num information

JOURNAL FOR CNC-TOTAL SOLUTIONS

num®
CNC HighEnd Applications

No. 65 – September 2024

Editorial
Massimiliano Menegotto
CEO NUM Group

Dear readers

I am pleased to present you an overview of exciting developments that reflect our mission of continuous improvement and innovation. Inside a conservative market, our goal is to always offer the best proven solutions in order to provide our customers a competitive advantage.

A highlight of our commitment to technical excellence is our brand new NUMROTO X tool grinding software with a very successful market launch during GrindingHub in May 2024. This innovative software sets new standards in tool grinding technology and enables our customers to take their tool manufacturing to the next level. With NUMROTO X, complex tools can be manufactured with the highest precision and efficiency, resulting in a significant increase in production output.

We are also proud to introduce our latest CNC control. Take the most flexible CNC system Flexium+, improve computing power, speed, connectivity, flexibility, integration density and energy consumption and the result is NUM FlexiumPro! But, we want to emphasize, that even if FlexiumPro is being commercialized, our proven Flexium+ CNC control remains available and will continue to play an important role in the future.

In addition to the technical innovations, we are also focusing on an enhanced and strong international presence, providing 360-degree support all around the world with our regional NUM Technology Centers (NTC). Each NTC has application experts and after sales teams; this helps our customer, interacting personally and directly with our specialists, to develop better machines and competitive solutions. If required and requested, we can take care of all the application development and machine commissioning. Some examples of these collaborations can be found inside this magazine; you will discover how flexible, scalable and powerful our products and organization is.

> "At NUM, we provide a unique 360-degree support with innovative products and technology solutions. We have an international presence, but we act locally in close collaboration with our customers", says Massimiliano Menegotto, CEO NUM Group.

Our international presence is also represented by attending various trade shows. Visit us at IMTS (International Manufacturing Technology Show) in Chicago, the largest manufacturing technology show in North America, September 9-14, 2024, at DMP in Shenzhen in November 2024 and at IMTEX in Bangalore in January 2025.

Innovation, reliability and customer satisfaction are at the heart of everything we do at NUM. We firmly believe that our latest technical developments and our global presence will help to continue writing our customers' success stories.

With kind regards,

Massimiliano Menegotto
CEO NUM Group

Imprint

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Our LinkedIn channel is a one-stop shop for videos showcasing the innovations and technological breakthroughs in our industry. From fascinating insights into our latest products to inspiring stories about how our technology is changing the world, we offer a diverse selection of content that will pique your interest.

You'll also get exclusive behind-the-scenes insights into our company. Be part of our community and connect with like-minded people to help shape the future of the technology industry.

In addition, there are exciting job opportunities available at NUM worldwide.

Follow our LinkedIn company account today and discover the highlights.

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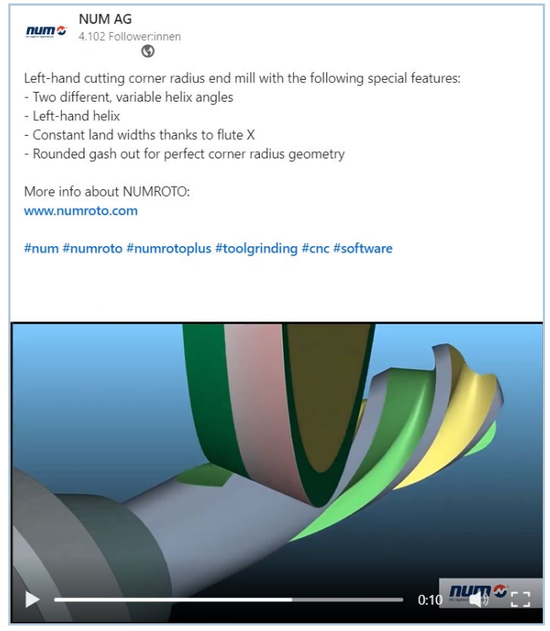


NUM on LinkedIn

NUM Event Calendar 2024/2025

IMTS 2024
September 9- 14, Chicago, USA
North Building Booth 236609

Marmomac 2024
September 24-27, Verona, Italy
Hall 2 Booth D7

Glasstec 2024
October 22-25, Düsseldorf, Germany
Hall 14 Booth 14C23

MetalMadrid 2024
November 20-21, Madrid, Spain

DMP 2024
November 26-29, Shenzhen, China

IMTEX 2025
January 23-29, Bengaluru, India

In-Process Measurement for Non-Circular Grinding

In-Process Measurement for Non-Circular Grinding

A new feature has been devised for non-circular grinding, allowing operators to utilize an in-process measuring unit. This innovative feature is integrated seamlessly through a user-friendly selection box displayed in the In-Cycle of the "External XPI" grinding command, making it easy for machine operators to determine the corresponding switchover point of the measurement unit.

Initially designed for operations involving polar coordinates and basic plunge grinding, this system's functionality is being expanded to include Cartesian coordinates, multiplunge operations, and cylindrical traverse modes. This ongoing development represents a significant leap in the system's versatility and applicability.

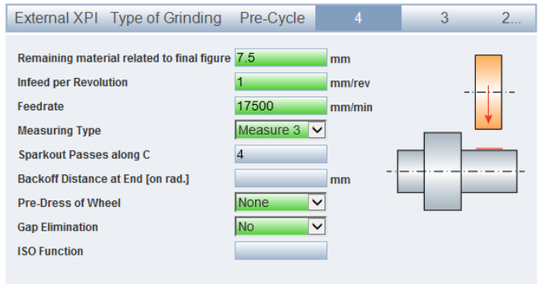
At the core of this advancement is the harmonious interaction between the measuring unit, PLC (Programmable Logic Controller), and CNC (Computer Numerical Control) systems. This synergy ensures precise and efficient grinding processes. The process begins with setting the switching points on the measuring controller. Operators then create the grinding program and assign the switching points to specific cycle steps. Once the grinding program starts, the measuring gauge automatically extends and activates if required. The measuring unit triggers the switchover point, and the PLC sends a signal to the CNC indicating that the switchover point has been reached, regardless of the workpiece's current position (C-axis).

Following this, a definable lift-off from the workpiece occurs, allowing for repositioning and re-entry at the last offset where the interruption occurred. The grinding process continues to finish the entire shape with the last offset, completing the In-Cycle. The next In-Cycle starts with a new switchover point, and this sequence is repeated until the cycle is finished. Upon completion, the measuring gauge automatically retracts and deactivates, marking the end of the program.

This innovative feature was realized and tested in collaboration with the OEM Palmary, utilizing the NUMgrind system. In practical application, it successfully ground an elliptical shape defined in polar coordinates (XC). The results were impressive: during a test series of 30 workpieces, shape deviation of a maximum of 6 µm were achieved, with most shape errors being 3 µm or less.

The new system offers several advantages. It allows the grinding process to be interrupted at any time, providing greater control and flexibility. It operates independently of the measuring system manufacturer and facilitates the simple integration of the measuring system into the PLC, including exchanges to NUMgrind cycles. The NUMgrind HMI (Human-Machine Interface) allows for straightforward selection of switching points, making it a ready-made solution that requires no additional development effort in the HMI or CNC.

This groundbreaking feature for non-circular grinding marks a significant advancement in precision machining, enhancing accuracy, efficiency, and flexibility. As this technology continues to evolve, it promises to set new standards in the industry, driving forward the capabilities of precision grinding.



NUMgrind HMI

More details on NUMgrind:
num.com/complete-solutions/numgrind

NUM FlexiumPro CNC System

NUM, a leading provider of CNC solutions, proudly announces the launch of NUM FlexiumPro, a groundbreaking advancement in CNC technology. Designed to elevate machining operations to new heights of efficiency and productivity, FlexiumPro represents a significant leap forward in CNC innovation.

Featuring enhanced calculation power, speed, connectivity, and reliability, NUM FlexiumPro is a versatile system catering to a wide array of machining applications. Here's what sets it apart:

Reliable and scalable embedded architecture
The NUM FlexiumPro RTK (Real-Time Kernel) seamlessly integrates both PLC and CNC processes on a single board. This consolidation, powered by a multi-core ARM processor, significantly reduces the number of components, enhancing system reliability and availability.

System on Chip Technology
Leveraging this cutting-edge technology, NUM FlexiumPro achieves an unprecedented level of integration. The result is a highly efficient CNC system that optimizes machine productivity and minimizes downtime.

Hard Real-Time Operating System
The NUM FlexiumPro RTK employs a hard real-time OS, eliminating latency and avoiding the complexities associated with soft operating systems. This ensures precise control and responsiveness.

High-Speed CNC
NUM FlexiumPro CNC operates more than 10 times faster than its predecessor as well as CNC and PLC are strictly synchronized.

Expanded Features
NUM FlexiumPro retains all the featuresof NUM Flexium+, with various enhancements including:

- Control of up to 32 axes and/or spindles
- Support for 32 machining channels
- Free-of-charge auxiliary channels and PLC axes
- Sub-nanometer interpolation
- Real Tool Center Point (RTCP)
- High-Speed Cutting (HSC)
- Specific technology functions and machining cycles
- Improved diagnostics
- Modern and intuitive Human Machine Interface (HMI) that an be easily customized

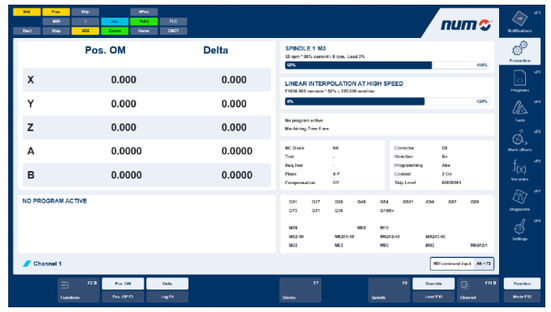
Data Security
Critical data, such as PLC applications, part programs, machine configurations, and calibrations, are securely stored on a removable µSD card. Additionally, the system's Real Time Kernel board (NUM FlexiumPro RTK) integrates super-capacitors, ensuring safe shutdown even during power failures.

Seemless migration
OEMs familiar with NUM Flexium+ will experience a smooth transition to NUM FlexiumPro. The PLC programming languages and environment remain consistent, part programs remain compatible, and software interfaces to custom HMIs remain unchanged.

Simplified Functional Safety
All necessary safety motion functions (STO, SS1, SS2, SOS, SLS, SLP, SDM, SCA, SBC) are activated through the system's Safe PLC by means of FSoE (Fail Safe over EtherCAT), PLC and Safe PLC are programmed in a unique environment and pre-certified safety functions makes safety an easy task.

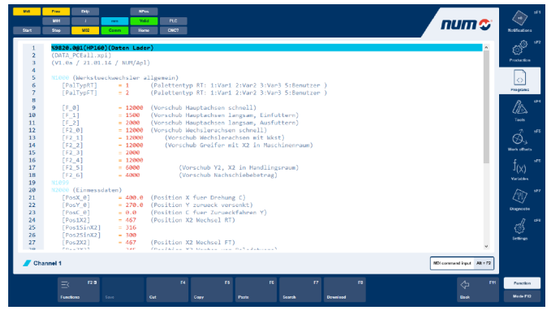
Compact with Scalable Power,thanks to mono-axis, bi-axes and quad-axes servo drives
NUM DrivePro is a modular drive system optimized for multi-axis applications. To reduce wiring and dimensions, power units for mono, bi and quad axes have been developed. With the new DISC ET servobus, the integration level of drive/CNC is elevated to unprecedented levels.

In summary, NUM FlexiumPro represents a paradigm shift in CNC systems. Its speed, reliability, and versatility position the new system as an ideal choice for modern machining applications. Whether upgrading from NUM Flexium+, seeking a new CNC partner, or exploring CNC technology for the first time, NUM FlexiumPro promises unparalleled speed, reliability, and versatility.



FlexiumPro HMI – Production

FlexiumPro HMI – Tools



FlexiumPro HMI – Text-Editor

NUMROTO X

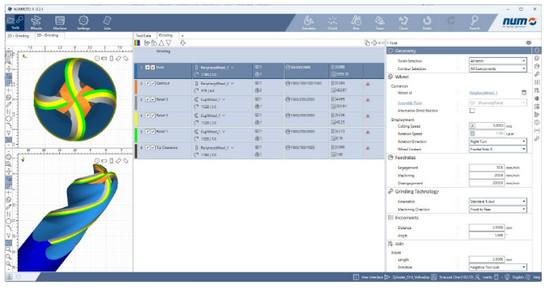
NUMgear Hobbing and FlexiumPro HMI Integration

NUMROTO Sets the Course for the Future

With NUMROTO X, NUMROTO is getting a new product line that will provide our customers with the usual high standards of NUMROTO technology in the long term. The new software has been rewritten from scratch, with particular attention paid to modern technologies and flexible expandability. This allows not only the implementation of demanding requirements for tool grinding, but also prompt adaptations to changing market needs.

Like NUMROTO*plus*, NUMROTO X is also designed as a desktop application and will also be available on the workstation PC as an application on the grinding machine. Proven concepts such as the multi-user database, 3D simulation and collision check as well as product documentation with NUMROTO-Draw will also be retained with NUMROTO X.

During the development of NUMROTO X, various innovative development priorities were implemented. The focus was on the optimized production of complex standard milling cutters. NUMROTO X not only offers an extended number of configurable geometry elements, but also provides completely new options for production and process planning. Grinding operations and probing cycles as well as dressing and calibration processes can be organized in sequences. With the option of executing sequences from within other sequences, these can be combined as required, allowing complex production processes to be configured and still clearly displayed.



These innovations are complemented by an integrated job manager, which has been redesigned from scratch. This provides the user at the machine, as well as in work preparation, with new possibilities in production planning. Job lists can be changed and expanded "on the fly", allowing uninterrupted production operations.

Instead of nested dialogs, the interface relies on scrollable areas that clearly display the numerous parameters. User input is immediately evaluated and converted into machining paths, which enables rapid visualization of the workpiece. This makes it possible to observe the effects of parameter changes in real time. The innovative visualization calculates a pixel-precise image for each zoom level, making every detail visible, no matter how small.

The kinematics module was implemented with a completely new approach to calculate the machine movements. It offers interesting possibilities, including support for interpolating 6-axis movements. New strategies have been implemented for the transfer movement between two grinding operations, which are not only more efficient, but also control the axes more optimally.

When creating a new workpiece, the user is supported by an extensive default value system. The default values can be configured as required by the user and adapted to the requirements of the tool range to be produced.

The guiding principle of "faster and more precise" is implemented by the NUMROTO development team with great ambition. In addition to the above-mentioned optimizations, which allow faster and more efficient programming and production of the tools, new algorithms have been implemented which deliver even more precise results.

For example, the flute calculation can maintain the programmed tool core exactly, even if the cutting angle of the grinding wheel is large, regardless of whether it is calculated automatically or defined manually. For the reliefs, the user can choose whether the relief angle should be maintained at the cutting edge or over the programmed relief angle width, analogous to the measuring depth when calculating the flute.

NUMROTO X was officially launched at GrindingHub 2024 and will be available in its first version with the range of functions for manufacturing complex standard milling cutters. To ensure a smooth market launch, the new software will initially be used by selected customers in consultation with the machine manufacturers. After this initial trial phase, it will then be gradually introduced into the production facilities, opening a new chapter in the NUMROTO success story.

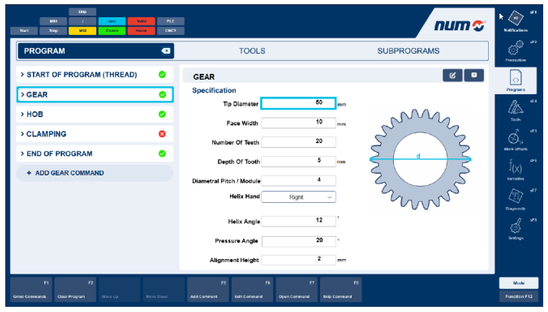
Even if NUMROTO X does not initially reach the functional scope of NUMROTO*plus*, the new software package boasts many new functions and innovative solutions. It is important to us to continue supplying our customers with the proven and high-quality NUMROTO technology in the future, which is why NUMROTO*plus* and NUMROTO X will be available in parallel for several years.

NUMgear Hobbing and FlexiumPro HMI Integration

Gear production with NUMgear Hobbing and FlexiumPro HMI
Modern gear production is defined by the challenge of meeting increasing demands on costs, quality, and productivity. NUM is currently developing a solution that combines NUMgear Hobbing with the advanced FlexiumPro Human Machine Interface (HMI). NUMgear Hobbing, as a central component of the NUM application solution for gear machining, has proven to be groundbreaking. The dedicated application not only enables specific functions for gear hobbing but also integrates seamlessly with the new FlexiumPro HMI system.

Efficient production of gears on a shaft
The basic idea behind NUMgear Hobbing is to enable the efficient production of gears on a single shaft. By using innovative hobbing technology, several gears can be manufactured precisely and compactly on one shaft. This not only revolutionizes manufacturing efficiency but also minimizes the risk of collisions between adjacent gears compared to traditional methods.

Efficiency and precision in harmony
The axis configurations (X, Y, Z, A, C) enable precise movements and adjustments for different gear profiles. Gears, tools, and processes can be seamlessly integrated into one workflow. NUMgear makes it possible to combine different gearings in a single machining process.



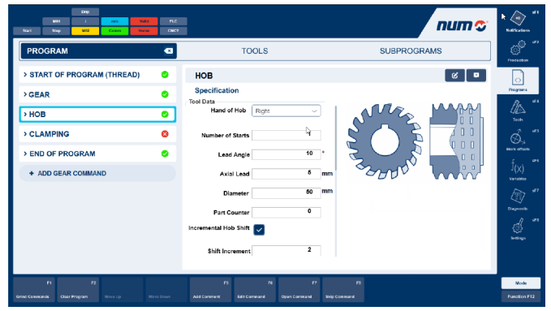
Automatic alignment
Particularly noteworthy is the automatic alignment of gears. This function is used when a tool needs to be aligned with a gear, especially when a machined gear needs to be machined again or when operating two gears on the same axis.

Electronic gearbox
In addition to special milling functions, NUMgear Hobbing utilizes an electronic gearbox (EGB) that enables complete synchronization of all main axes with the tool spindle. An outstanding feature of the electronic gearbox (EGB) is that no calibration or switching of parameter sets is required – the EGB performs these tasks independently. This innovation emphasizes the user-friendliness and efficiency of NUM's electronic gearbox, playing a key role in efficient gear manufacturing.

The integrated user interface
NUM's FlexiumPro HMI is not just an interface between man and machine, but a revolution in the way gear hobbing machines are operated. Integration into the FlexiumPro HMI enables seamless operation and programming without the need for complex ISO code knowledge.

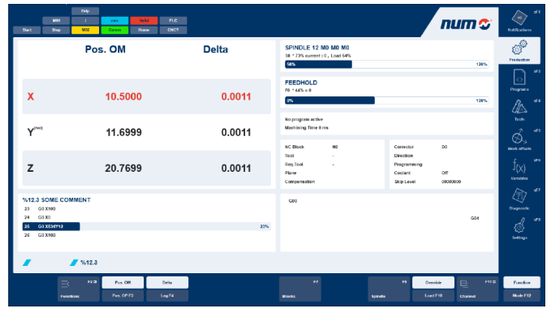
Graphically supported, intuitive data input
Operation is via the NUM control panel with a customized circular land or surface. This graphically supported and intuitive user interface enables simple operation after just a few hours of training. The user interface is not only clearly structured but also adapted to the workflow. An explanatory graphic is displayed for each input. This enables even inexperienced operators to work productively with NUMgear Hobbing within a very short time. The ability to easily translate texts into different languages makes this solution attractive for international teams as well.

Simple creation of processing programs
Another advantage is the simple creation of machining programs after entering data for the work piece, tool, and process. Manual copying and activation on the control are no longer necessary, as the NUMgear user interface is integrated into the FlexiumPro HMI and is automatically generated and enabled when a gear cutting project is selected.



Software Development Kit (SDK) extends the FlexiumPro HMI
Another significant strength of the new HMI lies in its flexibility. With a powerful Software Development Kit (SDK) and a configurator, the FlexiumPro HMI offers the possibility of adaptation, expansion, modification, and personalization. This gives machine builders an easy way to integrate customized FlexiumPro HMI modules into the HMI. For example, the production page can be adapted to your own requirements and also expanded with machine-specific displays. This SDK was developed based on C# and WPF. You can also compile and customize the predefined plug-in HMI components according to your individual requirements. Support also extends to multi-HMI configurations, where a machine is equipped with more than one HMI.

Time savings and increased productivity
The integration of NUMgear Hobbing into the FlexiumPro HMI not only results in significant time savings when programming a gear machining operation but also means that operators quickly become familiar with the system. These time savings and ease of operation contribute to a significant increase in productivity. Operating errors are effectively avoided, and the NUM application solution is designed for the industrial production of precision gears with maximum accuracy and a high-quality surface finish.



More details on NUMgear:
num.com/complete-solutions/numgear

Dressing with an Acoustic Emission Sensor

Flexium 3D: New Digital Twin Functions

NUMgrind – Dressing with an Acoustic Emission Sensor

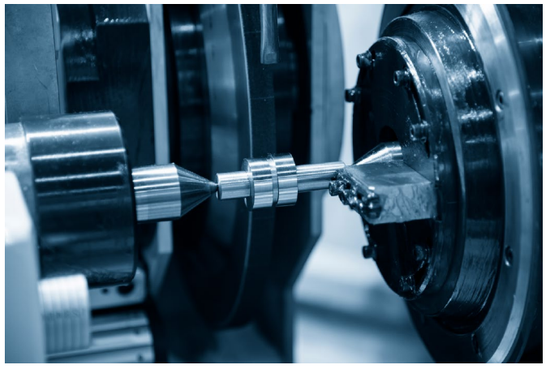
Introducing our latest breakthrough in dressing technology: a cutting-edge function that revolutionizes the precision of dresser positioning along the X-axis. Leveraging state-of-the-art acoustic emission sensors, this feature automatically detects the optimal diamond tip location, ensuring unparalleled accuracy in grinding wheel dressing.

In addressing the inherent challenge of varying grinding wheel diameters caused by dressing parameter selections, our solution offers a streamlined approach to minimizing deviations between theoretical and effective diameters. By seamlessly integrating the acoustic emission sensor, operators can effortlessly optimize dresser positioning, resulting in enhanced grinding performance and superior product quality.

Accessible across all dresser types, this innovative function provides unparalleled flexibility, allowing for easy activation or deactivation to accommodate diverse grinding wheel setups. Stay ahead of the curve with our advanced dressing solution, setting new standards in precision engineering and manufacturing excellence.

The procedure is as follows:

1. Move to the dresser position along Z
2. Move to the start position for the search along X
3. Activate the acoustic emission sensor
4. The search loop is started and continuously checked whether the acoustic emission sensor has been triggered or not
   a. Feed along the X-axis of a defined increment
   b. Oscillation across the entire grinding wheel width along the Z-axis
   c. Repeat points a and b until the search path has been used up (continue with point 5) or the acoustic sensor has been triggered (continue with point 6)
5. If the acoustic emission sensor is not triggered, the dressing cycle is aborted with an error message
6. If the acoustic emission sensor has been triggered, the coordinate system of the dresser get corrected according to the trigger position
7. Start of the actual dressing process
8. In conclusion, the inaugural successful test implementation has already been achieved on a cylindrical grinding machine belonging to our OEM partner, Hardinge, in China



NUM's cutting-edge dressing technology enhances precision in dresser positioning along the X-axis, utilizing advanced acoustic emission sensors for automatic detection of optimal diamond tip placement, ensuring unmatched accuracy in grinding wheel dressing and setting new standards in precision engineering.

More details on NUMgrind:
num.com/complete-solutions/numgrind

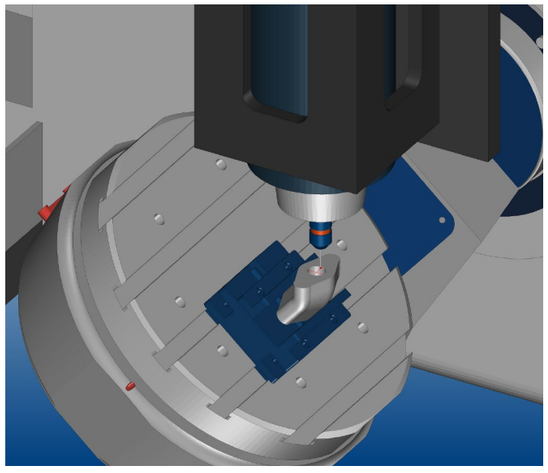
Flexium 3D: New Digital Twin Functions

Flexium 3D is a comprehensive and powerful software designed to simulate and evaluate various aspects of machining, including material removal, cutting, and additive manufacturing. It also addresses collisions, virtual piece measurements, PLC logic, and auxiliary axes. But how does it emulate interactions among kinematics, touch probes, calibrated spheres, blanks, work pieces, PLC, and CNC?

With the latest version of Flexium 3D, this is now possible! Many operations and cycles previously feasible only with the complete machine, a probing system, and NUM CNC can now be emulated. Some examples include determining the origins of blanks, measuring work pieces with 3, 4, or 5 axes kinematics (including RTCP and inclined planes), and calibrating machine kinematics (cycle G248).

Should the cycles require dedicated reference bodies, such as a reference sphere for the kinematic calibration cycle, these can be easily imported as STL files and positioned within the machine.

What are the advantages of emulating these operations? Commissioning becomes faster (5-axis kinematic calibration can be emulated), machine operators can learn in a risk-free environment, parts can be measured, custom measuring cycles can be developed and tested, and interactive demos can be created.



It's worth noting that, in a simulated environment, the interaction between multiple software layers offers a different degree of repeatability from real systems. However, tests conducted at relatively limited speeds in the final probing phase have yielded satisfactory results, thanks to Flexium 3D's precise collision detection capabilities, even with complex shapes.

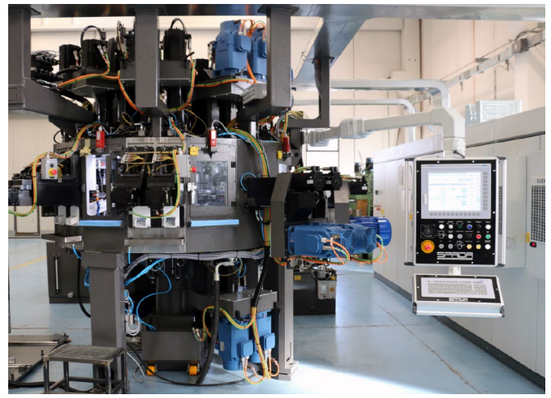
A second significant development allows for the simulation of increasingly complex and articulated systems. This includes the ability to design for multichannel systems, for which Flexium^{+} systems are particularly well suited: transfer machines, multi-spindle lathes, and machines with multiple milling, turning, or cutting heads.

During the machine kinematics creation phase, it is now possible to associate each linear or rotary axis with the corresponding machining channel, representing all machine components moved by the entire CNC.

Positioning of the workpiece from one station (channel) to the next is easily implemented, whether using a CNC axis or moving the workpiece via hydraulic or pneumatic actuators with specific Flexium 3D commands, called Host Commands, interpreted by the ISO program as simple comments.

Additionally, with dedicated commands, it is possible to select the machining channel, associate the machining point (tool tip, TCP) with the specific channel, and change the axis-channel association—a particularly popular feature of NUM control.

Functions already present in the software include defining for each station (channel) the relative tool from the tool table and estimating the machining time for simple parts, typical of machines with many machining stations. This makes the system complete and allows for the entire machining process to be simulated.



Even online simulation, i.e., with connection to a real system, is now feasible on all 8 channels of the system by selecting the channel to be monitored during the setup phase.

Flexium 3D is proposed as a versatile software that can help Application Engineers and OEMs accelerate machine commissioning, feature training, and debugging, as well as enable end customers to refine and optimize part programs before sending them to production.

Check out the Flexium 3D video here:
t.ly/UdTP2

When Numerical Control Makes the Difference

Ten years ago, Faimond, a small Italian company renowned for its expertise in crafting machine tools for the goldsmithing industry, made a strategic decision to expand its horizons by venturing into the dental sector. They chose to partner with NUM to deliver a comprehensive solution centered around Flexium+ 68, while also receiving support for system customization and integration.

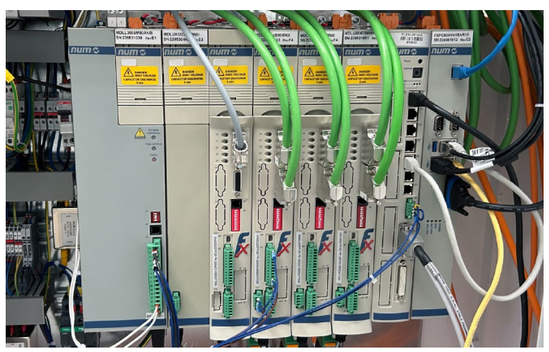
Precision is paramount in the production of dental prostheses and specialized components. Whether crafting parts from grade five titanium or chrome-cobalt alloys, absolute accuracy is non-negotiable. Once a prosthesis is fabricated, there's no room for adjustments. Precision isn't just recommended – it's essential.

In light of these principles, the pivotal role of technology becomes apparent. Achieving the micrometric precision demanded by the dental sector requires highly sophisticated solutions, enabling the manufacturing of components with tight tolerances and exceptional quality, all starting from the technical drawings.

Situated in Arcugnano, on the outskirts of Vicenza, is the headquarters of Faimond – a small business founded almost fifty years ago in the goldsmithing sector by Gianluigi Dal Lago. Over the years, Faimond has adeptly adapted to changing landscapes, leading to the establishment of a dedicated division for dental machinery a decade ago. Today, this division accounts for about a third of the company's revenue, showcasing Faimond's ability to turn necessity into opportunity.

Entry into the dental sector

"A few years ago we decided to expand our outlet areas", explained Andrea Dal Lago, at the helm of the company together with his brother Fabio, as well as head of sales. "And so we looked for a sector that – from a technological point of view – was akin to the goldsmithing sector, so that we could exploit our know-how as much as possible."



Interior of switching cabinet

XD 182

XD 182 L

In this scenario, Faimond's engineering department conceived an initial machine tailored for both the goldsmith and dental sectors: a compact five-axis continuous milling center with three distinct configurations. Each configuration varies based on the workpiece gripping system it's equipped with—namely, for ring machining, dental sector machining, and micro-machining. The dental configuration proved most successful, initially introduced as the XD180 and now in its third iteration as the XD182. Faimond also announced the upcoming XD183 version, boasting significant new features and a notable reduction in footprint.

"Our typical customers are the dental laboratory", continued Andrea Dal Lago, "or user with classic milling center, specialized in the development of dental components. In fact, the XD182 is mainly used for machining metal and, in particular, grade 5 titanium and a chrome-cobalt alloy, both materials mainly used for the production of bars on which dental implants are then fixed, or the internal capsules on which zirconia tooth prostheses are mounted."

Notably, the XD182's versatility extends to processing zirconia itself if required, although the material's extreme brittleness mandates dry treatment and subsequent heat strengthening.

A niche market

In the realm of dental milling, machines vary widely in complexity. While ninety percent are simple and small, primarily used for processing soft materials like zirconia, Faimond has strategically positioned itself in a niche market. Specializing in the construction of metalworking solutions requiring advanced technology, Faimond's machines are designed to achieve unparalleled precision.

The decision to integrate NUM's Flexium+ 68 – a highly flexible numerical control system – into the XD182 was deliberate.

"After several researches", explained in fact Fabio Dal Lago, head of the technical department, "we identified Flexium+ 68 as the solution that best matched our idea of numerical control, both from a technological point of view and for its quality/price ratio."

"After several researches", explained in fact Fabio Dal Lago, head of the technical department, "we identified Flexium+ 68 as the solution that best matched our idea of numerical control, both from a technological point of view and for its quality/price ratio."

Technology collaboration

NUM provided Faimond with a tailored turnkey solution, along with comprehensive support for system customization and integration.

"We dealt with the development of the PLC software to manage machine automation", explained Marco Battistotti, NUM Italia's NTC manager, "but also with the customizations of the 'human-machine interface, with the aim of simplifying the use of the system for the target audience it was intended for. On Faimond's instructions, we thus built graphic pages that would highlight the operations essential for dental technicians to operate the machine. And finally, we interfaced with the software house that developed the CAD/CAM used by Faimond and integrated it into our control."

The XD182, a standard machine with customizable features, incorporates the complete NUM Flexium+ 68 system, featuring BHX motors and MDLUX drives.

HMI

A collaboration in the making

"In recent years we are seeing the complication of a certain type of application", added Fabio Dal Lago. "If before we were dealing with customers who had to perform fairly basic machining, more and more we are encountering operators with more complex requirements. This implies – on a practical level – having to elevate the machine's performance, through the development of dedicated macros for specific controls on the part, and it is precisely thanks to the choice of relying on a flexible control such as Flexium+ 68 and a team of highly qualified professionals such as those NUM provides, that it is possible to carry out a certain type of customization, pandering – in this way – to the needs of the market."

From left to right: Pietro Mazzocchi, Sales NUM Italy, Andrea Dal Lago, Sales Manager Faimond, Fabio Dal Lago, Technical Manager Faimond and Marco Battistotti, NTC Manager NUM Italy

Federal Broach & Machine Company: Leading Precision and Innovation in Broach Machines and Tools

Nestled in the heart of scenic central Michigan, Federal Broach & Machine Company has been a beacon of excellence in precision tool making and machine building since 1952. Since relocating from Livonia, Michigan, to Harrison in 1984, Federal Broach has established itself as a cornerstone of the community. Today, Federal Broach is part of the esteemed NIDEC Machine Tool Corporation in Ritto, Japan, alongside NIDEC OKK, PAMA, and Takisawa. As a leading company, Federal Broach continues to drive innovation in this industry.

Federal Broach's journey has been one of remarkable growth, fueled by an unwavering commitment to excellence in serving key industries like automotive, large truck manufacturing, aerospace, agriculture, and defense. Spanning an impressive 96,000 square feet (about 8900 m²), its cutting-edge manufacturing facility specializes in producing broach machines, a variety of broach tools, and the sharpening and recoating of gear-cutting tools. Notably, the company boasts its own coating facility, a rare feature among gear-cutting tool suppliers, highlighting their dedication to offering comprehensive solutions to customers.

To meet the escalating demand for gear-cutting tool services, Federal Broach recently augmented its capabilities by integrating a second coating system. This strategic enhancement positions the company to efficiently handle increased business volumes, providing crucial support to gear manufacturers across the United States.

A pivotal element in Federal Broach's enduring success and expansion has been its strategic collaboration with NUM, a global leader in CNC control solutions. This partnership, which commenced in 1999 when Federal Broach embarked on upgrading its Brown & Sharpe spline grinder, has proven instrumental in modernizing its operations. Ken Kernen, President of Federal Broach, recalls the early days, highlighting NUM's willingness to engage in a custom, one-off project. This collaboration laid the foundation for Federal Broach's standardized use of NUM for many of its broach production machines, a testament to NUM's commitment to innovation and customer-centric solutions. Ken Kernen recalls: "NUM was willing to work with us. We had a custom, one-off project. None of the other approached CNC control suppliers were interested in a one-off custom job. Now we have standardized on using NUM for all our broach machine products."

Switching cabinet

NIDEC/Federal Broach Model VRT with NUM Flexium+ at Motion+Power Expo 2023 (Detroit, MI)

Reflecting on the partnership, Kernen emphasizes the invaluable support provided by NUM's customer service team, which surpassed expectations during the initial project. Federal Broach has consistently turned to NUM for various projects, leveraging NUM's flexible controls and drive systems, allowing them to tailor machine interfaces and functions for specific operations. This collaborative approach has significantly enhanced efficiency, maintained impeccable quality standards, and prolonged the lifespan of Federal Broach's high-value machines.

In 2023, Federal Broach and NUM joined forces once again to introduce the 10T economical broach machine, marking a natural progression from their successful collaboration in broach tool production. Seeking a partner with a global presence, exceptional support infrastructure, and a diverse product range to meet machine requirements across all lines, NIDEC chose NUM for this endeavor.

The broach machine process entails the precise interaction between the workpiece and the broach, a multi-toothed cutting tool with progressively larger teeth or cutting edges. The broach is gradually fed into the workpiece at a controlled rate, while its teeth progressively remove material to form the desired shape or feature. Modern broaching machines, including the 10T economical broach machine, have transitioned from hydraulic systems to electric servo drives for enhanced precision and control.

HMI 12" FS122 touch screen with MP08 machine panel all custom programmed in the PLC logic including the visualization screens for programming and operation

The NUM Flexium+ CNC and MDLUX Servo drive system emerged as the ideal solution, providing a unified hardware and software platform that seamlessly integrates with base non-helical models and extends to NIDEC's more complex dual ram and helical machines. This approach empowers Original Equipment Manufacturers (OEMs) to capitalize on application expertise, optimizing control engineering efficiency to deliver competitive machines. NUM's MDLUX motor/drive kits for the axes (known as the Loader, Handling, and Ram) epitomize versatility in motion control, delivering the precision required and providing the power necessary for the broaching process.

The key advantages of the NUM CNC and drive system encompass precision, flexibility, energy efficiency, minimal maintenance requirements, and enhanced control over the machining process. These attributes collectively contribute to improved productivity, operational efficiency, and cost-effectiveness for Federal Broach and its customers.

Ken Kernen recalls: "NUM was willing to work with us. We had a custom, one-off project. None of the other approached CNC control suppliers were interested in a one-off custom job. Now we have standardized on using NUM for all our broach machine products."

This state-of-the-art machine from Federal Broach, powered by NUM, demonstrates the seamless integration of cutting-edge technology and precision engineering. The NUM Flexium+ 6 serves as the cornerstone, providing a robust platform for streamlined operations. Notable features such as the Early Block Change function to begin executing movement of the next block before the current block has ended, a standardized PLC Control system, flexible EtherCAT IO and safety modules, and an enhanced operator experience facilitated by a 12 inch FS122 display running custom made visualization screens all contribute to Federal Broach's commitment to providing machines that are efficient, high quality, and high safety.

Finishing shell for spiral broach tool

The successful collaboration between Federal Broach and NUM embodies the strength of innovation, strategic alliances, and a mutual dedication to enhancing manufacturing capabilities. The extensive utilization of NUM components in the 10T broaching machine reflects the depth and breadth of this partnership, reaffirming Federal Broach's dedication to innovation and excellence in manufacturing. While Federal Broach leads the way in pioneering precision and innovation within broach tool production, NUM continues to be a reliable partner in promoting efficiency, quality, and technological advancement.

Federal Broach & Machine Company, founded in 1952, is a precision tool-making and machine-building company based in Harrison, MI. Specializing in broach machines, broach tools, and gear-cutting tools, Federal Broach has been a key player in various industries, continually evolving to meet market demands

25 Years of MKM International GmbH: Customized Solutions and Customer-Oriented Partnerships

East Westphalian-based MKM International GmbH is celebrating an important anniversary this year – 25 years of successful operation in the field of CNC special plant engineering. Since its founding by Michael Köhler in 1999, the company has become a leading supplier of innovative, directly-sold CNC systems. From the start, MKM, with a dedicated team of now 60 employees, has focused on customized, modular products to meet its customers individual requirements. MKM has continuously evolved and specialized, from developments in entry-level machines for solid wood processing to the manufacture of systems for processing complex materials such as plastics, light metals, or composites.

The Path to Success: Customer Centricity and Transparent Communication
MKM's success story is based not only on its development of high-quality, specialized CNC systems but also on a philosophy of partnership where MKM pursues an extraordinarily strong customer orientation as an ideas and solutions provider. By involving customers early in the development process, using clear, competent communication and short decision-making paths, and relying upon modular system segments, fast and reliable solutions are created–all focused on maximum customer satisfaction and reliability.

Long-term Partnership: Continuity, Technology Reliability, and Customer Satisfaction
MKM and NUM look back on a long-standing partnership. This partnership enables MKM to obtain spare parts and carry out repairs at any time, even after 25 years. Together, MKM and NUM maintain a full spare parts service for every MKM machine supplied to the market to date. The openness, simplicity, and exceptional sustainability of NUM CNC systems have enabled MKM to meet even the most demanding customer requirements and develop innovative solutions that set new standards. The high reliability of the technology, long-term spare parts availability, and high stock levels ensure continuous machine operation. This cooperation enables MKM to meet the growing demands of its customers.

Universal System with Robot Automation
An outstanding example of the successful cooperation between NUM and MKM is the development of a special machine with 3 CNC controls, 6 power supply groups, 50 axes, 12 spindles, and 14 channels. This machine, equipped with a NUM CNC control, showcases the innovative strength and technical expertise of both companies.

Mr. Blötscher emphasizes the importance of the cooperation with NUM: "With NUM, we design ideas that can also be implemented. Together we set new benchmarks and drive innovation in CNC system engineering."

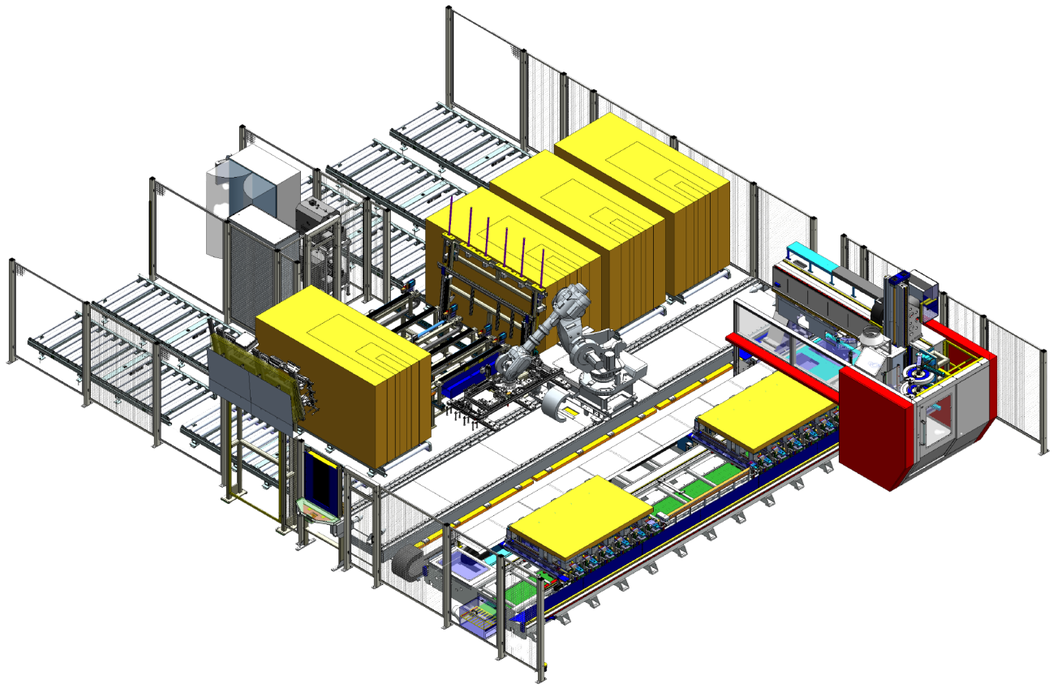
Another highlight in MKM's product portfolio is a stationary universal system for door leaves with robot automation. Also equipped with a NUM CNC system, this machine enables fully automated door processing in extremely confined spaces, setting new standards in efficiency and precision. Pendulum processing allows production on one side of the machine while the other is being set up; transitions take mere seconds. The new HMI FS184 and the Machine Panel MP07 are in use and installed in duplicate to enable operation from both sides. The system is designed for unmanned production but can also be run manually by an operator.

The Future of CNC Plant Engineering
MKM sees NUM as more than a supplier, as a strategic partner for the future. Together, the two companies set new benchmarks and implement innovative ideas. This partnership is based on a shared corporate culture and effective communication, enabling short paths and promoting efficient cooperation.

Mr. Holger Blötscher, Managing Director of MKM, emphasizes the importance of the partnership with NUM: "The cooperation with NUM enables us to push the boundaries of what is technically feasible and to meet the highest demands of our customers. We see NUM as a partner for the future and look forward to further successful projects."

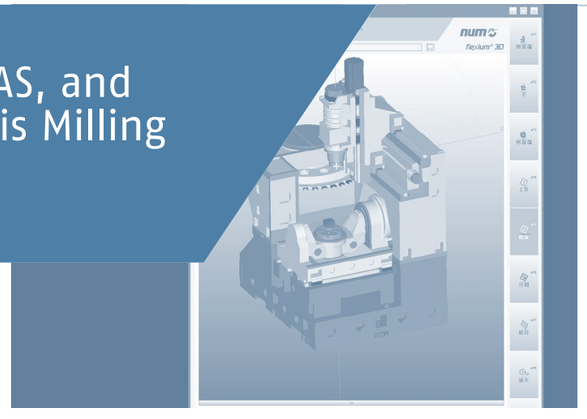
MKM International GmbH is celebrating not only 25 years of successful business but also looks optimistically toward the future—with NUM by its side as a partner for further innovative developments in CNC system engineering. Mr. Blötscher emphasizes the importance of the cooperation with NUM: "With NUM, we design ideas that can also be implemented. Together we set new benchmarks and drive innovation in CNC system engineering."

From left to right: Mr. Holger Blötscher, Managing Director MKM, Mr. Christian Unger, NTC Manager NUM Germany, Mr. Frank Essmann, Head of Sales Office North NUM Germany, Mr. Julian Rabbel, Head of Electrical Department MKM



Universal system for door leaves with robot automation

Advancing Precision: NUM, ANDAAS, and Partners Introduce AMU260 5-Axis Milling Machine



ANDAAS and its partners together with NUM, developed an innovative High Speed 5-Axis Milling Machines; using the well-known high performance and flexibility of the NUM CNC system machining speed and quality was pushed to the limits and the human machine interface was fully customized as per ANDAAS requirements.

As a leading global company listed on the Chinese stock exchange, Guandong Anda Automation Solution Co., Ltd. manufactures and sells technological solutions for controlling the application of fluids in manufacturing processes to customers from a wide range of industries. The efficient and high-quality system solutions developed by ANDAAS are used in high technology markets, such as smartphone manufacturing, aerospace, e-mobility and medical care.

Since July 2022, ANDAAS has been systematically expanding its portfolio by developing 5-axis milling machines. For the latest project, the state-of-the-art AMU260 machine tool, ANDAAS relied on the expertise of NUM as a CNC technology leader.

NUM's high-performance hardware together with NUMhsc targeted software algorithms, delivers a proven total solution for achieving maximum quality at the highest speeds in 5-axes machining.

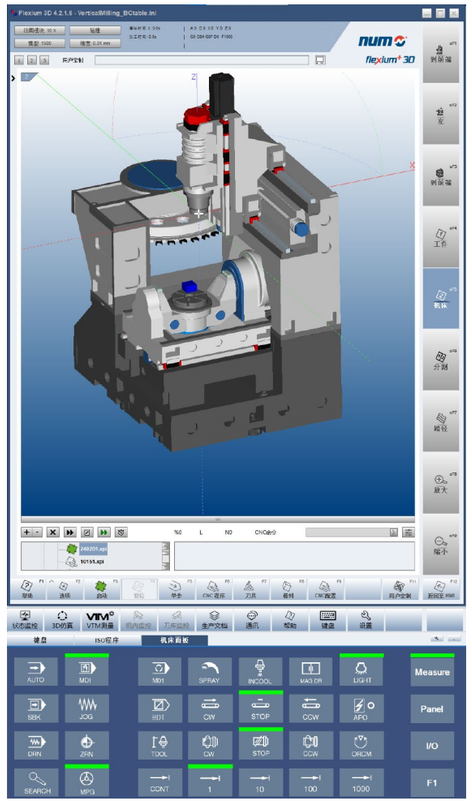
The AMU260 also features NUM's advanced Flexium 3D simulation software. About the control system, NUM supported the project in the creation of the ICS system, which provides the user with a camera, the VTM tool measuring system and a WeChat function. The tool measuring system (VTM) was fully integrated into the CNC system by NUM and ensures maximum precision in the machining processes. NUM also assisted in the development of a digital machine tool control panel.

The AMU 260 machine key features are:

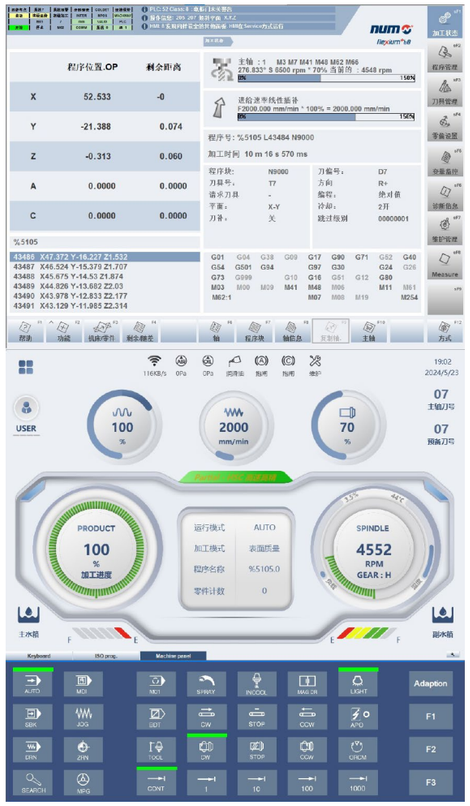
- Central cooling system for enhanced performance
- Automatic lubrication system for smooth operation
- Automatic tool change system with 40 tools (optional 140 tools)
- High-speed spindle motor with up to 24,000 rpm
- Advanced control system with NUM Flexium+ 68 controller and 23.8" Touch control panel
- Real-Time Tool Center Point (RTCP) function for precise machining
- Customized ICS software help the intelligent machining and connectivity
- Chip container and cooling systems for efficient chip management
- One-year mechanical warranty and two-year controller warranty for peace of mind

In addition to NUM, ANDAAS opted for the support of its strategic partner Shanghai Weiyan Precision Technology Co., Ltd (WPT) to support the development of the AMU260. For the AMU260 project, they supplied an image processing-based tool monitor (VTM) for two-dimensional CCD imaging of the cutting tool for precise contour monitoring in the AMU260 project.

"In collaboration with ANDAAS, our esteemed partner, we've once again demonstrated our prowess in developing cutting-edge technology in 5 axes milling application. The AMU260 milling machine which integrated of the most flexible and open NUM CNC controls, a testament to innovation, combines high-performance hardware and full customized functional software to deliver unparalleled precision and efficiency in machining", adds NTC Manager China Mr. Longwei Jiang.



Flexium 3D Simulation



HMI

AMU260

Partnership Success: Pilkington and NUM Jointly Optimize CNC Machines

The Pilkington Automotive Deutschland GmbH plant in Witten is one of the largest automotive NSG Group sites in the world. Roof glass, windscreens, and rear windows are produced here for all European vehicle manufacturers. Integrated antenna systems are also developed in Witten and installed in the windows. A total of around 700 employees work at the Witten plant. The NSG Group is represented in Germany by the Architectural Glass and Automotive divisions and employs around 2,500 people. The site in Witten is part of the Automotive division with main production sites in 14 countries. The division is one of the world's largest suppliers of glass and glass modules for automotive glass applications and supplies the Original Equipment (OE), Automotive Glass Replacement (AGR), and Specialized Transport (ST) sectors. Automotive OE offers complete glazing solutions, from initial design to final product, with a comprehensive range of glass products and glazing systems.

Continuity in Cooperation: Pilkington and NUM
In 2012, Pilkington and NUM carried out a successful modernization of a cutting system. This collaboration proved to be groundbreaking for the future of both companies.

Twelve years later, Pilkington returns to NUM to tackle another retrofit project. In this project, the mechanics remain unchanged, while the control system is to be completely renewed.

The ongoing collaboration between Pilkington and NUM demonstrates both companies' commitment to continuous improvement and adaptation to the changing needs of the industry.

The Challenge of 24/7 Production
The upcoming modernization of a CNC machine poses a particular challenge for Pilkington, as its operation is uninterrupted. The machine to be modernized is responsible for cutting and grinding glass in various thicknesses, which is then used in roof glass, windscreens, and rear windows for leading vehicle manufacturers. Around one in five vehicles worldwide is fitted with Pilkington glass from the NSG Group, so continuous production is of the utmost importance to ensure the existing supply agreements are met with the usual high quality.

The requirements for the successful modernization of this machine were therefore extremely high and varied. Minimal downtime within a fixed schedule is required to minimize production downtime. In addition, the machine must be put back into operation quickly and efficiently after the conversion, which requires careful planning and coordination of all those involved in the project.

A Partnership for Smooth Processes
As part of the retrofit of the machine and system components, Pilkington successfully carried out a series of hardware adaptations. These included the construction of a new control cabinet in which the NUM CNC system and other components were fully installed and wired. In addition, mechanical modifications were made to the machine, including the assembly of the motors in the system and the installation of new protective grilles.

A detailed work plan was developed and coordinated to meet the high requirements in terms of time pressure and functional guarantee. This included the status of the machine, the pre-commissioning of the motors, the removal of the plant components during the summer vacation break, and the installation of the new motors by Pilkington. NUM then carried out the commissioning according to the specified schedule.

During commissioning, it was discovered that existing production programs needed to be converted. NUM reacted professionally and wrote a conversion tool on-site to ensure the continued use of existing programs. NUM also successfully merged two operator terminals, keeping the operation as identical as possible to minimize operator training.

The converted plant components were returned to the plant on schedule and within the machine availability period, and 24/7 shift operation was resumed. Pilkington was highly satisfied with the smooth integration of the converted plant components into production and the successful completion of the project. The collaboration between Pilkington and NUM has resulted in an efficient and timely redesign of our plant sections, optimizing production processes and improving plant performance.

The challenge for Pilkington was to ensure continuous production around the clock. The installation of new software with new hardware components and the subsequent guarantee of a smooth production process were decisive requirements. In this context, NUM demonstrated its expertise. Mr. Anthony Becker, Group Leader Technical Department, emphasizes: "Adherence to the schedule and trouble-free commissioning were of crucial importance. We considered this project as a pilot project with NUM to consider a possible conversion of further CNC machines."

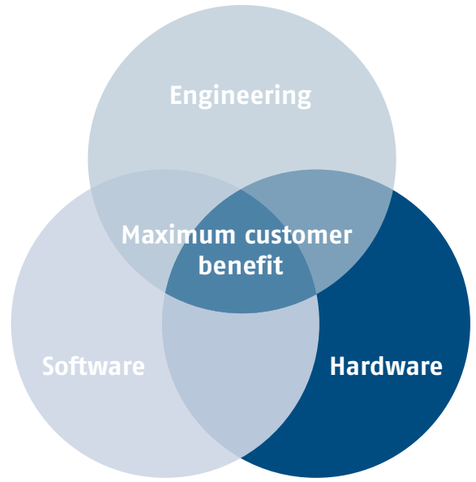
The commissioning went extremely smoothly. Mr. Becker emphasizes: "In the event of any obstacles, we received first-class support from NUM. The NUM team responded professionally and extremely quickly, so that we were able to start production again surprisingly quickly."

Success Factors: Careful Planning and a Strong Partnership
Pilkington did not approach the planning of this venture lightly but was aware of the potential risks that could arise when involving external partners. Thanks to the short lines of communication with NUM and the maintenance of an excellent partnership, the project was successfully implemented. Mr. Ayhan Dikmen, Project Manager at Pilkington, emphasizes: "NUM proved to be extremely flexible in overcoming complex challenges and impressed us with their know-how and quick response, which gave us a high degree of security and reliability throughout the entire process."

Increase in Production Output and Future Prospects
After minor faults were successfully rectified after commissioning, production continued to run smoothly without any disruptions. While the mechanics remained unchanged, the control system was renewed. By merging two operator terminals into one, machine operation was optimized, saving the operator the inconvenience of having to walk around. The quality remained consistently high, while the speed could be increased, and the CNC control proved to be more precise than before after the conversion. Pilkington's CNC cutting and grinding machine currently produces around 6000–7000 individual panes a week for windshield production in the automotive industry.

Thanks to its professional approach, NUM always provided security during the conversion and smooth commissioning and was seen as a reliable partner. Mr. Dikmen emphasizes: "During the entire course of the project, the NUM team was able to guarantee security for a professional implementation. I was able to rely on their support and quick response at all times. Expectations were exceeded."

Pilkington is planning to modernize further CNC machines with the NUM CNC control system in the coming years. This decision underlines Pilkington's confidence in NUM's expertise and innovative strength.



From left to right: Mr. Anthony Becker, Group Leader Technical Department Pilkington, Mr. Ayhan Dikmen, Team Leader Technical Department Pilkington and Mr. Frank Essmann, Head of Sales Office North NUM GmbH

ALESA AG: Swiss Precision in Circular Saw Systems and Special Tools

ALESA AG, with its headquarters in Seengen (CH), Aargau, employs around 65 highly motivated and experienced employees and can look back on an impressive tradition in the manufacture of cutting tools that began back in 1934. The family business is now independently managed by the 4th generation. The company's pride lies in its consistent focus on the highest quality and precision. ALESA has set itself the goal of supplying both the Swiss market and the world market with first-class tools, which are mainly manufactured or resharpened using NUMROTO software. The company is known by end customers as a "problem solver" and consultant who can optimize processes and maximize tool life. This combination of tradition, quality and innovative thinking makes ALESA a reliable partner for sophisticated cutting tool solutions.

Precise variety
ALESA presents an impressive product portfolio: Circular saw systems and special disk milling cutters which dominate a whopping 40 % of the product range and are manufactured at their production facility in Switzerland. The range also includes 40 % milling heads with indexable inserts, which enables precise milling with a high volume of chip removal. In order to meet the wide range of requirements, a wide range of special tools are available, which make up 20 % of the portfolio. Of course, ALESA AG also offers a comprehensive resharpening service for its tools.

Innovative technologies and quality
ALESA has been successfully using NUMROTO software to manufacture its tools since 2009. The commissioning of the first HAWEMAT machine with NUMROTO was a significant milestone in the company's technological development. Since then, ALESA's shop floor has grown considerably, preferably with machines equipped with NUMROTO. The use of this software enables precise and efficient production of tools that meet the highest quality standards.

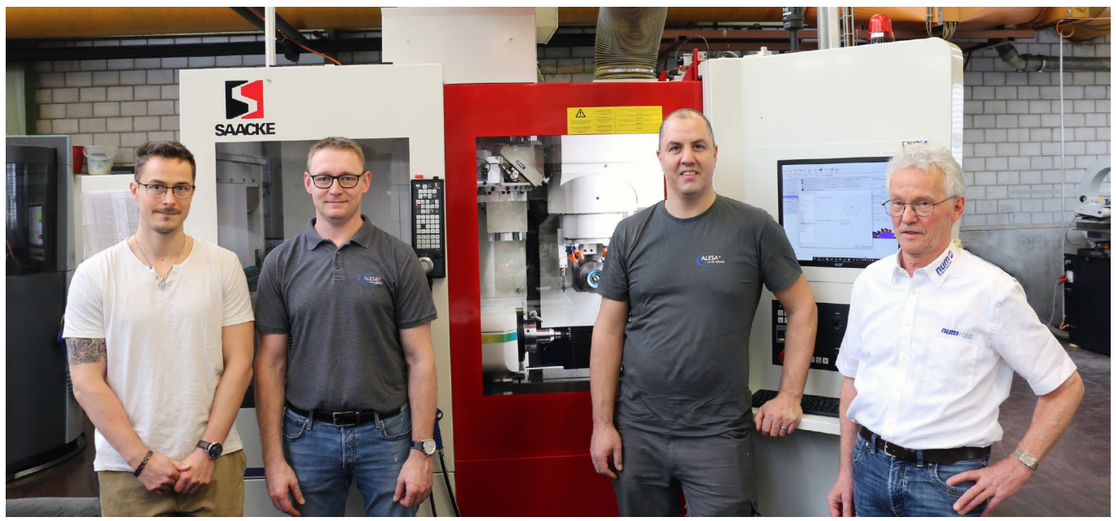
ALESA optimizes its manufacturing processes through the comprehensive use of the NUMROTO infrastructure. The possibilities of 3D simulation, dressing, in-process measurement and the NR-Control job manager are particularly worth mentioning. The company's own expertise is also incorporated, particularly in the form of free programming, which is combined with the standard NUMROTO operations and tested as a whole in the 3D simulation. The complete program is then sent to the grinding machine, where everything is ground in a single clamping operation. Mr. Florian Legoll, Application Engineer ALESA, emphasizes: "The 3D simulation makes it possible to precisely predict the production time of a tool too, which makes it much easier to prepare quotations."

Precise star interfaces and innovative circular saw systems
The circular saw systems in the Nutex family enable precise sawing and slotting on CNC centers without the need for end face clamping elements. This ensures that the circular saws and disk cutters are free on the face side, enabling work pieces to be cut precisely and flatly. The new, patented Nutex Star clamping system complements this. This pioneering, star-shaped star interface enables even greater cutting depths with even greater precision. This clamping system is also ground on NUMROTO machines at ALESA. Daniel Buchmann, Operations Manager at ALESA, emphasizes: "The ability to use NUMROTO on different machine types makes it much easier to train employees. Operators can be deployed on different machines without any problems. Changing a tool series from one machine to another is particularly quick and uncomplicated, even if the machines have different handling systems, such as chain loaders, robots or pallets."

ALESA's strategy for tool manufacturing and resharpening
A major advantage of NUMROTO is that the same programs that are developed for tool production can be used in the resharpening centers without any changes.

Increasing demand for circular saws made of ceramic
"Currently, 80 % of ALESA's tools are made from carbide. The remaining 20 % of our tools are made of high-speed steel (HSS) in order to meet the diverse requirements of our customers", says Mr. Daniel Buchmann. There is a strong increase in demand from the medical sector for circular saws made of ceramic. In contrast to carbide and high-speed steel (HSS), ceramic does not contain any heavy metals that can be potentially harmful to the human body. ALESA took up this challenge and can now offer optimum solutions for this emerging industry. It is once again setting new standards in tool manufacturing and reaffirming its position as a reliable partner for high-quality and industry-specific solutions.

Synergy ALESA and NUMROTO
Mr. Markus Steiner, Head of the Grinding Department at ALESA, emphasizes: "NUMROTO is an absolute must for the procurement of a new tool grinding machine." The clear statement emphasizes the essential role of the NUMROTO platform for ALESA's demanding standards in tool manufacturing. The consistent use of NUMROTO not only reflects technological excellence, but also contributes significantly to the efficiency and precision of the production process.



From left to right: Florian Legoll, Application Engineer ALESA, Daniel Buchmann, Plant Manager ALESA, Markus Steiner, Head of Grinding Department ALESA and Jörg Federer, Application Manager NUMROTO

Circular saw blades for efficient cutting
ALESA's general expertise in the range of circular saw blades is self-evident. Today, these saws are mainly made of carbide and are used for end products that are particularly difficult to machine or high-alloy end products. In addition to the cylindrical tools, various other forms, such as V-shaped circular saw blades, are also available. Thanks to the individual shaping of the saw blade teeth, they offer a flexible solution for various applications. Thanks to the small diameter of the star interface, the outer diameter of the circular saw blade is reduced while the cutting depth remains the same. As a result, the grinding time and material consumption of such circular saw blades can be significantly reduced.

Special form cutters for the automotive industry
One outstanding example is the special form milling cutter, whose complex form is logarithmically relief-ground and which ensures an important safety function in vehicles in the automotive industry. The high demands of the automotive industry have been fully met with this tool. Tool life was maximized, thanks in part to an ideal rake and relief geometry.

Corner radius cutters for the oil industry
Other interesting tools have been developed for the oil production industry. One such customized special milling cutter with corner radius and special chip breakers, also manufactured with NUMROTO, ensures maximum performance in this demanding environment.

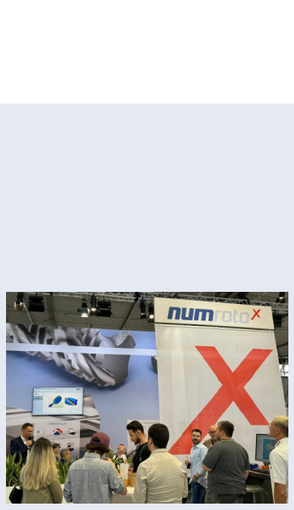
NUM's Global Presence at International Trade Shows

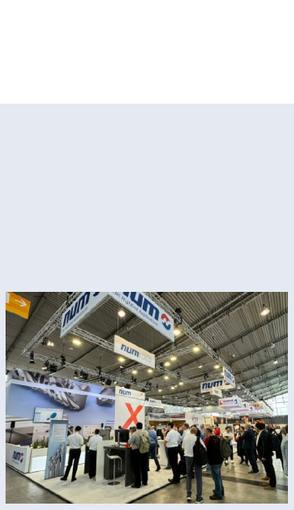
mav Innovationsforum 2024

Leinfelden-Echterdingen, Germany

GrindingHub 2024

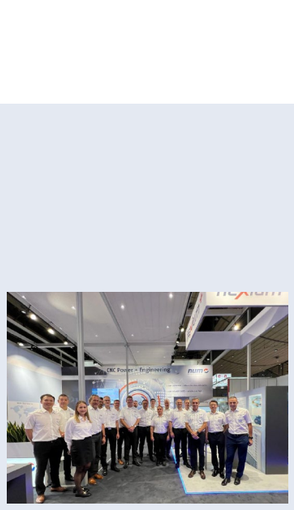
Stuttgart, Germany





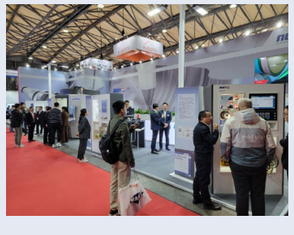
EMO 2023

Hanover, Germany



CCMT 2024

Shanghai, China



FABTECH 2023

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