J.Schneeberger Maschinen AG

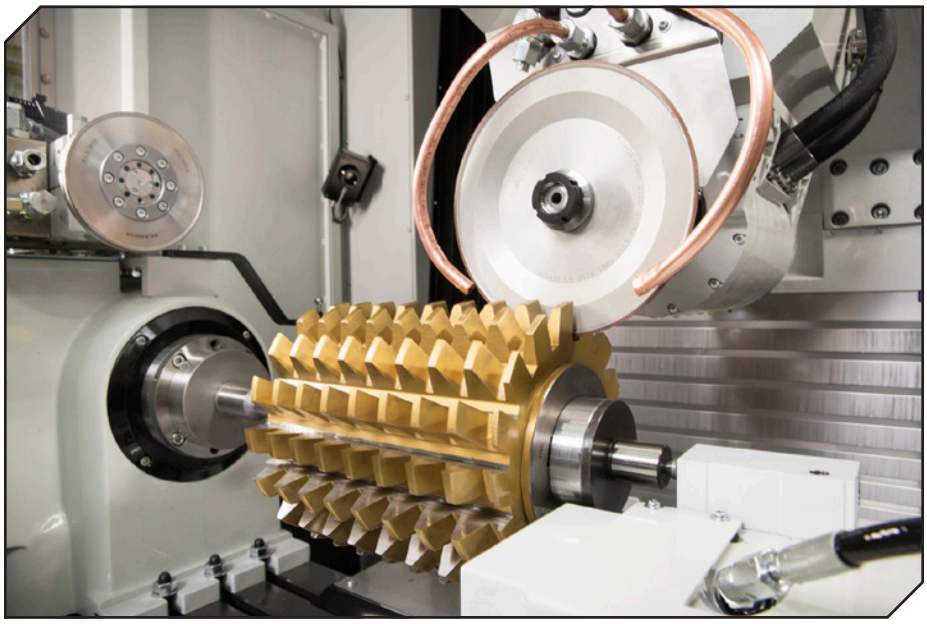
OFFERS MODERN DRIVE TECHNOLOGY FOR SEVERAL GRINDING OPERATIONS WITH CORVUS SERIES

The Corvus series machine is designed to offer, high horsepower 5-axis CNC tool grinder for pelletizers, slab mill cutters, and other applications requiring a long machine bed, high torque headstocks and high horsepower grinding spindles. Today, the machine has evolved with an intelligent modular machine design that allows it to be configured as a 6-axis broach grinder as well as a spline grinder, heavy-duty 5-axis machine, gear hob profiler or sharpener and thread grinder.

High 72 hp grinding motors with wheels up to 450 mm and tools that exceed 450 mm in diameters can be presented to the Corvus NGB. Grinding wheels can be automatically balanced after dressing, auto tails stocks, supports, etc., the options and accessories are endless. For the gear market, a special design of the wheel head called pencil grinding can grind a large gear profile with ease. Options like a wheel changer enhances the roughing, pre grinding and finish grinding of complex gear profiles with probed quality control and dressing options.

The operation of side clearance grinding for small flat broaches has been implemented into the Corvus NGB BBA machine. Side clearance height of a ¼" is not unusual and requires a small wheel. The use of the 30,000 rpm or higher spindle allows for more efficient grinding capability. The standard, double-ended HSK50 spindle remains to grind the face of the broach, straight or on a shear angle. Clamped on a CNC controlled trunnion style table, the tool can be finish ground in a single setup. Qg1 software is a highly graphical interface that welcomes the application knowledge of the operator. This compared to manual dry grinding has been welcomed as leap forward for broach shops, manufacturing or re-sharpening. Such special applications are the backbone of Schneeberger, working towards the easiest and best solution for the customer for affordable pricing.

A further version of the Corvus NGB product line is the back off profile grinder, one of the most challenging



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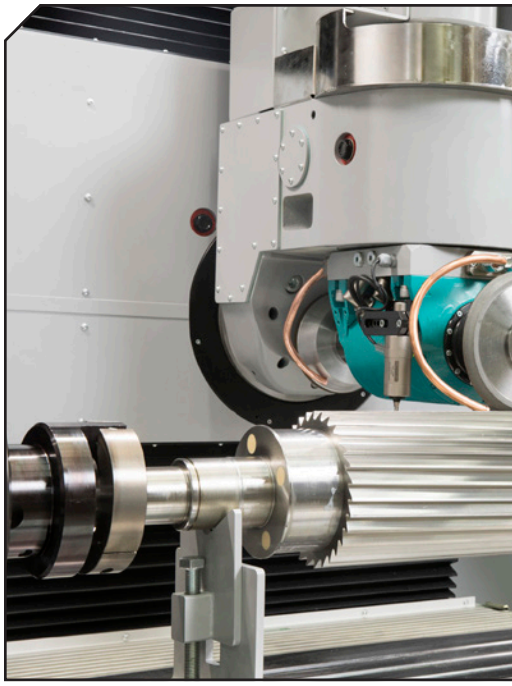
requirements in manufacturing an aircraft broach. First the broach is profiled with a wide wheel that grinds the complete profile over. Multiple dressing maintains the tight tolerance before the machine switches to the short stroke linear motor vertical axis with a higher rpm spindle using the smaller 2"–3" wheel used to back off the clearance and drop right behind the cutting edge. Anybody manufacturing such broaches is aware of the incredible accuracy requirements, and as a prequalification before removing the broach from the machine appreciates the ability of the probe to scan the ground profile and calculate corrections to the wheel form.

Eliminating multiple setups is the ultimate benefit of this machine as well as the incredible grinding speed the linear motor allows. A 40 percent time improvement is not uncommon. The same machine configuration is used to grind car panel stamping dies. The die form is digitized by the 3D probe and with the reciprocation grinding motion, the form is duplicated on the die to achieve the smallest possible cap for punching out car body panels.

The machine length capacity is offered in various lengths of 850 mm, 1,250 mm, 2,100 mm 3,100 mm. All lengths feature the FANUC linear motor technology to eliminate vibrations, heat and wear as well as offer the highest positioning accuracy. The variety of wheel head configurations offers a wealth of applications, face grinding high helix hobs, coarse pitch hobs profiling as well as face grinding. Rack grinding, thread



roll dies, scrolls compressor screws, any type of broaches can be introduced to the machine. The extreme size of a slab mill cutter with the intricate cutting-edge geometry on the inserts require the rigidity of the Corvus machine. The stationary table accept almost any extreme weight due to the traveling column maintaining grinding forces no matter the size of the tool.

Aside from the flexible modular machine design, Schneeberger offers a variety of automatic loading systems for the tools as well as the wheels packs. A multi pallet system for either 2 or 4 pallets is complimented with a circular magazine tool storage for very heavy tools. Loading carts for easy access or, ultrasonic parts washers and laser marking can be incorporated in the loading cycle.

The Schneeberger technology is complimented with a easy to understand graphical programing interface Quinto *Qg1*. The simple steps using easy to understand pages supported with help text and graphics are essential to make the machine shop conform and user friendly. Also, the latest capability of accepting step file format allows the software and machine to handle just about any type of application, tool or none tools to be ground.

The versatility and flexibility of the Schneeberger Corvus machine welcomes special requests and the challenges that are turned away from the general machining industry.

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The intelligent modular design allows the Corvus to be utilized for several different grinding applications.

Röders GmbH

OFFERS FLEXIBLE GEARWHEEL PRODUCTION WITH 5-AXIS MACHINING CENTERS

The manufacture of gearwheels for machine building applications usually involves machines especially designed for the purpose. Important techniques include gear hobbing, gear shaping, gear-generating planning, profile milling and profile broaching. Generally, specialized tools whose geometry is precisely adapted to the workpiece are required. Due to the stringent requirements placed on the hardness of the gearwheel surfaces, manufacturing is often carried out in three steps: soft machining, hardening and finishing. New developments in the field of hard machining now enable fast, single-stage manufacture with general-purpose 5-axis machining centers.

"In the production of gearwheels for industrial use, such as in mechanical engineering, speed and flexibility are often crucial factors," said Dipl.-Ing. Jürgen Röders, managing director of Röders GmbH in Soltau.

While sectors such as the automotive industry prioritize large quantities, the batch sizes in mechanical engineering are significantly smaller. Sometimes less than ten items are required and occasionally only single pieces. However, the deadline pressure is frequently considerable. This is true when the machining steps and the elaborate advance production of tools with a specially adapted geometry prove to be a handicap. A plant technology which enables a medium-sized gearwheel to be produced in good quality from a hardened blank within roughly one working day is of particular interest for sub-contract job shops, who have specialized in the manufacture of industrial gearwheels in small quantities and short deadlines.

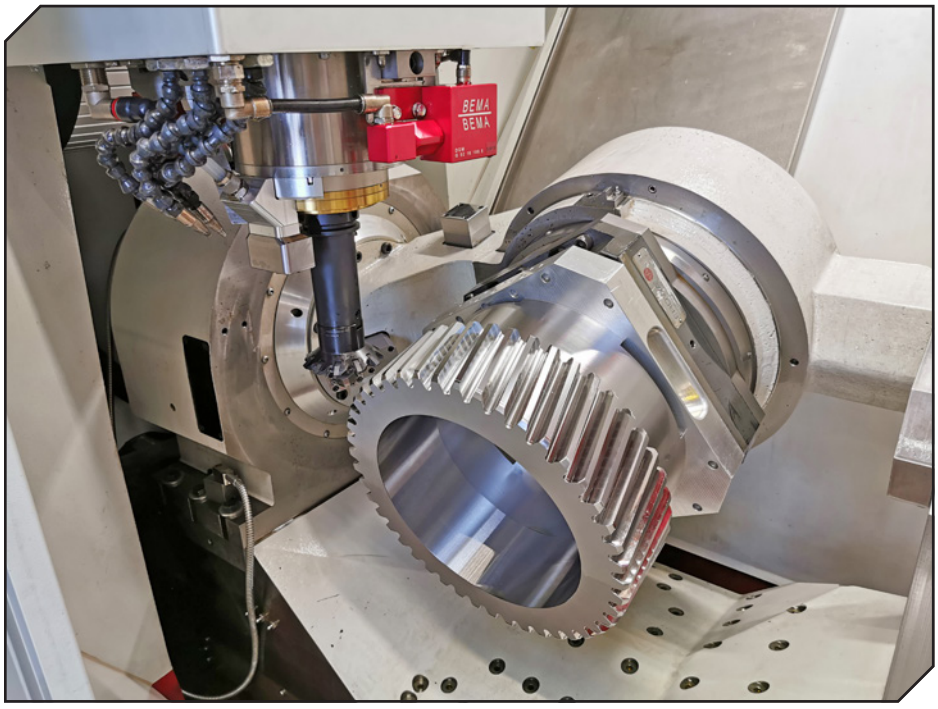
"For the production of gearwheels, one needs purpose-designed CAM software that covers the various types of tooth profile correction," said Carsten Wendt, who supervises the development project. The technology partner here is the CAM software developer Euklid, a company that has developed a program designed precisely for these assignments in the form of *Euklid GearCAM*. This convenient software module supports the user in producing highly accurate gearwheels on standard milling machines. This solution is of particular interest for those companies which need one-off items or small batch sizes as a prototype, a special model or a replacement for failed parts in existing gears — either in parallel to or as a supplement to their normal production.

The program also takes account of the usual tooth profile correction functions such as width and depth crowning as well as tip and root relief. Another benefit of producing on a 5-axis machining center is that no correction is required for what is known as the

tooth flank bias, which may cause problems in some of the conventional manufacturing technologies as a consequence of limitations to the machine kinematics. In contrast, this problem does not occur in the first place when a 5-axis milling machine is used.

"The precision of the machining center used plays a crucial role in gearwheel production," said Sales Manager Dr.-Eng. Oliver Gossel. Since Röders developed its system for use in particularly demanding mold and die-making operations, the system inherently meets the most stringent requirements concerning precision and dynamics. Activities within this segment involve machining materials with degrees of hardness in excess of 60 HRC, while maintaining accuracies down to the single micrometer range.

The machines used for this project, such as the RXP 601 DSH, are not only suitable for milling applications, but

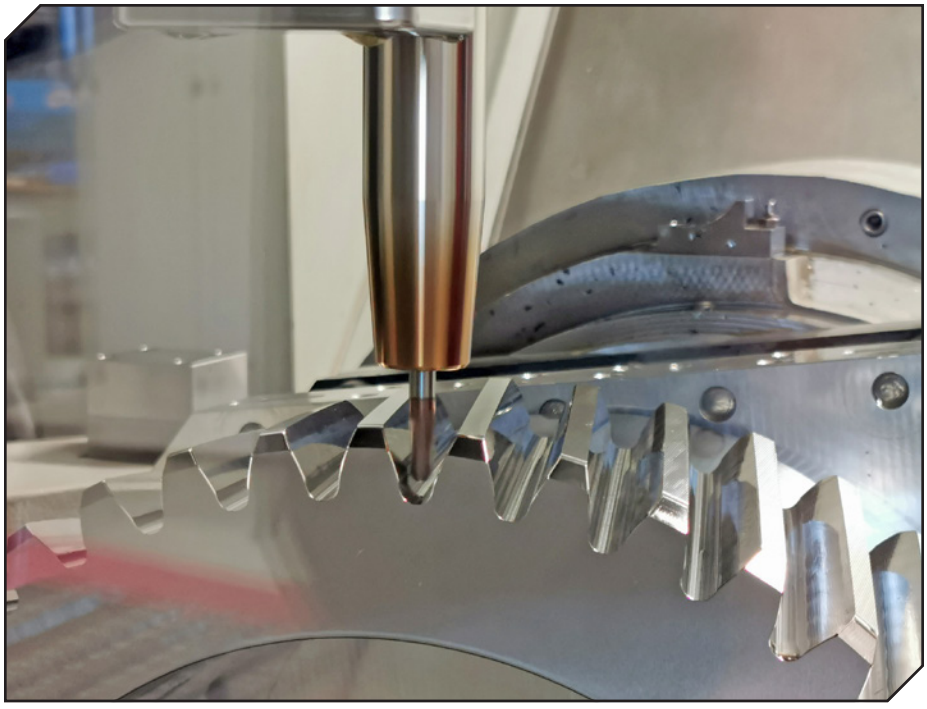


High-quality gearwheels are produced from hardened blanks within a very short time on 5-axis milling centres supplied by Röders.

also for jig grinding. Their accuracy is assured by a whole host of engineering design features, ranging from the use of a solid machine bed made of polymer concrete, via high-precision guide systems and frictionless linear direct drives, through to sophisticated temperature management with internal media flow channels in all essential components. Temperature-conditioned intermediate elements stop the diffusion of heat from the drives into the machine bed.

Particular attention is also paid to the temperature-dependent lengthening of the main spindle, which is monitored and compensated for by the control unit. Another important feature is the exceptionally high clock rate of the controller intervals ("Racecut"), which enables even the smallest path deviations to be detected and corrected. Other positive factors are glass scales with a resolution of 5 nanometers and a patented weight compensation system for the z-axis.

The extensive compensation for all deviations in position and angle of the rotating/swivelling table additionally plays a special role. For this purpose, the unit passes through more than 400 different positions of the two rotational axes and its position is recorded with high accuracy at each step during this process. The position and angle data thus determined are stored in the control system as a reference.



Standard milling cutters from the internal tool magazine are used to produce the tooth root relief. Photo courtesy of Klaus Vollrath.

"Tools with significantly larger dimensions than is usual in milling operations are used in the machining of gears, and therefore, an additional tool magazine is available for them," said Röders.

The magazine arranged beneath the portal can accommodate three tools with diameters of up to 200 mm. As a result, the chain magazine inside the machine remains unchanged and stays stocked with the usual tools of smaller diameters. The position of the magazine and its protective roller shutter prevents even the smallest contaminant particles or chips penetrating, which might otherwise cause angular errors between the machine interface and the tool. A further positive aspect is that the vector control of the main spindle guarantees the transfer of these special tools always takes place in the same angular position so that even after multiple tool changes no misalignment of the grinding tools can occur once they have undergone dressing.

Another special characteristic of these tools is a separate piping circuit for the grinding oil supply which is installed together with the tool as a single package. As a consequence, the nozzle is always exactly aligned and thus guarantees an optimal oil supply for the contact zone between grinding tool and workpiece.

"Since there are hardly any restrictions in the selection of tools, the operator enjoys an exceptional freedom of choice," Gossel said. Instead of expensive and sophisticated special tools such as grinding worms, gear hobbing mills or shaving cutters, the jobs can be carried out with milling cutters, grinding discs and grinding wheels of comparatively simple design. In the case of the grinding tools, the use of a truing wheel makes it possible to choose between a simple planar geometry or the production of a contour with a shape adapted precisely to specifications. The latter solution permits higher productivity.

The software offers the choice between various machining strategies and tool preferences for roughing and finishing. Using the tooth geometry and prescribed tolerances, *GearCAM* automatically minimizes the number of tool paths in such a way that the tolerances are maintained exactly. The corresponding cutting and performance data can be obtained from a configurable tool database. Depending on the specifications, the tooth quality may reach level 2 or 3. A further advantage of the new solution is that cylinder surfaces such as the bore or shaft can be machined in-line on one clamping position.

The latest tooling option now available in the form of InvoMilling provides a combination of special milling tools developed in collaboration with Sandvik and a correspondingly optimized milling strategy.

"The system has recorded such a success among our customers that we have since developed special options for automating the processes as well," said Wendt. "First and foremost, these are compact RCS workpiece and tool magazines with integrated handling that enable automated changing of the workpiece so that the milling center can be operated 24/7 almost without interruption. This makes it possible to achieve low manufacturing costs even for one-off items. Thanks to the technology partnership with Euklid, Röders now provides the customer with full application support not only for the milling center, but also for the *Euklid GearCAM* software."

Hence, selecting a system such as this would give customers two highly interesting options at once. Firstly, the user is enabled to produce a ready-to-use gearwheel of high quality from a hardened blank in an exceptionally short time. Additionally, the customer would simultaneously have an extremely precise and powerful 5-axis milling center that could also be used for a wide range of other operations within the firm.

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Heidenhain

EXPANDS TNC 640 CONTROL CAPABILITY

Heidenhain is bringing to market its new Gen 3 version of its high-end TNC 640 control for machine manufacturers and end users looking for forward-thinking manufacturing capabilities. This control is useful for machines ranging from 3-axis milling to 5-axis simultaneous machining with milling, turning and grinding operations with up to 24 axes. It is scheduled to be displayed at IMTS 2020 trade show in Chicago (Sept. 14–19) in booth #135226.

With its new Gen 3 drives, the TNC 640 boasts powerful inverters and controller technology that are key components in the complete system of its control package. Now providing even higher spindle and axis dynamics during the manufacturing process, these drives also require less space in its electrical cabinet, and result in reduced storage, mounting costs and servicing time.

With Gen 3 drives serving as the new system foundation, new TNC 640 customers will benefit with high availability and surface quality with shortened machining times, as well as with any other upcoming path-breaking functions of Heidenhain controls.

Some of the new feature highlights of this latest generation TNC 640 control include new jig grinding functions, Extended Workspace Compact, Optimized Contour Milling (OCM) within its "Dynamic Efficiency" package, as well as the ongoing option of a "Dynamic Precision" package. Also, Heidenhain's new StateMonitor 1.3 makes it very easy to remotely monitor efficiency improvements and ROI of these new CNC functions.

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