Gleason

COMBI HONING EDRIVE GEARS

DR. ANTOINE TURICH, DIRECTOR, PRODUCT MANAGEMENT OF HARD FINISHING SOLUTIONS, GLEASON CORPORATION

As the automotive industry moves toward e-mobility, transmission manufacturers are faced with new challenges. Larger gear ratios are necessary to reduce the high input speeds of electric motors to the required speed of the drive wheels. At the same time, gear noise that was concealed by the sound of a combustion engine is now evident, presenting completely new challenges for acceptable transmission noise levels. Finally, there are the special requirements to consider for the various new transmissions developed specifically for eDrive application. A common solution for eDrive transmissions are planetary transmissions using "stepped pinions", as shown in Fig. 1.

In specific planetary gear applications (Fig. 1), the two gears on the stepped pinion are synchronized to fulfill an exact timing within very tight tolerances.

Due to the noise sensitivity of such components, hard finishing by grinding or honing is indispensable. Gear honing proves to be particularly advantageous, since honed components have a proven lower noise behavior than ground components due to their specific, curved surface structure. Gear honing is also a requirement for machining gears with interfering contours, as is the case with stepped pinions. This is due to the small cross axis angle between the honing tool and the component and the fact that, unlike grinding, no tool overrun paths are required.

Combi Honing, New Possibilities

With the acquisition of the Faessler gear honing business, Gleason has added a unique process to its gear hard finishing portfolio that makes it possible to hone synchronized stepped pinions in one clamping with extremely tight tolerances and the highest quality. This so-called Combi Honing system uses two honing rings. The honing head of a Gleason 260HMS Honing Machine (Fig. 2), for example, can clamp two honing rings in parallel. The resulting eccentric offset of the honing rings is compensated for with a B-axis (swivel axis). In addition, flank line modifications such as crowning can be realized with the B-axis during the honing process.

The Combi Honing process starts with honing ring 1 honing the larger gear, and then honing ring 2 honing the smaller gear, all in the same clamping. Although this may sound trivial, this process has decisive and unique advantages, especially with regard to finished quality. While this specific component could also be machined in two separate set-ups, e.g. grinding the larger gear and honing the smaller one, the quality of the resulting gear would not be the same, particularly the angular synchronization of both gears. When finishing both gears in one clamping, non-productive time for loading/unloading as well as indexing (centering tools and gears) occurs only once and not twice per component.

Figure 1 Planetary transmission with stepped pinions.

The Combi Honing Process on the 260HMS was specially developed for synchronized stepped pinion applications. A particular challenge was achieving the reliable and accurate positioning of the synchronized gears in relation to the honing rings. When indexing, i.e. centering gear teeth and tools, both teeth of the large and the small gear must be detected while corresponding exactly to the required angular offset and the tolerances of the index hole on the face side of the gear. The latter guarantees the final correct installation position of the stepped pinion in the planetary transmission. Three indexing sensors (Fig. 2, right hand side of the picture) are used to measure the position of all teeth of the large and small gear as well as the position of the index hole on the face side. A corresponding algorithm calculates the correct position of the gear teeth in relation to the honing rings. Parts with

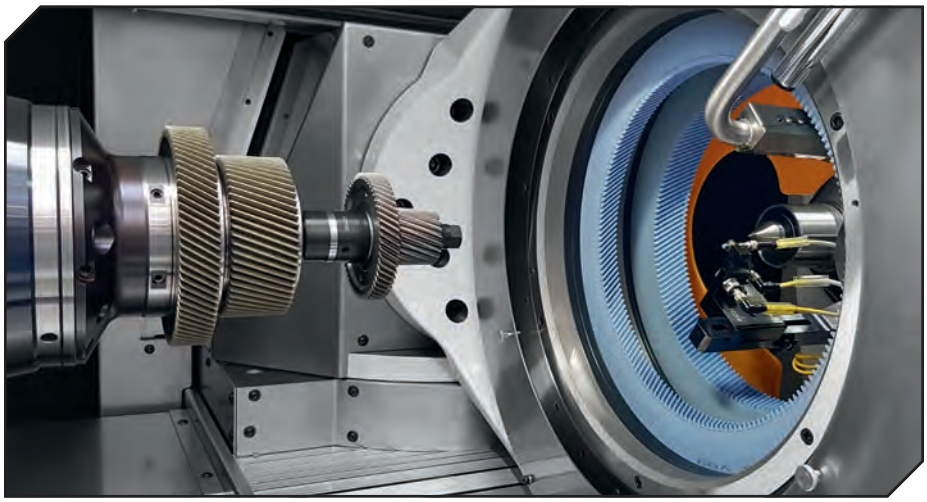

Figure 2 260HMS can apply the Combi Honing process to produce stepped pinions reliably and at the quality levels needed to ensure the correct installation position in the planetary transmission. Integrated sensors measure the position of all teeth on both gear as well as the position of the index hole on the face side.

excessive hardening distortions, which can't be honed in exact tolerances to the index bore, are automatically ejected.

Another important feature determining quality is the fixed position of the two diamond dressing tools on the work spindle (Fig. 2). The location of the dressing tools ensures that the position of the teeth on the honing rings does not change either absolutely or relatively — even after dressing of the honing rings. Loading/unloading of dressing tools to the work spindle, as is often the case in other honing applications, cannot reliably achieve this important quality aspect.

Polish Honing for Better Performance

Another advantage of the Combi Honing process is the possibility of super finishing gears with "Polish Honing." The requirements for increased transmission efficiency and reduced noise levels demand a superior surface quality of hard-finished components. While Polish Grinding using a two-zone polish grinding worm is a proven approach, a similar process has not, until now, been possible with gear honing.

With Combi Honing, however, it is now possible to use two honing rings in one clamping and thus use two completely different tool specifications for rough finishing and polishing of a gear (see Fig. 3). This makes it possible to achieve the surface qualities of Rz ≤ 1 µm typically required for polish grinding by means of gear honing — but with the added benefit of achieving the surface structures typical for the gear honing process.

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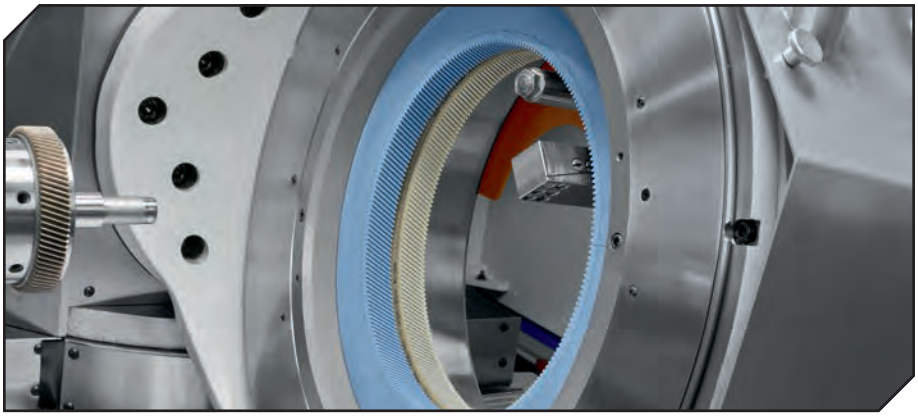


Figure 3 Super finishing by Polish Honing can now be done with Combi Honing, and using two honing rings for rough finishing and polishing of a gear.

Emuge

OFFERS EFFICIENT, QUICK-CHANGE WORKHOLDING

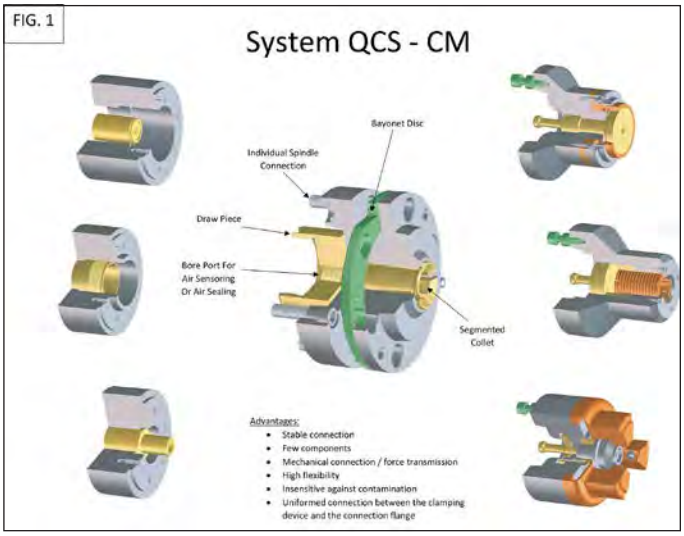
GREG MCLENNAN, SALES MANAGER-PRECISION WORKHOLDING, EMUGE CORP.

Controlling production costs is critical for today's gear manufacturers, especially when factoring in global economic pressures. One key effective cost savings measure is using a quality quick-change workholding system (QCS). A quality quick-change workholding system can increase machine uptime, resulting in greater production on existing machines. Also, by minimizing the changeover time from one workpiece to another, investing in quick-change workholding for new machines can often reduce the number of machines needing to be purchased.

Controlling or reducing costs is paramount in gear manufacturing facilities due to the considerable investments to produce today's high-quality gears. In gear manufacturing, being flexible with the ability to adapt to challenging workholding requirements is more important than ever. Utilizing a quick-change system across multiple operations is a great way to achieve this. For instance, the same arbor can be used for hobbing a green blank, as well as both end face grinding and finish tooth grinding operations after heat treat. This saves costs by not requiring an investment in complete dedicated arbor assemblies for multiple machines. Where production is high enough that machines run concurrently, having the same arbors saves on the amount of spare assemblies, spare parts and requires less operator and maintenance personnel training.

Emuge offers three quick-change designs, including the QCS-CM, QCS-CA and the QCS-HM, to suit a wide range of requirements. With all three quick-change systems, each machine spindle is fitted with an Emuge quick-change adapter. This allows for precision clamping devices to be interchangeably mounted with minimal changeover time. In most cases, after the clamping devices have been mounted to the adapter, there is no need to adjust the runout of the clamping devices. It is only necessary to check runout with the master to verify proper mounting to the adapter. And while the primary functionality is constant, the machine spindle and workpiece requirements will factor into the final design of the quick-change system.

The system QCS-CM (Fig. 1) utilizes a bayonet disc to uniformly secure the clamping devices to the adapter. Each clamping device has multiple studs that protrude through the bayonet disc. The bayonet disc is then rotated and locked into position, pre-mounting the clamping device to the adapter. The studs are uniformly tightened with a wrench, firmly mounting the clamping device to the adapter against the tapered connection flange. A draw piece attaches the drawbar of the machine spindle to a segmented collet within the EMUGE quick-change adapter. The segmented collet enables the machine spindle drawbar to operate various clamping methods, dependent upon the design of the clamping devices. If a customer requires air sensing or air pressure within the clamping device, a channel can be bored through the quick-change adapter. Air sensing is used to facilitate proper workpiece seating to the location points during loading and prior to centering the workpiece. This ensures the clamping device only operates when the workpiece is in the correct position. Air pressure is used for pressurizing the clamping devices to aid in preventing coolant from penetrating the device.



The system QCS-CM utilizes a bayonet disc to uniformly secure the clamping devices to the adapter.

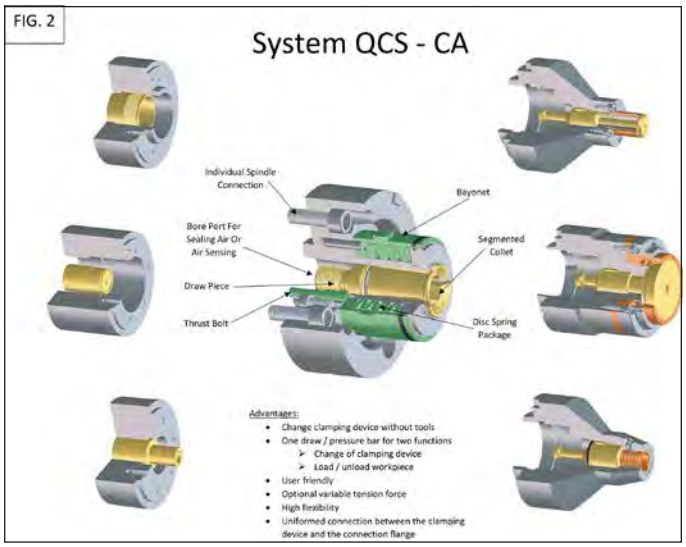
Advantages of the QCS-CM system include providing an extremely stable mechanical connection with few components, maintaining a highly flexible system with maximum force transmission from the machine spindle to the customer's workpiece, and excellent resistance to chips and coolant penetrating the connection during use.

The system QCS-CA (Fig. 2) uses a bayonet to hold the clamping devices onto the adapter, like the QCS-CM. The bayonet is actuated from an internal disc spring package and released from the machine spindle drawbar via the thrust bolt. When changing the clamping device, the spindle drawbar is moved to the full forward position, compressing the disc spring

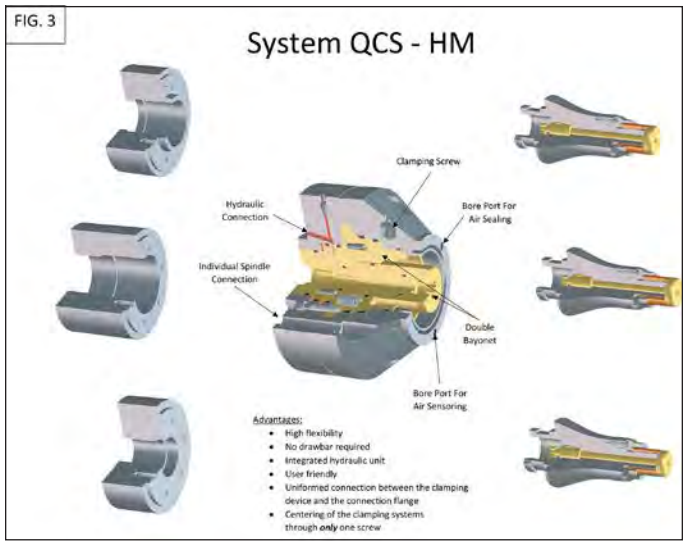
package and releasing the clamping device. The clamping device is then rotated until the bayonet lugs are aligned to the load/ unload slots and can be removed from the adapter. After the adapter and new clamping device are properly cleaned, the clamping device is inserted onto the adapter in the reverse order of which it was removed. Once the spindle drawbar moves to the operating position, the disc spring package holds the clamping device firmly against the connection flange. Also, similar to the QCS-CM system, there is a segmented collet and draw piece, which allows the machine spindle drawbar to actuate the clamping device and enables air sensing or sealing air to be supplied through the adapter.

Advantages of the QCS-CA system include the highly flexible, user-friendly changeover without the need for tools. Also, the drawbar can be used for two functions: changing the clamping device and loading/ unloading of the workpieces.

The system QCS-HM (Fig. 3) uses a double bayonet system without the requirement of a drawbar from the machine



The system QCS-CA uses a bayonet to hold the clamping devices onto the adapter, like the QCS-CM.



The system QCS-HM uses a double bayonet system without the requirement of a drawbar from the machine spindle.

spindle. The connection bayonet mounts the clamping device to the quick-change adapter. The second bayonet, the clamping bayonet, actuates the clamping device.

The connection bayonet uses springs and a hydraulic unit contained within the quick-change adapter to attach the clamping device to the quick-change adapter. To remove the clamping device from the adapter, the operator rotates one clamping screw charging the internal hydraulic system. This pressure compresses the spring force allowing the release of the clamping device. Next the clamping device is rotated, aligning the bayonet lugs from the clamping device with the loading/unloading slots in the bayonet adapter. The clamping device is now easily removed from the quick-change adapter. After proper cleaning of both the quick-change adapter and the next clamping device, assembly takes place in reverse order of the removal process.

The clamping bayonet is actuated from the machine spindle hydraulic pressure connection. As the hydraulic pressure is applied to the quick-change adapter, the unclamping spring force is overcome, enabling the bayonet to pull on the clamping device drawbar and achieve workpiece clamping. After the machining operation is finished, the hydraulic pressure is removed for the unclamping springs to ensure the return of the drawbar and removal of the workpiece from the clamping device has been completed.

Advantages of the highly flexible QCS-HM system include the user-friendly centering of the clamping device by using only one screw, and fitting to machines where no draw bar is required.

Low Mix, High Mix—No Problem

All three QCS systems achieve more machine up time with smaller lot groups of workpieces, as well as facilitate easier preventative maintenance of the clamping devices. In smaller lot groups of workpieces, the Emuge clamping device can be mounted to multiple machine operations, reducing the number of clamping devices required. The clamping device can be moved from one machining operation to another, with minimal to no components needing to be exchanged. Where a machine is dedicated to one workpiece, having a quality quick-change workholding system installed will allow for the removal of one clamping device for preventative maintenance, while another identical clamping device can be installed to keep the machine running.

Emuge QCS systems are also suitable for a family of workpieces similar in size and geometry. Gear manufacturers can use the quick-change system to keep the machine running, while they are preparing for the next workpiece to run.

Whether production ranges from high volume using machine dedicated clamping devices, or smaller lot sizes that are changed over frequently, Emuge quick-change systems can be customized to meet the requirements of keeping production costs down and machine run-time up.

For more information:
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Mitutoyo America

LAUNCHES CRYSTA-APEX V SERIES

Mitutoyo America Corporation is pleased to announce the release of the CRYSTA-Apex V Series to its Coordinate Measuring Machine product line. The new generation of the CRYSTA-Apex Series will provide the highest speed, accuracy, precision, and versatility in the current Mitutoyo CNC coordinate measuring machine lineup. The launch of the CRYSTA-Apex V also introduces the Mitutoyo Gold Care PLUS Productivity Program.

Key features:

High-Speed/High Acceleration/Drive: Features a maximum measuring speed significantly faster than competitive CNCs. The combination of high speed and high acceleration dramatically reduces measuring time and cost.

Shorter Measurement Times: Users can set measuring paths for high speed scanning, 3D and active scanning of complex workpieces.

Temperature Compensation System: Guarantees measurement accuracy for temperature conditions between 16 to 26° C. Independent sensors work in tandem to measure scale, workpiece and ambient temperature. Results are superior to comparable systems that only compensate for scale temperature.

Smart Factory Functionality: The CRYSTA-Apex V series utilizes three smart factory applications, consolidating the information management manufacturing process within a network: Status Monitor allows remote monitoring of the operational status of measuring instruments; Condition Monitor enables remote monitoring of the current condition of measuring instruments; MeasurLink reduces the production of defective parts through "visualizing quality" via complete data management.

Smart Measuring System (SMS): Allows online monitoring of the measuring status and visualization of measurement data, enabling product quality improvement and internet of things capabilities.

Flexibility: CRYSTA-Apex V Series can adapt to work on a range of sizes for small- to medium-sized work pieces. It also features multi-sensor capabilities and compatible vision and scanning probe technologies.

Gold Care PLUS is an updated version of the Mitutoyo legacy productivity program, Gold Care. Gold Care PLUS continues many of the Gold Care features while adding MeasurLink V9, Status Monitor with integrated MT Connect, Quick Launcher, Fixture builder, a 12A power conditioner and an air dryer.

For more information:

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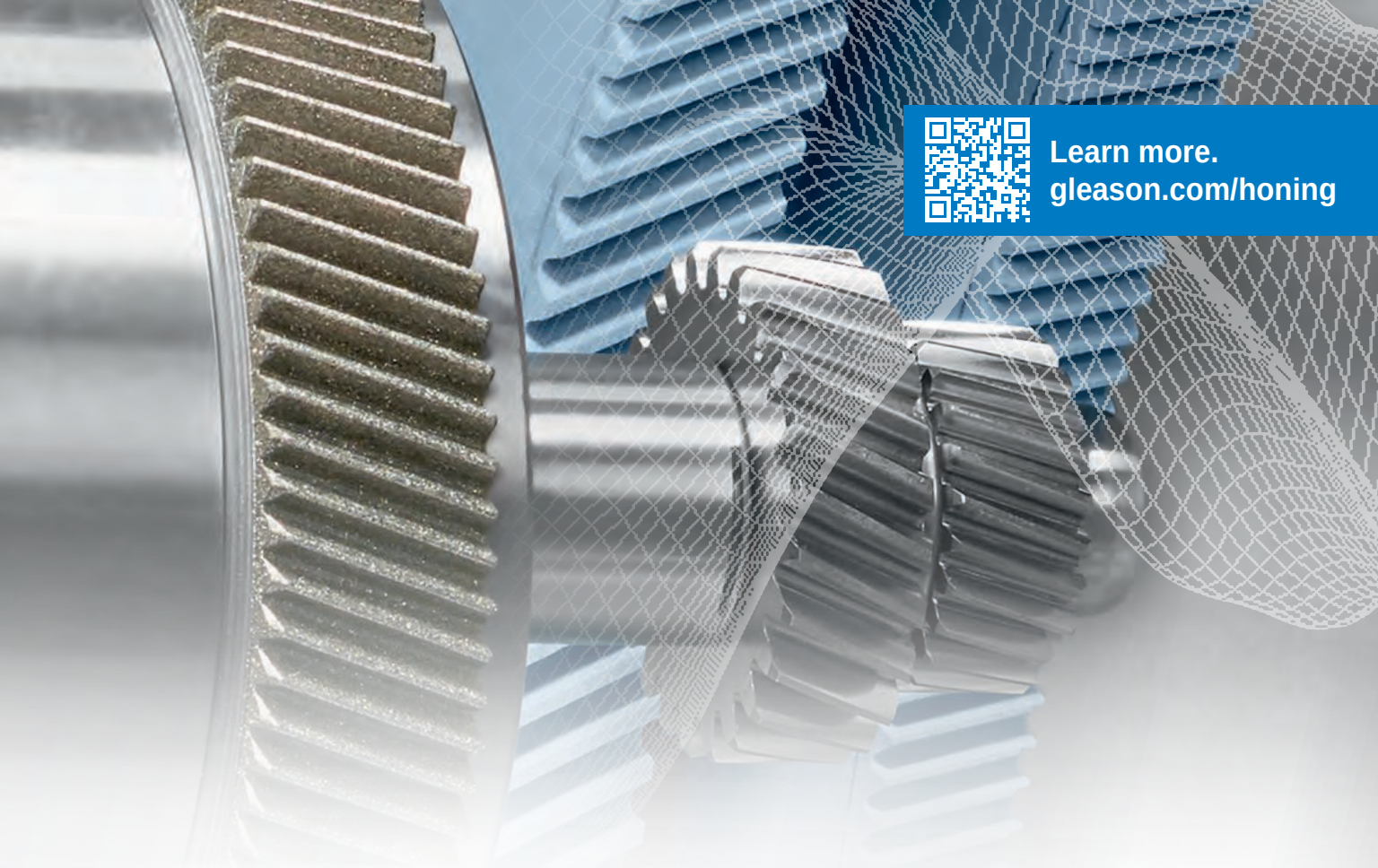


Learn more.
gleason.com/honing

Combi Honing for Faster Production of Quieter Gears

With Combi Honing, you can finish, or even super finish, two gears on a workpiece in a single setup. It's the perfect solution for eDrive stepped pinions and other transmission gears that need precise timing between each other and extremely good surface finishes. Gleason delivers the process with its Gear Honing Machines and tooling in a complete system that ensures the highest quality with the shortest cycle times.

Total Gear Solutions **Gleason**

Schunk

INTRODUCES ITENDO SENSORY TOOLHOLDER

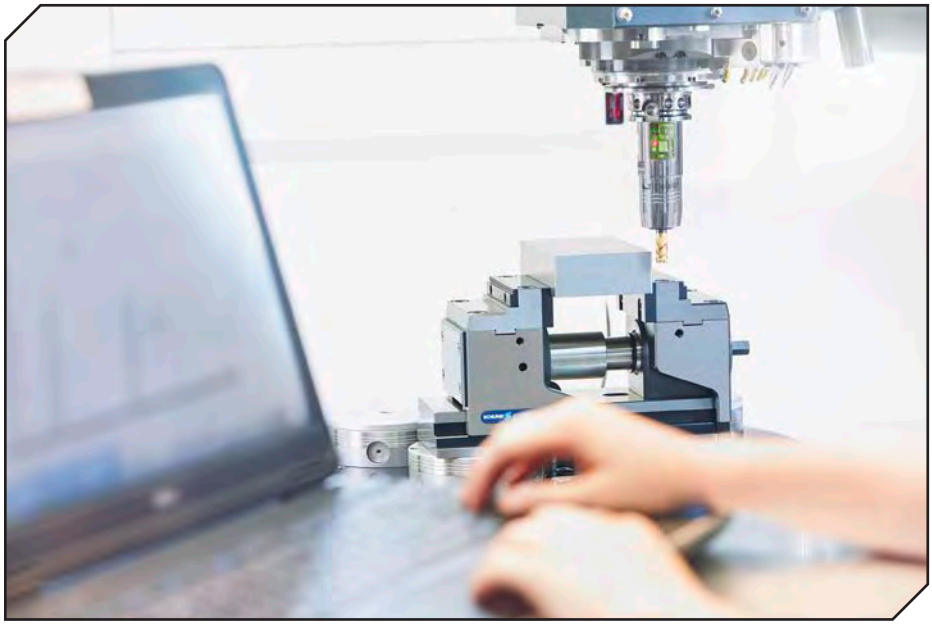
Schunk is putting the power of data in your hands with the new iTENDO sensory toolholder. For the first time, it will be possible to monitor machining processes at high resolution at the tool and to control cutting parameters in real time. The required acceleration sensor and electronics are integrated into the toolholder without affecting its interfering contour and other characteristics.

The iTENDO seamlessly records the metal cutting process, monitors previously defined exact limit values and, in the event of irregularities, enables real-time adaptive control of the speed of rotation and feed rate, among other measures. Equipped with a sensor, battery, and transmitting unit, the intelligent toolholder records the data at the tool and transmits it wirelessly via Bluetooth to a receiver unit in the machine room, where it is forwarded by cable to a control and evaluation unit. This makes the system fundamentally different to other solutions for process monitoring by providing precise process data. In pilot applications, the intelligent mounting has proven performance for milling, drilling, countersinking and even deburring.

This information collection closes the loop on industry 4.0 machine processes and takes the guesswork out of machine adjustments.

Starter set for simple commissioning

In a first step, Schunk is standardizing the iTENDO for the common interface HSK-A 63 with clamping diameters from 6 mm to 32 mm and a length of 130 mm. The sensory toolholder is suitable for the use of coolant and is designed for speeds of up to 10,000 rpm. The commissioning and data analysis is carried out via a browser-based dashboard on standard PCs, tablet computers or smartphones. In the simplest configuration, which can be implemented completely without machine-side adjustments, the live data from the sensor can be displayed on the Schunk dashboard via a local connection. For this purpose, Schunk provides a special case system with integrated display, enabling toolholder commissioning within two hours and with minimal effort. In a second configuration, the real-time controller is ideally connected to the machine control system by a service technician via digital or analog I/O so that, for example, alarms can be triggered or processes can be adaptively controlled. The third and most sophisticated configuration enables additional information exchange with the machine (e.g. in the case of the latest Siemens control system via OPC UA). All variants can also be operated and centrally controlled via a cloud solution.



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NUM

LAUNCHES DIGITAL TWIN TECHNOLOGY

CNC specialist NUM has launched digital twin technology that enables machine tool manufacturers to reduce their time to market dramatically, by using powerful Industry 4.0 simulation techniques.

Originally known as pairing technology, and first used by NASA in the early days of space exploration, digital twin technology is now rapidly gaining industry acceptance as one of the most cost-effective means of accelerating the development of products, processes and services.

For automation products such as machine tools, a digital twin is a virtual model that uses simulation, real-time data acquisition/analysis and machine learning techniques to allow full evaluation of a machine's dynamic performance before constructing a physical prototype. The same technology can also be employed for customer presentations, virtual commissioning, and operator training purposes — and all well before the actual machine itself has even been built.

NUM offers two versions of digital twin technology, to best suit customers' needs.

Both versions are designed for use with NUM's powerful, open-architecture Flexium+ CNC platform. One version

uses a naked Flexium+ controller and resident virtualization software running on the system's industrial PC to simulate the twinned machine automation. The other version uses the actual Flexium+ controller that will eventually be incorporated in the machine, linked via EtherCAT to a standalone PC running specialist high speed hardware simulation software to represent the mechatronics of the twinned machine.

The virtual controller version includes a software development kit for creating the software model of the machine. The model is a standalone PLC program that uses predefined components to simulate individual machine elements, such as sensors, spindles, pneumatic cylinders, etc. It is loaded into the integrated PLC of the Flexium+ controller.

The Flexium NCK in the controller executes the NC programs and simulates the changing position values of the machine's axes. To help users visualize the process, NUM's package includes the CODESYS Depictor software tool produced by CODESYS GmbH, which is used to produce 3D visualizations from the IEC 61131-3 code created by the simulation.

The other version of NUM's digital twin technology package accommodates real-time data acquisition and analysis. It is based on the ISG-Virtuos hardware simulation software produced by Industrielle Steuerungstechnik GmbH (ISG). The Flexium+ controller that is intended to be used in the physical machine is connected via an EtherCAT network to a standard PC and interacts with the simulation software in real-time. The PC acts as the twinned virtual machine — with all simulated, virtual components behaving like real components in terms of their interfaces, parameters, and operating modes — to accurately replicate the structure and dynamic performance of the real machine. The movements of the machine are displayed realistically on the PC, using the supplied 3D simulation software.

NUM's new digital twin technology provides machine tool manufacturers with a very powerful and cost-effective means of reducing their developments costs and accelerating their time to market. The virtual controller version is especially useful for the early development stage of a project, before the CNC system has been finalized, while the real-time hardware simulation version has the advantage that all sequencing (PLC) and motion control (CNC) programs that are created during development can simply be transferred to the real machine as soon as it becomes available.

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Helios

INTRODUCES HERA 200 CNC GEAR HOBBING MACHINE

Helios Gear Products exclusively offers the Helios Hera 200 CNC gear hobbing machine. This machine, manufactured by YG Tech, provides gear manufacturers a vertical hobbing solution with its siblings, the models 150, 350, and 500. The model 200 completes the fine- to medium-pitch range of the Hera series with the same standard of proven technology. Adam Gimpert, president of Helios, remarked, "We are excited to bring the new Helios Hera 200 to North American gear manufacturers who need an updated, cost-effective, profitable hobbing platform for gears up to about 8 inches—all with 30+ years of domestic support expertise."

The Hera 200 offers 6 axes (7 with automation) of Fanuc CNC, a 4 module (6.35 DP) pitch rating, and 1,200 rpm maximum hob speed. This combination comes on a base that handles parts up to 200 mm (7.874 in) diameter and 530 mm (20.866 in) length with up to 250 mm (9.840 in) axial travel. With hob shifting up to 180 mm (7.087 in), this machine offers versatility for short- or long-run jobs. Said David Harroun, vice president of Helios, "The Hera 200 offers many of the great features found on a Hera 350, but in a more compact size with a smaller financial footprint." The machine offers safety features such as electromechanical interlock and a splashguard door. The machine's cast iron base provides superior dampening and stability for extreme cutting conditions.

Software on the Hera 200 provides gear manufacturers simple dialog programming with visual examples to help guide operators and accelerate training. Cycles include cutting of one or two gears on a single workpiece using single- or two-cut cycles with radial, axial, climb, or conventional hobbing (or any combination thereof). Additionally, crowning (lead modification) and automatic shifting over a damaged hob section are included in the machine's base package.

With Helios and YG Tech, the Hera series comes with over a half-century of gear machine tool expertise.

For more information:
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