num information

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num®
CNC HighEnd Applications

No 53 – September 2012

Words from our CTO

Dear readers,

The NUM success story is thanks to special people who, with their passion for the work, were able to make a difference. Today, after 50 years in the business, people in NUM continue to work with that very same passion; they are highly motivated, welcoming both challenges and responsibility. Most of our collaborators have many years of experience in the sector, which is essential for developing and optimizing complex products such as those used in the automation of machine tools. Passion, qualification and organization are the characteristics that help NUM make products and solutions as competitive and complete as those of the biggest worldwide players in numerical control.

The work environment is fundamental to maintaining this spirit over time. I truly believe that communication between collaborators and work groups develops 'know-how' and a sense of belonging in the company. I also believe that people who create products, whether these products are software, hardware or electromechanical, need a positive and motivating work environment in order to achieve their maximum potential and come up with new ideas. A cordial, collaborative and more generically positive and motivating work environment is one of my, and NUM management's, main objectives.

Creativity and ideas are obviously useful during the pre-analysis and definition phases of the project, then in the development phase, strict respect of scheduling targets and functional objectives is essential and such targets and objectives must be clear, tangible and easily verifiable; the management, and the project managers, have considerable responsibility in this case, and must set the first and best example.

„Passion, qualification and organization are the characteristics that help NUM make products and solutions as competitive and complete as those of the biggest worldwide players in numerical control."

(Massimiliano Menegotto
Managing Director NUM S.p.A and CTO of the NUM Group)

On the subject of challenges, 2012 will be a very busy year for our R&D dept. and a very important one for NUM in general, with a completely new offer in the works.

After the amazing success of Flexium with over 10,000 realised applications, we are pleased to present Flexiumplus and NUMDrive X. We will also be presenting a wide range of new products, including a new and highly innovative 19" PC panel, with touch-screen PC keyboard and operator panel fully integrated in the HMI software; only the main controls remain on a small traditional operator panel. The HMI design has also been completely renewed, with a more modern functional character.

Impressum

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The functions of the numeric control have also been developed to offer improved flexibility, scalability and accuracy. In particular, we have increased the number of spindles that can be managed (up to 32 for each NCK), improved internal computing resolution, increased 'servobus' speed, and implemented various additional functions and improvements – too many to mention.

Great news also about functional safety – the new architecture has a safe PLC fully integrated in the Flexium PLC. This safe PLC, as well as communicating with the safe inputs and outputs, also communicates through a 'safe field bus' with the new NUMDrive X, where the safe motion monitoring functions are executed. In brief: a single programming environment for both 'safety related' and 'non safety related' logic, simplified wiring with a notable reduction in the number of connections, and new functions.

NUMDrive X, as well as featuring the new SAMX functional safety board, maintains all of the superlative characteristics of NUMDrive C, such as compact build, reliability, performance, scalability and modularity. Other new features include doubled computing power, higher resolution and bandwidths, more inputs and outputs available, and complete removal of the encoder cable thanks to an innovative communications protocol with '2-wires' integrated in the drive cable, carrying power to the encoder and position data simultaneously.

Finally, I must take a moment to sum up what makes NUM a successful company: an open, flexible and high performance system that allows our customers to realize machines with truly unique characteristics offering the best possible performance. The size of the company is big enough to secure state of the art solutions and at the same time small enough to react fast to customers' requirements. Our customers, and end-users, can easily get in touch with technicians of unquestionable experience, doing their job with passion and self-sacrifice; in more complex cases our R&D dept. is directly involved and works hand-in-hand with the application engineers in the field.

Massimiliano Menegotto

Managing Director NUM S.p.A and
CTO of the NUM Group

NUM Event Calendar

IMTS
From 10th – 15th September 2012 in Chigaco, USA
Booth E-5135, in the East Building

AMB
From 18th – 22nd September 2012 in Stuttgart, Germany
Booth C25, hall 4

BIMU
From 2nd – 6th October 2012 in Milan, Italy
Booth G35, hall 11

Euro Blech
From 23rd – 27th October 2012 in Hannover, Germany
Booth H35, hall 15

TIMTOS
From 5th – 10th March 2013 in Taipei, Taiwan

Events

Flexium+ CNC system – Safety, Flexibility and Productivity

Flexium+ builds on the success of NUM's Flexium system to advance CNC to a new level. It combines all the power, flexibility and user-friendliness NUM's products are renowned for, with additional state of the art functionality and a completely new hardware and software platform.

The new platform

The outstanding success of Flexium with over 10,000 applications completed in a short space of time paved the way for development of Flexium+. We took the best components, kept those elements behind the success of our previous CNCs, such as scalability, flexibility, unique CNC functions, standardized interfaces and PLC programming, then renovated and improved the complete system.

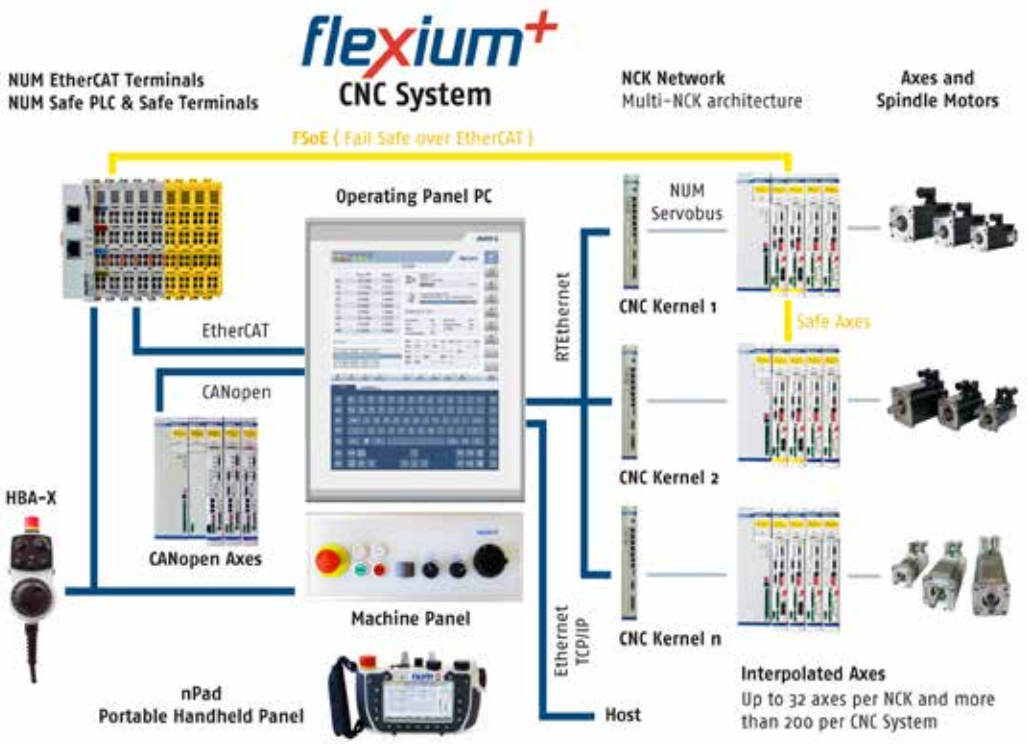
Flexium+ has new and enhanced features, new panels, a new HMI, an enhanced servo bus, enhanced drives and simplified connectivity – all within a safety-related architecture. There are three configuration levels – Flexium+ 6, Flexium+ 8 and Flexium+ 68 – to provide optimum cost/performance ratios.

Architecture

The key element of a Flexium+ system is the CNC. Its compact dimensions are the result of a design aimed at limiting energy requirements. Latest generation processors powering intelligent and evolutionary hardware ensure return on investment and long system life, in line with NUM's philosophy.

Increased CNC functionality offers improved flexibility, scalability and accuracy. In particular, we have extended the notion of axis or spindle to allow control of up to 32 spindles per CNC unit (NCK for NC Kernel) and make spindle/axis commutation even easier. We have also improved internal computing resolution, increased 'servobus' speed, and much more. The freedom to link several NCKs together in a global configuration has of course been maintained, enabling, for example, control of large transfer systems with more than 200 interpolating axes.

The system controls the NUMDrive X digital drives via up to three RJ45 ports, allowing for distributed drive sets on the machine. In addition to the digital interface, two interfaces are provided for analog control. The PLC complies with the IEC 61131-1 standard and communicates via efficient standardized interfaces. The single development environment provides different access levels for machine integration, setup and maintenance.



New Flexium+ architecture

Operating Glass Panel MP05

FS192i Virtual keyboard

FS192i Virtual machine panel

19-inch Touch Panel

With the latest 19-inch capacitive touch screen system, NUM has set a new standard for operating panels in the machine tool industry. A compact and scalable panel PC with Intel's i5 allows entry to multi-processor technology under OS Windows 7.

NUM's new FS192i operating panel provides a durable, modern front end for machine control. It has an ingress protection level of IP65 at the front, and IP20 at the rear. High-quality 4 mm hardened glass protects the front, without introducing any disturbing reflections. A narrow brushed aluminum frame with rounded edges provides complete side protection for the glass and multi-touch sensors. All necessary printing on the protective glass complies with NUM corporate design and color standards, and is executed with durable ceramic inks, using screen printing technology.

The FS192i presents a completely new face to the world. NUM has completely revised its Flexium HMI panel software, in line with its design guidelines, to accommodate dual touch gestures such as 'Drag & Drop', 'Wipe', 'Zoom' and 'Rotate'. Of course, touch gestures are only interpreted at the panel software level, so the system is still capable of handling faster or more direct forms of input. All HMI context levels have been adjusted to the new design for improved usability and operator convenience.

FS192i Virtual keyboard / FS192i Virtual machine panel
As an option, a complete virtual machine operating panel with softkeys for the target PLC visualization is available. Implemented with the same NUM design guidelines as the keyboard, this virtual machine panel eliminates need for an MP04 machine panel, reducing cost considerably. Due to its 19-inch screen and sensor protection frame, the new Flexium FS192i operating panel has different dimensions to NUM's earlier FS152 family. However, machine builders will discover that the new panel is an easy mechanical fit in cabinets. Users will re-experience the power of NUM products.

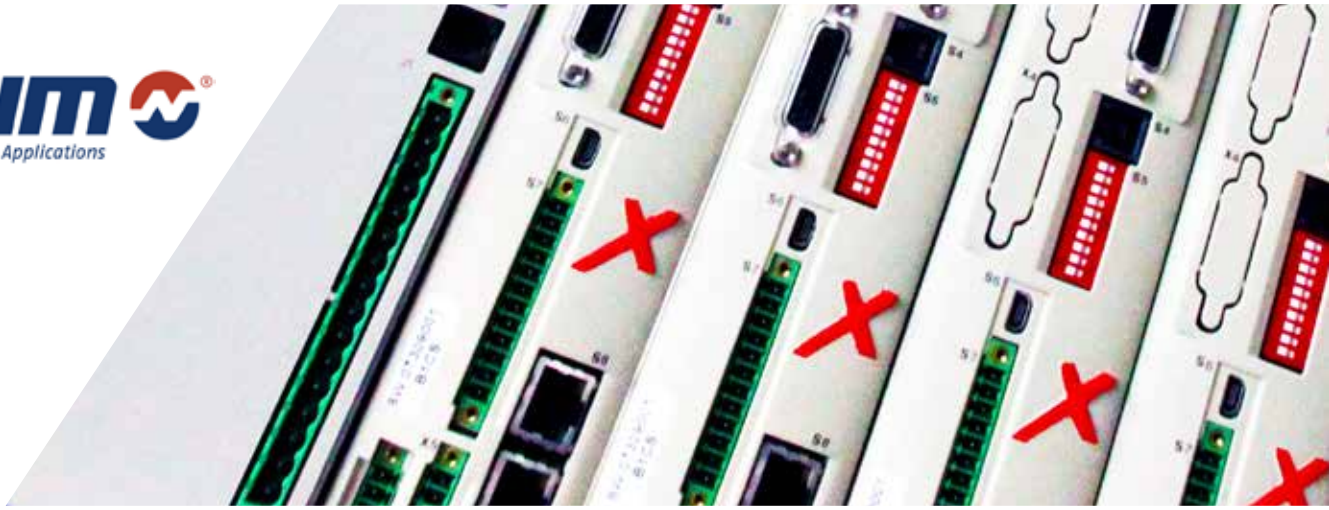
MP05 Glass Operating Panel
To accompany the new FS192i touch panel, NUM has launched the MP05 machine operation panel. This uses the same 4 mm hardened safety glass as the FS192i and has the same IP65 protection level at the front. The glass is scratch resistant and screen printed on the reverse – again, using durable ceramic inks and to NUM's corporate design and color standards. Four-sided glass protection is afforded by the brushed aluminum frame with rounded edges. A solid aluminum back plate ensures correct stiffness.

Together, the FS192i and MP05 form the most modern panel and operating system NUM has ever created. The combination provides OEMs with a powerful competitive advantage.

Frontpage picture of the new NUM Flexium+ broshure

Flexium+

CNC HighEnd Applications



NUMDrive X compact and scalable

NUM's latest drive – NUMDrive X – is the result of more than 20 years' experience in developing all-digital drive systems. This compact and modular drive is fully scalable – different performance/cost versions are available to suit any type of machine tool application.

A high degree of integration and efficiency has allowed us to achieve an extremely compact design that makes NUMDrive X one of the smallest high-end drives on the market. Its small installation depth and scalable width (a multiple of 50 mm) simplify cabinet layout. A wide range of power modules, available in single- and dual-axis versions and with continuous current ratings from a few amperes up to 200 Arms, enables each application to be technically optimized at the lowest cost.

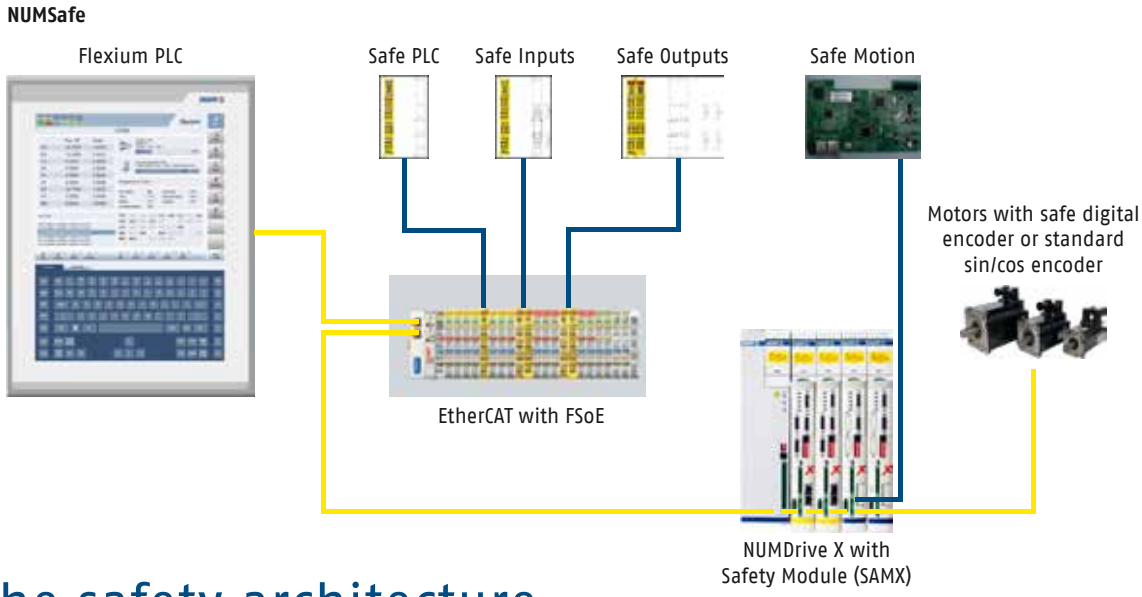
NUMDrive X offers a choice of two performance levels: High-Performance (HP) drives and Standard-Performance (SP) drives. The HP versions are designed for sophisticated and complex applications in precision machine tools. Featuring high internal resolution, a short sampling time (50 microseconds) and specially developed algorithms, they offer outstanding regulation performance and very wide current, speed and position loop bandwidths, as well as a number of built-in application-specific functions. High-Performance versions can interoperate with a huge variety of encoder and motor types, enabling OEMs to optimize their machines without compromise.

The SP versions are intended for systems and precision machine tools of medium complexity, and are especially suitable for cost-sensitive applications. As described previously, NUMDrive X provides safe functions by means of two options: a basic board for implementing the Safe Torque Off function (NUM-STO), and a powerful board (NUM-SAMX) which provides a huge number of safe motion monitoring functions.

Significantly reduced wiring effort

Every machine builder has experienced the complexity of encoder wiring and knows that it takes time and effort to install and debug satisfactorily. NUMDrive X introduces a revolutionary innovation to overcome these issues. The drive incorporates a full digital encoder interface which uses a two-wire communication protocol. The two wires are integrated in the power cable, so there is only one cable connecting the drive to the motor. Furthermore, the two-wire connection handles the encoder supply voltage, as well as high resolution position, redundant position (for safe applications), motor thermal sensor and diagnostic data. Encoder wiring now becomes a very simple task. Elimination of the encoder cable means that there is no longer any need to crimp and solder a large number of wires – the power cable merely contains two additional shielded wires, which are connected by screw terminals on the drive side. Aside from reduced installation time and cost, other advantages include reduced cabling costs, smaller cable carriers, lower moving masses, better reliability and electromagnetic immunity, and higher resolution control.

NUMSafe archticture with the new FS192i touch-screen panel and the NUMDrice X



NUMSafe – the safety architecture

Flexium+ integrates comprehensive solutions for the functional safety management of each machine type.

NUMSafe provides hardware and software solutions for implementing standard automation and safety technology in the Flexium+ system. Offering a wide range of benefits in terms of scalability, flexibility and reduced wiring needs, NUMSafe also provides a common programming environment for all system devices. Architectures with mixed standard and safety related signals and components are possible; the NUMSafe PLC (CTMP6900), the NUMSafe Input (CTMS1904) and the NUMSafe Output (CTMS2904) can be positioned inside a standard terminal line up, that by means of a NUM EtherCAT gateway communicate with the automation PLC, other EtherCAT gateways, servodrives and safety related components. The safety related motion functions are realized inside NUMDrive X by means of the NUM-SAMX board.

All safety related information is transmitted over the standard EtherCAT connection, with data reliability ensured by use of a Fail Safe over EtherCAT protocol (FSoE); wiring is reduced to a minimum, while flexibility and scalability are maximized.

Safe motion functions

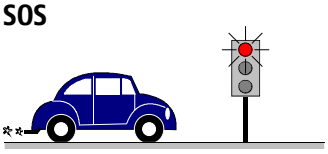
The safe PLC contains the programmed logic of the safety application, while the safe motion monitoring functions are handled by the NUM-SAMX board built into NUMDrive X servodrives.

The available monitoring functions, according to EN 61800-5-2, are: Safe Torque Off (STO), Safe Operating Stop (SOS), Safe Stop 1 (SS1), Safe Stop 2 (SS2), Safely-Limited Speed (SLS), Safely-Limited Position (SLP).

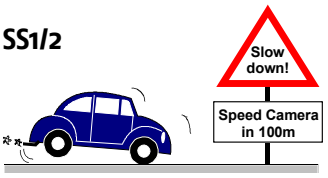
The safe motion functions can be realized using safe digital encoders (with 2-wire connections integrated in the power cable) or, for synchronous motors, any standard sin/cos encoders.

STO

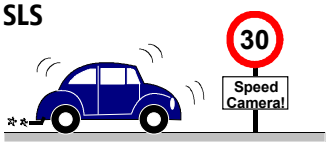
SOS



SS1/2



SLS



SLP

Flexium+

Advanced CNC solution accelerates NASCAR wheel production

An advanced NUM CNC retrofit of a spin forming lathe is providing a platform for substantial gains in manufacturing efficiency for the NASCAR wheel supplier, Aero Race Wheels, Inc. Productivity improvements include faster batch changeovers, tighter process control and automated program generation for new parts.

Aero Race Wheels is the leading supplier of premier steel racing wheels for NASCAR events. Founded in 1995, the company has grown to become the US's largest manufacturer of steel racing car wheels. The company's facility in Estherville, Iowa, produces hundreds of race wheels every day, which are used by a broad cross-section of the racing community. Drivers participating in IMCA and WISSOTA events use Aero Race Wheels' products, and more Cup, Nationwide and Camping World Series races have been won on the company's 59 Series NASCAR wheels than all other brands combined.

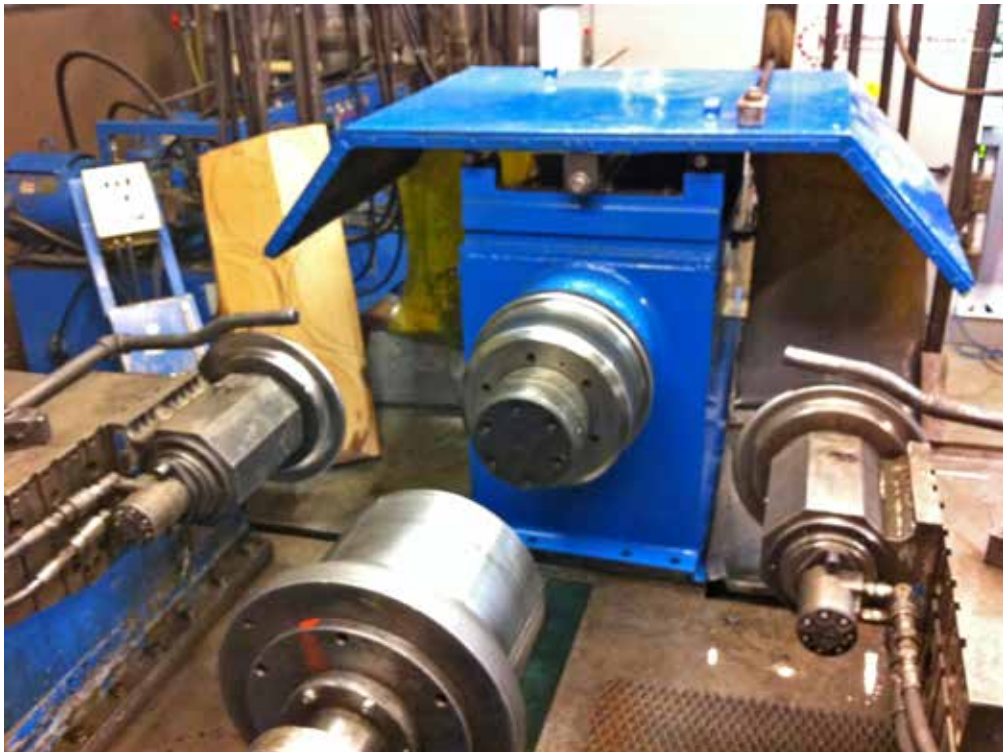
Aero Race Wheels utilizes spin forming techniques to produce its high performance racing wheels. The process involves rotating a cylindrical steel work piece and a forming tool at high speed while exerting localized pressure using a roller, causing the metal to flow over the tool. The technique is ideal for manufacturing axially symmetric parts such as wheel rims. It creates a very strong, seamless component from a single piece of material, with little or no scrap.

The shape forming operations are performed on a 20-year-old Autospin metal spinning lathe. This machine has two sets of pressure rollers – one at the front of the work piece, the other at its rear – which enable both sides of the wheel rims to be formed without manual intervention. Each set of rollers has two motion control axes, X and Z, driven by four hydraulic cylinders, plus the motor-driven lathe spindle. Given that the seasoned Autospin lathe is vital to its manufacturing operations, Aero was becoming concerned about its reliability. Although supporting the machine's mechanics was not problematic, obtaining replacement parts for the original motion control system had become nearly impossible.

Further, the original control was at best rudimentary. It had limited functionality and could only be programmed using a point-by-point data entry table that made it difficult to visualize and modify machine motion, demanding extensive operator training. And because the system could only store programs for a few types of wheel, production changeover was often time-consuming – typically

taking up to three to four hours or more – severely impacting the economics of the company's small batch oriented production processes. To improve this situation, Aero turned to a machine rebuilder which specializes in machine upgrade solutions for the spinning market.

The machine rebuilder performed a comprehensive mechanical and electrical rebuild of the lathe. For the critical CNC element of the refurbishment, it chose to retrofit a high-end solution from NUM, primarily because unique application-specific software developed by NUM's US facility helped overcome all limitations of the lathe's existing control system. The software is a tailored version of the NUMspinform control package for spin forming applications. The retrofit also includes a NUM FS151 operator's panel, a custom HMI programming interface and a customized machine panel.



Prior to the Aero Race Wheels application, the NUMSpinform interface employed a teaching method of programming where the operator begins by copying the shape of the forming tool, or mandrel, and specifying the desired wall thickness of the part; the CNC system then calculates a two-dimensional safety zone to prevent any roller-tool collision. Next, the operator spin forms the new part by controlling the X and Z axes of the roller manually via a joystick, while the CNC system records the motion paths. Before it is saved as the final production program, the recorded spinning cycle can easily be optimized by modifying the roller path in the X or Z axis – on the fly – using a calibrated hand-wheel.

In the case of Aero Race Wheels' 4-axis Autospin lathe, the preferred programming approach is to teach the mandrel safety zone, but to then draw the spinning cycle as a series of spline curves using an on-screen drafting tool. This drawing approach is now also part of the NUMSpinform solution. It has many benefits for a spinner, including a reduction in direct exposure to the machine elements, which increases safety, and a simplified learning curve for operators who do not have the years and years of spinning feel, required for the teach-in process.

NUMSpinform also accommodates offline program generation. Users can choose to create their own tooling files with the software's graphical drawing facilities, or import them from a design automation source such as AutoCAD, and then program a spin cycle using simple mouse-driven point-and-click techniques. As soon as the design is ready, all defined geometry can be converted into a production program with a single click of a button and exported to the lathe's CNC system to produce a trial part. The user is no longer bound by file storage issues to limit the number of spin cycles in the library, as the NUM system provides a local drive as well as access to a network drive.

The NUMSpinform package accommodates either a simple two axis spinning lathe or a four axis machine as in the case of Aero Race Wheels. Aero's machine slides can be programmed and operated as independent paths or in a method where the operator programs one X1/Z1 slide and the other X2/Z2 slide simply follows in a mirrored mode.
According to Marv Dailey, Design/Process Engineer, of Aero Race Wheels, "Our business demands very flexible manufacturing – we manufacture mainly in small quantities and we need to switch between batches as quickly as possible, as well as being able to trial new designs. The service provided by NUM and our machine rebuilder partner has been exemplary, giving us a combination of precision mechanics and state-of-the-art metal spinning programming and control. Product changeover typically now takes less than 20 minutes, and the semi-automated method of generating and optimizing spin cycle programs has significantly reduced development and operator training times. Offline programming also frees up time on this critical production machine, further boosting productivity."

Steven Schilling, General Manager of NUM Corporation, points out that application-specific software is central to NUM'hs business strategy. "Upgraded CNC software is often the most important element of a successful machine rebuilding project, and we have been very pleased with the outcome of this project, which resulted from the very close liaison between NUM's, the system integrator's and Aero's engineering teams."

NASCAR

RICHTER MASCHINENFABRIK AG

num CNC HighEnd Applications

Gigantic dimensions – Precision in the µ range

Richter Maschinenfabrik AG has spent years consolidating its comprehensive expertise in the manufacture of maximum dimension machines and system components. In combination with the knowledge NUM has built up in the CNC field over the last fifty years, Richter is able to produce parts with a single-piece weight of up to 300 tonnes. In this context, it is not problems which are being addressed, but rather challenges which are being mastered. Where others face failure with single-piece weights of 100 tonnes, Richter is in its element.

The Richter company was founded in 1945. Each year, Richter processes over 8,000 t of steel plates and 2,000 t of finished, flame-cut plates. The combination of all-embracing competencies found under the Richter roof ensures the customer benefits from optimal production quality and efficiency logistics management. The company, characterised by its boldness and eagerness to blaze new trails right from the very start, continues to grow and develop. Working in close consultation with its customers, Richter, as a work-order only producer, develops permanent solutions in its main business areas of welding construction, stress-free annealing, sand blasting, priming and varnishing, mechanical processing and assembly – consistently maximising its achievements.

Flame cutter utilising the angle-cut function

Over the last few decades, these outstanding capabilities of the Richter Maschinenfabrik Richter AG, which create competitive advantages, have helped the company to evolve into a reliable partner to innumerable well-known manufacturers in the most diverse industrial sectors. The industries it primarily caters to are energy systems, press machinery, system machinery for forging, and solid forging technology, tunnelling equipment and mining.

Being an all-round system supplier producing everything under one roof means providing CNC controlled flame cutting (for plate thicknesses of up to 300 mm), welding, thermal treatment, sandblasting, varnishing, mech. processing, metal cutting, vertical turning, assembly, packaging and transport (with access to inland shipping lanes). Richter Maschinenfabrik is able to offer its customers all these work processes and services, which are by no means a routine event in these magnitudes.

Just like the close collaboration with the aforementioned customers, Richter also works together with NUM when it comes to utilising CNC systems for processing materials or workpieces, and also when it comes to trying out innovative ideas which have never been realised before.

Large photo: 120 mm-thick, machined construction component
Photo, lower left: clean, unprocessed edge cut after using a flame-cutter
Photo, upper right: Angled cut with a thinner plate section already welded in

From left to right: Alexander Seiler, machine programmer and application specialist at Richter AG, Dirk Kunig, manager of the electrical department at Richter AG, and Bernhard Simon, sales manager of NUM Germany

NUM CNC control unit – Flexium 68

Flexium HMI on the upper screen, customer software on the lower screen, the NUM CNC control panel FS152i

In a recent example, a Flexium 68 CNC control unit made by NUM was installed to allow a flame-cutting machine with two aggregate heads to be controlled and operated. NUM was involved in everything from project planning to implementation, also overseeing the operational start-up. By limiting the points of contact on both sides to a few highly competent people, an effective solution could be swiftly developed which is now operating successfully every day. This co-operative venture was characterised by a very high level of flexibility and a solution-oriented approach by both parties, which created a high level of mutual trust while also allowing new projects to be tackled which are far from routine.

The flame cutter can process plates from 20 to 300 mm in thickness with a maximum size of 180 m². The machine is calibrated by laser and has a repeat accuracy well within the µ range. This high precision even allows Richter to process very large workpieces extremely accurately right from the start, saving time and therefore money during the subsequent work processes. The parts which are produced on this system are components utilised in the construction of excavators, presses, turbine assemblies (wind), etc. In this case, it is the girder components in particular which can be cut to order using the flame cutter.

To ensure the construction girders end up being lighter, pre-defined segments are cut out from the inside of the girder elements and are then replaced with thinner plate sections, restoring the flexural rigidity of the girder at the same time as saving material and reducing the weight. Because the plate sections which have been incorporated are thinner than the girder sections, the machine must cut an edge on both sides which is as level as possible, with the angle of the flame head being calculated by the NUM control unit in an "angle cut compensation" application by using a virtual contour offset. The type of tool path movement this enables allows contour cuts to be made with outstanding quality, also making post-machining of the workpiece superfluous.

The fact that both Richter and NUM maintain a keen interest in new solutions, true to the motto "if we rest, we rust", consistently developing and implementing these in active collaboration with partners, allows us to look forward to continuing the good working relationship between the two companies.

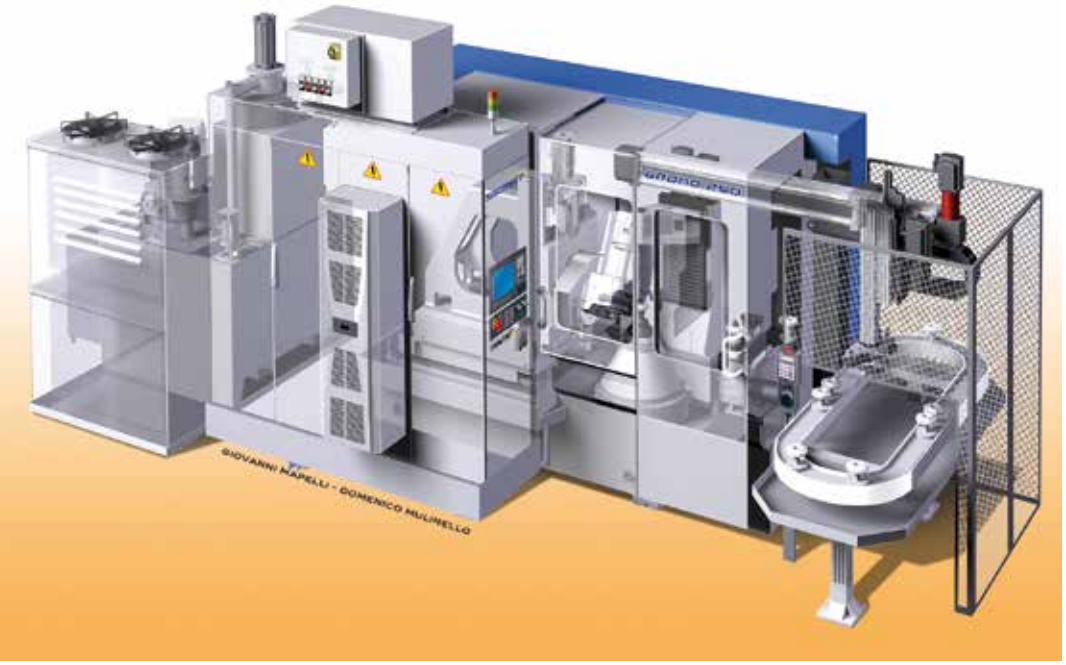
Precision

NUM to expand its presence in the automotive and automotive supplier industries

Sicmat and NUM speak the same language. Sicmat was founded 80 years ago, as one of Italy's first machine tool manufacturers. NUM was one of Europe's first CNC steering and application development companies. With its new Grono 250 twin power architecture gear honing machine, Sicmat has set a new industry standard for post-hardening fine finishing. The machine's ultra precise CNC steering program was developed by NUM, following extensive analysis of its motion control requirements.

Sicmat specializes in the development and manufacture of precision gear finishing machines for the automotive and automotive supply industries. The company's products use the latest technology to help customers maximize throughput and minimize their production costs – without doubt, the best business strategy for a European machine manufacturer in today's intensely competitive markets. Until four years ago, Sicmat specialized exclusively in machines that used shaving technology for gear finishing. This type of finishing process is used extensively by companies manufacturing medium to high quality gears for the automotive industry. However, in the past few years processes other than shaving have become increasingly competitive, so Sicmat has introduced a gear honing capability to its product portfolio – but typically, has approached it in an entirely different way to its competitors.

Input shaft of sports car transmission honed with GRONO 250



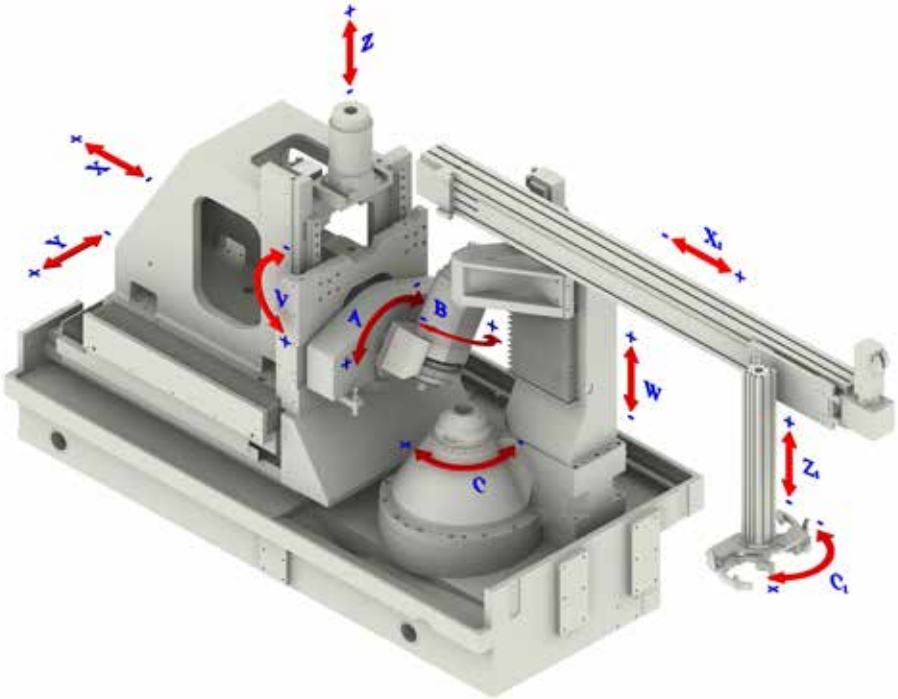
Grono 250 – Twin Power honing machine

Capitalizing on its extensive knowledge of the shaving process, Sicmat has completely changed traditional gear honing. The innovative Grono 250 machine features a honing wheel with external teeth, bringing the advantage of shaving to post heat treatment finishing. Designed specifically for ease of use and simple integration with other factory automation, the machine has very low installation and operational costs.

From left to right: Francesco Grippo, Technical Director, Marco Battistotti, Director NUM Italy, and Ettore Miletto Petrazzini, Managing Director, beside the bust of Alberto Petrazzini, the founder of SICMAT in 1932

Sicmat started out producing universal machine tools such as radial drilling machines, over the years progressing to highly specialized machine tools for gear finishing. The Grono 250 is based on an innovative platform conceived and realized by Sicmat, representing the culmination of more than 50 years' experience of manufacturing machine tools for the automotive industry. This history of innovation mirrors that of NUM, which has 50 years' experience in developing high-end CNC solutions. The platform's main mechanical characteristics are its cost-effective modular construction and exceptional stiffness – the bedplate is created from electro-welded steel filled with anti-vibration bonding. It is inherently resistant to vibration, thanks to the use of cast iron for the head, frame and tailstock. The physical layout of the platform provides excellent accessibility for operation and maintenance, and its vertical workpiece positioning facilitates integration with other automation on the production line. The Grono 250 has 11 motion axes, all controlled by a NUM Flexium CNC system. The main machining axes are operated by direct-drive motors, while the honing wheel and workpiece axes are driven by electro-spindles. The two electro-spindles are synchronized and controlled by a specially developed NUM application. They operate in a unique master-slave configuration, but without any delay of the slave spindle. The spindles can currently operate at speeds up to 7,000 rpm, and machines are already in development with 10,000 rpm spindles for even tighter control of the production process.

Twin Power honing machine & Twin Power shaving machine platform



The Grono 250 is uniquely positioned: it combines the advantages of both power honing and grinding processes, with none of the disadvantages of either process.

NUM Flexium CNC control

Sicmat and NUM have large booths at the IMTS 2012 exhibition in Chicago. Both companies will be highlighting their commitment to cooperative development with their customers, to ensure that their high end production needs are fully satisfied.

Twin Power

EuropTec – high precision from Switzerland

EuropTec has grown from a Swiss family business to a globally operating industrial supplier of high precision glass and plastic components. NUM Flexium CNC systems have helped the company to shorten and optimize a critical production process, increasing throughput dramatically. This increased productivity gives EuropTec a major advantage in the highly competitive automotive supplier industry.

Competition in the automotive supplier industry is fierce. Companies need to produce high quality products at affordable prices to stay ahead of the game. To help meet these objectives, EuropTec employs advanced manufacturing automation to ensure its production processes operate at peak efficiency. Its most recent addition is a high throughput water jet cutting machine, for producing laminated glass screens used in the central information displays of automobiles.

Made by a European manufacturer, the water jet cutting machine has three cutting stations, each with its own cutting head; these operate in parallel and concurrently, but instead of being rigidly joined to one another are controlled individually by a NUM Flexium CNC system. The machine has 17 CNC axes which are divided into four channels. Three of the channels accommodate 5-axis interpolation with RTCP (rotating tool center point) and tool correction functions.

High precision water jet of a water jet cutting machine

Water jet cutting machine with 3 parallel, but independently moveable, water jet cutting heads controlled by a NUM Flexium CNC system

All three cutting stations are separately loaded with laminated glass plates; each plate is pre-printed with borders for multiple display screens. A special procedure uses camera sensors to determine the exact positions of the display screens and passes this information to the NUM CNC controller, which calculates the starting point for each of the cutting heads. All three cutting heads then move in parallel to their respective starting positions and begin cutting in synchronism. The cutting heads' ability to operate independently, but in parallel, is essential for production efficiency

and high work quality. If the individual cutting heads were rigidly connected, it would be impossible to cut pre-printed display screens from three separate glass plates due to the tolerances involved. This would necessitate each display screen being printed separately after cutting, which is inefficient and time-consuming. The glass plates would also have to be aligned precisely, which is difficult to achieve and would further add to production costs.

EuropTec is currently using the machine to produce glass screens for the central information displays in luxury class and top of the range vehicles made by a German automobile manufacturer. For this application, it is particularly important that the glass does not have any shiny reflective patches, which could be distracting for the driver. The edges of the screens are therefore cut by tilting the water jets at an appropriate angle to ensure that reflections do not occur. This is the type of small but extremely important detail that helps distinguish high end vehicles from less expensive models.

Control panel with NUM Flexium HMI

Thomas Wechsler, Head of Operations, EuropTec AG Oftringen

The water jet cutting machine is run 24 hours a day, during which time it produces approximately 2000 glass screens. "Europtec offers far more than just glass and plastic, and is renowned as an 'added value' supplier. This sets us apart from the competition", says Thomas Wechsler, Head of Operations at EuropTec AG in Oftringen. "EuropTec machines, coats, prints, bends, sticks, laminates and assembles glass, ceramic, transparent and industrial plastics in all kinds of variations. Our customers benefit from this vast amount of expertise, which we have accumulated over many years of experience."

Complete water jet cutting machine, showing operator's control station and process waste disposal unit

High Precision

MECCANICA
PONTE CHIESE

25-year collaboration brings continued success

Meccanica Ponte Chiese is a family owned company with 40 years' experience in the field of mechanical machining. To help it stay ahead of competitors, the company has always used the most technologically advanced manufacturing solutions available. For the past 25 years, it has based its operations on high quality machines built by MCM, incorporating CNC technology from NUM. Business success and efficient management have enabled the company to invest heavily in its operations over the past decade, including provision of a new building and production system with a significant number of CNC machining centers from MCM – all equipped with NUM CNC high performance control systems.

3 parallel CNCs by MCM with one common high-rise storage rack for the work pieces and 3 individual high-rise racks for the tools, one of them clearly visible in the front

Typical work piece – a part of a boat engine

The company handles precision machining of medium and large sized components fabricated from materials such as cast iron, aluminum and steel, involving the mechanical removal of shavings and comprehensive workflow management. Its principal markets are earth-moving vehicles, marine and industrial equipment, and printing and textile machines. Meccanica Ponte Chiese has the major advantage that its MCM machinery is ultra modern and incorporates advanced CNC technology, enabling it to stay one step ahead of its competitors through production flexibility; this same forward-looking philosophy is shared by NUM, which is one of the reasons that the companies' 25-year collaboration has proved so successful.

Most of the production process is automatic and computer-controlled, allowing the machinery to operate 24 hours a day with minimal supervision by the company's highly qualified

From left to right: Mirko Ferraboli, Technical Manager, Monica Ferraboli, Export Sales Manager, Marco Battistotti Director NUM Italy, Giovanni Ferraboli, General Manager and founder of Meccanica Ponte Chiese and Gianluca Ferraboli, Production & Quality Manager

staff. Each work piece is mounted on a pallet which is tracked by a computer system, with all work-in-progress temporarily held in high-rise storage racks. The pallets are automatically retrieved by CNC-controlled robotic handling systems, which transport them to the appropriate CNC machine for the machining process. This type of workflow management makes it easy to instantly ascertain the status and position of any particular work piece – at any time of day or night. The machine operator is able to see immediately on-screen which work piece is currently in production, as well as the position of any other work pieces in the storage rack.

Above: Work piece control of the 3 CNC machines by MCM

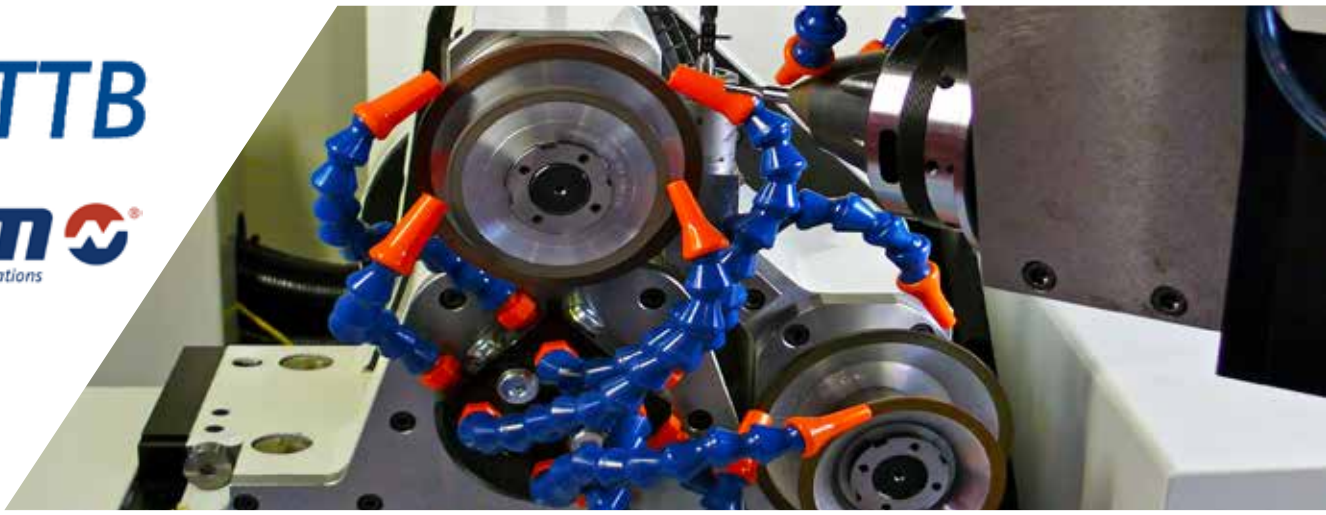
Below: Work piece inside an MCM machining center

Meccanica Ponte Chiese implemented its latest CNC machine complex in 2011. The complex built by MCM comprises three interlinked 5-axis CNC machines, each equipped with a NUM CNC control system, NUM HP servo drives and NUM BPH series motors. Each of the three CNC machines has a high-rise tool rack holding between 400-500 tools, which means that the complex has access to approximately 1,300 tools! The CNC machine automatically searches for the required tool, and a CNC controlled robot then fetches the tool from the rack, transports it to the machine and mounts it ready for use. A special computer program continuously monitors the condition of each tool. Providing the tool is in good condition, an on-screen image remains green; if the tool's parameters become critical because it has been used for a lot of production, the image turns yellow. However, if any of the parameters are outside tolerance measurements, the tool is blocked from further use and its screen image appears red, indicating to the operator that the tool needs to be exchanged.

Allocation of work pieces to particular CNC machines is also handled completely automatically. Each CNC machine has its own high-rise storage rack for work piece pallets; in the case of a multiple machine complex, the pallets are held in a single rack and the associated CNC controlled robotic handling system serves all CNC machines in that complex. As soon as the machining work is finished, the robotic handler returns the pallet to its appropriate position in the storage rack.

Giovanni Ferraboli, the founder of Meccanica Ponte Chiese, runs the family business with his wife and three children Gianluca, Mirko and Monica. Thanks to its highly flexible production infrastructure and small adaptable workforce – there are just 18 employees – the company is able to respond quickly to customer demands for small batch sizes. Meccanica Ponte Chiese has the major competitive advantage that it can produce high quality precision work, in small to large quantities, within a short timeframe and at a reasonable price. This is principally because the machinery is completely automated and computer-controlled, which minimizes changeover time between one type of production and another – and as we all know, time is nowadays the most valuable asset of all.

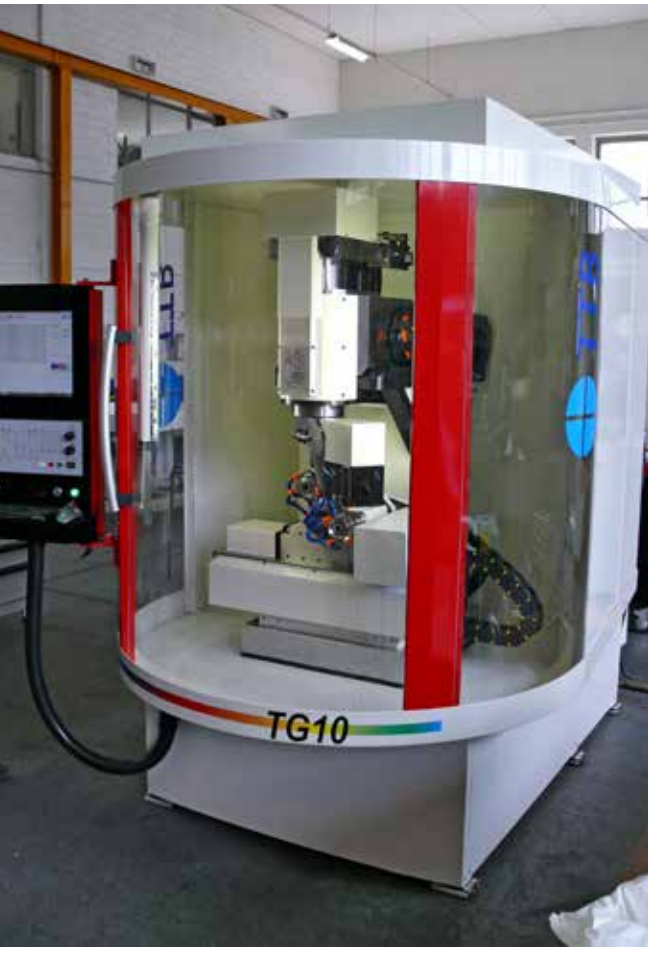
Advanced



CNC High-Precision Grinding Centre

When it comes to machines for producing spiral drills with diameters as small as 0.02 mm or lengths up to 450 mm, TTB (SAACKE Group) is one of the industry's prime innovators. The company manufactures high-precision tool grinding machines equipped with the latest NUM CNC control systems, and supplies customer-specific technology for tool grinding applications in carbides, HSS and other special materials. The extraordinarily productive collaboration between TTB and NUM is now entering its tenth year, with consistent growth assisted by a lively exchange of knowledge in developing new products.

NUM Flexium CNC control system

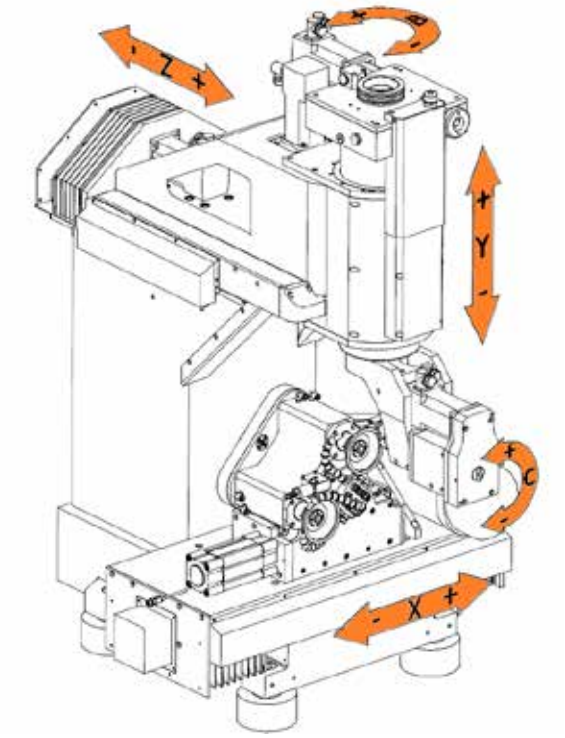


TTB TG10 high-precision grinding centre

TTB unveiled its latest innovation in grinding technology – the TG10 high-precision grinding center – at GrindTec 2012. This latest generation production machine uses a unique vertical axis configuration to minimize physical space requirements and accelerate throughput. The machine's linear axes employ a satellite drive system to maximize reliability; this technology is also used by the aeronautical and aerospace engineering sectors for exactly the same reason. Together with the symmetrical arrangement of the axis kinematics, this results in a feed movement that is up to three times faster than conventional machines, as well as contributing to the TG10's extremely compact design. The machine is controlled by a NUM Flexium CNC system and NUMROTOplus tool grinding software, which provides a direct and very efficient path between tool design and manufacture.

Built to the same high quality standards as TTB's renowned TGC and Evolution tool grinding machines, the new TG10 marks the company's first venture in cost-reduction engineering. TTB developed the TG10 in direct response to increasingly sophisticated market demands for machines offering improved productivity, flexibility and efficiency at the lowest possible price, but without compromising on quality. The design objective of creating a precise, high quality machine with a low acquisition cost has been fully realized, giving TTB a significant advantage over other machine manufacturers in this market segment. NUM is delighted to have helped and supported development of the new machine, while at the same time honoring its mission statement, "NUM CNC solutions help machine manufacturers gain a competitive advantage".

The new kinematics of the TG10 introduce precisely controlled movement to the tool grinding process. The machine's innovative vertical axis architecture was developed by TTB and capitalizes on the performance of NUM's latest generation axis drives to boost productivity by means of fast feed rates and short traverse paths. High levels of stability and rigidity are ensured by the design's exceptionally compact nature; the machine only requires a small



On the left: TG10 kinematics with high stability and rigidity thanks to a compact design and innovative vertical axis principle

On the right: Front view of the TG10 with the swivelling grinding wheel changer

amount of space at the user's production facility, which simplifies installation and helps reduce costs.

Using the new grinding wheel changer for the TG10, the production cycle is accelerated even further. Spindle changing times are reduced considerably by the swivel unit, and the standard grinding wheel changer can be upgraded to a unit with a maximum of four holding fixtures. Up to 800 work pieces with a diameter of 16 mm and a maximum length of 150 mm can be accommodated by the automatic loader, facilitating uninterrupted volume manufacturing; different versions of loader are available to match users' needs.

The combination of NUMROTOplus application software, advanced CNC control and innovative kinematics introduces considerable flexibility to the machining process. Capable of outperforming conventional tool grinding machines by a significant margin, the TG10 provides machine tool manufacturers with a reliable, low cost means of accelerating production. Equally suited to volume or small batch manufacturing, the machine enables even newly-developed custom tools to be machined effortlessly and cost-effectively.

Below, from left to right:
Roberto Vassalli, CEO TTB
Juan Carlos Guanella, R&D Manager
Carlo Martucci, Technical Director
Sandro Pollicelli, Mechanical Design Engineer

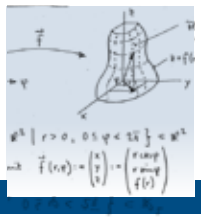
Revolutionary

numroto®

Total solution for tool grinding

25 years of high technology in toolgrinding

YEAR	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
NUMROTO-DOS	1.0	1.2	2.2	4.0	5.0	5.2	5.3	5.4	5.6	5.8	5.9	6.0	6.1							
NUMROTOplus									1.1.0	1.1.5	1.2.1	1.3.1	1.5.0	1.6.0	2.1.1	2.5.0	2.5.4	2.6.0	2.7.1	2.8.0
DOS	3.3		4.0		5.0		6.0		7.0											
Windows					3.0		3.1		95				98		2000/XP					
PC Processor	80386 20 MHz		80486 25 MHz		80486 50 MHz		Pentium 60 MHz		Pentium 120 MHz		Pentium II 300 MHz		Pentium III 600 MHz		Pentium 4 1.7 GHz		Pentium 4 3.2 GHz		Pentium Dual Core	
NUM CNC	750/760				1060				1050				Axium							
NR-OEMs	Strausak (1987)		Saacke (1990)		Ewag (1991)				UWS (1995)		Hawema (1998)		StarCutter (1999)		Deckel (2001) Zaro (2001)		Farman (2003)		TTB (2004) Kennametal Widia (2004)	



1987

First hand-written documentation

1987

First 2D simulation from NUMROTO-DOS

1989

Second version of the 2D simulation from NUMROTO-DOS

1989

First NUMROTO brochure

1995

Start NRplus Development

1999

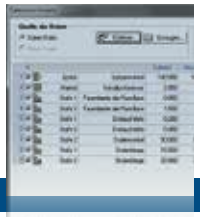
First NUMROTOflash

1999

Use of a central data base with all NUMROTO data for all machines of a company.

2000

Photo of the first GrindTec stand 2000



2000

Data interface to measuring machine

2001

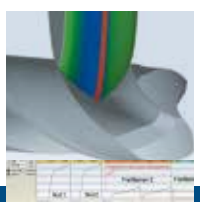
3D-Simulation Vericut

2006

First NUMROTO 3D simulation

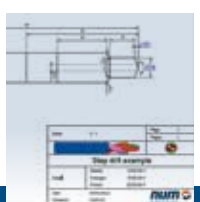
2006

Measuring in process



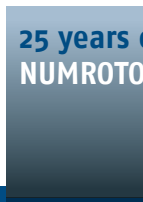
2007

QW' analysis in NUMROTO 3D simulation



2012

Presentation of NR Draw



2012

3000 NUMROTO-Installations
40 different machine models
1000 customers in 50 countr

NUMROTO Draw: Automatic Product Documentation for Ground NUMROTO Tools

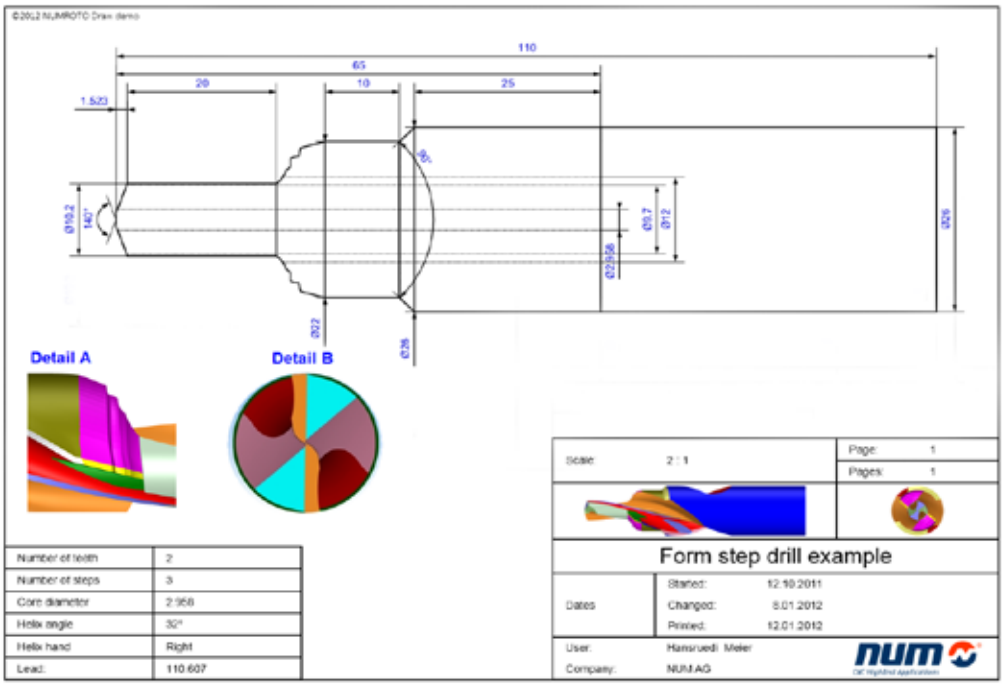
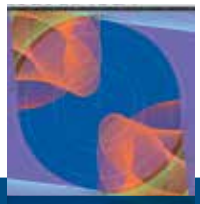


Figure 1: Tool drawing of a step drill

2007	2008	2009	2010	2011	2012
2.9.0	3.0.0	3.5.0	3.5.1	3.6.0	4.0.0
Vista		7			
Core 2 Duo		Core i5		Core i7	
				Flexium	
				Paragon (2012)	



1996

2D-Simulation NRplus

1'oooth NUMROTO delivery

2004

NUMROTO is very widespread on the market with over 3000 systems. Many millions of tool data sets are saved on these systems. For both existing and new tools, NUMROTO Draw provides product documentation that is both uniform and realistic. This documentation is generated on a largely automatic basis, saving time and money.

Today's certification practice ideally demands that every product be supplied to the customer with product documentation. Consequently, tool manufacturers and resharpeners also increasingly require such documentation.

In contrast to the drawing generators which have been on the market to date, NUMROTO Draw is more an output generator which uses the complete infrastructure of NUMROTO. It builds on the NUMROTO data, so to speak. In order to be able to create a front elevation drawing, it is necessary that at least the variables that define the spatial route of the cutting edge be defined. NUMROTO Draw then derives the drawing from this data and dimensions it. If the tool is fully programmed with all the grinding wheel data in use, NUMROTO Draw can also apply 3D details and integrate them into the drawing.

The standard dimensioning is generated automatically. If this does not correspond to the customer's requirements, the dimensioning specifications can be shifted where appropriate and additional dimensioning can be added. For detailed views, 3D objects obtained directly from the 3D simulation are provided and can be arranged on the sheet in selectable positions. Since the 3D simulation shows every detail in a realistic manner, this ensures that the end customer sees even very complex details or sections in the same way as they will be ground on the tool grinding machine. These details can be shown in colour (Figure 1 Detail A) or as a wireframe model (Figure 1). The document header can be designed by the user on a customer-specific basis. All fields can be edited and the tool designation can be copied directly from the NUMROTO database. In addition, a separate table with parameters of the illustrated tool can be placed on the drawing. The table can be formatted according to customer specifications. The text can be edited and the values copied from the NUMROTO database. Table templates are provided for tools of the same type. This reduces the effort required for a new drawing to a minimum.

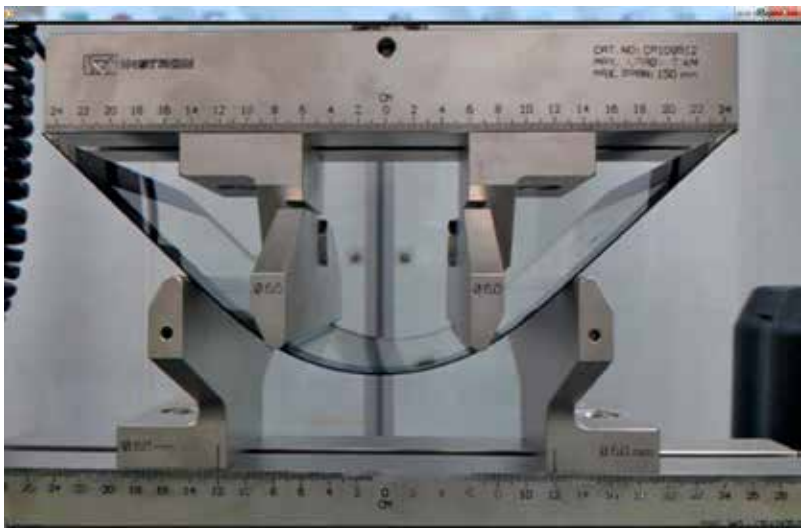
25 years

Collaboration speeds development of new-generation glass finishing machines

Customized CNC systems and in-depth engineering support from NUM are enabling specialist machine manufacturer Viewtrun Technology to enter and compete in fast-growing markets in Asia.

Based in Taiwan, Viewtrun is developing a range of glass finishing machines for consumer electronics products that set new cost/performance levels in this highly competitive automation sector. This market is currently dominated by Japanese manufacturers, producing mainly high-end machines.

Viewtrun's first machine, the JG-500 glass grinder, has just been launched and is proving extremely popular. The machine is designed for manufacturers of flat panel glass-fronted displays for products such as smartphones, tablets and other touchscreen devices. After a glass panel is cut to size, its edges need to be precision ground to remove the chips that are an inevitable result of the cutting process. The work necessarily involves close working tolerances, to ensure that the panel retains the correct form factor once its edges have been smoothed.



The structure of the glass changes after its edges have been polished, increasing its breaking point significantly

Some examples of Viewtrun's application

Viewtrun has chosen to base all its machines on CNC systems from NUM for a number of strategic reasons. First and foremost, the company wanted to partner with a CNC company prepared to collaborate on the development of custom hardware and software to shorten its time to market and add value. Secondly, the CNC system itself needed to have an open architecture, to provide a flexible platform for future machine development.

According to Adrian Kiener, Managing Director of NUM Taiwan, "The market for glass finishing machines is relatively young, so Viewtrun didn't want to get locked into proprietary control technology that might preclude taking a particular design route sometime in the future."

The very successful NUM 4-axis JG-500 from Viewtrun with customized HMI. The entire control system was developed by NUM Taiwan

New Generation

The JG-500 precision glass grinder is a 4-axis machine with a double spindle. There are two linear axes – X and Z – and a spindle motor mounted on the vertical Y axis. All four motion axes employ NUM servomotors driven by MDLU digital servo drives, which together with the spindle motor are controlled by a NUM high-end CNC system. High speed interpolation techniques ensure tight, cost-effective positional control of motion.

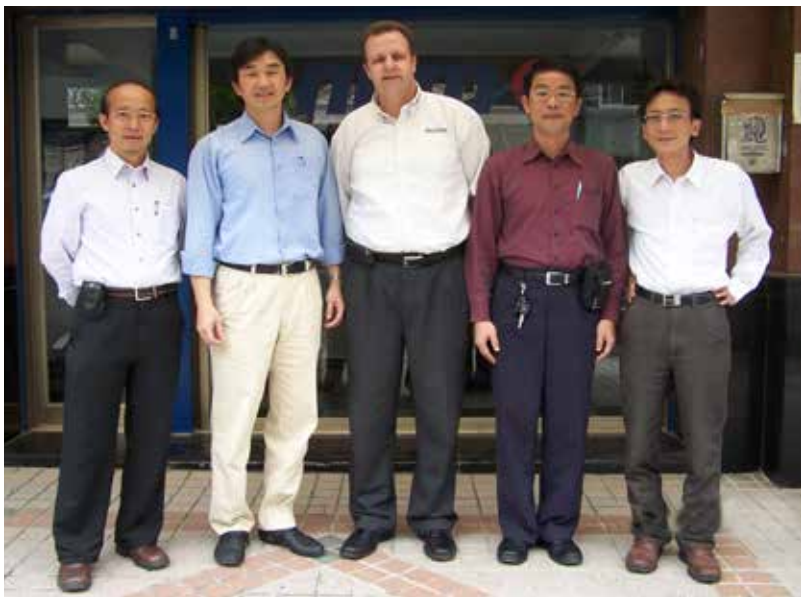
A custom HMI, which utilizes special functions and parameters, and employs the Chinese language for all operator communication, was specially developed for the JG-500 by NUM Taiwan. The HMI links to a parts database that was also created by NUM specifically for the machine. NUM's ability to provide this level of local development support was another factor behind Viewtrun's choice of CNC solutions provider; it judged that it would obtain more responsive service from a company that operated in the same country.

Depending on the dimensions of the glass panels being processed, the JG-500 is capable of grinding up to three times faster and more accurately than similar machines from competitors. The panels then undergo a separate finishing stage, where their edges are polished to alleviate stresses that build up in the glass during the cutting process.

Viewtrun has also developed a machine – the JP-6MA – that combines glass panel grinding with edge polishing to an accuracy of a few microns, to further simplify the production process and help reduce scrap. This machine has six motion axes and two spindles, again controlled by a NUM high-end CNC system. Launched in Q4, 2011, the JP-6MA is currently sold to specific customers in Taiwan.

Thanks to its very high accuracy polishing capability, Viewtrun's JP-6MA machine produces glass panels that have an unprecedented bend strength, significantly reducing the risk of them breaking during use. The unique design of the polishing tool and associated process provide Viewtrun with a powerful competitive advantage in this sector of materials finishing automation.

Adrian Kiener of NUM Taiwan adds, "A partnership ethos has always been at the heart of NUM's business philosophy. This is proving particularly advantageous in Asia where NUM's willingness to share the risk that young OEMs face when developing new machine tools is winning us significant new customers such as Viewtrun."



from left to right:
Mr. Yann Song
Technical Manager NUM Taiwan
Mr. Joshua Kong
CEO Viewtrun
Mr. Adrian Kiener
Managing Director NUM Taiwan
Mr. Ivan Chen
Vice General Manager Viewtrun
Mr. Roy Chen
Independent Consultant

CNC Complete Solutions Worldwide

num®
CNC HighEnd Applications

NUM systems and solutions are used worldwide.

Our global network of sales and service locations guarantees professional service from the beginning of a project to its execution and for the complete life cycle of the machine.

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Visit our Website for the current list of locations.

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