ph HORN ph world of tools

TOPICS:

- Special feature: Aviation
- Trade fairs: Sharing ideas face to face
- Special feature: From design to series production
- About us: Paul Horn Hall

Issue 1/18

EDITORIAL

Dear Readers,

Aviation is one of the biggest industries in the machining sector. Here, safety is the top priority and manufacturing errors have to be avoided at all costs. In light of this, the tools used for each machining operation are subject to extremely stringent requirements. The materials to be machined represent a further challenge. Titanium, Inconel and Hastelloy are just a few examples of materials that come into contact with the cutting edge.

Another area that is addressed in this issue of "world of tools" is prototype manufacture. Prototypes often serve as preparation for series production but in a small number of cases they result in a one-off component. Prototypes are used in all kinds of industries and that calls for good advice so that an appropriate machining solution can be identified.

Thanks to the new Hall 10 at the Messe Stuttgart trade fair centre – the Paul Horn Hall – we are sending out a clear signal. By sponsoring it, we are once again declaring our commitment to the region and demonstrating our strong bond with Messe Stuttgart and with trade fairs in general. In spite of – or perhaps precisely because of – increasing digitalisation, I am convinced that trade fairs provide the optimum platform for sharing ideas face to face, meeting with others and finding solutions together.

"HORN – EXCELLENCE IN TECHNOLOGY" is a motto that we live up to at trade fairs, in the "world of tools" magazine, but most importantly in dealings with our customers.

Lothar Horn
Managing Director
Hartmetall-Werkzeugfabrik Paul Horn GmbH
Tübingen

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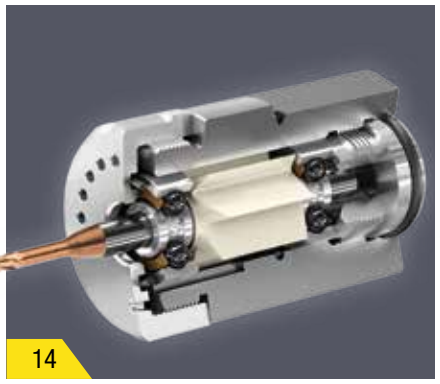
world of tools



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AVIATION

HIGH-FLYERS IN THE AEROSPACE INDUSTRY

› Every eighth job in Germany is linked to flying.

Over the next two decades, the global aviation industry is expecting to see more than 30,000 orders for wide-body aircraft. In monetary terms, that equates to almost five billion euros. In the fourth quarter of 2017, Airbus reported a bulk order for 430 of its A320 airliners. The facts and figures for the aviation industry clearly show the vitality and potential for growth that exist within this industry. With their highly qualified specialists, suppliers to the aviation industry also contribute to the success of this main pillar of the German economy – from upholstery right through to machining of sensitive engine components. According to the German Aerospace Industries Association (BDLI), the aviation industry sustains every eighth job in Germany.

With an annual turnover of 35 billion euros and an annual growth rate of 5 percent, aviation is a key branch of industry within Germany and Europe as a whole. The large number of people employed within this area make it a major job generator for the Federal Republic. The stronghold of the industry is Hamburg. Not only that, but this city on the Elbe river is also one of the industry's most important locations worldwide. From its base here, the Airbus factory coordinates the construction of its best selling airliner: the A320. It was this aircraft that helped the European company land a deal for 430 planes in 2017, the biggest order in the company's history. Some other important cities for the German aviation industry are Munich, Bremen and Augsburg. Thanks to its highly qualified specialists and the expertise of its suppliers, this branch of industry will continue to play a significant role in the future despite the high salaries commanded.

Demanding materials call for powerful tools

The materials used for aircraft construction have to be as light as possible while still being able to withstand the maximum possible loads. Typical materials include aluminium, high-tech materials such as titanium, high-strength steels and nickel-based and magnesium alloys. In addition, superalloys are available for high-temperature applications.

Carbon fibre reinforced plastics (CFRP) and multi-component metal matrix composites (MMC) made from CFRP plus aluminium and titanium help to reduce weight. The disadvantage of many of these materials is that they are difficult to machine. However, if the cutting geometry, substrate and coating are adapted appropriately, the tool is able to counteract the high wear forces generated by the materials. Within this context, the aviation industry places high demands on the safety and precision of machining processes.

The German aviation industry was born in 1891, when German engineer Otto Lilienthal became the first person to travel significant distances in a glider. With his flying machines, he was able to travel between 50 and 250 metres (164 and 820 feet). Nine years later, Ferdinand Graf von Zeppelin built the first airship. Even though it had to make an emergency landing on Lake Constance, its maiden flight on 2 July 1900 still lasted 18 minutes. The first all-metal aircraft was built by engineer Hugo Junkers in 1915. In 1926, his Junkers G24 aircraft established the first ever flight connection between Germany and Beijing. Lufthansa used two planes to cover the distance in eleven stages. The first jet-propelled aircraft was designed by Ernst Heinkel. On 27 August 1939, he ushered in the age of the turbojet. In 1970, the Europeans began competing with American giant Boeing. Together, Germany, Spain, France and the UK founded Airbus Industries. The first Airbus A300 B was a success. In 2005, the Europeans sent their A380 on its inaugural flight, thereby stealing the crown from the Boeing 747 as the world's largest passenger airliner.

Sources: BDLI – Bundesverband der deutschen Luft- und Raumfahrtindustrie e. V.,
BDL – Bundesverband der deutschen Luftverkehrswirtschaft e. V.

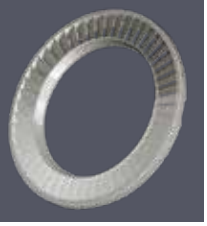
AVIATION

S224 GROOVING SYSTEM WITH INTERNAL COOLING

DAH62 HIGH-FEED MILLING SYSTEM

› Grooving tools with internal cooling through the insert are ideal for all profile turning and grooving operations involving titanium and nickel-based materials.

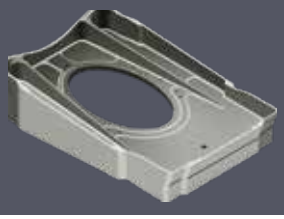
Thanks to the targeted system technology, the coolant is applied directly to the cutting edge and chip breaker, thereby ensuring good machining conditions in the cutting zone. The coolant jet facilitates chip forming while reducing the chance of chip build-up and the formation of built-up edges and break-outs on the cutting edge. With this system, higher cutting parameters can be achieved than with conventional cooling methods. The S224 with internal cooling makes titanium and Inconel machining safer, more efficient and more economical.



Stainless steel turbine component

› With exactly the right combination of cutting geometry, substrate and coating, the DAH62 is an extremely effective high-feed milling tool for rough machining.

Thanks to the insert and tool holder design, it can be used to machine titanium and stainless steel. The special cutting geometry enables rapid plunging and a soft cut. Large chip volumes can be removed in no time – with a high level of stability and long tool life. The DAH62 can be used in numerous applications to achieve considerably shorter machining times and greater productivity.



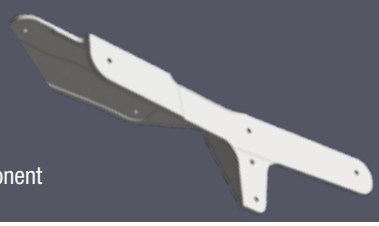
Stainless steel turbine fixture

AVIATION

DS SOLID CARBIDE END MILLS
M310 GROOVE MILLING SYSTEM

› The DS system epitomises efficient machining with minimum tolerances for roughing, finishing and fine finishing work.

DS carbide end mills have been designed around three parameters: the substrate, the coating and the geometry. HORN has expanded the range of DS system products specifically for titanium machining. Numerous milling cutter versions are available so that even complex workpiece geometries can be machined. Special coatings ensure good thermal and chemical resistance. Even hard machining involving a hardness in excess of 70 HRC does not pose any problem. This allows the machining of titanium materials with high cutting parameters, for instance.



Titanium fuselage component

› HORN has many years of experience with side milling cutters. A wide range of high-performance slotting cutters are available for machining every kind of aerospace material.

With a wide choice of diameters, cutting widths, substrates and geometries, HORN has every application covered. High machining capacity really pays off in the case of hard-to-cut materials and when producing high-quality components in large quantities. With its M310 groove milling system, HORN provides greater reliability and process stability.

Inconel turbine holder

AVIATION

S117 BROACHING AND PROFILING SYSTEM

› The S117 system offers a wide range of standard tools for time-saving broaching/profiling operations on lathes and milling machines.

These HORN tools are capable of cost-effective workpiece profiling with complete contouring and angular accuracy. The profiled inserts are custom-produced in accordance with customer specifications with a multitude of different profiles and relief angles. Shapes with small relief angles can be finish-ground. PCD and CBN-tipped inserts can also be supplied on request. The wide selection of tool holders and insert profiles saves having to purchase a special broaching/profiling machine and reduces workpiece costs.

Titanium turbine component

DR REAMING SYSTEM

› For high-precision and efficient reaming: When precision machining bores with diameters of Ø 11.9 to 140.6 mm, the DR tool system can achieve concentricity of ≤ 3 µm (0.0001181").

It offers numerous advantages for aerospace industry applications, such as high feed rates, easy handling and concentricity adjustment, high repeatability during cutting edge changes, as well as a wide choice of cutting materials, coatings and cutting geometries. The design allows a higher number of teeth than conventional reamers with diameters in excess of 23.6 mm (0,9292"). This makes it a functionally reliable and cost-efficient solution for producing finely finished surfaces with high degrees of cylindricity and roundness.

Air supply component

AVIATION

THE 932 CIRCULAR MILLING SYSTEM
ISO TURNING SYSTEMS WITH PCD/ CVD-D

With its circular 932 inserts for milling, HORN has added to its range of triple-edged and six-edged products by introducing some new tools that are even more powerful.

Featuring nine cutting edges, the 923 offers approximately 50 per cent more machining capacity. Thanks to its compact design, the “T” groove cutter – which has a diameter of 21.7 mm – is flexible and extremely easy to handle. This offers milling widths of between 2 and 4 mm (0.0787 and 0.1575") in combination with a groove depth of 8.3 mm (0.3268"). During finishing and pre-finishing, the nine cutting edges facilitate higher feed rates without any change in cutting speed – increasing productivity by around half and ensuring long tool life and process reliability.

Inconel turbine component

To enable efficient titanium machining, finishing and pre-finishing, HORN offers appropriate diamond inserts made from various diamond cutting materials such as polycrystalline diamond (PCD) and CVD-D diamond.

The composition and/or structure of the ultra-hard cutting materials are optimised for different tasks. Two chip breakers are lasered directly into the diamond cutting material: HN for first-finishing and HS for finishing. The PCD and CVD-D ISO inserts are also available with a trailing chamfer profile. These inserts increase efficiency during pre-finishing and finishing of titanium.

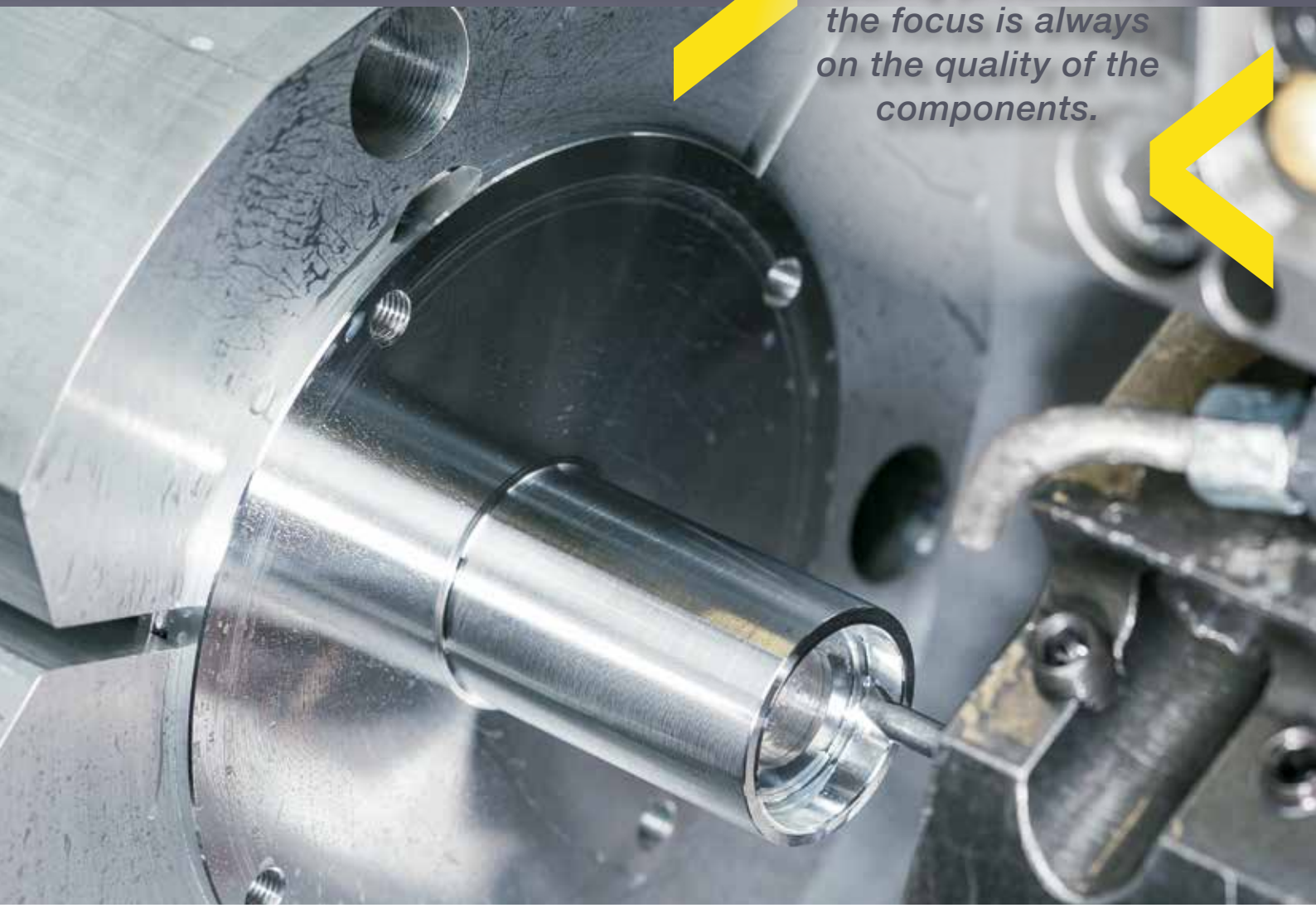
Titanium turbine component

AVIATION

PREFERRED SUPPLIER – HIGH QUALITY IS THE ROAD TO SUCCESS

According to Gerhard Herrmann, Managing Director of Herrmann CNC – Drehtechnik, “a strong company works just like a strong family”. This is the principle that his company observes when producing high-quality components for the aerospace industry. And it is a maxim that family-owned company HORN could also claim for itself. The two companies have been working closely together since 1990. During this time, they have solved a number of machining problems involving components with very strict quality requirements.

During production, the focus is always on the quality of the components.



Boring an internal diameter with the Supermini system, type 105.

During a partnership spanning almost 30 years, Mr Götze (HORN), Mr Wetterich (Herrmann) and shift supervisor Mr Maxime d`Arexy (Herrmann) have solved a number of machining problems.

Originally founded in quite a large garage back in 1986, Herrmann CNC-Drehtechnik GmbH now has 7,000 square metres (75,347 sq ft) of combined production and office space in Hohenlinden near Munich. This Bavarian company, which employs 100 people, specialises in the manufacture of aerospace components. Thanks to its expertise in the machining of critical components and hard-to-cut materials, Gerhard Herrmann and his team have established a very good reputation with many large aerospace groups, winning “preferred supplier” status with them.

In addition to machining everything from aluminium and stainless steels through to titanium, the contract manufacturer also handles hard-to-cut nickel-based alloys such as Inconel and Hastelloy. During production, the focus is always on the quality of the components. In order to meet the strict requirements for aerospace certification according to DIN EN 9100, it is absolutely essential to have a clean and tidy working environment, highly qualified personnel and a form of quality assurance that relies on high-tech measuring machines. However, official certification inspections are not the end of the story because Herrmann's customers also visit the site to carry out regular audits. “Cleanliness, precision and constant quality control are an absolute must when it comes to our everyday work”, says Klaus Wetterich, who is the Deputy Production Manager at Herrmann. The company produces every class of component for the aviation industry, from Class 3 to Class 1. The most critical of these is the Class 1 component, the failure of which poses a danger to human life. When a Class 2 component fails, it seriously impairs the ability of the aircraft to function but landing is still possible. The failure of a Class 3 component has no impact on functionality.

Stable turning process

To produce housing covers made from high-strength aluminium alloy AlZn5.5MgCu (EN AW 7075), the Deputy Production Manager relies on tools from HORN. The Class 2 housing cover is used on the undercarriage of the Airbus A350. Herrmann produces around 100 of these components a year. “We have been using HORN turning tools right from the start. The turning process runs very smoothly and is stable. What's more,

Finishing the small outside diameter and the concave face with the Mini R114 axial grooving tool.

with its tool carrier interfaces, HORN allows special inserts to be clamped onto standard holders", explains Wetterich. The turning and grooving operations for the housing cover are carried out using the Supermini and Mini tool systems. To enable aluminium machining, Michael Götze (the responsible sales representative and a technical consultant at HORN) selected grade TH35. Given its low coefficient of friction, this coating is highly suitable for machining aluminium materials and prevents the formation of built-up edges.

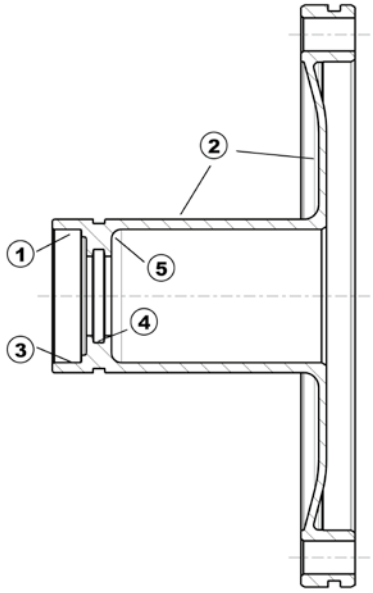
The particular challenges that had to be overcome when turning the housing cover were the stringent run-out and concentricity tolerances, the level of surface quality required and the thin-walled component design. "Reducing the weight of aerospace components has a key role to play. This is often a challenge for machining specialists because the thin walls of the workpieces are constantly forcing us to develop new component clamping approaches", says Wetterich. The housing cover is clamped using a three-jaw chuck with bored-out aluminium segments.

Challenging workpiece clamping

To accommodate the large diameter of the component, the clamping pressure of the three-jaw chuck has to be adapted due to the concave internal profile that is 1 mm (0.0394") thick. For the machining work, the people in charge opted for the Mori Seiki NL 1500 CNC lathe.

Supermini type 105 being used to machine a 1 mm (0.0394") wide internal groove.

The machining process for the housing cover is as follows: In the first step, the internal diameter (1) is pre-turned using a Supermini R105. Then, the outside diameter of the pin and the concave profile of the face are finished in a single operation (2) using a Mini R114 axial grooving tool. With the Mini tool system, the inserts are clamped on a carbide shank. Thanks to the high density of the carbide, this prevents vibrations from occurring even in the case of longer projection lengths, in turn eliminating chatter marks. The next step is to finish the internal diameter (3) with a Supermini R105 and to create the 1 mm (0.0394") wide internal groove (4), again using the 105. The final step is to create the recess (5) with an R111 insert. All the tools used feature internal coolant supply.

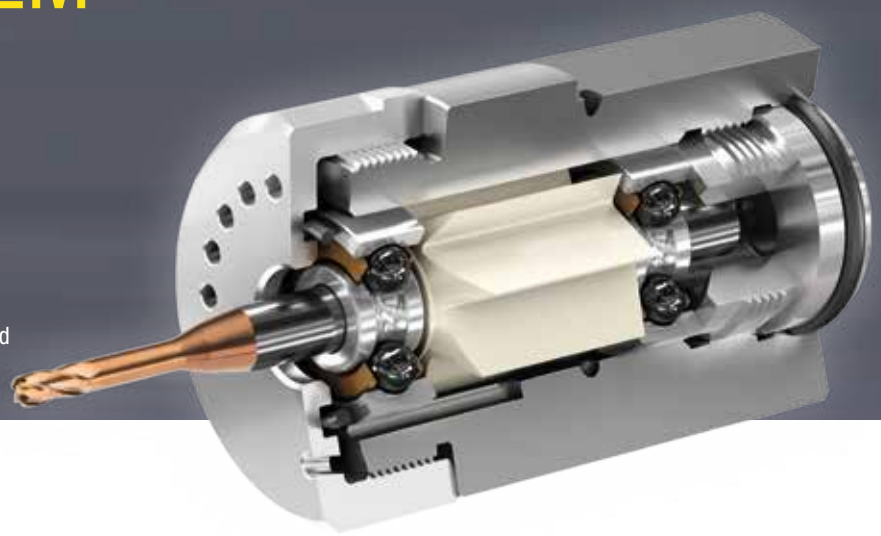


Wetterich and Götze are clearly very satisfied with the successful results of the work. “I have nothing but praise for HORN as a partner. The company is very reliable and with the assistance of Michael Götze as a consultant we have been able to find a suitable solution for every machining problem”, says Wetterich enthusiastically.

› As a technology partner for manufacturers in the aerospace industry, HORN can offer suitable solutions for machining both high-tech and conventional materials. Well-conceived machining strategies are absolutely essential for increasing profitability and competitiveness, particularly in the case of high-strength materials such as titanium/GFR/CFRP composites and high-temperature materials. HORN's tool concepts increase efficiency and can reduce machining times significantly while offering high levels of process reliability and quality. Take, for example, the HORN polycrystalline diamond (PCD) tools. With their sharp, hard, wear-resistant cutting edges, they are highly durable when used with non-ferrous materials. When it comes to machining CFRP and GFR composite materials, CVD thick-film diamond tools with a precision-lasered cutting edge offer lots of potential for increasing efficiency. These are up to 99.9 percent pure diamond, have the highest thermal conductivity of any cutting materials and have an edge that is up to 10 times sharper than previous PCD cutting edges.

NEW

TOODLE HIGH-SPEED SPINDLES FOR THE DS SYSTEM



› The high-speed spindle is compatible with standard tool holders.

Precision milling with diameters ranging from 0.1 to 3 mm (0.0039 to 0,1181")

HORN is proud to present high-speed Toodle spindles from SFI, which have recently been added to its portfolio. With this addition, users do not just benefit from the advantages of these world-renowned spindles – in particular, they can reap the rewards of combining them with the solid carbide milling cutters from HORN's DS series. More than 600 DS milling cutters with diameters ranging from 0.1 to 3 mm (0.0039")can be supplied with a pre-mounted Toodle spindle within the space of one week. The milling cutters can be adapted to meet specific requirements more than simply in terms of their diameter. Thanks to the numerous versions with various geometries, coatings and carbide substrates, the tool can be perfectly matched to the application. The advantages of the high-speed spindles include low purchase costs, simple mounting and consistently high concentricity. DS milling cutters cannot fail to impress with their concentricity of 0.005 mm (0.0002") and long service life.

High-speed spindles with various drives and speeds are available for machining tasks such as profile milling, high-feed milling and trochoidal milling, as well as chamfering and engraving. The TB131 and TB131-90 models, which are turbine driven with coolant at 10 to 60 bar, achieve speeds of between 40,000 and 75,000 rpm. The turbine of the TG131 model is driven by compressed air at 3 to 7 bar and is designed for speeds of between 35,000 and 60,000 rpm. For special tasks, the milling cutters, bearings and drive can be adapted to the particular requirements.

The spindles can also be used in a stationary machine spindle. The high-speed spindles can be clamped with ease in standard tool holders, such as hydraulic expansion chucks, collet chucks and Weldon shank adapters, as well as in boring bar holders. h5 or h6 tool shanks with diameters of 3, 4 and 6 mm (0.1181, 0.1575 and 0.2362") can be clamped. These product features – along with various others – provide customers with a set of high-speed spindles and milling tools that deliver major benefits when performing complete machining tasks on turning or milling centres, even at low machine spindle speeds.

PRODUCTS

NEW

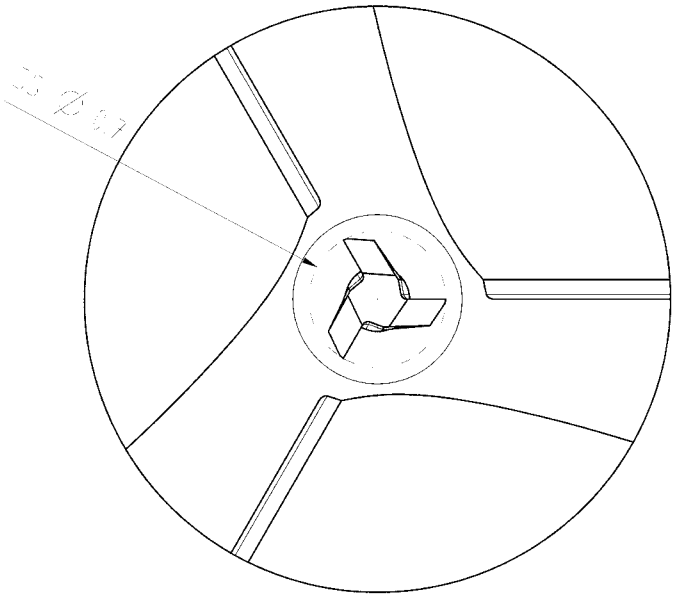
DCG THREAD MILLING CUTTERS FOR M1 TO M2.5

› The single-row milling cutters in the DCG system, suitable for a range of thread pitches.

Thread production in hard-to-cut materials

HORN presents new developments in the DCG milling system for thread milling. With working ranges from M1 to M2.5 (metric ISO threads DIN 13–20), these new products extend the possible applications of the DCG series for the reliable milling of small threads, have extremely sharp cutting edges, and are suitable for universal use thanks to their coating. The solid carbide milling cutters are available as standard up to a thread length of 2 x D. They demonstrate their special capabilities and efficiency when machining steels, stainless steels, cast iron, non-ferrous metals, and in particular with the hard-to-cut materials that are used in the medical technology sector, for example.

The DCG solid carbide milling cutters have been proving themselves in the production of threads sized from M3 to M12 for many years. As the single-row milling cutters can be used for different pitches, a high degree of flexibility is guaranteed.



PRODUCTS

NEW

SOLID CARBIDE FINISHING MILLS WITH DIAMETERS FROM 2 MM (0.0787")

› DSM finishing mills, 2 to 20 mm diameter (0.0787 to 0.7874").

DS multi-edge cutters up to 4 x D

With the solid carbide tools from the DS milling cutter system, HORN is incorporating top-class products into its portfolio for machining copper, graphite, aluminium, plastics, fibre-reinforced plastics, soft and hardened steels as well as titanium and superalloys. The end, torus, full radius, double radius, multi-flute and roughing cutters are available from stock with diameters from 2 to 16 mm (0.0787 to 0.6299"). Micro end mills can be supplied with diameters ≥ 0.2 mm (0.0079"). The h5-quality tool shanks boast an impressive concentricity of 0.005 mm (0.0002"), which makes them ideal for finishing operations.

The expertise acquired in a whole host of applications is now demonstrated in the new products added to the range of DSM multi-flute cutters. With an extended working range from 2 to 20 mm (0.0787 to 0.7874"), the finishing mills with six to eight cutting edges are available with machining depths that are 2 x, 3 x and 4 x the diameter in a sharp-edged version or with a corner radius of 0.2/0.5 and 1.0 mm (0.0079/0.0197 and 0.0394"). Their precision-ground chip spaces ensure good chip flow and the optimised face geometry produces very good surfaces, for example R_a ≥ 0.1 µm (0.000003937") for 42CrMo4. When machining steels, cast iron and hard-to-cut materials, the face geometry ensures an even wear rate and the new coating increases tool life.

PRODUCTS

NEW

HIGH-PERFORMANCE DR REAMING SYSTEM

› The exchangeable head system offers repeatability of 3 µm (0.0001181").

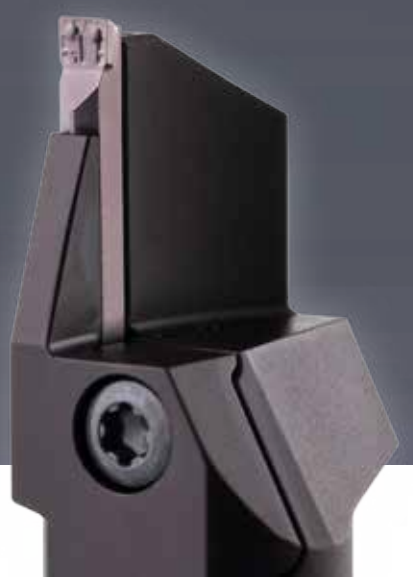
Reaming system for bores ranging from 7.6 to 140.6 mm (0.2992 to 5.5354")

The DR and DR small reaming systems from HORN are now available from stock in the most popular sizes. With its uncoated or coated reaming cutters, the DR tool system has been proving its worth for many years in reaming applications involving diameters from 7.6 mm to 140.6 mm. The reaming cutters – which are made from carbide or Cermet and are just 4.3 and 5.3 mm (0.1693 and 0.2087") wide – are securely fastened and positioned on the tool carrier. This ensures changeover accuracy of < 3 µm (0.0001181") for excellent concentricity. As well as having a choice of numerous cutting geometries tailored to the application, users can also select the ideal combination of substrate, geometry and coating for virtually any machining task. The DR and DR small systems allow bores to be reamed with minimal use of cutting material – cost-effectively, precisely and at very high speeds. The efficient use of carbide or cermet cutters helps to reduce the cost per bore.

The following versions of the DR reaming system are available from stock: for H7 bores with a diameter of 12 to 50 mm (0.4724 to 1.9685") in mm increments and for bores with a diameter of 52 to 100 mm (2.0472 to 3.9370") in a further eleven sizes. Each size is available with two cutting geometries: straight fluted for blind bores and left-hand helical for through-bores. With its considerable hot hardness and high oxidation resistance, the ALCrN coating is bound to impress when machining steel and cast iron. Other beneficial features include excellent anti-friction properties and low adhesive tendency. The standard reaming cutters can even be used to machine brass and bronze alloys cost-effectively. DR small, the world's smallest modular quick-change reaming system, can be supplied in four sizes for reaming diameters from 7.6 to 13.1 mm (0.2992 to 0.5157"). DR small is also available for delivery from stock in straight H7 dimensions. Supporting a variety of cutting materials, cutting edge designs and shank versions, the small reaming system is able to cover a very wide range of applications.

NEW

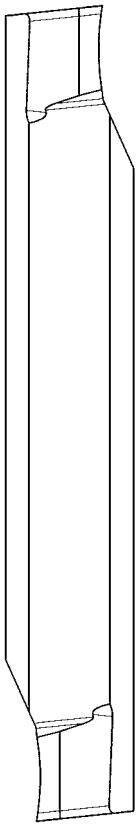
25A AXIAL GROOVING SYSTEM WITH EXTENDED WORKING RANGE



› Thanks to the extension of the range, the 25A system now supports even deeper axial grooves.

New applications thanks to increased diameter ranges

The proven 25A axial grooving system with cartridge design and round shanks is now even more versatile thanks to the introduction of new products. The previous system with single-edged or two-edged indexable inserts achieved cutting widths of 2 to 4 mm (0.0787 to 0.1575"), and a grooving depth of up to 18 mm (0.7087") with an external diameter of 15 mm (0.5906") or more. However, the enhanced cartridge and round shank versions now allow for grooving diameters of 50 to 65 mm (1.9685 to 2.5591") and from 65 to 80 mm (2.5591 to 3.1496") with cutting widths of 3 and 4 mm (0.1181 and 0.1575").



The cartridges are designed for HORN's K220 standard cartridge interface and are therefore compatible with all base holders for this system. The internal coolant supply ensures efficient cooling without any negative effect on chip flow. The tool holders can be equipped with single or double-edged carbide inserts of type 15A or 25A in carbide grade TH35 and with a TiAlN coating. The .10 geometric shape for long-chipping materials ensures safe chip flow, even with deep grooves.

The single-edged cutting insert also allows grooving along an interfering contour, such as a collar, making it suitable for universal use. As the dimensions of the cutting insert designs are identical, the single-edged inserts also fit into all 25A system holders.

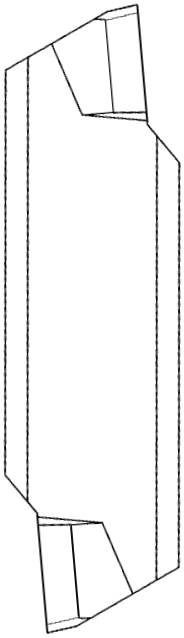
PRODUCTS

NEW

INTERNAL GROOVING WITH THE 209 AND 216 SYSTEMS

› Systems 209 and 216 offer good damping properties and an internal coolant supply.

Grooving depths down to 7.5 mm (0.2952"), grooving widths of 2 to 6 mm (0.0787 to 0.2362")



The grooving systems are designed for the internal machining of bores with diameters ≥ 16 mm (0.6299") (system 209) and ≥ 20 mm (0.7874") (system 216). At retraction distances up to 50 mm (1.9685"), a maximum grooving depth of 7.5 mm (0.2952") can be achieved. Key elements of both systems include tool holders with internal cooling and two-edged indexable inserts with cutting widths of 2 to 6 mm (0.0787 to 0.2362"). The robust shank with elliptical cross-section on the boring bar neck ensures excellent damping properties. The g6-quality shanks are available from stock in a left-hand or right-hand design.

The coolant jet escapes both from a nozzle in the clamping finger and from the side of the tool holder. The two coolant jets cool the cutting zone effectively and remove chips from the inside of the workpiece in a controlled, efficient manner. Made from AS45 substrate, the precision-sintered, two-edged indexable inserts with widths of 2 to 6 mm (0.0787 to 0.2362") are available in the geometries .5 / .1A and .KF for medium-strength materials. All three geometries prove their worth thanks to very good chip control and targeted chip breaking, even with long-chipping materials.

209 system toolholders with a shank diameter of 16 mm (0.6299") allow retraction distances of up to 30 mm (1.1811") in conjunction with a grooving depth of 3.5 mm (0.1378"). For bores with a diameter of 18 mm (0.7087") or above, a more stable shank diameter (20 mm (0.7874")), also with a retraction distance of 30 mm (1.1811"), can be used to achieve a grooving depth of 5 mm. The 216 system can be used for internal grooving in bores with a diameter of 20 mm (0.7874") or above. For this, tool holders with a shaft diameter from 20 mm (0.7874") are available. With these dimensions, grooving depths down to 7 mm (0.2755") can be achieved at a projection length of 2 x D.

PRODUCTS

NEW

BOEHLERIT INTERNAL COOLANT SUPPLY FOR TURNING

› Boehlerit extends its range of ISO products by adding holders with internal coolant supply.

Cooling directly at the cutting edge

HORN presents Boehlerit's extended product portfolio for turning using tool holders with connections for internal coolant supply. The new tool holders are available with toggle clamp (ISO-P) and screw clamp (ISO-S) systems.

Boehlerit's tool holders with connections for internal coolant supply are available from stock with a toggle clamp system (P) and a screw clamp system (S). The P tool holders are suitable for all ISO indexable inserts. There are no loose parts and only a few spare parts are required, making them easier to handle. The indexable inserts can be clamped quickly and securely. They can also be released easily. As no obstructions are introduced, smooth chip flow is guaranteed.

The S tool holders also enable the insert to be secured simply and safely. In this case, a cone-shaped positioning screw is used. Here too, chip flow is not compromised and a maximum of three spare parts are needed. In both cases, the coolant is supplied at the back of the shank end as standard or from below the head as an option.

PRODUCTS

NEW

CUTTING SINTERED CARBIDE

› Thanks to the CVD-D cutting edges, the tool opens up new possibilities for carbide machining.

Tools with CVD-D tips

With the standard tool concepts available on the market, it is not possible to drill, groove, turn or mill features and contours in sintered carbide without pre-treatment or subsequent treatment. For such applications, CVD-D-tipped tools offer real advantages. Their geometrically defined cutting edges are matched to the particular machining tasks concerned – from extremely sharp and rounded all the way up to positive and negative chamfers. Thanks to the flawless and geometrically optimised cutting edges, the CVD-D diamond can be used on anything from roughing work to fine finishing. As the tools enable accurate contour machining in the µm range, they offer substantial cost advantages along with increased manufacturing flexibility compared to grinding and eroding processes, for example. In terms of roughness, polishability and corrosion behaviour, the surface structure is also superior, or at least equivalent, to these two methods.

HORN has been utilising the application advantages of synthetic CVD thick-film diamonds for several years in a special tool range for machining CFRP and GFR composite materials. These tools can also be used on carbide and ceramic green compacts, sintered carbide and aluminium wrought alloys.

PROTOTYPE

FROM DESIGN TO SERIES PRODUCTION

1 Requirement

› Every product starts with a requirement from the customer or a deliberate strategy. As the inventor thinks about this requirement, the product begins to take shape inside his or her mind. Questions at this stage include: What does the customer want? Who is our target group?

2 Planning, setting objectives

› Developing the concept for in-house production involves discussing what benefits the product will bring for customers and how the delivery of these customer benefits can be ensured. In addition, a market analysis allows the company to determine whether a product already exists at the planning stage or whether any associated patents have been registered.

3 Concept

› During this phase, the developer comes up with the solutions to the task and produces a feasibility study. Depending on the size of the project, it may be worth assembling project teams. The advantage of this is that the individual functions/assemblies/modules can be distributed across multiple project teams. This is particularly beneficial when developing mechanical and electronic components, for example. Another important element at this stage is good cooperation between the product managers and Research and Development (R&D). By remaining in close contact with customers, the product managers are able to ensure the optimum customer benefit.

PROTOTYPE

6 Market launch

To some extent, the market launch starts during the prototype phase when deciding which select group of customers will be involved for testing purposes. The tests are overseen by Product Management with assistance from R&D. Following successful testing, the standardisation process commences, which marks the start of the market launch.

5 Preparation for series production

Once the final tests on the prototypes have been completed, it is time to prepare for series production. This includes the following tasks: creating production schedules and preparing production resources such as jigs or special tools. In addition, quality assurance measures have to be developed.

4 Design

At the end of the concept phase comes the prototype. The manufacture of one or more prototype products may result in changes during development. In addition, alternative manufacturing methods are explored, such as 3D printing. Furthermore, FEM simulations and tests come into play.

PROTOTYPE

FROM DESIGN TO SERIES PRODUCTION

Vitality at the touch of a button? That is the promise being made by a company that markets a handy device for biophoton irradiation of food products and the main energy centres of the human body. The device was designed, developed and prototyped by TDC Engineering, a prototyping company from Mannheim that also handles series production of the device. To make the prototypes and for small series production, it depends on the flexibility and speed of delivery offered by HORN.

When Michael Herbel founded TDC Engineering & Design in 2006, his vision of prototype development was to get from the initial idea to a series producible product in record time. Together with his team of 15 employees, the Managing Director now offers the complete range of product development services. “Hand in hand with our customers, we design products, build models and develop prototypes. We accompany the product from the early development to small series up to the series production”, says Herbel. His customers include large companies in the fields of medical technology, pharmaceuticals and commercial catering equipment, as well as other industries.

However, TDC Engineering does not merely design and produce prototypes. Its services also include small series production and peripheral equipment. For instance, Michael Herbel's team develops testing & measuring equipment and assembly stations for the new products. The range of services encompasses more than just mechanical components. That is because the Mannheim-based company has also established a good reputation as a developer and producer of electronic modules.

Milling a concave radius on the side.

Milling a pocket to hold the battery.

PROTOTYPE

According to the company, the device is intended to vitalise food.

The biophoton device for use in alternative medicine is a prime example of this. By aiming concentrated light at food products, the device is intended to stimulate the biophotons in the food to vitalise it for the benefit of humans. From receipt of the development order, it only took around four months to get to the pilot series stage. At its small prototype workshop, TDC Engineering is currently using three CNC machines to produce 500 parts a month. To manufacture the housing components, Herbel relies on tools from HORN. His company has been working closely with the tool manufacturer for two years. “We appreciate the flexibility and fast delivery times because we often have to respond rapidly in the event of changes. In addition, we receive a lot of technical support from Thomas Massinger, the HORN sales representative”, explains Herbel.

The housing is produced using solid carbide milling cutters from the DSA and DP systems, Boehlerit ISO turning tools and a monocrystalline diamond (MCD) turning tool. Herbel orders the ABS plastic enclosure for the device from an external supplier. However, it was TDC Engineering that developed and produced the injection mould for the grip. For the purpose of machining the aluminium mould inserts, solid carbide end mills from the DS aluminium series were once again used.

The aluminium end piece is what holds the battery in place. For this, Herbel opted for the anodisable alloy AlMg3 for design reasons because he wanted the colour of the anodised finish to be as consistent as possible across different batches. Once the bayonet fitting has been turned using a Boehlerit VCGT 35° insert, the battery pocket is milled.

This involves the use of a solid carbide milling cutter from the DS aluminium range with a diameter of 8 mm (0.3150"). The tool, which has a cutting length of 8 x D, mills the 40 mm (1.5748") deep pocket with an infeed of a_p = 4 mm (0.1575"). The DS aluminium milling cutter has very sharp cutting edges and polished chip spaces.

A close cooperation spanning two years. Michael Herbel talking to Thomas Massinger from HORN and Mathias Herbel (from left to right).

Together with effective coolant supply, these prevent chips from the AlMg3 (which is not the easiest of materials to cut) from sticking.

Once the bayonet fitting and the pocket for the battery have been machined, the component is reclamped in a special workholding device. So that the taper of the part can undergo final turning in one hit without a recess, the component is clamped using the pocket that has already been milled. It cannot be clamped using the bayonet fitting because the wall is too thin. The turning operation that creates the taper is once again handled by the Boehlerit ISO insert featuring a polished chip surface.

As a special design feature of the aluminium component, the team from Mannheim also mills a concave radius on the side of the taper. This involves using a solid carbide end mill from the DP system with a diameter of 12 mm. The radius is produced with a_e = 5.0 mm (0.1969") and a_p = 4.0 mm (0.1575"). Another special design feature of the device is the PMMA tip. The manufacturing challenge here was to achieve the required clarity of the acrylic glass. For this, Thomas Massinger recommended an S117 MCD-tipped tool for brilliant-finish machining, a finish that can be achieved thanks to the flawless cutting edge of this tool.

Thomas Massinger values the cooperation with the team at TDC Engineering: “Whenever I get in touch with the TDC team, they are always very competent and it's like talking to family. In this context, I often get the chance to solve machining problems of all kinds.” The fantastic teamwork between the companies and the expertise shared and applied when developing and machining the individual components for the device have invigorated the people from TDC and HORN who were involved, and they are looking forward to working on further exciting projects together.

INTERVIEW

TRADE FAIRS: SHARING IDEAS FACE TO FACE

› Wolfgang Geckeler has worked for HORN since 1st March 1995. Since 1st January 2016, he has been in charge of the German trade fairs.

Mr Geckeler, why does HORN exhibit at trade fairs?

We want to facilitate face-to-face meetings and show our customers and potential customers what solutions we have to offer. Trade fairs are the ideal platform for that.

How many trade fairs does HORN attend as an exhibitor?

Globally, we exhibit at 50 to 60 trade fairs a year. In Germany, the figure is around five trade fairs per year.

Which trade fairs are you responsible for?

The ones that come under my responsibility are: EMO Hannover, the AMB in Stuttgart, the Moulding Expo (also in Stuttgart), Metav in Düsseldorf, Intec in Leipzig, Nortec in Hamburg, the Turning Days in Friedrichshafen and Tube in Düsseldorf. On top of those, there are a few international trade fairs as well – the Intertool in Vienna and Neftegaz in Moscow.

What are your duties in this regard?

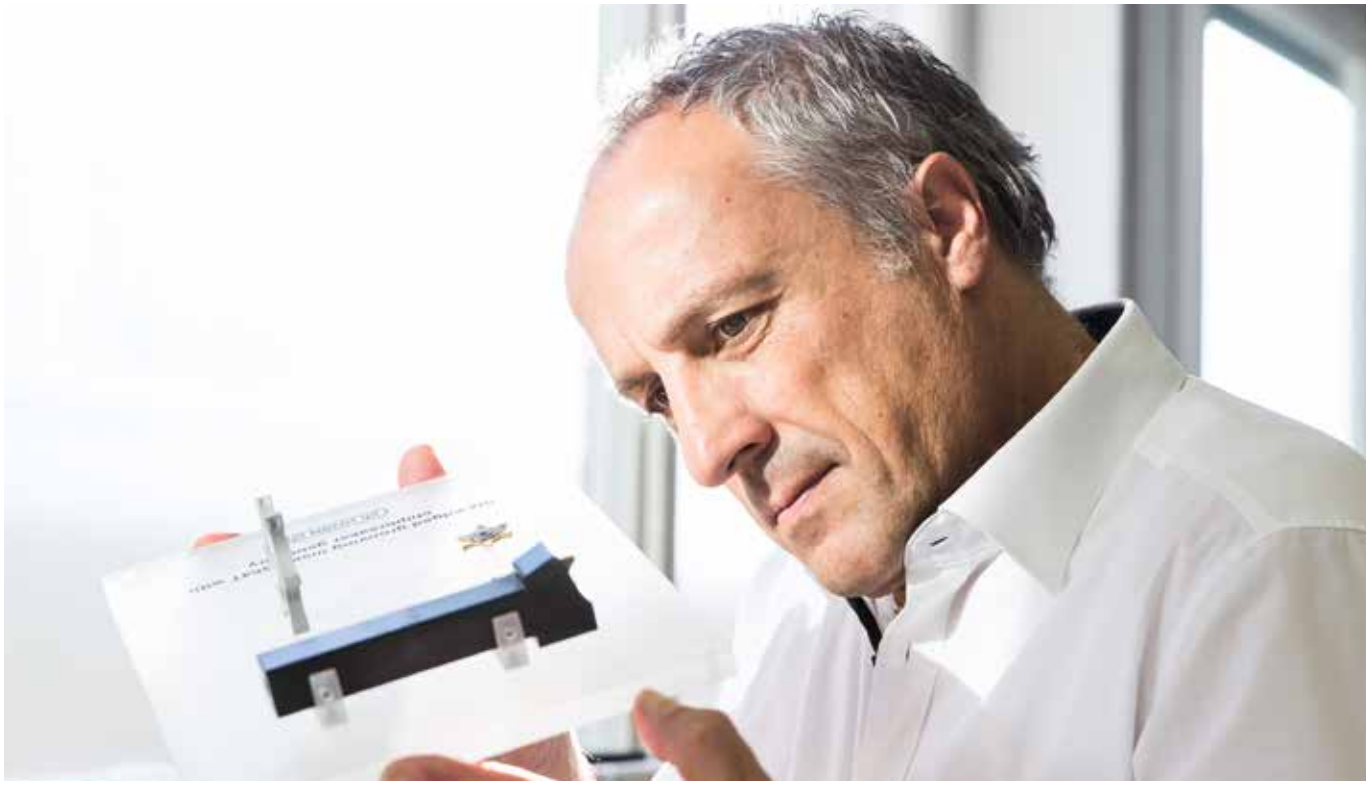
I am involved in absolutely everything that has to do with trade fairs. For example, the concept for the stand, the presentation of new products and developments, preparation of the equipment and materials right through to their dispatch, setup and dismantling, and follow-up work and debriefing.

Are there any central requirements for trade fair appearances around the world?

Of course we want HORN to be recognised across the globe. That is why requirements and a framework have certainly been put in place. However, there is still scope for regional differences and peculiarities to be taken into account.

What is it that draws visitors to the HORN stand?

First and foremost, it is the fact that every visitor is important to us. Another aspect is that we naturally show highlights at our stand. The machines run live – putting on a fake display is not an option for us. In addition, we demonstrate example applications using workpieces from various industries and many of our exhibits



Wolfgang Geckeler is also responsible for the design and setup of trade fair exhibits.

are supported by multimedia technology. We concentrate on our visitors and our products. For us, putting on an “empty show” on our stand would be out of the question.

Why is that so important?

The trade fair visitors only have a certain amount of time to spend on the stand. This time has to be used wisely and in a manner that is focused on solutions. We do not attend trade fairs out of vanity but to provide visitors with added value.

What do you do during the trade fair after the stand has been set up and before it needs to be taken down again?

During the trade fair, I make sure that there are no bottlenecks or problems. If something does crop up, I am there to resolve the issue. Like my colleagues from the Sales department, I spend most of my time between setup and disassembly advising customers. My technical background certainly helps in that regard.

What impact is digitalisation having?

Digitalisation enhances our everyday life. Everything is becoming faster and better networked. I regard this development as a very positive one. Nevertheless, digitalisation can never fully replace the personal touch. That is why it is all the more important to make the most of the ever smaller number of opportunities for face-to-face meetings by using them wisely and productively. Trade fairs are perfect for that. Visitors receive lots of information within a manageable space in a relatively short period of time.

From where do you get your inspiration for future stands?

As well as going to the German trade fairs, I personally attend international events and trade fairs for other industries. At some point or other, you become blinkered – and so you have to pull the blinkers off regularly. Of course, you – and the company as a whole – have to remain open to new ideas.

Why is the new Hall 10 at the Messe Stuttgart trade fair centre being named the “Paul Horn Hall”?

It's our way of declaring our commitment to our location, to Messe Stuttgart and to trade fairs in general. Because of where the exhibition centre is situated, it is also a great opportunity to showcase ourselves the whole year round even when the AMB and Moulding Expo are not on.

Do you have any closing words for us?

Come and pay us a visit – we've packaged our “excellence in technology” and you'll find it on our stand.

ABOUT US

THE PAUL HORN HALL

The new Paul Horn Hall (Hall 10) completes the symmetry of the exhibition halls at the Messe Stuttgart exhibition centre because the original plan by the Bau Neue Messe planning consortium envisaged a total of ten halls. Furthermore, the western entrance has been significantly enlarged, with meeting rooms and a restaurant also having been added. These were part of the initial plan but were put on hold for cost reasons. On completion, the Paul Horn Hall will take the amount of overall exhibition space at the Messe Stuttgart site from 105,200 to 120,000 square metres (1,291,670 sq ft) (equivalent to around 17 football pitches).

The quantities of installed materials are huge. For the building services, around 11 kilometres (6.8 miles) of pipework have been installed for heating, cooling, drinking water, waste water, sprinklers, compressed air and water systems for firefighting. Eight air handling units in the ventilation control centres are responsible for air conditioning – i.e. heating or cooling and recirculating – a total of around 360,000 cubic metres (12,713,280 cu ft) of air. When it comes to the electrical equipment, the figures are even more impressive. For the medium voltage supply alone, 16 kilometres (9.94 miles) of main cables were laid to distribute the electrical energy to the power network. For the 220 V electrical installations, 170 kilometres (105.6 miles) of cabling were required. Another 52 kilometres (32.3 miles) or so had to be laid for the low-voltage network, fire alarm equipment and control systems. Cable channels spanning a distance of 15 kilometres (9.3 miles) were also installed to carry some of these cables. To create the roof of the hall, 1,900 square metres (20,451 sq ft) of suspended drywall ceilings were installed along with roughly 2,700 square metres (29,062 sq ft) of suspended metal and expanded metal ceilings. Meanwhile, the wall tiles cover a total area of 1,800 square metres (19,375 sq ft).

ABOUT US

Lothar Horn, Managing Director of Paul Horn GmbH, said: “Thanks to the new Hall 10 at the Messe Stuttgart trade fair centre – the Paul Horn Hall – we are sending out a clear signal. By sponsoring it, we are once again declaring our commitment to the region and demonstrating our strong bond with Messe Stuttgart and with trade fairs in general. In spite of – or perhaps precisely because of – increasing digitalisation, I am convinced that trade fairs provide the optimum platform for sharing ideas face to face, meeting with others and finding solutions together.” In Stuttgart, Paul Horn GmbH exhibits at the AMB and Moulding Expo trade fairs. In this regard, the company benefits from its geographical proximity to Stuttgart and, in particular, from the densely populated economic regions of Baden-Württemberg (of which the primary one is Stuttgart) as well as Bavaria and beyond. Thus, HORN is also able to reach a wide audience outside the confines of the two trade fairs.

The Messe Stuttgart trade fair centre puts on around 70 exhibitions a year in Stuttgart. Just under 50 of these are its own shows and about 20 are guest exhibitions. They include consumer fairs, trade fairs and high-tech specialised fairs. Messe Stuttgart has set up its own subsidiaries in Istanbul/Turkey, Atlanta/USA and Nanjing/China so that it is able to participate in the trade fair market in these locations as well. In addition, the ICS International Congress Centre Stuttgart hosts numerous congresses, conferences and other events every year. More than two dozen rooms are available here with capacities ranging from 20 to 4,900 people. Overall, the venue can accommodate 10,000 people. In 2016, Messe Stuttgart recorded a high capacity utilisation factor of 15.7, making it one of the most successful exhibition centres in Germany and indeed the whole of Europe.

ABOUT US

RUSSIA RETURNING TO GROWTH

A market with lots of potential

› HORN RUS LLC has been operating in Russia with its own employees since the beginning of 2018. The HORN RUS headquarters in Moscow are the centre of its market activities. During the initial phase, the new company is concentrating on existing and well-known customers from the automotive, energy and aerospace industries, as well as their suppliers. There are no limitations to the range of products and services available. The Moscow office has a floor space of approximately 300 m² (3,229 sq ft) and houses the sales and administration departments, the storage area and facilities for delivering customer training. Despite the great distance between Moscow and Tübingen, the same short delivery times apply when placing orders for special tools in Russia. Through its systematic approach, HORN is replicating an important competitive advantage in Russia, which – together with quality and precision – represents a key criterion for success in the market within the Russian Federation.

Local team

The people in charge of HORN RUS LLC are Alexander Dick (Managing Director), Pavel Glazyrin (National Sales Manager) and Anastasia Dododnova (Operations Manager). Regarding the focus of HORN RUS, Alexander Dick has the following to say: “Russia is a growth market. Quality, ever increasing efficiency, speed and repeatability are the core requirements and these are perfectly accommodated by our product portfolio. In 2018, the Metalloobrabotka and Neftegaz exhibitions will offer the ideal platform for presenting our solutions and capabilities.”

Current market situation

In the first nine months of 2017, the German machine building industry exported around four billion euros worth of goods to Russia. That equates to a growth rate of approximately 23 percent. However, the export market is still lagging some way behind the level it was at prior to the economic crisis. By the end of the first nine months of 2012, a figure of six billion euros had been recorded for German exports. To get back to the 2012 level, it will take another two to two and a half years at the current percentage growth rate.

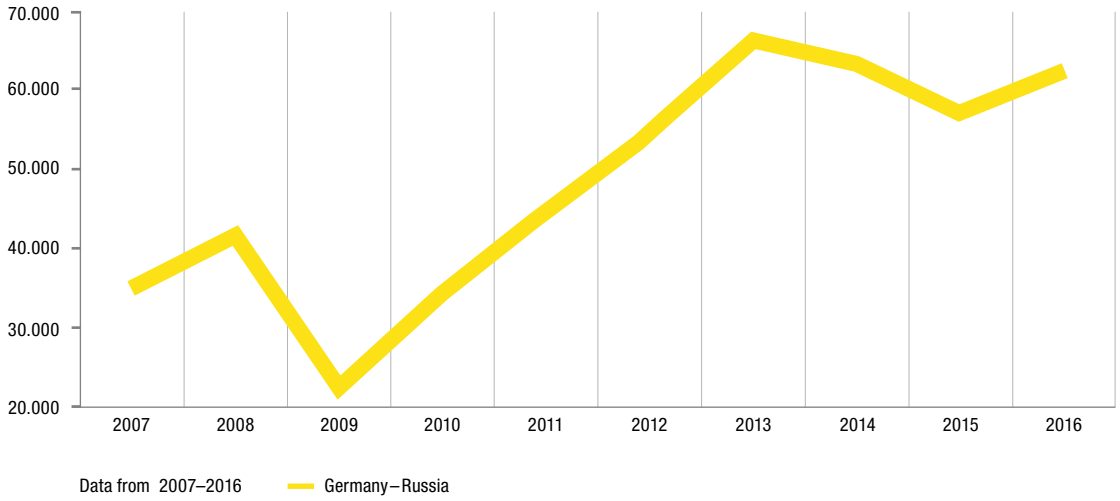
Agricultural technology continues to reign supreme in spot number 1. In building and construction, the upturn is mainly attributable to road construction projects, with the building sector remaining stuck at the previous year's level. One possible explanation for this is that the construction industry is experiencing a temporary boom in infrastructure because of the 2018 FIFA World Cup. Although machine tools are likewise seeing a small upturn, the decline in sales over previous years means they have even more catching up to do than the mechanical engineering sector as a whole if they are to return to pre-crisis levels. In addition to economic developments, sanctions also have a big part to play here. As far as cutting tools are concerned, the negative sales trend that started in 2013 has been reversed and is now heading in the positive direction (see graph).

The management team at HORN RUS LCC: Anastasia Dododnova, Alexander Dick and Pavel Glazyrin (from left to right).

Overall, almost all of the ten strongest export sectors in Russia have been growing. This suggests that the upturn is not simply being driven by a few major projects in particular sectors but is indicative of a general trend.

Source: VDMA Russian liaison office

Germany/Exports to Russia in thousands of euros
Cutting tools



Source: National statistical offices

MATERIALS

ALUMINIUM AND ITS ALLOYS

For industrial and personal requirements: highly shapeable, visually appealing

› Aluminium (Al) is found in the Earth's crust in mineral form. The most important ore for extracting it is called bauxite. Using a complex, energy-intensive process, pure aluminium oxide (known as alumina) is extracted from this rock, which is then smelted and subjected to electrolysis.

The German aluminium industry

The industry is made up of around 600 medium-sized companies and large groups. Together, they employ 74,000 people and in 2016 generated a turnover of 13 billion euros. 1,100,000 tonnes of aluminium were produced in Germany in 2015. Within the same period, there was a demand for 3,400,000 tonnes.

The value-added chain of the aluminium industry starts with the production, alloying and casting of primary aluminium. This is then shaped in rolling mills or presses, forges and foundries before undergoing further processing by the customer.

The recycling of these products is extremely important. Of the 3.5 million tonnes of aluminium processed in Germany, 35 percent of the required metal is sourced domestically. 20 percent of this comes from recycling (secondary aluminium) and is fed back into the aluminium value-added chain.

Main markets for aluminium 2016

Branch of industry	%	Branch of industry	%
Transport	48	Mechanical engineering	6
Construction	15	Iron/steel industry	6
Packaging	10	Other markets	4
Electrical engineering	7	Household goods, office supplies	4

Source: GdA - Gesamtverband der Aluminiumindustrie e.V.

Properties of aluminium

- Density is around a 1/3 of that of steel (lightweight construction, energy and cost savings)
- Chemically resistant (food and beverage industry, offshore applications)
- Good workability, weldability and castability (engine, car and aircraft parts)
- Decorative and abrasion-resistant surfaces (industrial, household, office applications)
- High electrical conductivity (cables, overhead lines)
- Non-magnetic

Machining aluminium

The tensile strength, elongation, hardness and rigidity of aluminium can all be influenced by alloying elements such as silicon, magnesium, copper, zinc and manganese. During machining, the material can become soft due to the heat generated which can cause the cutting tool to stick, with the impaired chip flow even resulting in the tool's destruction. Therefore it is important to ensure that the material and cutting parameters are properly matched to one other. The determining factors are the aluminium alloy, the cutting tool, the feed rate and rotational speed, and the type and quantity of coolant used.

HORN aluminium machining tools

Given the high adhesive tendency of aluminium, the most important features of our wide range of standard and bespoke tools are the special geometries with sharp cutting edges, polished chip surfaces and coatings with excellent anti-friction properties. Moreover, our carbide grooving inserts are peripherally ground to ensure an extremely sharp cutting edge. To cope with aluminium alloys that have a high silica content, the inserts are coated. For milling applications, the portfolio includes both coated and uncoated circular interpolation tools and solid carbide milling cutters. To handle the considerable chip volume associated with high cutting data, single-edged milling cutters with a large chip space can also be supplied.

To support long periods of use or more complex tasks, ultra-hard cutting materials are available, such as PCD and CVD-D with precision-lasered cutting edges. MCD-tipped tools are used, for example, for brilliant-finish machining of mirrors or aluminium blow moulds.

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