num information

JOURNAL FOR CNC-TOTAL SOLUTIONS

num
CNC HighEnd Applications

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Editorial
Peter von Rüti, CEO NUM Group

Dear readers,

The topics „**Industry 4.0**" and „**IIoT**" continue to dominate the covers of numerous trade journals. As in last year's issue, this year too we are dealing with the topic once again. This time, however, the focus is on implementation and data transfer.

Did you know that Flexium⁺ 4.1 or higher supports OPC UA? **OPC UA** is the next generation of OPC technology for data exchange in industrial communication. OPC UA differs considerably from its predecessors, in particular in its ability to not only transport machine data (control variables, measured values, parameters, etc.), but also to describe them semantically in machine-readable form. This makes OPC UA well suited for Industry 4.0 and IIoT applications as well as cloud solutions.

We can also support your IIoT application with Publisher functions based on **MQTT** (Message Queue Telemetry Transport) or with functions based on **MTConnect**. Appropriate solutions are also available on our systems for this purpose.

Starting with NUMROTO Version 4.1.0, the „**AC Grinding**" package (**Adaptive Grinding**) is available as an option. The main advantages of this new function are the improvement of the quality of tool surfaces and, in some cases, a considerable reduction in the production times of various tools.

Hydraulic axes are still in great demand for some machine types due to their special properties. This is especially true when very high power is needed or when space is at a premium. For such applications, NUM cooperates with an external partner whose hydraulic valves can be connected to the Flexium⁺ via a modern fieldbus. The hydraulic axes can be controlled like normal electric servo axes, making it possible to interpolate servo axes and hydraulic axes.

> "With our new TMX motors, we are expanding our servo and spindle motor range with torque motors. The TMX motors are specially designed for use on machine tools and are compatible with the torque motors of major competitors."
>
> *Peter von Rüti, CEO NUM Group*

In the area of control hardware we present new **industrial PCs** with quad-core processors. This processor structure allows commands to be processed in parallel, which significantly increases processing speed. The new industrial PCs also have industrial SSD drives. This speeds up access to the data stored on the drive considerably. The processors built into the PCs are part of the Intel Embedded product line, which guarantees long-term availability.

With our new TMX motors, we are expanding our servo and spindle motor range with **torque motors**. The TMX motors are specially designed for use on machine tools and are compatible with the torque motors of major competitors. However, they also have the advantage of a very low cogging torque. The TMX motors complement our partner company IDAM's extensive range of torque motors, which counts well-known European machine manufacturers among its customers.

IMTS opens its doors in Chicago in the autumn. NUM is of course on site again and looks forward to one of the highlights of the 2018 trade fair year: You will find us in the **East Building**, **Level 3**.

I hope that you enjoy reading this edition of NUMinformation and would be pleased to meet you personally at IMTS.

Peter von Rüti
CEO NUM Group

NUM on the Social Web

The use of social media channels is constantly increasing. This makes social networks ever more extensive and indispensable for NUM. But just being there is not enough. We provide continuously updated information on interesting new products, milestones achieved, international trade fairs, employee events, job offers and exciting press releases.

NUM's main social media presence is on LinkedIn, a web-based social network for maintaining existing business contacts and for establishing new business connections. We also place topical articles on Facebook, Twitter and YouTube.

So, are you following us already?

linkedin.com/company/num-ag

facebook.com/NUM.CNC.Applications

twitter.com/NUM_CNC
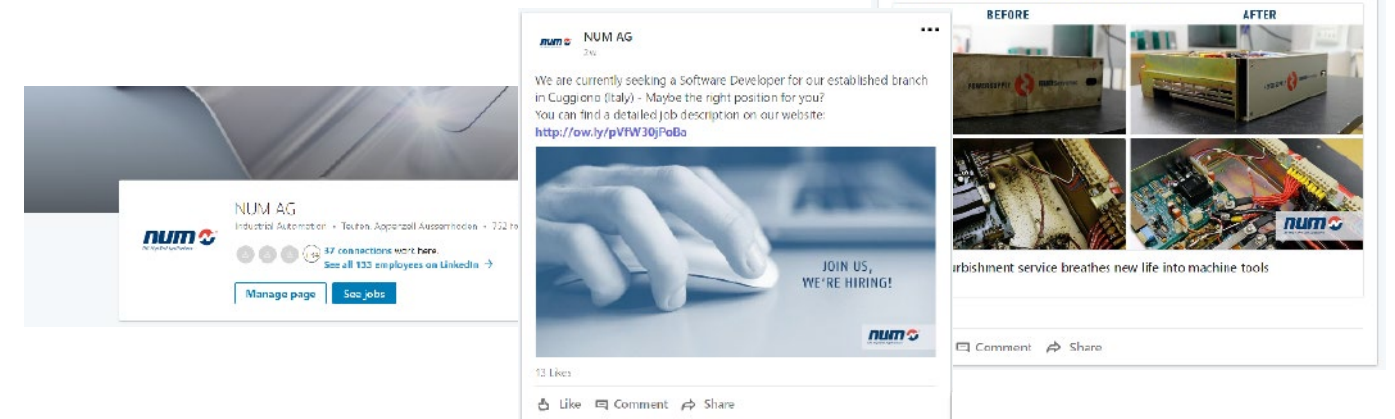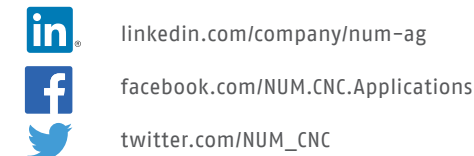
Events

NUM Event Calendar 2018

IMTS 2018
September 10–15, in Chicago, USA
East Building, Level 3

FMB 2018
November 7–9, in Bad Salzuflen, Germany
Hall 20, Booth H1

TMTS 2018
November 7–11, in Taichung City, Taiwan

EMAF 2018
November 21–24, in Porto, Portugal
Hall GAL5, Booth G528

SPS IPC Drives 2018
November 27–29, in Nuremberg, Germany
Hall 3, Booth 450

AC Grinding – Fully integrated, adaptive feed control

Advantages at a glance

- Shorter production times for a large number of tools due to
  - higher feed rate in areas of lower removal rate
  - higher feed rate during air grinding (defined by the operator)
- Smooth, even surfaces thanks to constant, controlled grinding pressure
- AC grinding can protect workpieces from excessive grinding pressure, which in turn helps prevent workpiece breakage and overloading of the grinding wheel
- Even wear of the grinding wheel during the process
- Permanent spindle current monitoring
  - Collision detection as monitoring function
  - Avoidance of consequential damage due to overload
- Feed controller offers individual marker functions
  - Reset after each tooth: The controller always starts with the preset potentiometer value
  - With marker: The feed controller starts at the next tooth with the old potentiometer value
- Feed controller parameter adjustable (optimization of controller behavior)
- Monitoring tool
  - Representation of the latest current flow during the respective grinding process
  - The recording function is used to evaluate the spindle current
  - Logging and storage of measured data for subsequent evaluation possible
- Detection of the condition of the grinding wheel used
  - Feed speed drops when the grinding wheel wears out („closes")
  - The necessary dressing or changing of the grinding wheel used can be controlled with this information
- Various settings can be set via the NUMROTO interface in a user–friendly manner
- Flexible definition of various monitoring and overload reactions (in the PLC)
- User–friendly handling of the potentiometer (the operator is always the master)
- The feed rate can be increased as well as reduced (depending on the defined pre–settings and current state of the grinding wheel)

Adaptive Grinding (AC Grinding)

The major benefits of this new feature include improving the quality of tool surfaces as well as reducing the production times of various tools. This is achieved by constantly measuring and monitoring the torque of the grinding spindle as well as automatically regulating the optimal feed rate. NUM's new purely software–based "adaptive grinding" feature can be integrated in all Flexium and Flexium⁺–based systems without additional hardware. To carry out a relevant spindle current measurement, a synchronous motor combined with a drive amplifier from the NUMDrive X or MDLU3 series are required.

How does AC grinding work?

The machine operator grinds a reference workpiece with a defined feed rate, during which the spindle current is evaluated. This spindle reference current value is then entered in the NUMROTO user interface. All subsequent workpieces are then grinded with identical reference currents. Thanks to the adaptive feed control, there is a constant grinding pressure during machining, which achieves uniform surfaces. The reference current value can also be called up and used on any machine for the corresponding workpiece and grinding wheel regardless of location.
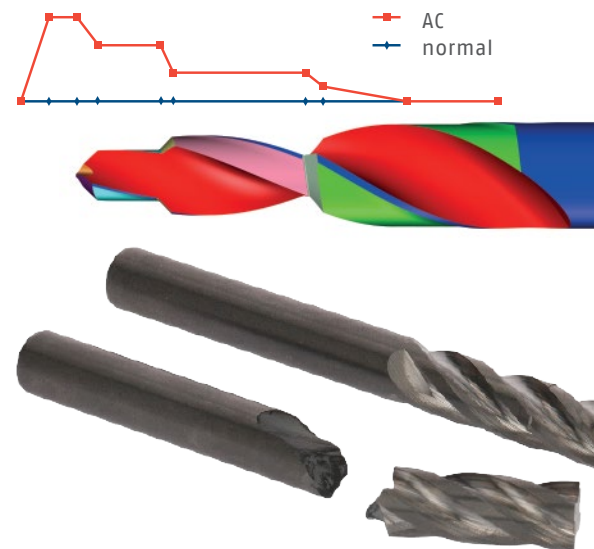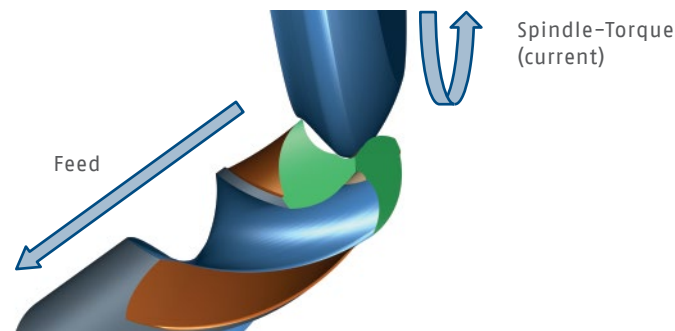
The „AC grinding" software package provides a recording function (monitoring tool), which records the current characteristic for the evaluation of the spindle current. The application offers various setting options, which can be set in the NUMROTO user interface in a user–friendly manner. During the AC grinding process, the machine operator master remains the master of the potentiometer and can intervene in the machining process at any time.

Shorter processing times

AC grinding can increase the feed to a defined maximum in „air grinding". When penetrating into the material, the feed is reduced back to the reference current in accordance with the processing force. Time is saved by accelerating in areas with little or no ablation volume. Test runs have shown that production times can be reduced by 10% to 30%.
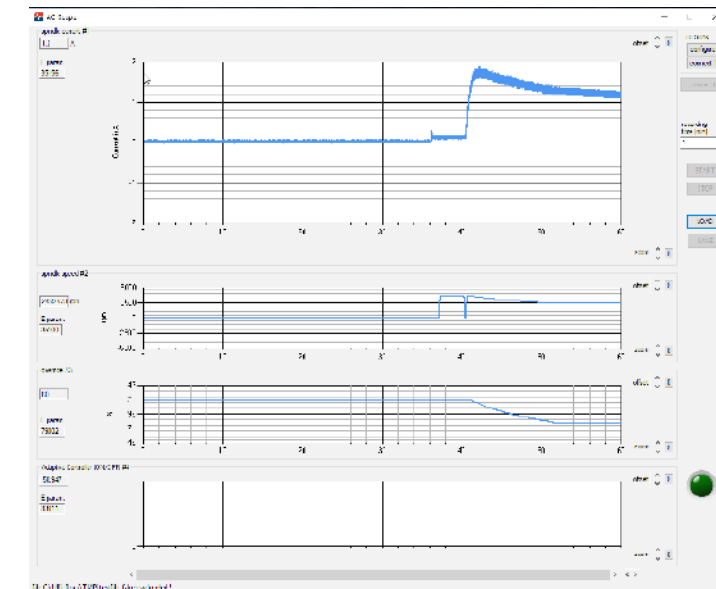
Protection against excessive processing pressure

Since the grinding pressure is controlled during AC grinding, parts can be protected from processing pressure which is (much) too high. In extreme cases, for example, blanks broken off by a worn tool can be avoided, which reduces waste.

Spindle–Torque (current)

Feed

- AC
- normal

Monitoring

AC grinding also provides monitoring functions for the spindle. Collision monitoring with a detection time of 2 ms immediately stops the machine when a configurable maximum current is exceeded and transmits a corresponding message to the PLC.

The wear of the grinding wheel can also be monitored. If the removal performance of the grinding wheel is reduced, the feed is automatically reduced by the control. If a predetermined minimum feed is fallen below, AC grinding sends a message to the PLC, which allows an individual reaction to the status. In this way, an automatic dressing of the wheel can be triggered among others.

Requirements and installation

As already mentioned, a synchronous motor and a drive amplifier of type NUMDrive X or MDLU3 are required for the spindle current measurement. But asynchronous motors can also be operated vectorially (with encoder). The use of other frequency converters can be checked individually.

Being a fully integrated solution between the CNC system and the NUMROTO software, installation is straightforward and easy with a software upgrade to existing machines.

The connection to Industry 4.0 is possible for effective and intelligent factory production.

Availability

The "AC grinding" package is available from NUMROTO Version 4.1.0 (around the third quarter of 2018).

Adaptive control not only for grinding

The basic function of AC grinding is the adaptive feed control, which reacts in dependence on the spindle load. The system can therefore also be adapted to various other applications.

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RTCP Editor, G164

RTCP Editor

NUM was already pioneering with RTCP and Inclined Plane solutions in the mid-80s. For those not too familiar with 5 axis machining, RTCP (short for Rotation around Tool Center Point), allows the center of an end ball tool to be maintained on the programmed trajectory whatever its orientation.

Defining the function seems easy, but implementing it is a little more complicated because each move on a rotary axis can generate an overspeed, an overtravel or even a collision, according to the current machine posture.

The initial solution based on Dynamic Operators has since been constantly improved to deal with most machine configurations, to efficiently manage the pitfalls and to handle the different situations together by keeping programming as simple as possible.

For this, two functions were developed: G24 for Inclined Plane machining and G26 for RTCP. They handle a large set of parameters to comply with different kinematics and machining situations. To limit the complexity, such functions are encapsulated in an upper level macro, permanently parameterized per machine requirements or to each channel independently for complex machines. Thanks to this, the part programmer can easily define machining operations with up to eight different kinematics (for machines with removable machining heads) and situations like RTCP activation – either after defining an inclined plane or prepositioning the tool, and taking part program origin into account before or after transformation, temporary suspension (e.g. for a tool change), reactivation, etc.

Lastly, we personalize this upper level macro. This operation is done permanently by the machine builder and to keep it as efficient as possible, Flexium Tools comes to the rescue in the form of a new tab in the CNC editor.

As shown in the picture, this tab reproduces the general look and feel of Flexium Tools, with a left window defining the main architecture and a larger right window for the associated parameters.

First are shown the general parameters as the macro number generally unique per channel, the location of saved variables, how to select a kinematic, how to indicate if RTCP or inclined plane is active or not, etc.
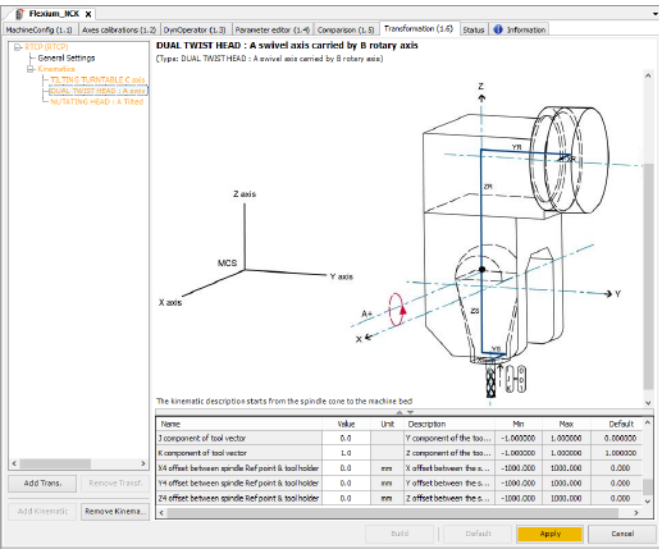
And then, a list of all 23 possible kinematics can be used on the machine. For each kinematic, its particular parameters like angles and offsets between axes and centers of rotation are entered. A full kinematic is always described starting from the spindle cone all the way to the machine bed.

Of course it is sometime necessary to re-adjust those parameters after a mechanical intervention, a collision or for some other reason. For this, NUM has developed a particular cycle (G248) which with a simple touch probe on a calibrated ball automatically takes the required measurements and adjusts the parameters accordingly. This macro can be run as often as necessary, either to adjust the kinematics or to simply validate the current settings before a sensible operation. This is another story that we will address in a future article.

G164

When running a CAD generated part program, every CNC system faces a dilemma: whether to strictly follow the programmed path or to optimize it to smooth the transitions. From the outset, NUM's philosophy has been the former: to strictly go through each set of coordinates of the programmed path. After all, if a point has been programmed there is a reason for it!
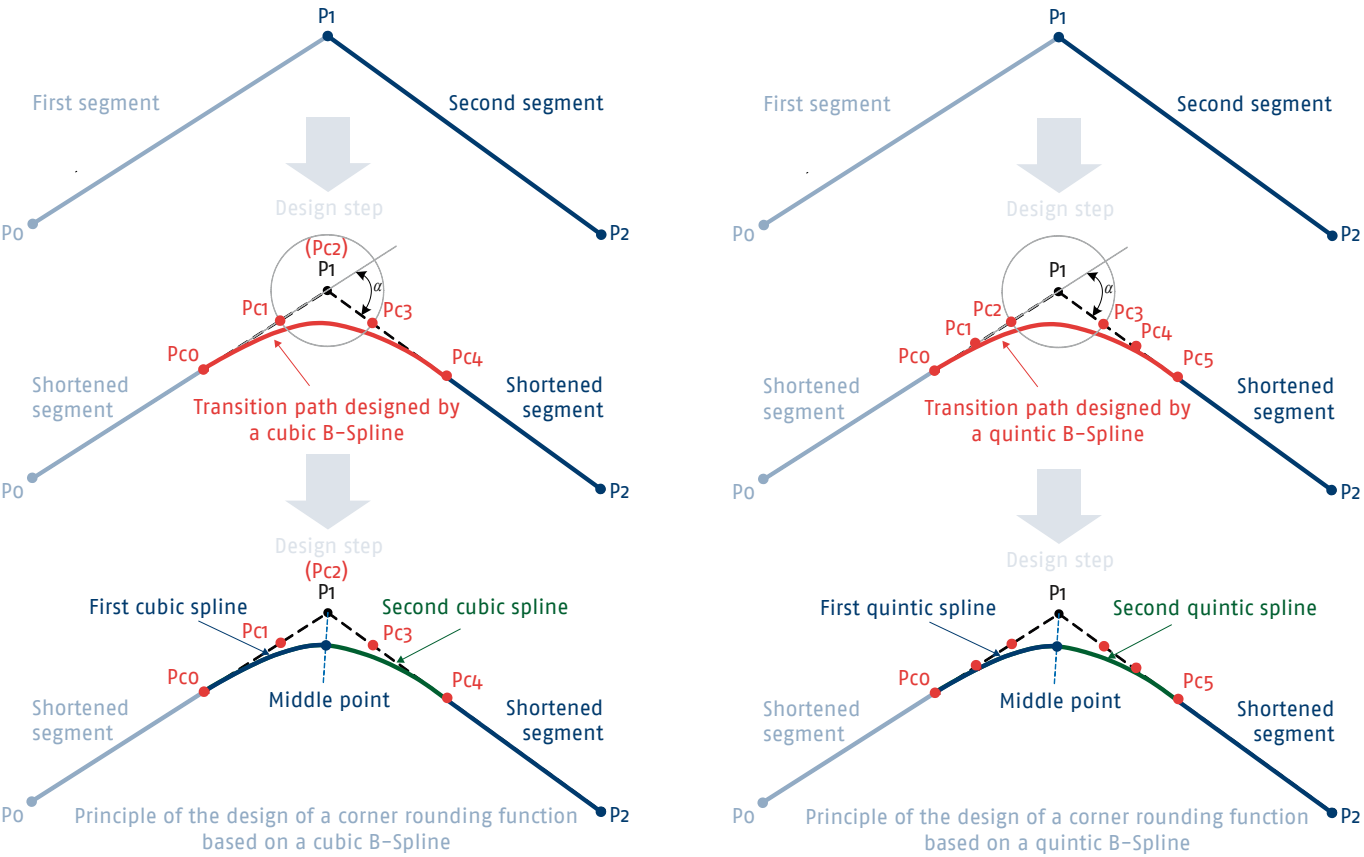
This of course assures the best compliance to the design, but there is a drawback: when two segments are not collinear (and they are not), then by definition they form an angle which is responsible for some micro orthogonal accelerations – and if those accelerations exceed a certain value, then the CNC will have to slow down the speed in order to pass the point without a shock. Of course, there are parameters to dictate what is acceptable and what is not, but as life is not perfect and the physics has immutable rules, it is always necessary to find a compromise between speed and accuracy.

Flexium+ is well known for its flexibility. Now, in order to maximize customers' possibilities – and still complying with its first priority which is accuracy – the CNC system offers several means of finding better compromises, each with specific advantages or for best-case use. Spline interpolation, polynomial interpolation and NUMcoss are now joined by the latest development in this matter: a corner smoothing function, known as G164. As it is a G function it can be invoked and revoked at several points of the program and remains modal in between.

The general principle can be seen in the following drawing. An exit and an entry point are calculated in the vicinity of the intersection of the two adjacent blocks, and then those two points are linked by a polynomial curve. They are calculated in such a way that no interference can be created and the polynomial curve can be either a cubic B-Spline or a quintic B-Spline (5th order). There is no limit to the number of blocks in which G164 is active and the function works with blocks as small as 100 μm.

The syntax is quite simple G164 [Hfile] Nbegin Nend ER.. [EQ..]* [ES..]* [ET..]*
- Hfile, Nbegin, Nend specify the portion of trajectory on which the corner smoothing function is applied
- ER defines the maximum permitted error (in respect to the programmed point)
- EQ is the type of polynomial
- ES specifies smooth or segmented polynomial interpolation
- ET is the engagement trajectory : tangential or linear

An interesting point to notice about this function is that it has been developed as a custom G code and not strictly embedded in the firmware. This gives additional flexibility but also demonstrates the power of the custom G codes feature. One could fear that these functions require too much system resource. This example shows that it is not the case; they are preprocessed and work directly on the firmware variables. Of course the computing power of Flexium+ is there, but a custom G code will be as efficient as an embedded function – and offer greater possibilities of adaptation. For more information on G164 or the custom G codes you can refer to the documentation or get in touch with your local NUM NTC, which will be glad to provide suggestions, examples and training if necessary.

Principle of the design of a corner rounding function based on a cubic B-Spline

Principle of the design of a corner rounding function based on a quintic B-Spline

IIoT, Hydraulic Axes

detection is possible through machine learning using artificial intelligence (AI).

As a result, AI can make sense of the whole bunch of data and therefore makes IIoT useful.

Please let us know when you start an IIoT project – we will be happy to support you.

INDUSTRIAL INTERNET OF THINGS

IIoT

To highlight the openness and flexibility of our system at the EMO exhibition in 2017, we decided to implement a real life Industry 4.0 application. So, let's start by implementing an IoT application. But what is IoT and what exactly is included in Industry 4.0 or IIoT? And how much do we have to implement on our own?

The main questions arose in the order that they appear in this article. The answer to the first question is rather simple.

IoT connecting anything with anything – or, if you prefer, everything with everything. (Reference: Building the Internet of Things/Page 12/Maciej Kranz).

This answer should push us in the right direction. We somehow have to connect our NC to the cloud. After some research, it was clear that the whole concept of IIoT lacks standards. And this lack of standards applies not only to the variety of protocols out there, but also to the purity of each protocol. You might have heard of OPC UA, MT Connect, MQTT or many more. The main purpose of these protocols is to collect or publish data from your machine at another place in your plant or cloud. Some are more popular in industry and others are more common for hobbyists and used for IoT. But on top of these protocols you can build your own applications which use your own proprietary or open protocols.

You may wonder what applications you should implement to catch up with the IIoT train. There are four main categories where you can place your specific needs. These are:
1. "Connected Operations":   where you join or link devices, sensors or meters to a network,
2. "Remote Operations":   where you monitor and manage your control systems,
3. "Predictive Analytics":   where you identify, understand and immediately react with the best actions, and
4. "Predictive Maintenance":   where you can increase uptime and productive hours.

In our case – for the display at the EMO 2017 exhibition – we chose "Connected Operations" paired with "Remote Operations". The connection of multiple NCs, which were installed on machines either at the show or in companies around the world, to the cloud over MQTT, were combined with a near-real-time dashboard where the actual values from these machines were updated instantly. The dashboard does not look as complex as you might think. Behind the scenes there are a lot of single components. It comprises a publisher on the machine itself, which obtains data from the NC and sends it to the cloud. Then there is a database where historical data is saved, and finally there is the user interface, which has to be multiplatform capable. Everything is connected via a secure message protocol.

We wanted to present the possibility of connecting a Flexium/Flexium+ system to the cloud and we reached that goal. But in doing so, we came to a conclusion: the whole topic is quite complex. Your goal is not to implement a solution or technology, instead you should think about implementing a change in your business process. You want to collect reliable data that you can use to improve the costs of a given problem using IoT. You will therefore have to define your own Industry 4.0 or IIoT concept with clear overall target definitions. You will have to decide which data needs to be obtained and processed. We can help you connect NUM CNC systems to the cloud or ERP systems, for example by using OPC UA, a cloud publisher or the SDK of FXServer. By doing so, we have to ensure that the data is shared in a standardized and interoperable format. This allows the solution to be expanded with minimal effort.

You may ask what the benefits of such cooperation are. Take "Predictive Analytics" and imagine the advantage in just being able to collect standardized information, compared to implementing the base on your own. In this case you can concentrate on the optimization of real problems in your business process. If the obtained data is not only from one system, but instead from multiple places, like your supply chain and the shop floor, you can optimize the process since the latency time is near zero.

But be warned; simply connecting devices and collecting data from a few sensors will quickly generate more information than you can handle. Your staff can be overwhelmed when the data starts rolling in faster than they can digest it, even with the help of alerts and other messaging. To handle this flood of information, significant data filtering has to take place. With machine learning and fog computing you should be able to extract the data you want. As an example of "Predictive Maintenance", you could use the data from a drive to detect a future failure of this respective drive or component and react in time to prevent failure of expensive parts. This
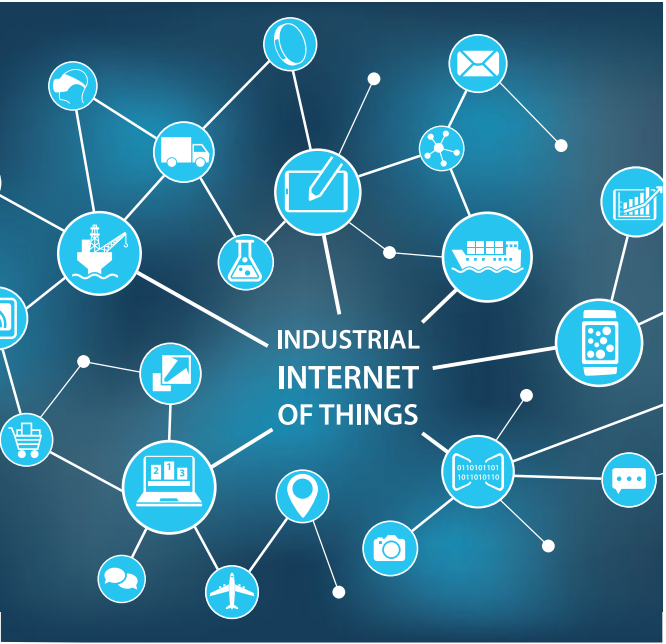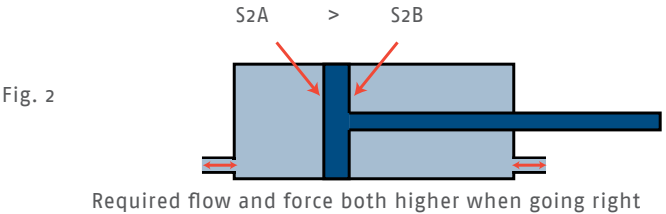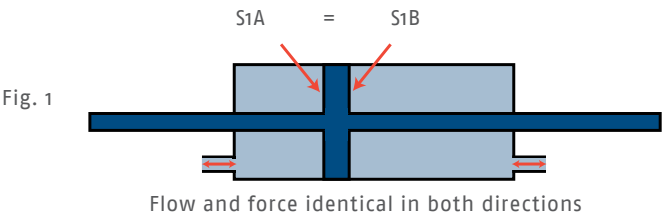
Hydraulic Axes

NUM systems are well known for their flexibility and suitability for less conventional applications and Flexium+ isn't an exception. A latest example is a recent application for hydraulic axes.

NUM's range of electric motors and associated NUMDrive X servos covers a wide field of possibilities. However, when high force is required, hydraulic axes remain an interesting solution.

For this specific application, NUM cooperated with a renowned worldwide company that specializes in the production of hydraulic valves, cylinders and the entire required environment. In particular, this company manufactures a hydraulic valve which can be connected to the Flexium+ PLC by means of a modern fieldbus.

The idea is, to not only make an auxiliary PLC driven axis, but also being able to handle this axis as any other NC axis, including interpolation, cutter compensation, canned cycles, calibration and so on. Here is where the power and flexibility of the Flexium+ architecture comes to the rescue.

PLC and NCK communicate through a Real Time Ethernet (RTE) link. A small firmware update has been written to exchange speed references issued by the interpolators and axis measurement device (encoder); all these data are exchanged through the fieldbus. Before transmission to the servo valve, the speed reference is adapted according to the direction of movement in the PLC to take into account the different possibilities of cylinder shapes (see fig. 1 / fig. 2). The position loop is then closed and adjusted with the standard machine parameters. The hydraulic axis is then controlled like any other axis. Of course the firmware update, which is now a standard feature, also includes some adaptations to compensate for the additional delay induced by the transmission to the PLC, in order to be able to interpolate the hydraulic axis with the more conventional NC axes, should they exist.

Fig. 1

S1A   =   S1B

Flow and force identical in both directions

Fig. 2

S2A   >   S2B

Required flow and force both higher when going right

Obviously, a hydraulic axis does not behave like an electric axis. Several parameters must be taken in account such as the oil temperature which can be challenging. Some parameters are already managed in the servo valve amplifier, but always in order to maintain the interpolation performance at its best, dynamic operators – another powerful Flexium+ feature – are put to use. At the pace of the axes sample task they perform additional tasks like specific integral gain to reduce following error at standstill.

This is just one of the many possibilities of using Flexium+ in a non-conventional way. Should you have any challenge to meet, do not hesitate to contact your local NUM Technical Center. Our sales and application engineers will be happy to demonstrate the endless possibilities that are hidden in our products and help you to increase your competitive advantage.

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OPC UA

How does NUM integrate OPC UA?

To have a Standard Interface for Industrial Communication in Smart Factories, IoT environments and Industry 4.0 solutions, OPC UA (Unified Architecture) is recommended and is integrated in Flexium+ systems. The OPC UA Server is fully integrated in NUM's RTS environment and can be released with this RTS option for a client TCP solution with PLC data variables.

The example below illustrates a standard OPC UA client to visualize PLC variables, connected to the Flexium+ system via intranet.
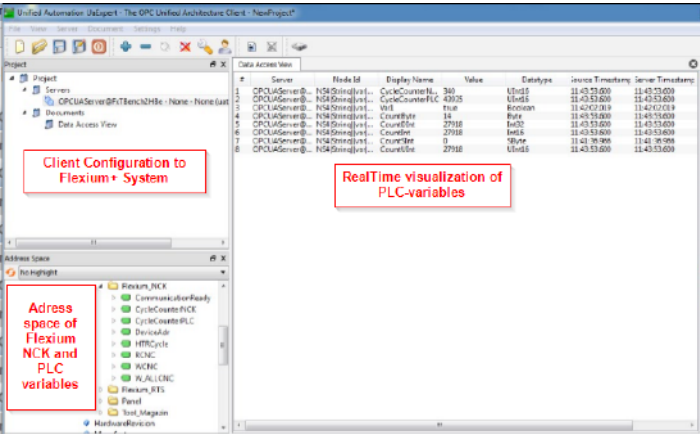
Left picture: after client configuration to provide access with the Flexium RTS (Server), you define address space inside the PLC program environment, specifying which PLC variables should be part of OPC UA communication. The specified PLC variables are displayed in the data access view window.

Right picture: this shows a simple visualization of PLC variables inside the Flexium+ system, facilitating communication evaluation of transmitted data.
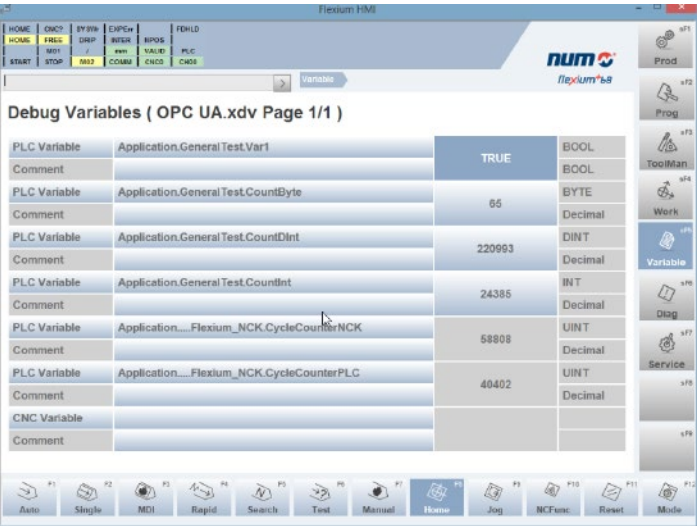
Note that to have access to read NCK variables (positions etc.) inside OPC UA, the NUM ENA lib is required and PLC adaptions have to be made.

The NUM's integration of OPC UA can support more than standard PLC information. In case you need to transfer CNC or any other information thru OPC UA you may need additional options / functions of the CNC system. NUM will be happy to advise you on all your Smart Factory projects.

OPC UA: Open Platform Communication Unified Architecture

What is OPC and why do we need OPC UA?
Since Flexium version 4.1.00.00, the optional "RTS license for OPC UA Server" communication channel is supported for Flexium+ platforms. Before presenting the OPC UA solution of NUM's Flexium systems, let's take a short look at OPC and the differences between OPC and OPC UA.

OPC technologies (OPC or OPC Classic) and servers were created during the early 2000s to allow information to be easily and securely exchanged between diverse platforms from multiple vendors and to allow seamless integration of those platforms without costly, time-consuming software development. But, the critical points were security issues and dependency on Microsoft platforms, as well as inefficient ways of moving data. So OPC worked well in the past, when the OPC application was managed very well.

Why do we need a completely new communication architecture called OPC UA?
OPC Classic was limited and not well suited to today's requirements of moving big data between machines/enterprises/internet systems and the systems that control real time processes to generate, observe and monitor "live" data.
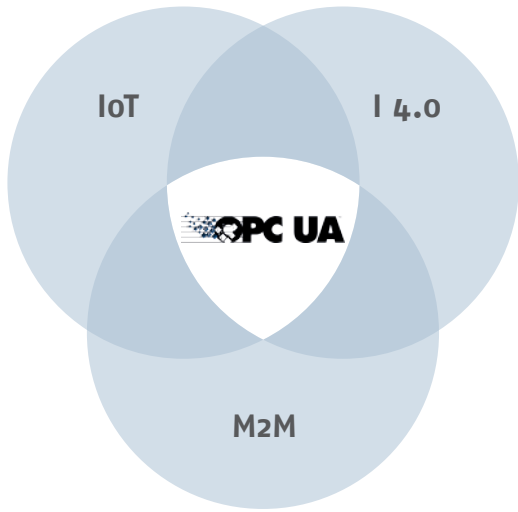
OPC UA is the next generation of OPC technology and can be described as information exchange for industrial communications. OPC UA is the first communication technology built specifically to live in a "no man's land" where data must traverse firewalls, specialized platforms and security barriers to arrive at a place where it can be turned into information. Therefore, OPC UA is suitable for Industry 4.0, IoT applications, Cloud solutions and Machine-To-Machine communication.

The advantage is, in particular, not only to transport machine data (control variables, measured values, sensor information, parameters, etc.), but also to write them semantically in machine-readable form to other machines, or via network/internet to other enterprise departments or smartphone/tablets etc.

The keynotes of OPC UA are:
- Safe and open mechanism for transferring any kind of information between servers and clients
- Scalable as well as platform- and vendor-independent (Windows, iOS, Android, Linux)
- Standardized communication over internet/firewalls (binary/HTTP)
- Service oriented architecture
- Security and data safety (rigid architecture with reliable communication mechanism to prevent data loss)
- OPC UA Companion standard (OPC UA for FDI/Enterprise and Control systems/PLCs/, etc)
- OPC UA provides a very flexible and adaptable mechanism for moving data between enterprise type systems and the kind of controls, monitoring devices and sensors that interact with real world data

OPC Unified Architecture

Interoperability for IoT, Industry 4.0 and M2M

IoT   I 4.0   OPC UA   M2M

Direct Drive Motors, NUM Flexium+ PC Hardware Evolution

## NUM further enhances motor range with launch of

TMX series torque motors

NUM has more than 50 years of experience developing servo and spindle motors. We pioneered the development and production of AC brushless servo motors, as well as synchronous spindle motors with flux weakening.

However, despite all this experience, for a variety of reasons NUM has never offered its own direct drive motor range. Until now!

The market situation has changed; customers nowadays prefer to obtain complete automation packages from a single supplier, in order to simplify relationships and responsibilities. Customers also increasingly request customized solutions.

Due to these changes, NUM has decided to develop and manufacture its own range of torque motors, known as the TMX series. At the moment the range is limited to two stator diameters: 140 and 291 mm, but the range will grow in the future. The torque-speed curve and schematic below show a NUM TMX140070 water cooled torque motor.

NUM's TMX series motors are compatible with the torque motors of major competitors but they have the additional advantage of a very low cogging torque – almost half that of competitor's solutions – as well as a very high S1 torque density.
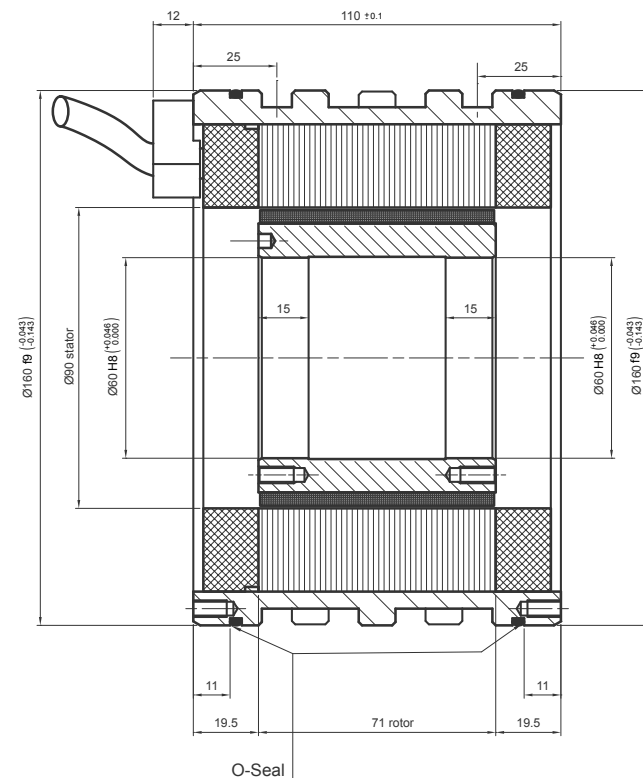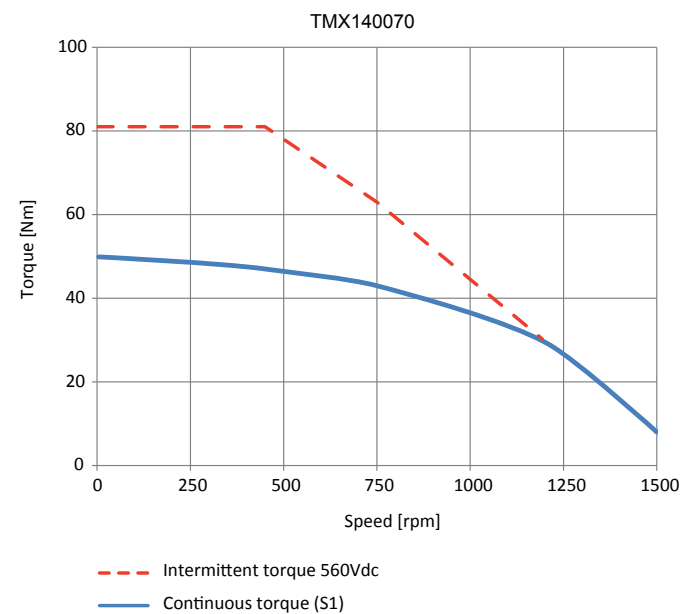
NUM Flexium+ PC Hardware Evolution

New NUM Industrial PCs with Quad-Core CPU Technology
The market is asking for a powerful industrial PC which fulfils the specific real-time requirements and has enough performance for Windows applications as well as extended communication interfaces like DVI, HDMI and faster USB 3.0 interfaces.

For this reason, NUM provides its fourth modern PC, based on the latest generation board which utilizes Intel® i5 Quad-Core CPU technology. The individual cores in a quad-core processor can run multiple instructions at the same time, increasing the overall speed for programs compatible with parallel processing.

NUM's industrial PCs are available in two performance levels:
- **P1**: standard performance with Celeron J1900 Quad-Core processor, hard disk and Windows Embedded 8.1 Industry Pro operating system
- **P2**: high performance with sixth generation i5 Quad-Core processor, Industrial SSD, 8 GB RAM and Windows 10 IoT Enterprise LTSB 64 bit

Both processors belong to the Intel embedded line to assure long time availability.

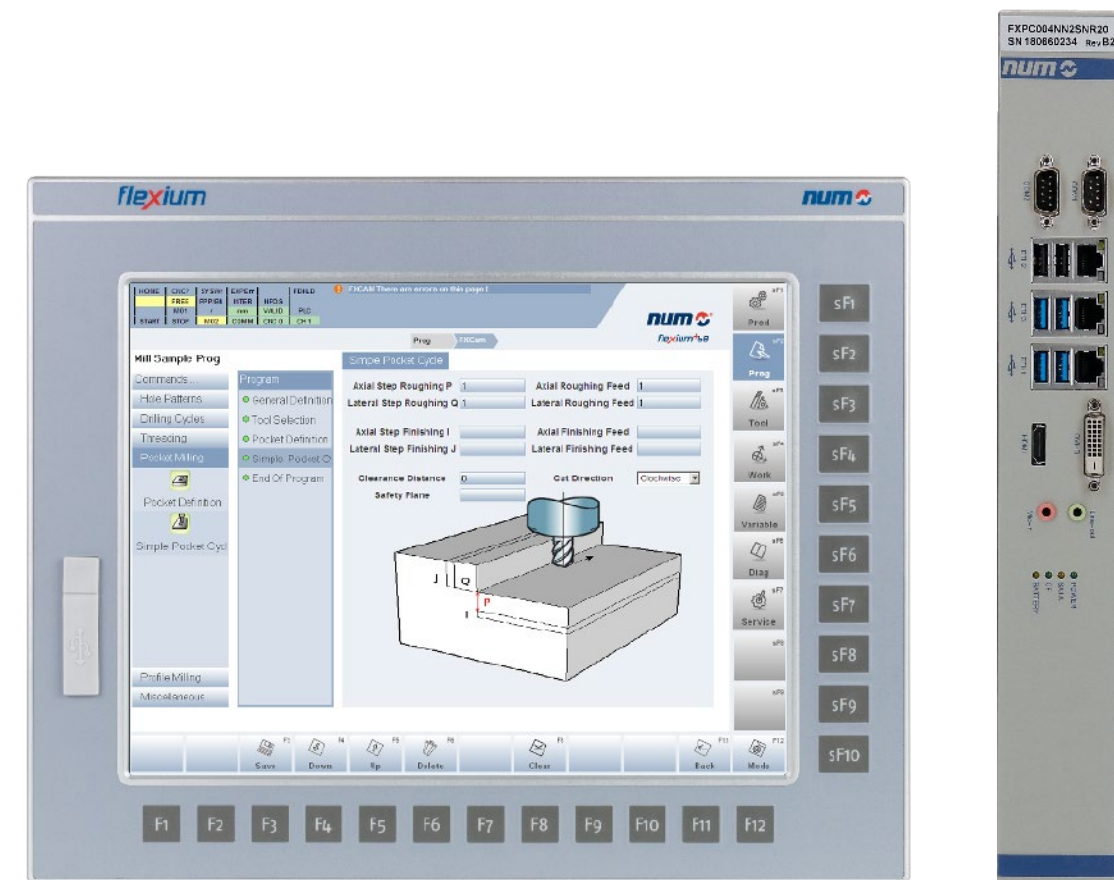All devices can be optionally equipped with a NVRAM+CAN board.

Different PC versions are available in various performance levels:
- **Industrial Box PC**: PC without human machine interface, typically used for cabinet integration
- **FS154i**: Panel PC with 15 inch display and various interface options: touch screen, full QWERTY keyboard, function keys
- **FS194i**: Panel PC with 19 inch vertical display, with hardened glass and capacitive multi-touch; suitable for implementing NUM virtual PLC key board, ISO key board and full QWERTY virtual key board (available only with P2 performance level)

The new high performance PCs use an industrial SSD with the following outstanding features:
- Firmware recognizes power fail: stops accepting commands from host, data will be safely stored and is readily accessed afterwards
- Extended emergency residual power: incorporating extra power buffering capacitators, the emergency residual power is extended to 60 ms, and this enables a 30 times longer duration to save data from volatile memory
- Industrial-grade design: the chosen industrial SSD can withstand high shock, vibration and has high thermal resilience. So reliable communication in challenging environments is guaranteed

The introduction of these additional features like Quad-Core CPU technology, industrial SSD technology connected with new interfaces (USB 3.0, HDMI) and most modern operating system make the new PC product lines extremely interesting and competitive for the machine tool market.

TMX140070

- – – – Intermittent torque 560Vdc
- ——— Continuous torque (S1)

Innovative, 17-axis wood milling machine for chair seats

The 17 axes of the uni_Portal DT milling machine are powered by a Flexium⁺ 68 control, NUMDrive X mono and bi-axis drive amplifiers with full safety functions (SAMX) according to SIL3 and motors from NUM. Axis accelerations up to 4 m/s² and travel speeds up to 25 m/min are possible during machining (depending on the workpiece to be machined). Three chair backrests can be manufactured synchronously per machine side. The machining of individual, fixed chair seats takes place via a machining head equipped with four interpolating axes incl. RTCP (Rotating Tool Center Point). The two machine halves each have a roller shutter in order to ensure the safety of the personnel during use.

„I am very pleased with the high flexibility of NUM as well as the long-standing partnership-based cooperation", Michael Köhler mentions in an interview, adding: „My employees are also very satisfied and appreciate the direct and uncomplicated communication with NUM."

It is a special feeling to enter the foyer at MKM International after reception, when there are outside winter temperatures of –3° C. An impressive palm (lat. Phoenix canariensis) means a „Welcome" and you can escape winter, at least for a moment. A small fountain with seating invite you to hang around, they also serve as a place for brainstorming and as source of inspiration (of course, at all seasons). In general, the new office building, which was built around four years ago, is inviting and modern thanks to the light-flooded rooms. With headquarters in Bad Oeynhausen (Germany), between Hannover and Bielefeld, MKM International focuses on the development and production of innovative special machines.

MKM International was founded in 1998 by Michael Köhler. In 1999, the initial operation started with eight employees. Right from the start, MKM relied on NUM controllers and systems, something that remains the same right up until today. Initially, CNC machines were developed in the field of solid wood processing, but over time machines were also added to the portfolio for processing plastics, light metals and steel, as well as punching machines. Today, MKM employs 60 people and in 2017, generated sales of approximately € 21.5 million. With the new construction of the office building as well as other conversions and additions, the premises of MKM experienced a doubling of usable space.

The creativity and innovation of MKM are not only reflected in the development and construction of special machines for customers, but also in solutions for in-house production. For example, new clamping jaws or replacement clamping jaws are manufactured overnight using 3D printing methods. A mold constructor is no longer required in this process, therefore savings are made on materials and rejects. The machining heads for the CNC machines are also manufactured independently by MKM, if this is not possible, they develop new solutions to meet customer requirements. All machine beds are relieved of stress, all machine axes have guide carriages with the highest pretension class of exclusively installed roller guides, incl. overpressure system (pollution prevention). These examples underline the high-quality processing and guarantee the longevity of the machines. Today, MKM manufactures around 90% of machines internally. Like NUM, this focus on consistency has a

Tool changer at the uni_portal DT.

Machining head with milling cutter on a workpiece.

critical impact on the final product. At the same time, MKM closely monitors and tracks trends in cross-industry relevance in the areas of "Automation", "Handling" and "Industry 4.0".

The uni_portal DT (for a turntable) milling machine presented here also satisfies. Up to now, the end customer was able to produce 1200 chair seats in one shift with his current machine. Thanks to

the new uni_portal DT, the output can be increased by more than 30% to 1600 chair seats per shift – while simultaneously reducing the energy requirement by more than 20%! Nowadays, efficiency is of immense importance, thus it is not surprising that MKM equips all new CNC machines with an energy certificate – a type of „data sheet" that shows the energy efficiency and consumption data, such as the amount of air consumed. Consumption values can thereby be checked and compared at any time.

Flexium⁺ 68 control with a FS153i HMI and MP06 operating panel by NUM.
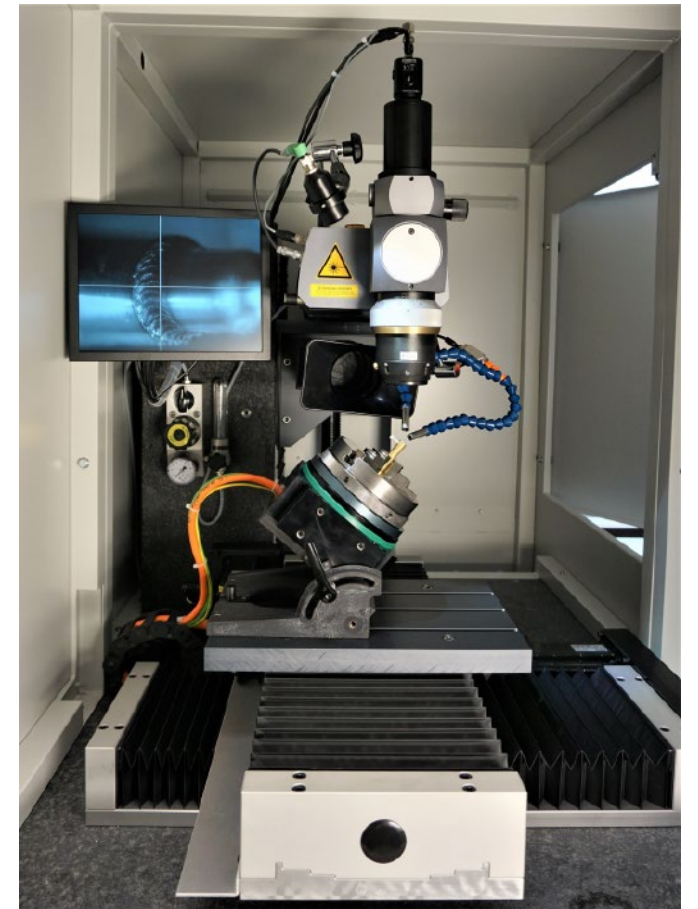

uni_portal DT in the assembly hall at MKM, just before delivery. The MKM machines are built at the end customers' site by the same people who assemble them at MKM.

From right to left: Mr. Michael Köhler, Managing Director of MKM International, Mr. Bernhard Simon, Sales Engineer of NUM Germany and Mr. Jörg Wilkening, CNC Programmer at MKM International.

num

In-house creativity and close external co-operation for a new laser welding machine

Cabinet of the LSW 330.

Felastec GmbH in Unterseen, picturesquely nestled between Lake Thun and Lake Brienz in the Bernese Highlands (Switzerland), was founded in 1998. Rudy Reichen has been managing the fortunes of the small, creative laser business since early 2017 and has over 25 years of experience in solid-state and fiber lasers. Felastec predominantly fulfills customer orders for laser cutting, laser welding, and laser drilling. It also offers titanium welding – a complex method of machining that requires specific expertise and specialist equipment to achieve optimum results. Spare parts for solid-state lasers are also on offer – with customers all over the world. The LSW 330 is now the first laser welding machine developed in-house to be launched on the market.

The machine has an extremely flexible setup – on request, it is possible to switch between laser welding, laser cutting, and laser drilling at any time without having to make any changes to the control concept. The combination of Felastec's knowledge of machinery and processes relating to all aspects of laser machining and NUM's expertise in controls and implementation resulted in a new machine being launched after only a short period of development.

View of the machining area of the LSW 330.

Felastec receives around 90% of its orders from the healthcare sector, but it can now accept more inquiries from the automotive and watchmaking industries, e.g. for custom developments and prototypes. Batch sizes typically run from a few hundred to a few thousand units. In the field of healthcare, items such as stents for blood vessels, titanium tweezers for surgical treatment of cataracts, or titanium bone plates with threaded bolts are manufactured. Using fiber lasers, ceramic materials such as industrial sapphire can also be machined.

The company's partnership with NUM goes back many years. Felastec, for example, today still uses the very first digital 1050 controller ever supplied (the NUM 1050 was manufactured from 1997 to 2002). Rudy Reichen: "What I truly love about working with NUM is its straightforward and consistently helpful after-sales service. We even still use NUM 760 controllers [editor's note: manufactured from 1983 to 1995], which are still supported by NUM." Reichen sees the quality of NUM products as another key advantage: "All these years, there have never been any problems."

The laser welding machine presented here is Felastec's first CNC machine developed in-house and is called the LSW 330. The customer from across the border wanted the laser welding process to be carried out in-house in the future, thereby inspiring Felastec's creativity. A risk analysis was carried out and a concept for the new machine was developed in cooperation with NUM and an expert on safety issues. The customer also requested good accessibility and compact dimensions, which Felastec succeeded in accomplishing. The overall machine has dimensions of 170 x 90 x 190 cm (L x W x H), with a machining volume of 300 mm³. A machine base made of natural black stone ensures the necessary stability. Also in response to customer requirements, the machine is CE certified and features a class 1 Nd Yag laser. Open operation in safety class 4 is also possible in combination with the necessary safety measures; this is frequently

NUM FS192i HMI, complemented by the operating panel developed in-house by Felastec.

requested especially for laser welding of small batches and high part diversity.

A Flexium$^+$ 6 is used to control the 4-axis machine together with NUMDrive X drive amplifiers and a NUMSafe safety architecture. Also used are SPX motors from NUM with their well-known "single-cable solution" that dispenses with the need for a separate encoder cable. A modern FS192i HMI, complemented by an operating panel developed by Felastec and a separate deadman's switch, complete the machine features.

The extremely compact LSW 330 from Felastec.

Left: Carl Södertun, Production Manager and Rudy Reichen, Managing Director Felastec GmbH. Right: Jean-François Hermann, sales engineer at NUM Biel.

num

HAM Präzision and NUM – Over 20 Years of Partnership and Cooperation

The Andreas Maier GmbH carbide tool factory, or HAM for short, was founded back in 1969 in Schwendi-Hörenhausen in Baden-Württemberg, Germany. It began quite literally as a classic garage startup, but today employs over 450 people worldwide, 240 of them at the parent company in Schwendi-Hörenhausen, about 30 km south of Ulm. HAM has its own branches and partner companies around the globe. HAM and NUM are already able to look back on more than 20 years of successful cooperation as partners. This is why HAM uses the proven NUMROTO programming system on many of its machines across the group companies.

HAM offers its customers highly reliable deliveries with the aim of being able to deliver tools plus coatings in just a short time at their usual optimal level of quality. To achieve this, HAM has invested heavily in recent years in expanding its production facilities and infrastructure. A major restructuring followed in 2013, thanks to which the warehousing, production, and delivery processes could be significantly improved, allowing the stated objective to be achieved. Also, HAM offers its customers an express service in emergencies. In-house coating systems plus comprehensive services (including tool management) complete the all-in-one portfolio.

The corporate cornerstones of HAM are defined as four areas: HAM Präzision, providing drilling and milling tools using solid carbide (SC) and polycrystalline diamond (PCD) for the automotive, aerospace, engineering, and component supply industries; HAM Elektronik, providing tools for the printed circuit board industry; HAM Medizintechnik, providing rotating tools for dental and medical applications; and HAM Kristall-Technologie, providing components for solid-state lasers.

To ensure the highest quality, HAM intends to keep its production site located in Germany. Mr. Andreas Marcus Maier, Managing Director of Production for HAM and the son of the company's founder, sees the specialization in special tools for the high-end market as a major competitive advantage. "The key foundations as we move towards the future are research, development, and innovative products", says Mr. Maier. NUMROTO adds a lot of technical know-how to this specialization in special solutions, for instance offering flexible solutions for even the most complex shapes. Mr. Jaruga, Solid Carbide Tools Production Manager at HAM, adds, "Our most complex tool shapes – the most difficult ones – can be realized with NUMROTO."

Furthermore, the high level of user-friendliness and the precise 3D simulations are seen as advantages. Mr. Maier notes, "What you see in the 3D simulation is implemented directly in the tool." The multi-user system that lets the NUMROTO workstations (a machine or programming station) work with the same sets of data is also being used successfully at HAM. Data for tools, wheels, machines, and settings are stored centrally on the database server.

A special tool manufactured, polished and coated by HAM (step drill with several form steps) according to customer order.
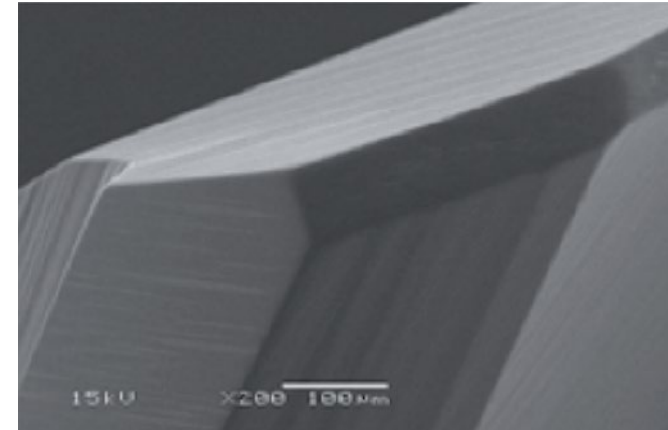
Cutting edge of a special tool after polishing using MMP Technology®, 200x enlarged. Only minimal edge rounding, which guarantees excellent cutting.

Another unique selling point is the MMP Technology® (Micro Machining Process, by BinC Industries SA) polishing process. HAM has secured the exclusive Europe-wide rights to essential parts of its product portfolio. Selective machining of micro-roughness allows the cutting edges and surfaces of solid carbide tools to be precisely and reproducibly produced and finished. Cutting tools treated with this procedure have defined edge rounding in the micron range, giving a significantly better surface quality than conventionally polished tools, which leads to a longer service life and allows higher cutting and feed speeds.

"One Step Ahead" – the mottos of HAM Precision and NUM Service reflect the promise of being close to the customer, forward-looking advice, and research and development.

Special tools treated with MMP Technology® and manufactured using NUMROTO software. The micro-treatment uses a special process comprising mechanical, physical, and catalytic aspects.

From right to left: Mr. Andreas Marcus Maier, Managing Director of Production at HAM Präzision, Mr. Dawid Jaruga, Solid Carbide Tools Production Manager at HAM Präzision, Mr. Jörg Federer, Application Technology Manager at NUMROTO.

From a block of stone to a luxury bathroom

CFM

International firm CFM, based in Pero Pinheiro (Portugal), specializes in the design and construction of machinery for sawing and milling stone. CFM is part of the Construal Group, which comprises Construal in Portugal and Canada, Feist Machine Service in the US, and CFM in Portugal. Construal is able to supply a wide range of products from a single source, thus allowing the company to take advantage of many synergies. CFM and NUM can now look back on a decade of successful and constructive cooperation.

CFM was founded in Portugal on September 1, 2006. Headquartered in Pero Pinheiro, CFM is located near Lisbon, the Portuguese capital, and currently has 26 employees. Its portfolio includes consultancy and servicing, machine construction, and retrofits which provides modernization and upgrading of existing systems in over 18 countries and on 5 continents. The company specializes in the design and construction of machinery for sawing and milling stone such as granite or marble. This equipment allows CFM to cover the entire machining process, from cutting the rough block of stone to shaping and ultimately the finished workpiece. The cooperation between CFM, at the time a department within Construal, and NUM was initiated in 2003. CFM was looking for a partner to help it meet a wide range of customer and application requirements, and NUM was awarded the contract thanks to its overall solution portfolio and extensive expertise. The engineers created a stone-working solution that can run on various CNC controller generations, such as NUM10xx, Axium, Flexium, and Flexium+. At present, Flexium and Flexium+ controllers are used on the machines and have the ability to machine on inclined planes.

The successful partnership between CFM and NUM has also produced the FP machine type, a CNC gantry machine with 5 axes, a tool changer, and a saw blade with a diameter of up to 1.3 m. The machine has an impressive height of 4 m, a floor area of almost 40 m², and an imposing weight of 7 tons. In light of its size, the machine can cut enormous blocks of stone. Although the saw blade can accelerate to 650 rpm within 30 seconds, the entire machining process for a bathtub can still take up to 30 hours. Impressively, the 6 mm-thick saw blade is able to cut stone into any shape while ensuring an outstanding surface quality.

The machining process is generated via an external CAD/CAM (EasySTONE Premium) and then sent to the NUM Flexium+ CNC controller with MDLUX drives that control the 5-axis machine. On this basis, the stone is then machined with an impressive spindle power of 22–30 kW. The FP machine offers various options: a laser for cutting marks, variable wheel speeds, a tilting table, vacuum pumps and cups, a tool changer for up to 24 tools, and a nesting program with camera.

This robust and low-maintenance gantry machine was designed for cutting and milling marble and granite. It features excellent cutting quality, performance, and flexibility, yet is also easy to operate. CFM co-owner Fernando Calçada: "The easy operation of the machine is a major advantage. It means that requirements and objectives can be efficiently met in accordance with the needs of the market."
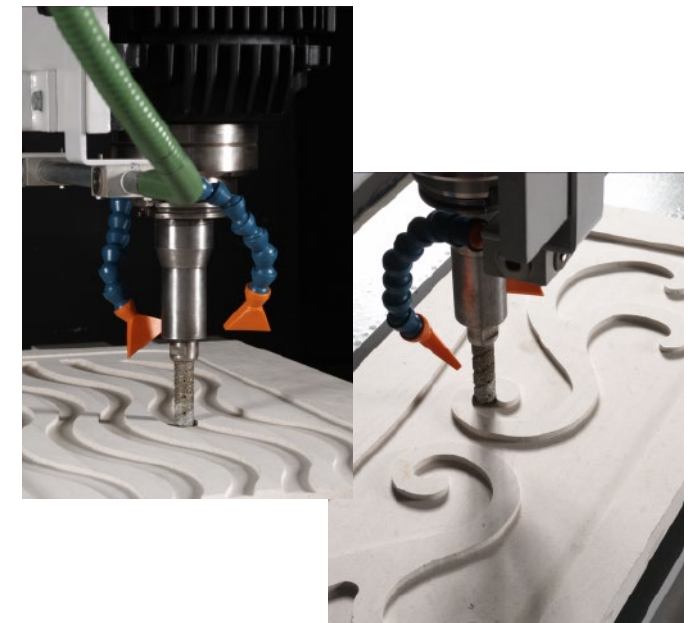
Images from the machining process.

At Construal Group, the customers are in good hands. CFM supports its customers worldwide with engineers, training, and remote maintenance services. Complex and specific customer requirements are implemented in close collaboration with NUM, on a flexible and customer-centric basis. NUM's high-end product, the Flexium+ controller, is at the forefront of automation technology. The end customer can make full use of and also individually customize the options offered by the Flexium+ CNC controller. NUM makes it possible to develop a tailored product for both CFM and its end customers.

The perfectly shaped and high-quality workpiece produced by the CFM machines guarantees the user a clear competitive advantage. Investing in a CFM machine means investing in a sustainable and long-term solution with upgradeable technologies that can be adapted to meet future needs.

The saw blade cuts stone at up to 650 rpm and has a diameter of up to 1.3 m.

The machinery made by CFM produces impressive workpieces, such as unique fireplaces or striking bathroom fittings including bathtubs and washbasins, complete with solid coverings – all naturally made of stone. CFM co-owner Fernando Calçada: "Nature provides a wide range of incredibly diverse structures and colors. Every stone has its own unique appearance. Natural stone is a true eye-catcher and gives spaces an incomparable flair."

Examples from the machining process.

5-axis CNC gantry machine from CFM with NUM controller.

num

Advanced 8-axis CNC multi-function machining centre

The ML125 machining centre is based entirely on NUM's latest-generation Flexium+ 68 CNC platform.

CNC specialist NUM has helped the Chinese machine building company Original Point Machine Tools (OPMT) to develop an advanced 8-axis CNC machining centre capable of processing many different types of materials, including metal, ceramics, glass and cemented carbide.

OPMT is a relatively small but fast-growing company based in Fo'shan – of Guangdong Province – in south China. It is rapidly acquiring a reputation for innovative complex engineering: after developing a highly successful 4-axis milling centre for an automotive production line, it then created a compact 5-axis milling station for the dental industry.

For its latest project, OPMT was asked by Guangdong University of Technology to develop a machining centre that combined high speed laser cutting and milling capabilities. This key provincial university is located in Guangzhou, Guangdong Province, China, and provides a wide range of courses, with a major emphasis on engineering. OPMT chose to partner with NUM for its CNC expertise and with the Xi'an Zhongke Microcrystalline Manufacturing Company and the Chinese Academy of Sciences to help with some of the complex materials processing issues.

The result is the ML125 8-axis multi-function machining centre. The machine has a dual laser head that is capable of switching between a 20 watt picosecond laser for very high speed cutting and an ultrafast 10 watt femtosecond laser for improved process quality. The femtosecond laser is capable of drilling and cutting almost any type of material, and its very short 1030 nm wavelength means that it is suitable for micro/nano processing applications.

Entirely controlled by NUM's latest-generation Flexium+ 68 CNC platform, the ML125 machining centre has eight servo axes, two independent NC channels and fast application-specific I/O embedded in the NCK hardware. Movement of the fully articulated laser head is controlled by five NUMDrive X servo drives, with high speed interpolation between all five axes – and the CNC system provides a full RTCP function.

By employing a special hollow shaft torque motor and a linear motor drive, the dual laser head has an exceptionally high positional accuracy of 8 micrometres (0.008 mm), with a repeatability of just 5 micrometres. The associated A/C axis rotation platform has a precision rotary feed function with a positional accuracy of 5 arc minutes. The milling head uses a 40,000 rpm spindle motor, and laser cutting and milling can be performed with just one clamping operation, which further improves process accuracy.

According to Bruce Zheng, CEO of OPMT, "The requirements of the industrial processing market keep changing, which means that our machines need to be extremely flexible so that they always offer customers what they need. Partnering with NUM helps us to achieve this; its open architecture CNC systems are easy to integrate with third-party products such as motors, and the

company is prepared to offer the long term commitment and technical support that is necessary for successful completion of complex machine projects."

The ML125 machining centre is now installed in a research laboratory at Guangdong University of Technology.

OPMT's new ML125 8-axis multi-function machining centre.
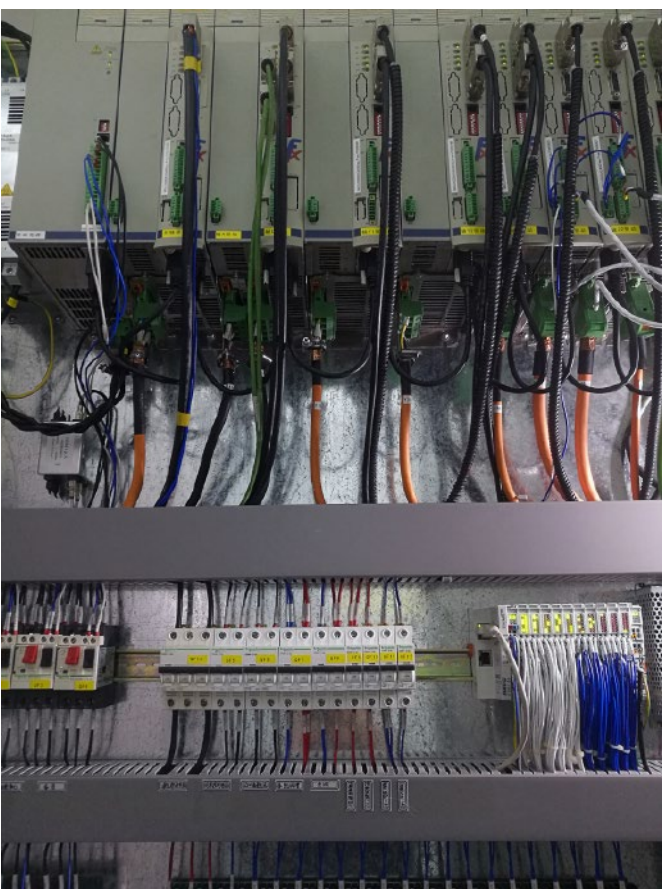
The HMI of the ML125 machining centre is based on NUM's Flexium touch screen technology.

The ML125 machining centre has a dual laser head capable of both high speed and high quality cutting.

num

Koike Aronson and NUM partner to produce precision 5-axis bevel head for acclaimed K-Jet waterjet system

Built-in technology tables to optimize cutting feedrates for each material and thickness.

NUM's Flexium CAM provides a standard shapes library. Fast and easy entry!

A resident block nesting page assist in quick pattern repetition.

CNC specialist NUM is helping one of the USA's top fabrication equipment manufacturers to develop an ultra-precise 5-axis bevel head for its market leading waterjet cutting system. This innovative engineering project will enable customers to use extremely fast abrasive cutting speeds to further increase productivity of their precision metal parts fabrication processes.

Koike Aronson, Inc. is a leading manufacturer of advanced cutting/welding machines and positioning equipment. Founded in 1918, the company is based in Arcade, NY, USA. Capable of operating three manufacturing shifts per day, with up to 100 employees, Koike is renowned for its expertise in metal fabrication systems; its research and development resources include mechanical, electrical and software engineers with more than 250 combined years of design, process and technical experience.

Koike's latest generation waterjet cutting system, the K-Jet, is designed to cut various types of material – including steel, aluminum, plastic and glass – without creating any heat-affected zones. There is a choice of five machine configurations, offering standard cutting areas up to 72 x 144 inches (1,829 x 3,657 mm), and three KMT intensifier pumps with pressure ratings as high as 90,000 psi, making it the world's fastest waterjet cutting system for straight-line cutting.

Each K-Jet machine features a robust, floor-mounted cutting table with a load capacity of 125 psf (610 kg/m^2), which is equivalent to supporting 6 inch mild steel. The tables employ a heavy duty precision machined main beam and saddles, fully enclosed air pressurized bellows, and hidden linear guide ways. There is a wide choice of optional Ebbco abrasive removal and closed loop filtration systems for efficient water management.

As part of its ongoing commitment to helping customers improve the productivity of their parts fabrication processes, Koike, in collaboration with NUM, has now developed an innovative and highly versatile 5-axis CNC bevel head for its K-Jet waterjet cutting system. The cutting head is specifically designed to combine ultra-fast movement with precision positioning capabilities and is available with pumps up to 60,000 psi capacity.

Koike chose to partner with NUM mainly because of its 'open' CNC architecture and its willingness to actively participate in joint development projects. As Koike Aronson Product Manager Tim Joslin explains: "Most CNC companies produce proprietary hardware and software, making it difficult to integrate third-party products. NUM, with its open architecture approach to CNC, is a notable exception to this practice. The company's Flexium$^+$ CNC system, for example, readily interfaces to standard cutting software such as IGEMS and SigmaNEST, and its NUMDrive X servo amplifiers are fully compatible with the specialist direct drive torque motors that we build into our new bevel cutting head."
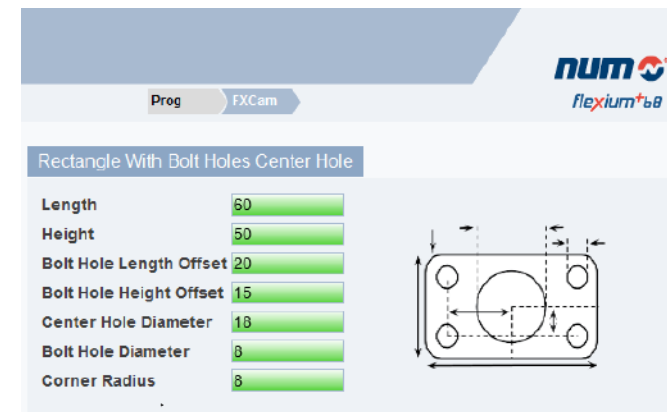
Based on NUM's powerful Flexium$^+$ 68 CNC platform, Koike's 5-axis bevel head introduces an unprecedentedly high level of cutting performance. The overall system offers a linear accuracy of +/- 0.003 inch (0.076 mm) and a repeatability of just 0.001 inch (0.025 mm).

In addition to the 5-axis CNC system itself, which features interpolation and synchronization facilities on all five axes, as well as provision for a 6th axis, NUM is supplying four 1.2 Nm SHX series single cable servomotors, together with one smaller BPX series servomotors for the IGEMS head, each complete with its associated NUMDrive X servo drive. The company is also supplying the PLC hardware, equipped with 16 inputs and outputs and an EtherCAT gateway, and a large 19-inch touch screen for the cutting head's HMI (human-machine interface).
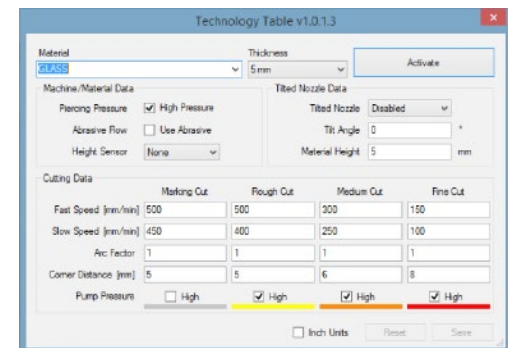
The CNC software being supplied by NUM includes specific waterjet cutting functions. The Flexium CAM Shapes library contains a large number of pre-defined common cutting shape forms, enabling the machine operator to quickly select the desired shape from the library, make dimensional inputs and create the motion sequence – without requiring knowledge of G-Code. Material types and cut types can then be incorporated to optimize the waterjet's cutting speed, and parts can even be nested using the on-machine block style nest feature.
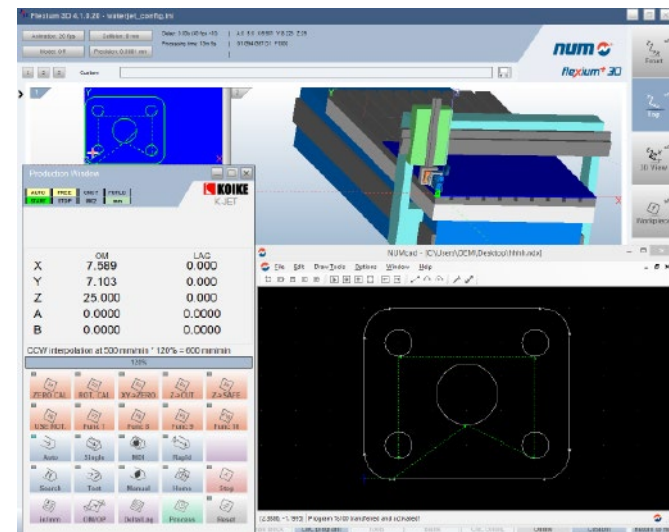
*The Flexium$^+$ interface screen gives intuitive operational views.*

The firmware in NUM's CNC system contains several optimized waterjet cutting functions, one of which is key to maintaining accuracy during high speed cutting. As Steven Schilling, General Manager of NUM Corporation in Naperville, Illinois, explains, "Our firmware has a built-in feedrate linear interpolation feature which can be used to smoothly ramp from one speed to another during movement. This produces a better cut quality by ensuring that material is completely cut through over the entire cross section – an especially important consideration when dealing with the extremely fast cutting speeds of Koike's new bevel head, in conjunction with NUM's tilted nozzle management feature."

Koike's new 5-axis bevel head will be on display at booth #236244 in the North Building, Level 3, at the IMTS 2018 exhibition in Chicago, from September 10 to 15.
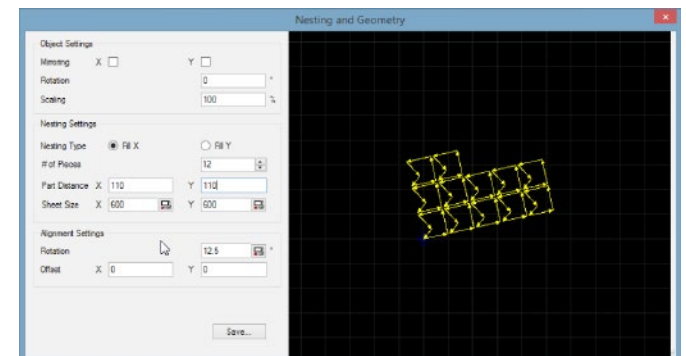
The 5-axis K-Jet waterjet system and NUM Flexium$^+$. Ergonomic, efficient and precise.

NUM Service

num
®
CNC HighEnd Applications

Your decision to procure a system and a solution from NUM marks a long-term investment. We see ourselves as your partner from the idea, design and synthesis stages, to on-site customer service. Our motto is, "One Step Ahead", we use our worldwide presence to be there for you before a problem arises by providing international support and assistance throughout the entirety of a product life cycle.

Our claim for the future is defined by NUM Service in a clear, customer-specified, proactive support agreement. Together with our customers, we draw up an inventory in order to identify any potential for improvement. We can then offer these in a targeted and customer-specific manner. We focus less on the standard that is customary in the industry, but rather on individual customer's needs.

Machine manufacturers and end users can make equal use of NUM's service. Usually the end user first contacts the machine manufacturer, who knows the machine best, and whenever necessary NUM provides direct and uncomplicated support. The same applies to end users if the machine manufacturer does not support them.

NUM has a global and efficient network of service points and branches. Our proven 3-level concept is structured as follows:

NTC: NUM Technology Center – Competence Center with its own spare parts warehouse
Agent: EIndependent partner company of NUM with local spare parts warehouse. Support and regular training by our specialists
Contact: Contact person on site, communicating in the respective national language for our customers

Spare parts can be delivered as quickly as possible thanks to our national agencies and partners. Also, spare parts delivery times can be minimized thanks to the local storage of each NTC.

To ensure that the right spare parts are in the local warehouse of the respective NUM subsidiary, among other things, we have introduced the warranty card process – simply, complete the online warranty card: https://num.com/support/guarantee-card. With this guarantee rule, NUM can effectively ensure that spare parts are stored close to the customer so that possible machine downtimes at the end customer are reduced. Furthermore, the warranty of the NUM system is extended by one year.

To keep machine downtimes as short as possible in the event of a motor failure, NUM Service can offer the production and delivery of new axial motors within 48 hours. Due to the large variety (more than 7,000 different motor types), NUM does not maintain any finished replacement motors in the spare parts warehouse.

Customers with a service contract achieve even greater security. This guarantees the availability of parts in the NUM branches, taking into account the CNC systems installed at the user's site. This is particularly applicable for older systems, where the availability of spare parts is becoming more complex.

NUM attaches great importance to the long-term support of its control and drive systems to guarantee customers the longest possible machine running times. Most components are available for well over 10 years or are replaced by compatible successor products. An example of this is the customer service still offered for discontinued products that were launched on the market over 30 years ago.

Convince yourself and be "One Step Ahead". Our Customer Service department is looking forward to hearing from you.

CNC refurbishment service breathes new life into machine tools

NUM's service department is helping end users to extend the life of their machine tools significantly, by providing fast-response diagnostics, maintenance and repair facilities worldwide for the company's range of CNC systems, power supplies, drives and servo motors.
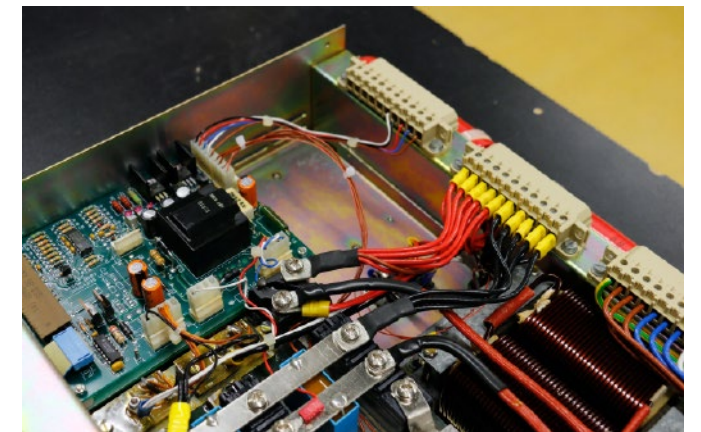
CNC machine tools are valuable assets and to help preserve their value, they require routine maintenance. However, it is all too often the case that the CNC system at the core of the machine gets overlooked until it is too late, when an outright failure can seriously impact shop floor productivity.

NUM believes that routine preventive maintenance is vital to ensuring the longevity of CNC systems and maximizing the uptime of machine tools. Over the past 25 plus years, the company has engaged in numerous highly successful CNC refurbishment projects, ranging in scale from simple CNC servicing, minor repairs and servo motor replacement through to complete change-out of entire machine control systems.
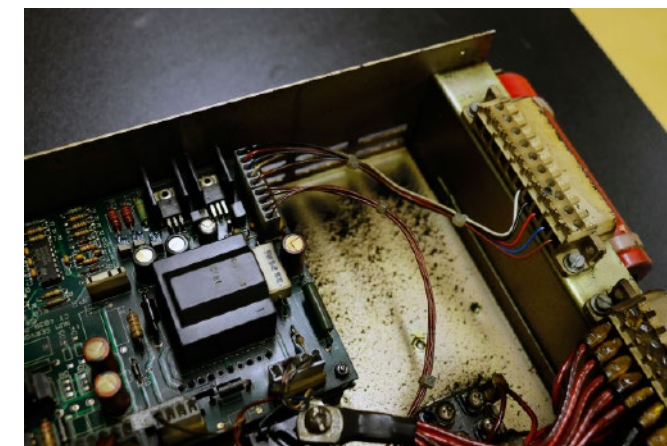
According to Steve Moore, General Manager of NUM's UK facility, "Many of our end users in the aerospace and automotive parts manufacturing industries solicit our help in refurbishing CNC systems, in preference to purchasing new ones, simply because the requalification timescales do not square with high demand production. About 50 percent of our service business is performed on-site at end users' premises – and in the case of servo motors, our manufacturing plant in Italy is able to provide a 3-day turnaround service."

NUM's service capability covers all of the company's popular early generations of CNC systems – including the 1020, 1040 and 1060 series – as well as their associated power supplies, drives and servo motors.
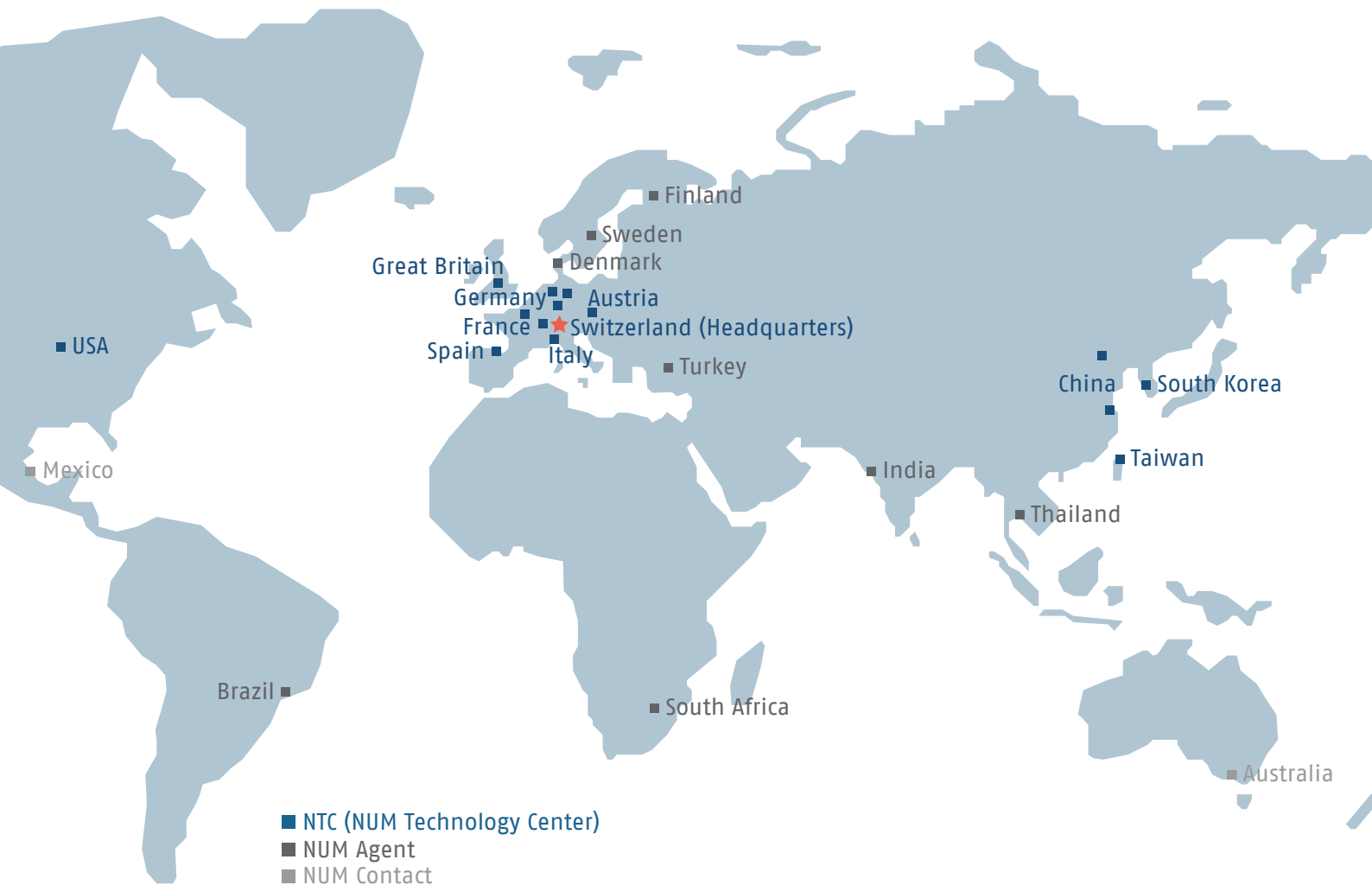

After

Before

num

Complete CNC Solutions Worldwide

num ®
CNC HighEnd Applications

Finland
Sweden
Denmark
Great Britain
Germany
Austria
France
Switzerland (Headquarters)
Spain
Italy
Turkey
China
South Korea
USA
Taiwan
Mexico
India
Thailand
Brazil
South Africa
Australia

■ NTC (NUM Technology Center)
■ NUM Agent
■ NUM Contact

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.

NUM has service centers around the world. Visit our website for the current list of locations.

Like us on Facebook and follow us on Twitter and LinkedIn for the latest information on NUM CNC Applications.

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