoffe GmbH can be produced in various possible dimensions, with diameters ranging from 1 mm to 180 mm (0.0394" to 7.0866") and a length of up to 800 mm (31.4961") – and they are optionally available with bores, undercuts, grooves and many other features.

Stringent requirements

Here are two prime examples of sophisticated carbide parts that have recently been realised: Firstly, you have the hydraulic components for control valves that are no longer accessible once installed. These are high-precision parts that come with a 30-year functional warranty. Secondly, you have the special components that take the form of corrosion-resistant, high-precision pistons for use in the 300 bar pressure range. With a diameter of 25 mm (0.9843"), a length of 20 mm (0.7874"), a groove and cross holes, 50,000 measuring points have to be captured. HORN carries out a 100 per cent inspection, as does the customer. As you would expect, the accompanying documentation is extensive.



Carbide blanks for wear parts and round tools.



Simulation of new hall number 10 at the Stuttgart exhibition centre – the HORN hall.

HALL 10 AT THE MESSE STUTTGART EXHIBITION CENTRE

New building to be named after Paul Horn GmbH Sponsorship deal agreed for 15 years. The precision tool manufacturer from Tübingen declares its commitment to Messe Stuttgart and the region.

The planning application for the construction of a tenth exhibition hall and for upgrade work at the western entrance to the exhibition centre has been submitted. Assuming that all goes to plan, the foundation stone for Hall 10 could be laid as early as autumn 2015 and it could be operational by the major exhibition year of 2018. Ulrich Kromer, Managing Director of Messe Stuttgart, has already found a patron to sponsor the hall. New exhibition hall number 10 will bear the name Paul Horn GmbH.

As far as Managing Director Lothar Horn is concerned, it is only logical that the new hall should bear the name of company founder Paul Horn once it is completed in 2018: "Through the name sponsorship, we want to highlight our close cooperation with Messe Stuttgart. Furthermore, it is a good way of declaring our commitment – as a globally active manufacturer of precision tools – to the region, to Baden-Wuerttemberg and also to Germany as a whole."

"Paul Horn GmbH has been associated with Messe Stuttgart for many years and is one of the largest exhibitors at our AMB exhibition. By concluding the sponsorship deal, which has been agreed for an initial period of 15 years, the company is sending

out a clear signal of its solidarity with the region," says Ulrich Kromer.

So what exactly will the construction project at the Messe Stuttgart exhibition centre entail? The plans cover the construction of a new hall with 14,600 m² of exhibition space that will directly adjoin Hall 8. It is to be built on a concrete area that previously served as a car park.

In addition, the western entrance is to be enlarged by around 3,000 m² and upgraded in terms of its importance. On completion of the extension work, Messe Stuttgart will have a total exhibition space of approximately 120,000 m². The cost of the expansion programme is estimated to be in the region of 67.5 million euros. The exhibition corporation will finance the new building from its own resources. No subsidies are to be provided by the town or by the state of Baden-Wuerttemberg. Once again, this project will be handled by the special-purpose company Neue Messe GmbH & Co. KG, which also built and owns the existing facilities.

Many of the events staged at the site are already approaching full capacity and so the new hall will offer them new opportunities for further growth. In addition, the new building will improve access to the exhibition centre from two sides and make it easier to disperse and control the flows of visitors attending different events.



TRAINING AT HORN

The training programme incorporates the advanced course leading to the “industry specialist in cutting tool technology” qualification from the IHK (German chamber of commerce). This covers various topics, including the grinding of carbide cutting elements.



Thinking outside the box

HORN currently has 60 apprentices. Every year, 15 young people are selected from a large pool of applicants to become apprentices and learn the trade of industrial mechanic. At the well equipped 1200 m² training centre, they are instructed, supported, challenged and encouraged by an experienced team of trainers as they work on state-of-the-art CNC machines. HORN apprentices regularly achieve the best results of the region in their final examinations. Many of them achieve this goal even earlier because they are fast-tracked on the basis of their strong performance. At the end of the training, there are numerous employment opportunities with HORN. As well as being able to enter a profession directly, they can also opt for a dual studies programme specialising in cutting tool technology.

More than a training curriculum

At HORN, there is a clear emphasis on the training curriculum. Nevertheless, apprentices still have to be able to think outside the box. To grasp what this means in practice, you need only take a look at what they have been getting up to in recent years. The apprentices have now built a pedal car on three separate occasions and will be returning to England in 2015 for another race. A pedal car is a soapbox cart that is powered by means of pedals. In 2013, the HORN apprentices were the winners of the intec young talent award, which was granted by the Leipziger Messe in recognition of the project as a whole – the pedal car had to be planned, budgeted, designed, produced and assembled, and the team had to communicate information about the car and drive it.

Information sharing and dialogue

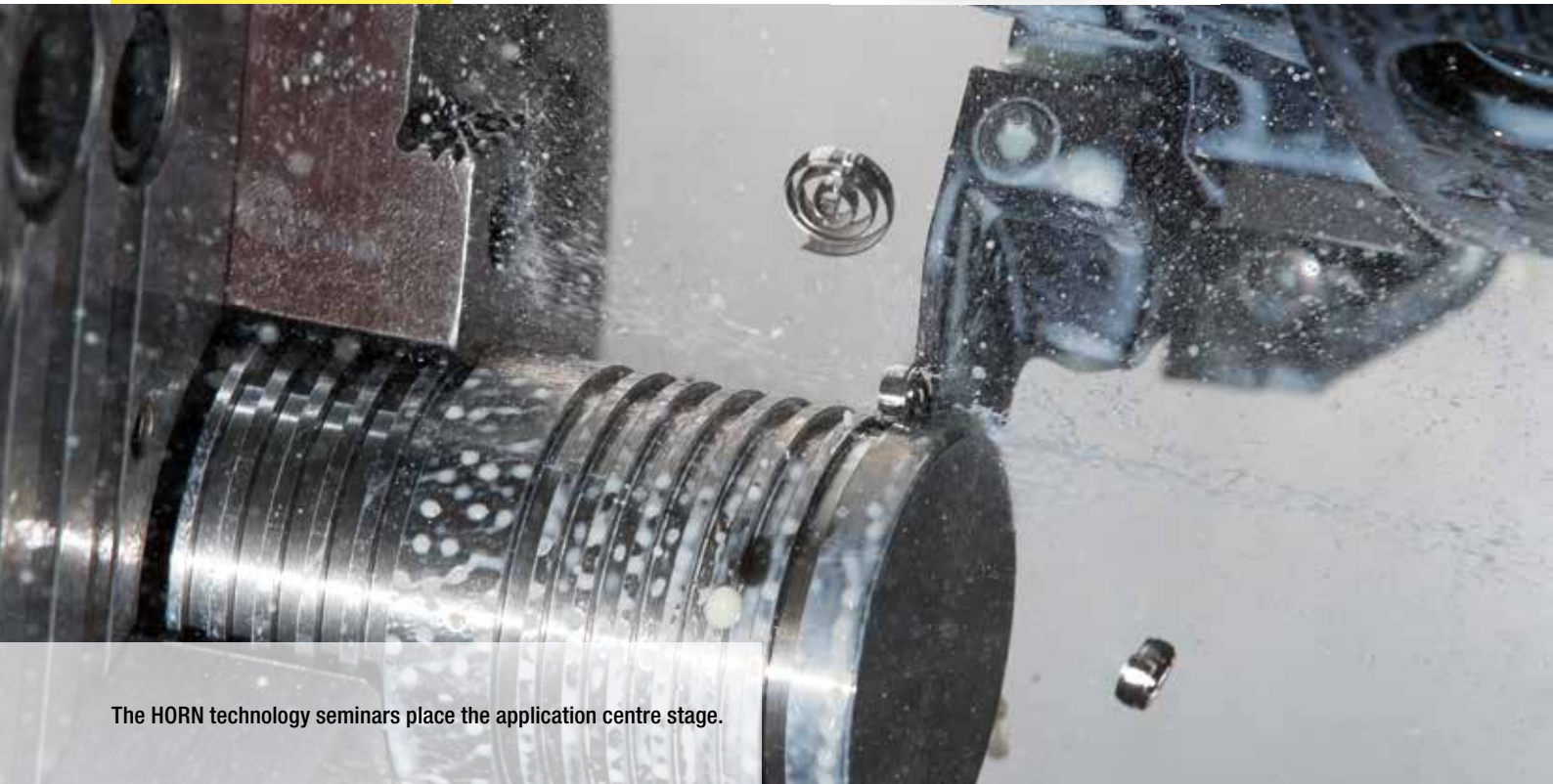
The process of sharing information with other firms is also very important. With this in mind, a visit from Berger was arranged – for instance – so that 80 of their apprentices could spend the day at HORN. The key aspects were a chance to get to know each other, to engage in dialogue and to share different perspectives. To round off the event, the apprentices spent the afternoon bowling together. In addition, HORN allows smaller firms from the region to enrol their apprentices in sessions at the HORN training centre that are designed to prepare candidates for their practical examinations. Once again, there are advantages for both parties. The external apprentices get the preparation they need while the HORN apprentices benefit from coming into contact with other views, opinions and approaches.

On the right track

In addition to gaining professional qualifications, HORN apprentices are expected to engage in personal development. With this in mind, the company offers carefully selected seminars but excursions are seen as another way of fostering development. Off-the-job experience is also included in this. As well as a visit to the opera in Stuttgart, apprentices also went on a three-day excursion to Munich. Head of Training Patrick Wachendorfer has the following to say about it all: "In my view, the complete 'Training at HORN' package is the only programme of its kind. When we see how well everyone involved interacts, how well equipped they are and how motivated they are, it serves as an everyday reminder that we are definitely on the right track."

Before they are allowed to put theory into practice, the apprentices are provided with a clear introduction to the relevant topic.





The HORN technology seminars place the application centre stage.

HOLISTIC APPROACH

Groove turning technology seminar

Groove turning is one of HORN's core areas of expertise. The company claims that it is a technology leader when it comes to machining between two flanks, an area which includes groove turning. Therefore, it should come as no surprise that, out of all the seminars that the HORN Academy offers to customers, the groove turning seminar is the one that sells out the quickest.

The seminar is divided into five units:

- › Correct selection of various grooving methods
- › Internal machining of bores
- › The basics of cutting materials – Carbides and coatings
- › Chip breaking geometries
- › Detecting and influencing cutting edge wear during groove turning

Why are there different grooving methods? What are the differences between internal, external and axial grooves? The first unit deals with machining processes, types of cut and the number of cutting passes, the chipping problems encountered during internal grooving and how to avoid collisions with the groove flanks during axial grooving. The second unit covers bore creation and machining.

It provides in-depth basic knowledge about drilling, boring out, slot/contour broaching, internal grooving and modern reaming methods. The basics of cutting materials are covered in the third unit.

The carbide manufacturing process is described in detail, from the alloy components and their properties, the mixing and grinding processes, granulation in the spray tower, the granulated material, and the various pressing and shaping processes right through to pre-sintering and sintering. This is followed up with supplementary information about the composition of coatings, the layer construction, grades and applications, coating methods such as CVD or PVD, coating systems and quality assurance systems.

The fourth unit deals with chip breaking geometries and their use in groove turning applications. It is designed to convey knowledge about which geometries can be used to influence the length of the chips by means of chip control and which geometric properties make it possible to reduce the chip width during chip forming. The topic is rounded off with the criteria for selecting the right geometry according to the feed rate, cutting speed and material.

The fifth unit focuses on how to detect and influence cutting wear during groove turning. The emphasis here is on the various types of wear and their effects, and on providing a basic knowledge of the ten key wear characteristics, from flank wear through to the formation of built-up edge chips. Like all the other technology seminars run by the HORN Academy, the groove turning seminar is a mixture of theory, practice and dialogue.

THE SMART WAY TO CREATE GROOVES & PROFILES

Slot and contour broaching

From the very outset, slot and contour broaching were the domain of large, expensive and sophisticated machines and tools. Furthermore, they could not be integrated into modern complete machining concepts.

Nowadays, new concepts are also proving very successful with their processes that save time and money. The HORN Academy's technology seminar on slot and contour broaching explores this topic by taking participants on a journey from the basics through to the latest developments and possibilities.

The content is divided into five units:

- › The basics of creating a groove
- › Slot broaching on CNC machines
- › Special profiles
- › Forces during slot broaching
- › Driven tools for slot broaching

The seminar describes common methods for creating grooves such as broaching, hobbing, gear shaping and slot broaching on the company's own special machines as well as slot and contour broaching on available CNC machines. The advantage here is that the investment volume is relatively low and relates to the broaching tool and, where applicable, the broaching

machine. These tools can be used to produce keyways, driver slots, internal and external toothing, hexagon socket and Torx profiles as well as custom profiles.

With this process, there are two possible approaches: broaching directly with the machine or broaching with a driven tool (DT) that is designed to protect the machine kinematics and supports a higher stroke frequency. In addition to common groove geometries, broaching tools also enable special geometries to be achieved, e. g. when broaching tapers, half-moon grooves or multi-start helical grooves that are internally or externally machined. Multi-edge toothing inserts provide a highly efficient way of machining teeth and knurled teeth, both internally and externally.

Other topics covered by the seminar include, for example, technological broaching data relating to the stroke, infeed and approach dimensions; calculation of the machining time; what points must be borne in mind with respect to the bottom of the bore at the groove run-out; and the reason why the 12 o'clock position is so important during internal broaching. On top of that, there are the technology tables and lots of practical tips. The combination of theory, practice and dialogue underlines the holistic and practical nature of the seminar concept.



SH117 tooth broaching tool with pre-cutting and finished tooth profiles for simultaneous rough broaching and finish broaching of the teeth.

HORN is at home in more than 70 countries in the world

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