



**numgear**

**TOTAL SOLUTION FOR  
GEAR MACHINING**

[www.num.com](http://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!**

- 02 NUM Solutions and Systems  
Established Worldwide
- 03 Customized Projects
- 04 NUM Solutions and Systems  
Intelligent and Creative
- 05 NUMgear – Perfection in Gear  
Machining
- 06 NUMgear moves Machines
- 07 NUMgear is precise
- 09 Flexium+ CNC System  
Flexibility, Productivity & Safety
- 10 NUM Motors  
Perfect for all Applications
- 11 NUM Services  
Worldwide at your Service



And 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 the most varied machinery. Our long, successful track record supports this finding in an impressive manner. We will continue to develop the readiness and flexibility of our systems in this direction and make the necessary investments in R&D 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 important flexibility and readiness of the systems to new market requirements even in the short-term.

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

# Customized Projects

**NUM supports you with your projects in the same way as it is ideal for your business and infrastructure. The goal of our cooperation, however, always remains the same: To find the most efficient solution for your project together with you.**



## 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 entire know-how in the 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**

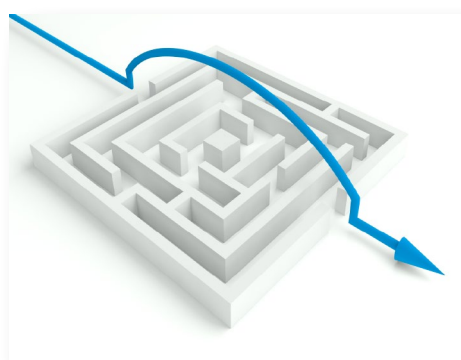
We assume the entire project management in the sense of a general contractor and are fully responsible for the successful implementation. Starting with the development of the requirements specification, over the development and commissioning, up to support and service.

# NUM Solutions and Systems

## Intelligent and Creative

**We have developed countless customer- and application-specific solutions for different industries and thus mapped out practical solutions for professional requirements. Based on this, our engineers have created groundbreaking total solutions for demanding applications.**

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



# NUMgear – Perfection in Gear Machining

**NUMgear on NUM's current control system Flexium<sup>+</sup> is one of the leading industrial solutions for the production of gears in the world. NUMgear is fully integrated in the controller. With NUMgear, gears can be produced – after a few hours of training – by just entering the tool, workpiece and process data with first-class precision of up to DIN 1 for continuous generating grinding and up to DIN 3 for gear hobbing.**

## Gears move the world

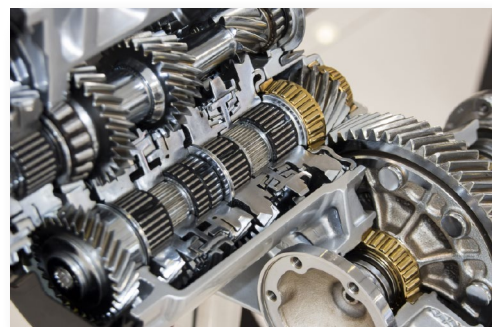
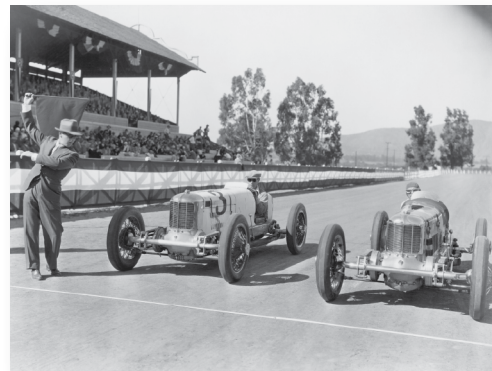
In 2010, the number of vehicles has exceeded the one billion mark. More than 90 million new vehicles are produced every year worldwide.

In most of these vehicles, at least one gear train is installed in the drive train in order to bring the power from the engine onto the road by changing combinations of gears.

For better efficiency, lower noise emissions and quicker start, the transmission technology is constantly evolving. Automatic transmissions with nine speeds are driven since 2013, and since 2015, ten speeds are available for particularly economical driving. More speeds require more gears.

And gear drives are used not only here. Gearboxes for axle differentials, wipers, window lifters or power seat adjustment use gears. Gear trains are also installed in oil pumps and wind turbines, in machinery, mining, marine propulsion and aircraft. Thus, more and more gears are required which have to meet increasingly higher requirements.

Various methods are distinguished in the production of gears. In general, the continuous process is the most productive one (hobbing and generating grinding). Rolling has been used for the production of gearing for over a hundred years already. Since then, machinery and technology have been developed further on a continuous basis.

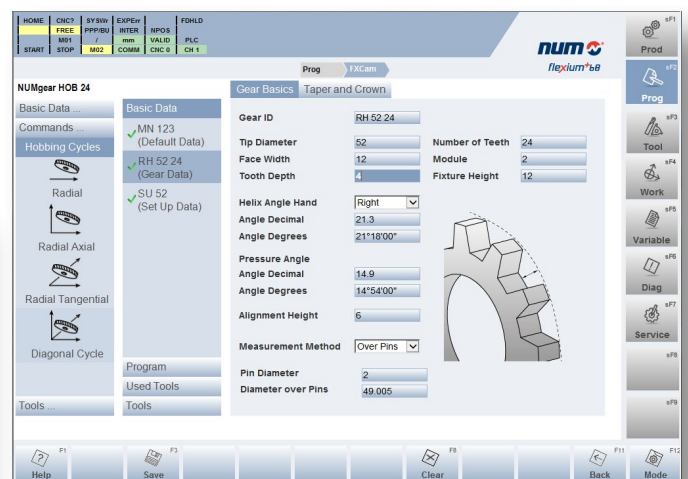
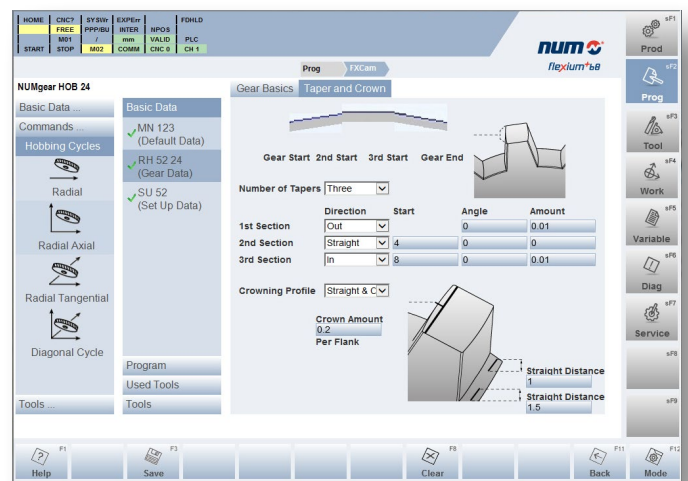


# NUMgear Moves Machines

On new machines, the old mechanical drives and couplings were replaced by modern CNC controls a long time ago. It is possible this way to manufacture gears that meet the requests of today's gearbox manufacturer.

As a leading manufacturer of modern, high-performance CNC controllers, NUM offers the complete technology software for the production of gears on hobbing machines, generating grinding machines and honing machines.

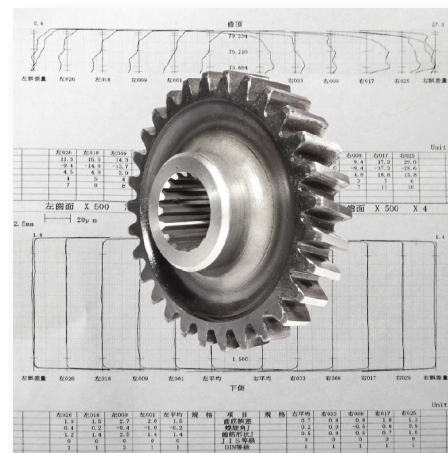
- NUMgear is fully integrated into the modern Flexium+ control system and provides an interactive user interface for the input of machine, workpiece and tool data as well as for the definition of the machining processes.
- Input fields are illustrated by graphics.
- Several processing steps can be easily combined.
- Once the data are entered, machining is started by the simple push of a button.
- In a central overview, the relevant production data are displayed during automated machining.
- The integrated tool management allows to record the machining and wear condition of various tools.
- For automatic loading, an extremely fast measuring system ensures that tool and workpiece are mounted in the correct position.



# NUMgear Is Precise

**Gears that are manufactured on a machine with a NUM control system meet the highest standards.**

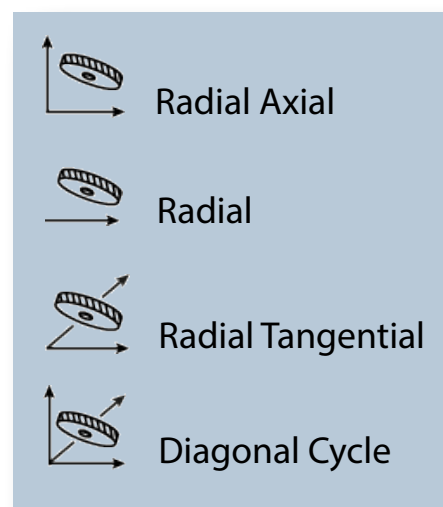
- DIN 1 for generating grinding.
- DIN 3 for hobbing.
- Combinations of different flank modifications – and profile modifications in case of grinding – are already a reality today.
- Beveled flanks and crowns – spherical, eccentric, or limited to certain flank areas – can be combined simply by entering the corresponding values in the NUMgear work-piece data.



## NUMgear is versatile

**The required CNC cycles are included in the technology software NUMgear.**

- Radially/axially the tool moves radially to depth and then cuts parallel to the tool axis. With this method, spur-toothed and helical cylindrical gears, axes and splines can be machined.
- Radially the tool cuts only by infeed without axial movement. Worm gears are thus milled.
- Radially/tangentially the tool moves to the radial retraction perpendicular to the radius and thus cuts worm gear shafts.
- Diagonally it is another method for spur-toothed and helical cylindrical gears and splines.
- For each workpiece, several different gears can be defined and produced in one operating cycle.
- The tool can be shifted continuously or incrementally in order to utilize the entire width.
- Cooling, clamping and other functions can be controlled with the machine functions.





# NUMgear Is Precise

## NUMgear is flexible

**NUMgear can be used as a complete package on new machines or on upgraded older machines.**

Since NUMgear is fully modular, a different user interface, proprietary technology- and calculation modules or other advanced functionalities can be integrated – as required. A particular strength of the experts of NUM is to work closely with customers and to make the best of both worlds into an outstanding product. We feel to be, in the best sense of the word, responsible for the success of the joint work. Projects and data can be stored centrally or locally. The HMI application NUMgear itself can run on both the individual machine, or on a Windows computer in the corporate network. This means that corrections can be carried out on multiple gear machines from a mobile device or from an office PC. NUMgear is, of course, „Industry 4.0 ready“.



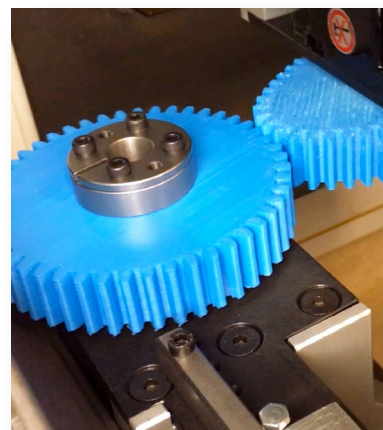
## NUMgear with super flexible EGB

**NUM provides a very flexible and powerful electronic gear train with the current control system generation Flexium<sup>+</sup>, with the accuracies up to the sub-nano range. Higher speeds increase the productivity and new technologies improve the precision.**

NUM's Electronic Gear Box (EGB) is integrated directly into the CNC kernel and can be used for gear production as well as for other technologies. There are two basic types, static and dynamic gear mechanism. With this EGB, tool speeds of up to 25,000 revolutions per minute are possible.

Static gear mechanisms use the factor specified in its definition factor for the axis coupling. Each axis of a machine can be the leading or controlled axis. Gear mechanisms can be combined and connected in series. Several axes can control an additional axis – this can also be virtual – and become the leading axis of another gear mechanism. In this case, linear and rotary axes can be combined with each other. In addition, it is possible to superimpose further movements to controlled axes. Dynamic gear mechanisms use curve tables instead of the fixed coupling factor. The interpolation between two table points is done linearly or as spline. Thus, the movement of the tool for non-circular gears, for special flank shapes can be controlled more flexibly.

Static and dynamic gear mechanisms can also be combined. A calibration or parameter set changeovers are not needed; the EGB takes care of it.







# 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.

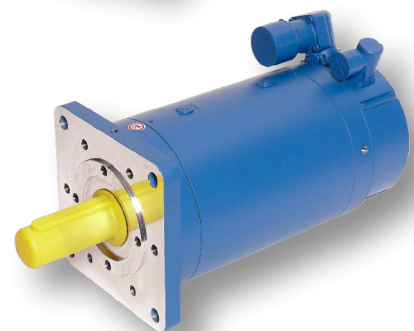
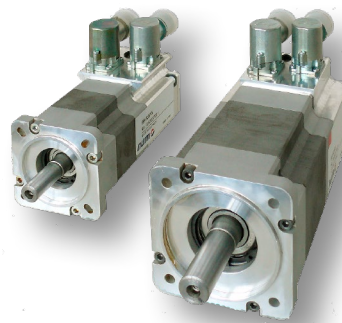
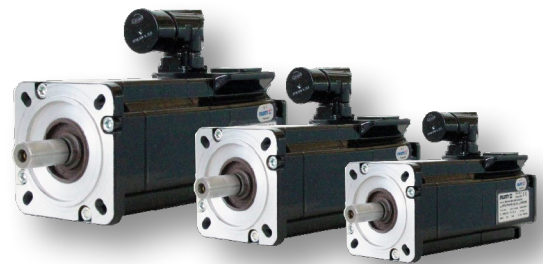
The comprehensive **servo-motor** series of NUM offer an excellent volume/output ratio, as well as first-class dynamic properties optimized for the machine tool industry. They, with perfect concentric run-out, satisfy even at very low speeds. The so-called "single cable" motors offer the advantage that the complete measuring system cable is eliminated. This simplifies the wiring of the machine significantly and thus saves 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 TMX motors are complemented by an extensive range of torque motors from our partner company Schaeffler Industrial Drives (IDAM), who's customers include many well-known European machine builders.

Key data of the motor series:

- Servo-motors from 0.318 to 160 Nm (IP65, IP67)
- Rated speeds of the servo-motors up to 8000 rpm
- Spindle motors up to 55 kW
- Special kit motors
- Liquid-cooled spindle motors
- Liquid-cooled servo motors
- Asynchronous and synchronous motor spindles (motor spindle)
- "Single cable" motors
- Custom motors



**SCHAEFFLER**

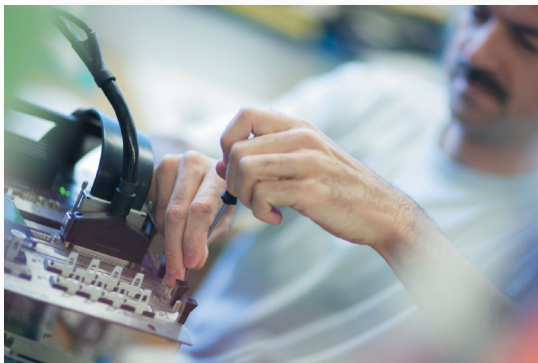
# NUM Services

## 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 via Internet. Of course, we will be happy to offer advice on site in your company.



### **Comprehensive training offer**

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

NUM provides a training offer matched to the customer needs:

- CNC operation
- CNC programming
- PLC programming
- Commissioning and servicing
- Preparation of custom surfaces
- 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, deployment on site, even for many years old installations. 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](http://www.num.com)



Follow us on our social media channels for the latest information on NUM CNC Applications.

[in linkedin.com/company/num-ag](https://www.linkedin.com/company/num-ag)  
[WeChat-ID: NUM\\_CNC\\_CN](https://www.wechat.com/id/NUM_CNC_CN)  
[twitter.com/NUM\\_CNC](https://twitter.com/NUM_CNC)  
[facebook.com/NUM.CNC.Applications](https://www.facebook.com/NUM.CNC.Applications)