

# Liebherr

## PRESENTS LATEST E-MOBILITY TECHNOLOGIES

New drive technologies in electric mobility are changing the requirements for gears and therefore also for the quality of the tooth flank surfaces. Manufacturers of gears have to adapt their manufacturing process accordingly. It's good to be able to rely on a technology partner with expertise covering the entire range of production processes and technologies, which enables them to find suitable solutions even for special challenges.



Illustration courtesy of Liebherr.

E-mobility is changing the entire drivetrain in cars, which also changes the demands made of gear components. One of the most important topics is the reduction of noise emissions from the drivetrain while driving. In order to minimize installation space, many parts of the gearbox are manufactured using a lightweight or compact design. At the same time, gear components must become increasingly robust and long-lasting in order to withstand the considerable stress caused by the higher engine RPM.

### Process and technology expertise from Liebherr

This results in high quality demands on the tooth flank surfaces, which in turn brings about growing demands on the gear cutting process. Liebherr-Verzahntechnik GmbH has addressed this issue and refined and optimized various technological solutions for e-gearboxes. "We know about the challenges that manufacturers and suppliers must master in terms of quality and process reliability", explains Dr. Andreas Mehr, who is responsible for the technology applications of gear grinding and shaping. "We apply our expertise both in the process depth and in the range of technologies. This means that we can advise and assist customers comprehensively in order to find the optimal solution for them and their application."

### Processes and methods

On the process side, generating grinding with dressing-free CBN grinding worms, for example, ensures a high degree of process reliability. During the hard gear finishing, the gears can

be precision-ground and polished, which further improves the surface roughness. Tools with small outside diameters machine collision-critical gears with limited tool overrun.

Methods for tooth lead modification are available for the tooth flank topology. For example, topologically error-free grinding with targeted end relief (GER) optimizes the load-bearing capacity. In order to reduce noise emissions, a targeted waviness can be applied to the tooth flank (Noise Excitation Optimization), or the diagonal amount during finishing can be increased in order to distribute the ghost line structure stochastically (Silent Shift Grinding).

### Tool material: CBN grinding worms

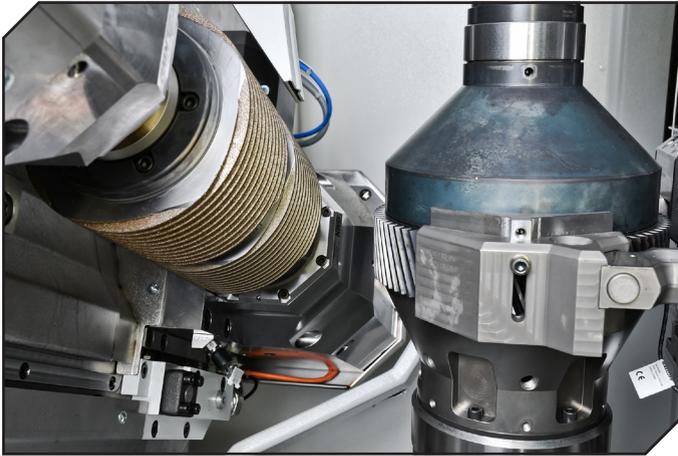
The more topological modifications are necessary, the more it pays off to think about the tool material: CBN tools can be an economical alternative here. For many applications, grinding with corundum grinding worms is a good solution which, however, reaches its limits when grinding with high topological demands because of the dressing effort required. Dressing-free CBN grinding worms from Liebherr's own production offer a number of advantages: high process reliability due to the long tool life, the avoidance of error sources during dressing, easy tool handling, and considerably reduced measurement and testing effort. For a topology with GER modification, for example, CBN grinding performs much better than corundum grinding with regard to the unit costs. Extremely fine surfaces with an Rz roughness factor of under three micrometers can also be achieved in this way.

### Clamping solutions for small components

The challenge when producing gear parts for e-bikes is often in the intricate measurements and small modules. To manufacture these components in a high quality, the grinding process and clamping technology must be fast and extremely precise. Special clamping solutions ensure that even small and collision-critical components, such as drive shafts with a module of 0.6 mm in a gear quality of DIN 1-4, can be machined without difficulty.



E-Bike



Generating grinding example of a drive gear for an e-drive with dressing-free CBN.

### Machine concept: economic efficiency and reproducibility

The exclusive Liebherr machine concept provides optimal concentricity and the highest possible reproducibility with a one-table solution — for the controlled and continual manufacturing of parts with quality requirements in the micrometer range, this is a technologically indispensable advantage. Particularly for smaller and medium batch sizes, which frequently occur in manufacturing for e-mobility, this concept is also particularly economical, since the short setup times enable a fast production start.

### At eye level with the customer

“We see ourselves not only as product providers but as partners and solution providers”, Dr. Andreas Mehr emphasizes. “We take the customer with us on the journey by offering advice and pointing out plausible alternatives so that he can finally make the decision that is best for him.” For this purpose, Liebherr has a number of test machines on which all the process parameters for the production of specific parts can be tested and designed, including the tool, the design or measuring software, grinding methods or process parameters, tooth flank modifications or other settings.

### The only limits are those set by physics

For example, in one customer’s gearbox, noise was emitted despite adherence to the required specifications. Liebherr addressed this issue in an intensive discussion with the customer under strict time pressure. On the test machines, a number of variants for the corresponding component were ground and tested. It was revealed that the cause lay in further parameters outside the grinding process and that the gearbox had to be designed differently. On the basis of these results, the customer was able to optimize its processes accordingly. Noise emissions were significantly reduced, achieving a satisfactory solution within the limits of what is physically possible.

“It was possible to maintain the narrow timeframe because

Liebherr has bundled the complete technology and expertise”, recalls Dr. Andreas Mehr, who explains further: “Often, there is no ‘right or wrong’. Rather, the choice of the optimal process depends on the specific requirements and parameters. At this point, we want to support our customers by honestly weighing up the pros and cons of one method or another.”

[www.liebherr.com](http://www.liebherr.com)

## Helios Gear

### EXPANDS GEAR CUTTING TOOL SOLUTIONS

For nearly all gear cutting applications, Helios now offers a solution for consumable cutting tools. Gear manufacturers benefit from Helios’s addition of power skiving cutting tools, broaches, the latest PVD (physical vapor deposition) coatings, and improved resharpener services to its current line of gear cutting tools, which includes hobs, shaper cutters, milling cutters, and custom-engineered options. Significantly, Helios continues to offer delivery times on built-to-order tools as quick as four weeks. Said David Harroun, Helios vice-president, “gear manufacturers have access to Helios’s world-class cutting tools delivered built-to-order extremely quickly and backed by both expert engineers and reconditioning services.”

Helios now offers gear manufacturers engineered power skiving tools. These tools can be used on power skiving machines for a highly productive gear cutting operation compared to traditional methods such as shaping. Helios power skiving tools are available in contemporary powdered metal high-speed



steel and high-performance carbide, designed to optimize each application's geometry, workpiece material, and available machine spindle speeds. When used on a Helios Neo Power Skiving (NEOPS) machine, gear manufacturers benefit from a profitably productive combination of quickly delivered, engineered tools and an affordable machine tool platform.

Also new to the Helios line of gear cutting tools are broaches offered in high-performance materials (including carbide) and the latest PVD coatings. Backed by Oerlikon Balzers, Helios offers Altensa coatings, which is the latest generation of aluminum chromium nitride coating engineered specifically for demanding gear cutting application. This coating offers up to 30% increased performance compared to the previous generation. Gear manufacturers that need the most from their cutting tools should speak with the Helios engineering team about this and other options to achieve higher levels of performance.

Helios continues to offer other cutting tool options, too, including hobs, shaper cutters, milling cutters, and uniquely engineered tools for special applications. Helios tools are offered in high-speed steel and carbide with a variety of coating options. Gear manufacturers also rely on Helios expert resharpener service, which has been improved with new optimization for quick turnarounds. Lastly, while supply chain disruption continues to impact gear manufacturers with delays and inconsistency, Helios leads the industry with reliable, short lead times on cutting tools. Gear manufacturers trust Helios for high quality, low cost, fast delivery cutting tool solutions — all backed by a dedicated team of tool engineers to support and ensure each application is profitably productive.

**[Heliosgearproducts.com](http://Heliosgearproducts.com)**

## Chiron Group INTRODUCESTWIN SPINDLE VMC

In response to the automotive and aerospace industries demand for dynamic, precise, and highly productive complete machining processes for their larger structural parts, the Chiron Group introduced the DZ 28 twin-spindle vertical machining centers featuring 1,200 mm spindle clearance and tool magazine with space for up to 60 tools.

“With the 28 Series, we are addressing new customers and workpieces,” said Kristoffer Siegmann, head of global account management automotive at Chiron Group. “Previously, only single-spindle manufacturing could be used for components of this size, but the new DZ

applied to more part families such as side beams, battery cases and housings for power electronics, as well as blades, blisks and impellers for engine and turbine building.

High axis acceleration and rapid traverse ensure more dynamic machining has previously been possible with workpiece dimensions in this range. The portal construction, rigid machine bed and active component cooling enable the required degree of precision on the workpiece.

A major advantage to the 28 Series, especially with large workpieces, is that operating and loading take place on



28 twin-spindle machines permit considerably shorter cycle times — while delivering optimum part quality.”

There are two versions of the twin-spindle machining center available: The DZ 28 P five-axis with pallet changer for high quantities and short cycle times, and the DZ 28 S five axis for direct loading.

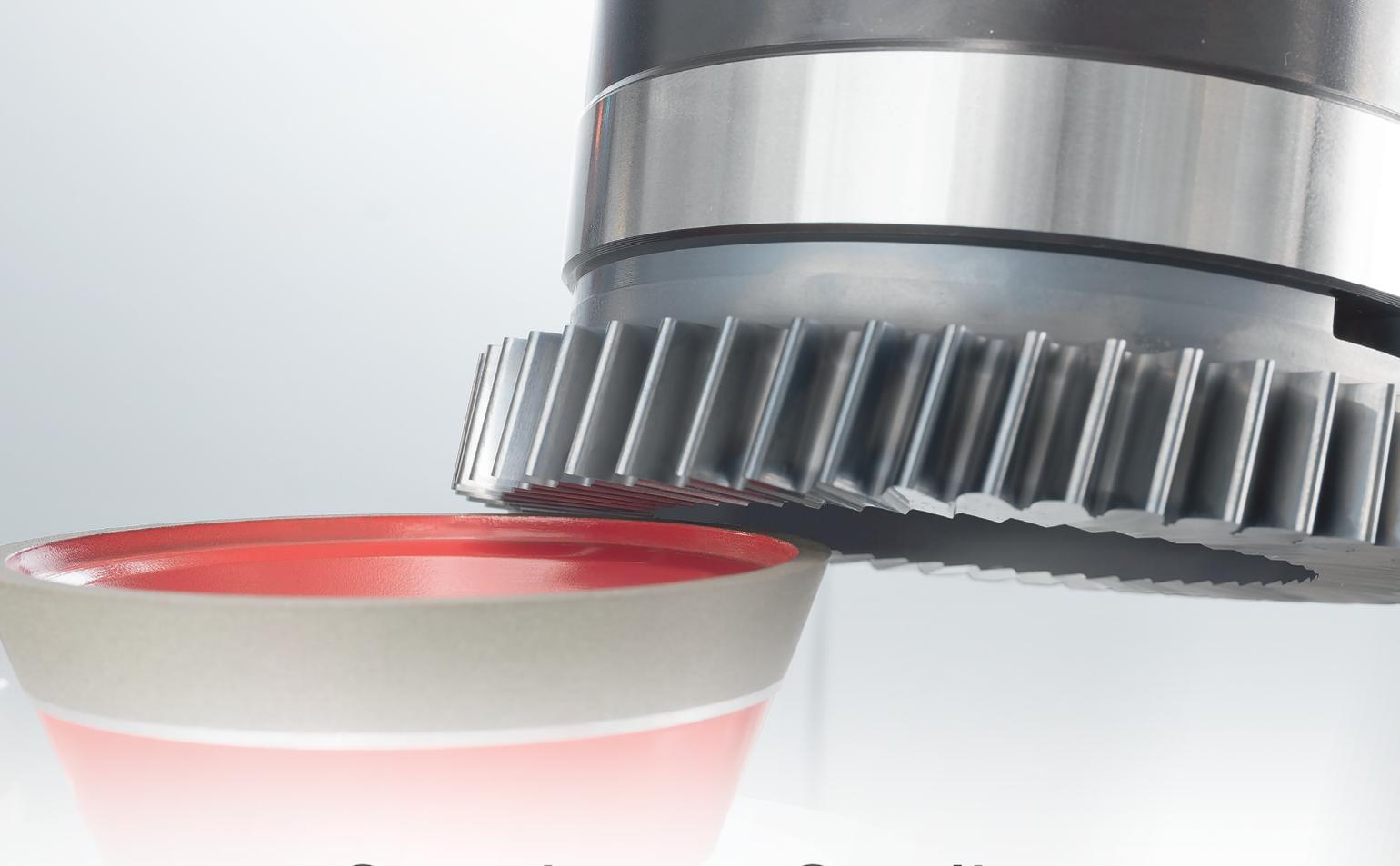
This new machining center series can be flexibly configured to completely machine larger-sized structural parts which require maximum surface quality and dimensional accuracy, as well as high production rates and minimal downtime. Users will benefit from the machine's compact layout, available robot or gantry automation, and fully independent Z and X-direction spindles.

The DZ 28's design allows Chiron's characteristic speed and precision to be

separate sides. This means the operator has clear access to the working area and an unobstructed view into the machining process.

The DZ 28 is operated via Chiron's TouchLine, the established operating system from the Chiron SmartLine portfolio. A large display panel allows easy monitoring of the machine condition at all times and as with all of the Chiron Group's new series, the 28 Series is prepared for integration of all SmartLine modules. For example, this includes ProtectLine for preventive protection against machine crashes and ConditionLine for automatic condition monitoring of relevant machine components.

**[www.chironamerica.com](http://www.chironamerica.com)**



# Consistent Quality with Reduced Cost

Resharpener of cutters for both soft cutting and hard finishing can now be fully automated on Gleason 300PS and 600PS vertical Power Skiving machines. Tool cost-per-piece is greatly reduced, and consistently high quality ensured.

[gleason.com/ps-resharpening](http://gleason.com/ps-resharpening)



Total Gear Solutions **Gleason**

# GF Machining Solutions

## HIGHLIGHTS EDM TECHNOLOGY AT EMO MILANO 2021

At EMO Milano 2021, GF Machining Solutions highlighted EDM technologies designed to help manufacturers increase productivity and accuracy. These die-sinking and wirecutting EDM machines — along with robust solutions that target the mold and die industry — provide operating precision, superb part quality and automated options.

The show marked the unveiling of the new AgieCharmilles CUT P Pro series of wire-cutting EDM machines designed for increased productivity, always available and ideal for every application with the largest technology database. The series includes the CUT P 350 Pro, the 550 Pro and the 800 Pro with robust designs and intuitive HMI as well as several automation options for lightsout operation.

At EMO Milano, GF Machining Solutions also announced the AgieCharmilles CUT X series of wire-cutting EDM machines, featuring new technologies that significantly increase operating precision. They are capable of holding extreme pitch positioning and contouring capabilities for superb part quality. The series includes the CUT X 350 and the CUT X 500 machines.

Particularly for mold makers in microelectronics, telecommunications, medical technology, connectors and optical systems, GF Machining Solutions demonstrated its AgieCharmilles FORM X 600 die-sinking EDM at EMO. The machine delivers positioning accuracy within  $1\ \mu\text{m}$ , and general machining accuracy on the workpiece down to  $5\ \mu\text{m}$ , combining speed and precision.

The new Uniqua human/machine interface (HMI), available for the CUT P Pro and the CUT X series, capitalizes on more than a century of EDM technology, with optimal functionality and ergonomics in a 19" vertical touchscreen, full keyboard and mouse. It is designed for every skill level, every approach

and every user. For the utmost compatibility, Uniqua supports legacy file types from various EDM manufacturers. It also creates, imports, modifies and executes sequential (ISO-based) and object-oriented (dynamic) programs from previous versions of VISION and AC CUT. With offline and at-the-machine programming, ISO-based functionality and object-oriented programming, Uniqua provides a powerful graphic tool with integrated CAM and also ensures compatibility with major CAD/CAM programs.

With Intelligent Power Generator (IPG) technology, CUT P Pro series

machines deliver surface finishes as smooth as  $Ra\ 0.08\ \mu\text{m}$  and heighten accuracy with integrated thermal regulation that allow to achieve an accuracy of  $\pm 2\ \mu\text{m}$ .

Linear scales and rotary encoders form a double measuring system that protects the X, Y, Z, U and V axes. In the event of a collision, the system differentiates between the linear and the rotary encoder, and the energy absorber system automatically stops the axes without damage to machine or workpiece. This full protection applies at machine speeds of up to 3m/min.

[www.gfms.com](http://www.gfms.com)





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# Seco/Vacuum

## OFFERS PIT-LPC AS A MODERN ALTERNATIVE FOR ATMOSPHERE FURNACES

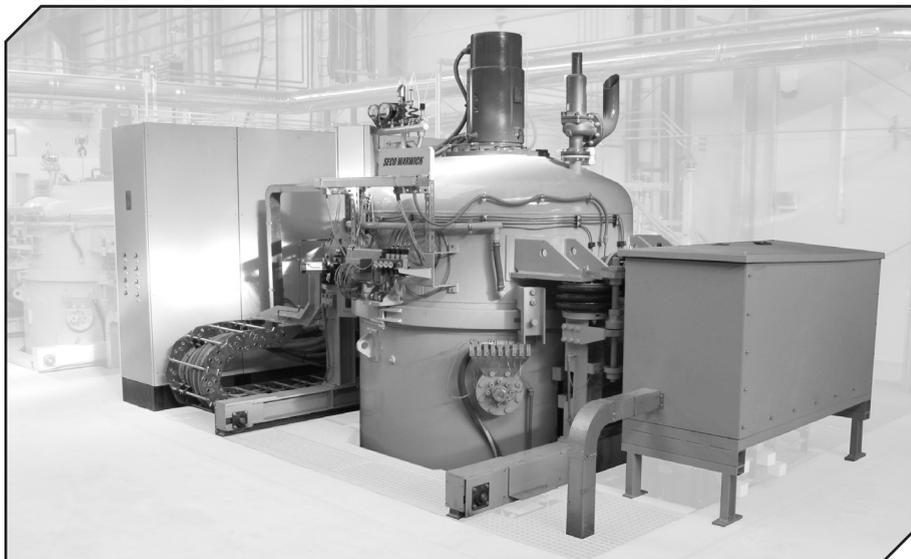
Seco/Vacuum's Pit-LPC is perfect for carburizing large or long elements and parts requiring thick case depths. Capable of temperatures up to 1900°F, Pit-LPC can reduce process duration and utility costs by 70%, while delivering 3X the yield of a traditional atmosphere Pit furnace in the equivalent space.

The Pit LPC is an advanced 21st century pit-type gas carburizing furnace for low pressure carburizing (LPC) of large parts or parts requiring deep case depths. As a modern alternative for atmosphere furnaces, the Pit LPC can reduce heat treating costs and improve production while improving the environment by operating in vacuum at higher temperatures than atmosphere furnaces can achieve. The Pit LPC also increases heat treater's production throughput without purchasing additional equipment, since a single Pit-LPC furnace is equivalent to the capacity of three atmosphere furnaces,

and it can be reconfigured to fit into the space of an existing atmosphere furnace. Additionally, a single vacuum furnace provides more capability since it can handle gas carburizing on larger and

longer workpieces.

Pit LPC is a state-of-the-art pit-type furnace solution meeting the most stringent environmental standards, while increasing worker safety through



## All The Gear Cutting Tools You Will Ever Need Are Right Here DTR is one of the world's largest producers.

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# United Grinding

PRESENTS LATEST MACHINE TOOL TECH AT C.O.R.E.

elimination of flammable and explosive atmospheres. High homogeneity of process parameters has a direct effect on the thickness of the carbonized layer and, as a result, on the quality of the processed workpieces. Plus, the unit can be reconfigured to the client's needs; SECO/VACUUM will adapt the Pit LPC furnace so that it can be installed in the old atmosphere furnace bay.

This LPC vacuum furnace is perfect for manufacturers carburizing large or long elements such as gears, bearings, drilling tools and other elements requiring thick case depths and it is a great furnace for companies who want to increase their production capacity without purchasing additional equipment (1 Pit LPC = 3 atmosphere furnaces), or save space by replacing three machines with one that fits into the same space as one.

[www.secovacusa.com](http://www.secovacusa.com)

On October 13–14, United Grinding North America opened its doors for Evolution to Revolution, a precision CNC grinding industry event filled with live machine demonstrations and technology innovations. Along with an 11-station display of part-production and automation solutions, the company also unveiled its Customer Oriented REvolution (C.O.R.E.) technology. Here are some highlights:

## BLOHM PROFIMAT MC Aero

Creep Feed and Profile grinding have the reputation of a basic 3-axis machine producing a single part feature or operation. Five-axis systems, long popular in the Aerospace market, have adapted to more general production applications that require multiple features in various orientations, all with exacting tolerances and fine finish. In this session, you will learn how the five axis features of the BLOHM PROFIMAT MC Aero allow combining multiple grinding applications into a single set up, reducing setup, handling and





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production costs.

The BLOHM PROFIMAT MC Aero is the third generation of the highly successful MC platform that utilizes a moving column concept to provide a large and flexible workspace inside a compact machine envelope. This machine was originally designed for the aerospace industry, utilizing fixe-axis movements and super abrasives to deliver exacting tolerances on complex forms ground into difficult to machine material.

Since the introduction of the BLOHM PROFIMAT MC Aero in 1999, there are over 250 units installed worldwide, and has expanded to serve markets outside of the aviation industry, such as energy, machinery, and mold and die.

### STUDER S33

STUDER technology excels at delivering flexibility and mastering unique configurations to achieve unique results. Attendees learned how the combination of hardware and software enables the STUDER S33 to use an ID wheel to grind the OD on a transmission shaft — and found out why that's the right way to tackle this difficult application.

### STUDER S11

Manufacturers need to make every square foot of production space count toward optimal productivity. Attendees learned how the compact performance of the STUDER S11 and its optional configurations for match and edge grinding help manufacturers achieve that efficiency, demonstrating how the machine grinds a standard shaft with multiple ODs.

### BLOHM PROFIMAT XT

Continuous dress creep feed (CDCF) grinding is a grinding process that's gaining popularity, especially among manufacturers that require high stock removal rate, high precision, AND fine surface finish quality. In this session, attendees learned about CDCF, and some of the applications where it excels, as well as a live demo of a CDCF rough pass, then a finish pass to see up-close-and-personally the material removal and surface finish that CDCF can deliver.

[Grinding.com](http://Grinding.com)

## WFL Millturn Technologies INTRODUCES M20 MILLTURN MACHINING CENTER

WFL Millturn Technologies recently introduced the new M20 MILLTURN complete machining center.

Alongside gear skiving technology, there is clear trend toward automation and the integration of sensors. The latest solutions from WFL range from smart software to screw programming through to intelligent tools and clamping devices.

The M20 is available with a tail-stock or counter spindle and features dynamic and powerful drives. The turning-boring-milling unit with integrated spindle motor and a B-axis with torque motor are entirely new features. The turning output of up to 44 kW means even hard-to-machine materials can be handled with ease. The milling spindle with up to 25 kW and 20,000 rpm is ideally equipped for all machining tasks. In terms of the tool system, there is the option of using HSK 63 or Capto C6.

The individual tool holder with B-axis on the lower slide is a real highlight. The upper and lower system can be used simultaneously, and both

systems are supplied by a reliable and dynamic tool changer from a shared magazine. This allows even complex components to be machined with optimal efficiency.

The tool can be moved up to 100 mm below the turning center, so drill patterns with diameters of up to 200 mm can be produced on the face with a high level of precision and without turning the C-axis. Another key benefit of the machine is the possibility of easily integrating a wide range of automation options. Depending on the customer's requirements, articulated robots, gantry loaders or an integrated production cell with the associated peripheral equipment can be implemented. The newly integrated production cell 'int-CELL' is fitted on the right-hand side of the machine and will also be presented to the public for the first time at EMO. The workpieces are supplied on a strip accumulator.

Furthermore, it is also possible to automatically switch the tool to the lower individual tool holder with B-axis. This makes it possible to set



up the tools parallel to machining time and to automatically access the stock in the magazine. Stored tools can therefore be placed in the upper and lower tool holder. With the integrated loading concept, WFL has reduced the space requirement by 50% in comparison to a conventional production cell.

The M20's integrated loading feature is designed for chuck parts with a diameter of up to 300 mm and a workpiece weight of up to 15 kg. For shaft parts, a workpiece diameter of 100 mm and a workpiece length of 300 mm is possible.

The new operational data acquisition system is myWFL Cockpit. Machine and program states will be displayed according to chronological order, productivity and technical availability. You can view this on a web browser via the control system, either on a PC or a mobile device. This means that the user can always be well-informed about their machine productivity. Also new with myWFL Cockpit is the integration of the energy usage measurement device myWFL Energy which displays the current power and energy consumption



data and that of each workpiece.

Another highlight of myWFL is the integrated condition monitoring cycle. When the cycle is running, the friction values of the axes and spindles, as well as the temperature in the milling spindle housing and the vibration or the rolling bearing condition value of the front milling spindle bearing are continuously recorded and stored on the control system.

Using Condition Monitoring Viewer, it is possible to select the data of the various condition monitoring runs on the control system, graphically overlay them and analyze them according to time in this way. This allows for the early detection of possible malfunctions and minimizes unplanned downtimes.

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# Sandvik Coromant

## LAUNCHES COROCUT QI

Sandvik Coromant has launched CoroCut QI, a range of internal and face grooving inserts designed for smaller diameters. Optimized to enable a lighter cutting action and reduced cutting forces, CoroCut QI ensures high process security, reliable grooving operations and precise chip evacuation, resulting in high surface quality grooves.

The addition of CoroCut QI completes the CoroCut Q platform, which already consists of CoroCut QD for parting off and CoroCut QF for secure face grooving. CoroCut QI provides a comprehensive selection of optimized tools for numerous parting and grooving applications, designed specifically for smaller diameters. All inserts fit both internal and face grooving tool holders, making it easier for users to select the right tool.

CoroCut QI is divided into internal grooving and face grooving application areas, and is an upgrade of the T-max



## SMT

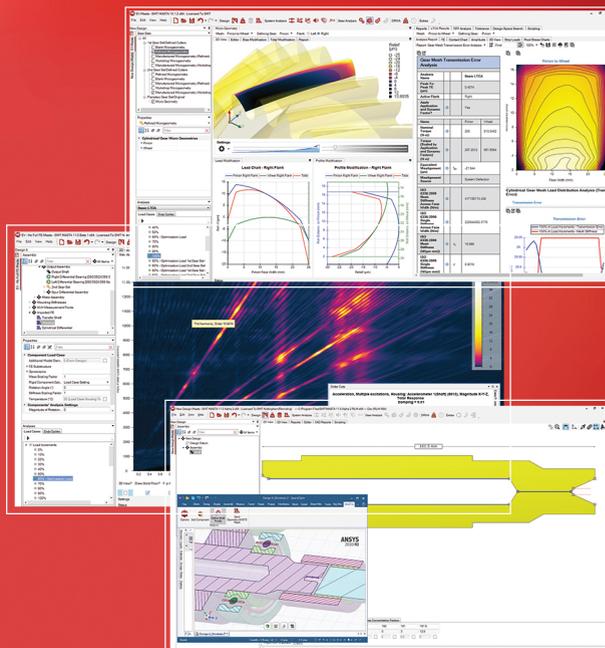
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Q-Cut 151.3 program. The improved design allows for greater chip control, a 10% productivity increase, 20% improved tool life aided by tighter edge-rounding tolerances and internal coolant for both internal and face grooving tools.

Key features of the CoroCut QI include an optimized tip seat angle for lighter cutting action and cutting forces that aid vibration-free machining, a rail insert seat for a stable and precise insert position ensuring minimal insert movement. In addition, screw-clamped tool holders ensure stability and high process security, and inserts with high edge line quality increase tool life and surface quality.

“Grooving can be a difficult technique to master,” said Angélica González, product manager of the CoroCut Q platform at Sandvik Coromant. “Long overhangs, difficult chip evacuation and

stuck chips are frequent problems when machining internal and face grooves. CoroCut QI has been developed to tackle these challenges to help achieve optimal results. Besides this, most CoroCut QI tools have internal coolant channels that deliver coolant directly to the cutting zone to enable efficient chip evacuation with minimum damage to the surface.

“The smaller the groove, the harder it is to machine. To combat this issue, CoroCut QI inserts are specifically designed for small diameters that require great precision. For example, the minimum hole diameter for internal grooving is between 12 and 60 millimeters (mm) with a cutting depth of two and eleven millimeters. Face grooving inserts can be used in a first cut diameter between 16 and 102 mm, with a cutting depth of 5.5 to 20 mm.”

The insert geometries include -GF, a ground sharp insert for internal grooving, -TF with direct pressed geometry for face grooving and internal grooving and turning, and -RM, ideal for non-linear turning such as internal and face profiling.

“CoroCut QI is the upgrade to our previous grooving system,” continued González. “In fact, performance tests compared with competing tools have demonstrated better process security and chip evacuation for a higher quality surface finish.”

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