

numtransfer

**TOTAL SOLUTION
FOR TRANSFER,
ROTARY-TRANSFER AND
MULTISPINDLE MACHINES**

www.num.com

NUM 
CNC HighEnd Applications

NUM Solutions and Systems

Established Worldwide

Outstanding solutions in machine automation have one thing in common: They are always the product of outstanding performance, exceptional technologies and a high degree of creativity!

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NUM has earned its exceptional reputation in the machinery and tools industry exactly with that. We develop **customized automation solutions** that ensure a high degree of added value both to the machine manufacturer and the user. With our expertise that we have developed over decades, we put our motto “NUM automation solutions provide machine builders with a competitive advantage” into practice. NUM had already developed the first CNC controller in 1961, i.e. 10 years before CNC- or NC control systems found a wide acceptance among users. With the launch in 1964, **NUM was one of the first CNC providers in the world.** Since then, we have maintained our position as a technology leader in this segment and are eager to expand it further. Today’s systems, with their flexibility and our expertise, enable us to automate a large variety of machinery. Our long, successful track record supports this finding in an impressive manner. We will continue to develop the **performance, functionalities and flexibility** of our systems in this direction and make the necessary investments in our products, our research & development, as well as in our staff

As an **international company** headquartered in Switzerland; we have sales, application development and service locations all over the world (see back cover) from which we operate worldwide. Our research and development departments are located in Switzerland, Italy and France. Our main production facility is located in Italy.

It is our clearly defined **vision** that we keep the **development and manufacture** of the core products in the CNC system, including the drives and motors, **under our control.** This enables us to adjust the performance, functionalities and flexibility of our systems to new market requirements very quickly and without delays.

The ready and flexible NUM automation systems combined with our locally available engineering expertise and the machine manufacturer, results in a uniquely flexible and powerful team.

Customized Projects

NUM tailors its support to your projects, ensuring it aligns perfectly with your business and infrastructure needs. Regardless of the specifics, our ultimate goal remains unchanged: collaboratively finding the most efficient solution for your project.



Project facilitation PRODESIGN

Efficient consulting for optimal application solutions

This model is ideal for companies with their own development teams and automation specialists. As an external partner, we provide our expertise and resources in field of CNC automation and take on an advisory role.

Project cooperation CODESIGN

Merging knowledge – potentiating results

Your development team will be combined with our team of specialists. Together we will realize the automation of your machine with clearly defined responsibilities. This form of cooperation has proven to be extremely efficient in many projects.

Total solutions ALLDESIGN

Delegating responsibility – controlling result

We assume the entire project management in the sense of a general contractor and are fully responsible for the successful implementation. Starting with the development of the requirements specification, over the development and commissioning, up to the support and service of the machine, and beyond

NUM Solutions and Systems

Intelligent and Creative

We have developed countless customer- and application-specific solutions for different industries as well as pioneering complete solutions for various industries, thus creating practical solutions for challenging applications and professional requirements.

All of our solutions are based on a wide range of perfectly matched proprietary products such as CNC, drive amplifiers and motors. The partnership with our customers in the evaluation, project and installation phase is further maintained by our training, support and other services even after commissioning. We attach importance to ensuring that our customers are served by our professionals with specific knowledge.



numroto

NUMROTO – successful trendsetter in high-precision tool grinding for many years

numspecial

NUMspecial – creative and practical solutions for your specific applications

numcut

NUMcut – a complete solution for advanced cutting machines

numgear

NUMgear – intelligent total solutions for new machines or as a retrofit in the field of gear machining

numtransfer

NUMtransfer – economical and flexible for all lot sizes for transfer, rotary transfer and multi-spindle machines

numhsc

NUMhsc – excellent quality at the highest speeds on machines with 5 or more axes

numgrind

NUMgrind – grinding and dressing cycles, with intuitive shop floor entry screens and 3D visual validation

nummill

NUMmill – flexible solution with a graphical interface for extensive milling cycles, including full 3D simulation

numwood

NUMwood – long tradition with powerful complete solutions in woodworking

numretrofit

NUMretrofit – rational extension of the service life of your machine by years

NUMtransfer – for Transfer, Rotary-Transfer and Multi-Spindle Machines

NUMtransfer, based on NUM's current Flexium control generation is one of the world's leading industrial solutions for transfer, rotary transfer and multi-spindle machines. NUMtransfer is fully integrated in the controller.

A transfer machine is a machine that automatically transports a workpiece from one processing station to the next. This achieves assembly line production. There are different types of transfer machines, with and without CNC. Those with CNC can also be subdivided: Several CNC machines connected via a conveyor belt or one machine with many processing stations. In the second type, the stations can be arranged in a linear or circular pattern. The "round" ones are called rotary transfer machines or multi-spindle machines and are based on a rotary table that is advanced with each cycle (completion of a partial machining operation).

Operating the transfer machines profitably

In mass production, transfer, rotary transfer and multi-spindle machines must be optimized to the parts to be manufactured in order to work in a time-efficient manner. The increasing demand for smaller batches, a greater variety and faster response times places increasingly greater requirements on the setup, conversion and handling of these machines. The profitable use of these machines therefore requires flexibility and efficient, intuitive operation that is transparent to the user.

Practice-oriented CNC total solution

NUM has been supplying CNC systems that are used successfully around the world for many years. Based on the wealth of experience it has gained, the CNCs have been developed and optimally adapted to the demands of the transfer, rotary transfer and multi-spindle machines.

Securing investments

Further development of NUMtransfer to meet the requirements of users secures the investments made by machine manufacturers and machine users.

They can be expanded as desired and adapted to the machine and users' needs (also see page 9)

- More than 40 stations
- More than 200 interpolated CNC axes
- Assignment and switchover of a C axis to different channels
- Integration of continuous rotating tables
- Only one PLC to control the complete machine (independent of the number of CNC kernels)
- Overall safety functions
- Control of hydraulic axes
- Integration of third-party devices using various fieldbuses

Computing power grows with the demand

A basic characteristic of the Flexium control systems is its flexibility, which is particularly important for transfer machines. An important part of this is the distributed "intelligence", i.e. the control consists of several computer units. This makes it possible to configure very large systems without any loss of performance, since with every component added, computing power is also added. A Flexium⁺ NCK can easily control up to 32 axes/spindles and execute up to 8 CNC programs in parallel. If more axes/spindles are required or if more CNC programs are to be executed, an additional Flexium⁺ NCK can easily be added for this purpose. A FlexiumPro RTK has even more computing power and can run 32 CNC programs in parallel.

Only one PLC, even with multi-CNC operation

In Flexium⁺, the PLC operates on a separate computer, distinguishing it from some competitors controllers where the PLC is integrated with the CNC in the same unit. This unique setup allows for effortless synchronization. It also allows the development of a dynamic PLC program that adapts to the specific configuration, including the number of axes, axis channels, and NCKs. The computer unit for the PLC offers two performance levels. In the case of FlexiumPro, multi-CNC operation is not required as sufficient channels are supported.

NUMtransfer – for Transfer, Rotary-Transfer and Multi-Spindle Machines

Diverse display devices

Various industrial PCs are compatible with displaying the graphical user interface. If a CAM system with high computing demands is to be installed on the machine, an office computer can be added to serve the Flexium HMI and the CAM, addressing the increased computational requirements.

Simple axis change between channels

On one hand, the rotary tables mentioned above facilitate the transfer of workpieces. Conversely, when motors are mounted on the rotary table, the corresponding axes transition from one axis channel to the next. Managing the numerous cables needed for power and signals between the axis amplifiers and motors would be challenging if the associated axis amplifiers remained fixed. Therefore, it is practical to mount the drives on the rotary table, requiring the transmission of only total power and the communication bus of the CNC drives. While the axis transition in the control software is a standard feature of Flexium controls, addressing the scenario of a Flexium+ system with more than 8 stations has also been considered. A special control function enables the seamless transfer of axes to other NCKs in such cases.

Compact, modular, simple cabling

Modular in concept, compact in size and with low power consumption, the NUM drive amplifiers (single, double or quadruple) ideally meet the requirements of compact control cabinets. The low power consumption and the resulting low heat dissipation reduce the cooling capacity required for the control cabinets.

Transfer machines have many axes. Further energy-saving measures therefore make sense. Power supplies with energy recovery are available for this purpose. The NUM drive amplifiers can regulate or control synchronous and asynchronous motors (V/f mode), which enables a uniform cabinet design.

The comprehensive servo motor series from NUM offer an excellent volume/performance ratio, great dynamics and are suitable for almost all applications. See also page 10.

Machine and process-oriented operating concept

Thanks to the parameterization, both simple and highly complex transfer machines are mapped for the operator in a simple, understandable way that corresponds to the operation of transfer machines. The names of the stations can be freely assigned and thereby clearly and quickly identified. For very large machines, the stations can be combined into “cells”, which can likewise be assigned any name.

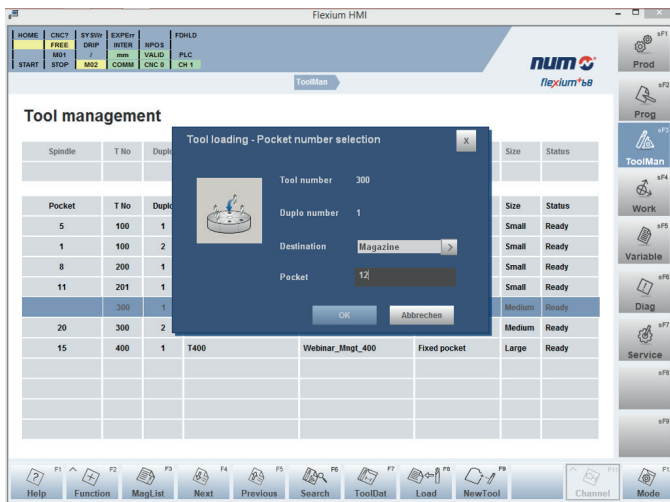


All information is displayed on a single HMI. This also applies to the Flexium+ multi-CNC solutions. Every station and every cell can be directly selected in any operating mode of the CNC system. The operator selects the corresponding function and does not have to bother about which axis channel and which CNC executes these functions. This provides an improved overview, increases operating speed and reduces inputting errors.

Comprehensive and precise error messages facilitate troubleshooting and reduce machine downtime. The messages are entered in a log file, in the case of Flexium+ regardless of which NCK they originate from.

Integrated tool management

The tool management integrated in the control system also covers the requirements of transfer machine applications. The tools can be assigned to an axis channel. The tools per channel are displayed on a special page.

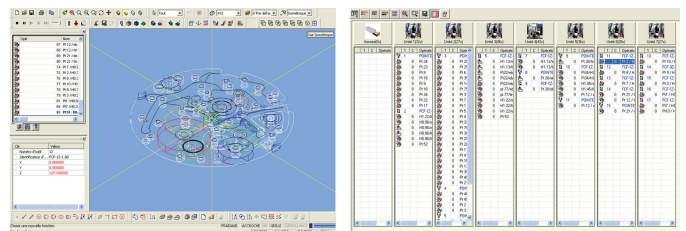


Problem-free use of multiple panels

Most machines get by with one display. For various reasons, however, additional displays may be necessary. This is easily possible. The additional devices are simply connected via Ethernet.

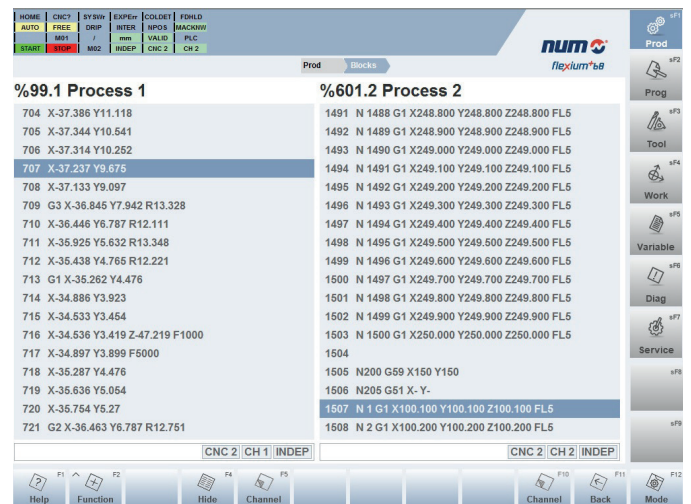
Setting up the part programs

A challenge is to optimize the various part programs so that the entire production time is as short as possible. Specialized CAM systems can be inserted for this purpose:



The CNC also includes functions for program optimization: Early Block Change (EBC) enables a faster machining cycle, as the execution of the next block can begin before the previous one is completed.

The Flexium HMI has the ability to display CNC block views simultaneously. The channels to be displayed in parallel are freely selectable. This option helps to program the part programs.



To increase the intelligibility of part programs the axis names can be indexed, e.g. X1, Y1, Z1, ... for channel 1, X2, Y2, Z2, ... for channel 2 a.s.o. On the one hand, the indexed axis names can be displayed in the user interface. On the other hand, they can also be used in the part programs.

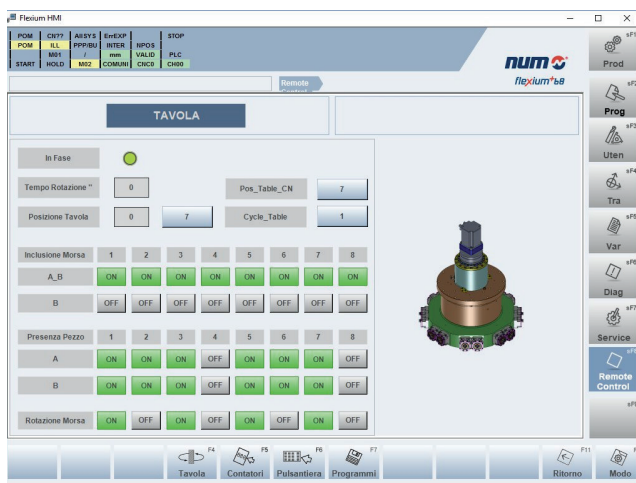
NUMtransfer – for Transfer, Rotary-Transfer and Multi-Spindle Machines

Process monitoring

The smallest incident may lead to huge economic consequences; this is why it's important to monitor the machining parameters in order to prevent down times due to a worn tool, a lubrication fault, a loss of performance or anything else. NUMmonitor implements such a real time process control without the need of additional sensor/hardware. It can be used, for example, to check the power consumption of the spindles.

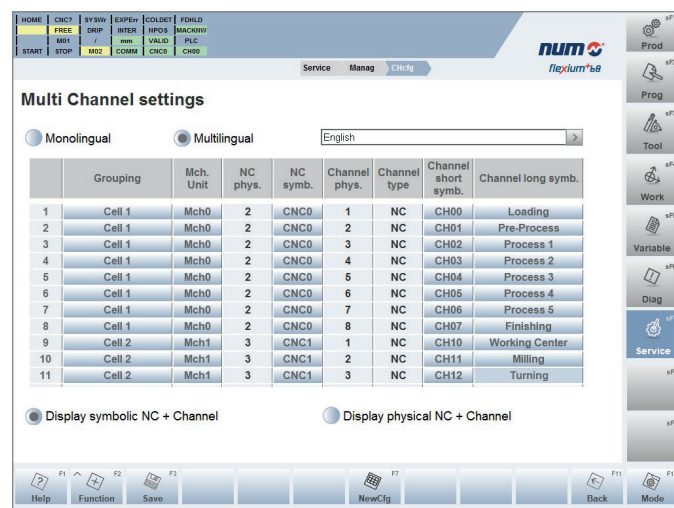
User interface that can be configured as desired

It is possible to have a user-friendly operator interface for the entire machine or specialized customizations for specific projects. Depending on the requirements, the standard HMI can be personalized, a completely new HMI can be created, or the standard HMI can be supplemented with custom HMI pages tailored to the exact requirements (inserting buttons, status displays, specific controls, data displays, etc.). To reduce the effort involved in creating your own HMIs, you can use the ready-made HMI components.



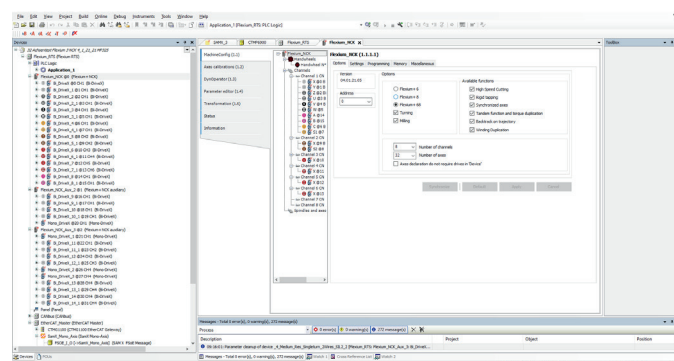
If you do not want to make the adjustments yourself, we will do this for you. So you don't have to look for a third-party company that has to familiarize itself with the subject first.

The names for the axes and the channels are defined in the 'Service' (sF7) context. Here is an example for the assignment of the channel names to an NCK and the channel number:



One program for complete control system commissioning

The definition of the control system and its commissioning is carried out by means of the Flexium Tools software. The corresponding project contains all information on all devices involved, as well as the PLC programs and the definition of the safety functions.



NUM Motors

Perfect for all Applications

Excellent volume/performance ratio and great dynamics, so that our motors can satisfy almost all applications.

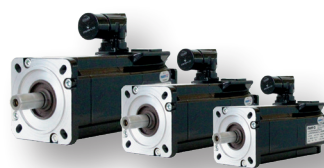
NUM has more than 50 years of experience developing servo and spindle motors. We pioneered the development and production of AC brushless servo motors, as well as synchronous spindle motors with flux weakening.

The comprehensive **servo-motor** series of NUM offer an excellent volume/output ratio, as well as first-class dynamic properties optimized for the machine tool industry. They, with perfect concentric run-out, give great performance even at very low speeds. The so-called "single cable" motors offer the advantage that the complete measuring system cable is eliminated. This simplifies the wiring of the machine significantly and thus saving time and money.

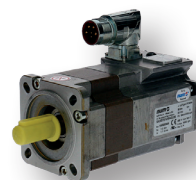
The **asynchronous motors** of the AMS series offer excellent quiet running at low speed, quick and accurate positioning and are ideally suited as a C-axis and for spindle indexing.

The TMX series **torque motors** have an extremely low cogging torque as well as a very high S_1 torque density. They are ideal for applications that require very smooth and precise motion, especially at low speeds. Typical applications are direct drive rotary tables or workhead axes of machine tools.

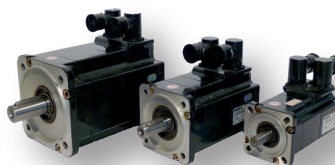
The NUM **LMX linear motors** are specially designed for machine tools. Among other features, they are characterized by a fully enclosed primary, a cooling circuit with large diameters to accommodate fluids with low specific heat capacity, a short pole pitch to increase the force density and reduce temperature, and many other interesting features.



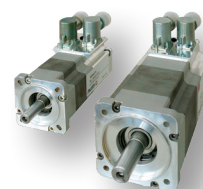
Motors of the series SPX "single cable"



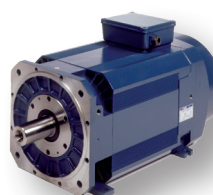
Motors of the series SHX "single cable"



Motors of the BPX series



Motors of the BHX series



Motors of the AMS series



TMX torque motors



LMX linear motors

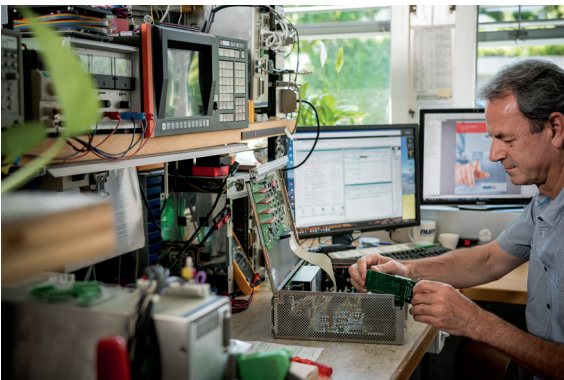
NUM Services

Worldwide at your Service

The decision for NUM is also the decision for a customer service that will support you long after the initial investment as on the first day – even after 20 years and on-site. Our specialists can ensure an extended life for your good (but old) machinery with NUM retrofits.

Worldwide support by experts

For professional analysis and trainings, a perfect infrastructure is available to our experts in all centers of excellence. So that we can assist you quickly and efficiently around the world, we also rely on the advantages of the most modern communication technologies, e.g. for remote maintenance. We can also offer on-site support and consultation services out of our regional branches



Comprehensive training offer

We orient our training to your individual needs – whether its operator training, maintenance, repair and service training, HMI; CNC or PLC programming, or adjustment of servo drives etc.

NUM provides a training offer matched to the customer needs:

- CNC operation
- CNC programming
- PLC programming
- Commissioning and servicing
- Creation of a custom HMI
- Customized customer training

Technically always up to date

Our team of specialists will actively inform you on the latest

hardware- and software developments and provide you with useful technical information.

Repair- and spare parts service

If an error unexpectedly occurs in your CNC system in spite of proper maintenance, you can trust that this will be fixed by dedicated service employees of our global network.



Customer service

For you and your markets, we have a worldwide service organization. The International customer service provides telephone consultation and deployment on site, even for machine installations that are many years old. With a retrofit from NUM, the operating time of an excellent machine can be extended by many years.

Our customer service is available and responsive to help even with cutting edge products and custom developments. We carry local inventory and have your materials and components in stock ready to meet your requirements for quality and delivery times.

Complete CNC Solutions Worldwide



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.

www.num.com



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