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## How do you set benchmarks in CNC production?

**SINUMERIK: The groundbreaking system platform  
for every machine tool requirement**

[www.siemens.com/sinumerik](http://www.siemens.com/sinumerik)

**SIEMENS**



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# Automation solutions for machine tools

SINUMERIK places a consistent system platform for machine tool automation at your disposal – in addition, it also provides cost-efficient solutions for different sectors and technologies. These include the automotive and aerospace industries, job shop production, tool- and mold-making and the power engineering and medical technology sectors. The specific requirements of each sector are fulfilled by tried and tested functions, consistent components and supplementary services – be it for small or large batches, simple or complex workpieces.

## One system – multiple possibilities

As a partner to the machine tool manufacturing sector, we continue to bring you new and better ways of implementing machine tools efficiently, innovatively and, above all, compatibly. For this purpose SINUMERIK follows this concept: One CNC system, multiple possibilities – from CNC control systems to drives and motors through to entire control cabinets. We are also setting new benchmarks in energy efficiency. Focus is on achieving the greatest possible customer benefit and low lifecycle costs.

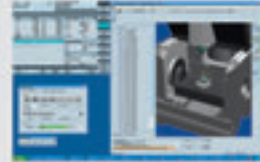
# More cost-efficiency across the entire lifecycle

SINUMERIK – innovative CNC systems, solutions and services:

- A comprehensive portfolio ranging from CNC control systems to drives and motors through to entire control cabinets
- Solution expertise across the entire lifecycle in all technologies and sectors
- High performance in both single-batch and large-batch production, on the shopfloor and in industrial operation
- Innovative services with SINUMERIK Manufacturing Excellence to optimize your machine or production
- A consistent CAD/CAM/CNC process chain



From machine planning ...



... through to the perfect, optimized machine.



From the idea ...



... to the finished workpiece.



We always provide the right automation solutions to help machine tool manufacturers and end-users of machine tools achieve a higher degree of cost-efficiency across the entire lifecycle.

## From machine planning through to the optimized machine

It is already possible to achieve considerably more cost-efficient overall structures and a higher level of productivity when new machines are in the planning and construction phase. Appropriate solutions and services ensure shortened development times for machines and a quicker time-to-market. Having the perfect automation concept means that more cost-efficient overall structures and a higher level of productivity can be achieved.

## From the idea to the finished workpiece

Fully coordinated processes and consistent solutions also allow even more efficient processes and cost-efficient production in the manufacture of workpieces – from the idea through to the finished piece. For the best productivity and consistently minimized lifecycle costs and total cost of ownership. Supported by innovative technology cycles, the usability and functionality of the SINUMERIK CNC control system allows even more cost-efficient production.

# In every industry



**SINUMERIK is the ideal CNC system for every industry, and ensures the best technological expertise – wherever the best processing results, with perfect surface quality, precision, quality and speed, are required. All of this combined with the best usability and a consistent process chain.**

## Automotive

With TRANSLINE sl, the automation concept for the automotive industry, we offer a modular and flexible system. Production lines are automated using components that come from a single source and are suited to the task at hand.

## Aerospace

The Aeroline concept, which was specifically designed for the aerospace industry, provides the correct automation solutions for the entire supply chain.

## Medical technology

SINUMERIK supports all production technologies for medical part production and impresses with its perfect surfaces, high precision and shortened change-over times. The use of a virtual NC kernel means that processing can even be optimized on the PC, thus making rejected parts made of expensive materials a thing of the past.

## Tool- and mold-making

In tooling and molding production – a sector in which precision, surface quality and speed requirements are very high, a combination of hardware power and software intelligence is indispensable in all functional areas.

## Job shop production

ShopMill® and ShopTurn® provide software solutions which are perfectly adapted to suit the requirements of shopfloor manufacturing – practical and user-friendly. Dialog-oriented and graphically-supported programming does not require any DIN knowledge.

## Power engineering

SINUMERIK is also the ideal CNC system for power engineering, e.g. in the production of complex wind power stations. This is because high productivity, perfect surface quality and strong functionality are especially required of all technologies used in this industry.

# SINUMERIK – from simple to versatile. The system solution.



## **SINUMERIK 802D sl – for standardized turning and milling machines**

The SINUMERIK 802D sl is an operator panel control system which unites all components of a CNC control system (NC, PLC, HMI) and the drive control in a single unit. The motors can be easily connected to the digital drives via DRIVE-CLiQ. This, together with the modular design of the SINAMICS S120 drive system, means that the requirements for easy and robust installation requiring minimal wiring are fulfilled. The scope of performance of the control system is ideally suited to use on standardized machine tools, from single-batch production through to large-batch production.

## **SINUMERIK 802D sl – at a glance:**

- Operator panel control system for standardized machine tools
- Up to 4 axes + 1 spindle or 3 axes + 2 spindles in addition to 1 PLC auxiliary axis on 1 channel
- 80-bit NANO<sup>FP</sup> technology
- 10.4" TFT operator panel fronts
- Programming support for cycles
- Process step programming with Manual Machine plus for turning

## **SINUMERIK 828D – compact, strong, simple – simply perfect**

This panel-based CNC control system is tailor-made for the kind of complex turning and milling machines that are typically found in job shops. The range of applications also includes vertical and simple horizontal machining centers, through to oblique turning machines with one machining slide, equipped with a Y-axis and counter-spindle. Operator panel and CNC electronics are packaged together in one robust, maintenance-free unit. The SINUMERIK 828D, with its very compact dimensions, offers many high-performance CNC functions, and thus sets new benchmarks in the compact CNC class. Equipped with a comprehensive CNC programming package, the SINUMERIK 828D is optimally prepared for every global CNC consumer market. Technology-specific, pre-configured system software and intelligent service functions also allow drastic minimization of the costs for machine commissioning and maintenance.

From left to right: SINUMERIK 802D sl, SINUMERIK 828D horizontal/vertical, SINUMERIK 840D sl



### SINUMERIK 828D – at a glance:

- Compact panel CNC in horizontal and vertical operator panel layout for compact machine tools
- For up to 8 axes/spindles in one processing channel
- 80-bit NANO<sup>FP</sup> technology
- 10.4" TFT operator panel fronts
- programGUIDE programming support
- ShopMill/ShopTurn process step programming available
- Operation and programming with animated graphics
- 3-axis SINUMERIK MDynamics technology packages
- Separate, pre-installed system software features for turning and milling
- Production-status monitoring via text messages (SMS)

### SINUMERIK 840D sl – open, flexible, powerful – powerful innovations

The SINUMERIK 840D sl offers modularity, openness and flexibility, as well as uniform structures for operation, programming and visualization. It provides a system platform with trendsetting functions for almost all technologies. Integrated into the SINAMICS S120 drive system and supplemented by the SIMATIC S7-300 automation system, the SINUMERIK 840D sl forms a complete digital system. The SINUMERIK 840D sl is distinguished by its high level of flexibility, dynamics and precision, as well as optimum integration into networks.

### SINUMERIK 840D sl – at a glance:

- Drive-based CNC for complex solutions
- For up to 31 axes/spindles in 10 processing channels
- 80-bit NANO<sup>FP</sup> technology
- 7.5"/10"/12"/15" TFT operator panel fronts
- programGUIDE programming support
- ShopMill/ShopTurn process step programming available
- Operation and programming with animated graphics
- 3-axis/5-axis SINUMERIK MDynamics technology packages
- Several operator panels can be used on one CNC
- Tool management functions
- Safety function  
SINUMERIK Safety Integrated

# SINUMERIK – the CNC solution with a system



The SINUMERIK CNC family –  
the benefits at a glance:

- Scalable hardware and software
- New SINUMERIK Operate user interface combines easy usability and functionality
- Openness in the user interface, CNC or PLC
- Diagnostics via DRIVE-CLiQ® right down to the competence level
- Fast commissioning via automatic identification of the drive components (plug-and-play)
- Safety function for protection of persons and machines with SINUMERIK Safety Integrated

**SINUMERIK is a robust, consistent system that provides standardized solutions for a high degree of investment security.**

**The uniform programming and operation with intelligent functions, in addition to the high degree of safety for people and machines, stand for the highest level of technological competence.**

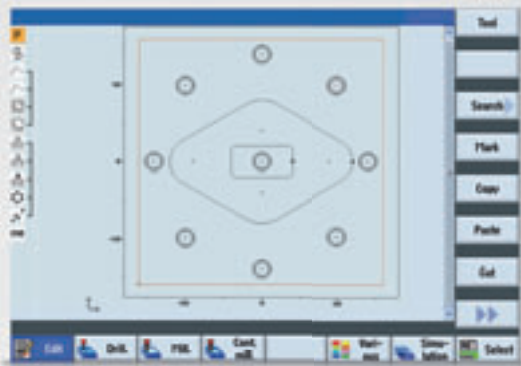
## **SINUMERIK MDynamics – milling expertise in a package**

SINUMERIK MDynamics provides technology packages consisting of CNC hardware, intelligent CNC functions and CAD/CAM solutions for three- and five-axis milling machines for our SINUMERIK 828D and SINUMERIK 840D sl CNC control systems. The Advanced Surface functionality, which is integrated into the package, represents an intelligent motion control and allows better milling machine results with perfect surface quality.

## **SINUMERIK Safety Integrated: Definitely more than just safety**

SINUMERIK Safety Integrated ensures functional safety. Both people and machines are effectively protected thanks to the complete integration of the safety functions into the control and drive technology, making your machine tool safe and practical to operate under all required operating conditions. All safety functions are certified according to the most up-to-date standards by globally-recognized test centers.

# SINUMERIK Operate – for efficient machine operation



## SINUMERIK Operate – the benefits at a glance:

- A consistent user interface for every new SINUMERIK control system
- Perfect operating and programming usability
- Clear and intuitively operable
- Optimum display in modern Windows style
- With new, powerful functions for setup, programming, tool and program management
- CNC programming for high productivity with programGUIDE
- New functionality for complete processing

The new SINUMERIK Operate user and programming interface is clear and intuitive. It combines the proven HMI Advanced, ShopMill and ShopTurn under one consistent, innovative user and programming interface.

The result: a uniform user interface which combines the entire range of functions for operation and programming.

## Programming has never been so simple

The new SINUMERIK Operate user interface is equipped with many new, high-performance functions. This allows the connection of process step and high-level language programming under one system interface – and thus a very fast, rational and intuitive NC programming and operational planning. The G-Code programming is combined with cycle support in programGUIDE.

This represents maximum flexibility and short processing times, and is exceptionally suitable for medium to large batch sizes. SINUMERIK also supports ISO-Code programming. ShopMill and ShopTurn process step programming is the tailor-made programming solution for the production of replacement parts and small batch sizes. This makes it the ideal solution for shopfloor production.

# SINAMICS S120 – the flexible, modular drive system for sophisticated tasks



## SINAMICS S120 – the benefits at a glance:

- Consistent modular system for all performance ranges
- Modular, flexible and compact
- Adaptable to any machine concept
- Decentralized through high-performance communication via DRIVE-CLiQ, PROFIBUS and PROFINET

## Technology overview

- Voltage range/performance range: 0.12 – 250 kW at connection voltages of 1AC 230 V, 3AC 380 – 480 V
- Simple system design for modular, scalable and decentralized machine concepts

The SINAMICS S120 drive system offers the perfect solution platform for high-performance applications in industrial machine and system engineering: a modular system which allows a very high degree of flexibility. Its multiple, coordinated components and functions allow tailor-made solutions to be implemented which are designed individually for the respective area of application.

## High productivity and modularity

SINAMICS S120 drive solutions for controlled motion control in your machine: high-performance, multi-axis configurations with modular multi-axis or self-sufficient single-axis modules. The modular system covers the performance range from 0.12 to 1,200 kW. Together with the SINUMERIK solution line, SINAMICS S120 is already the perfect basis for modular system and machine concepts in the performance range of up to 300 kW. The uniform and consistent engineering tools ensure considerably reduced engineering expenses.

## DRIVE-CLiQ: The digital interface between all drive components

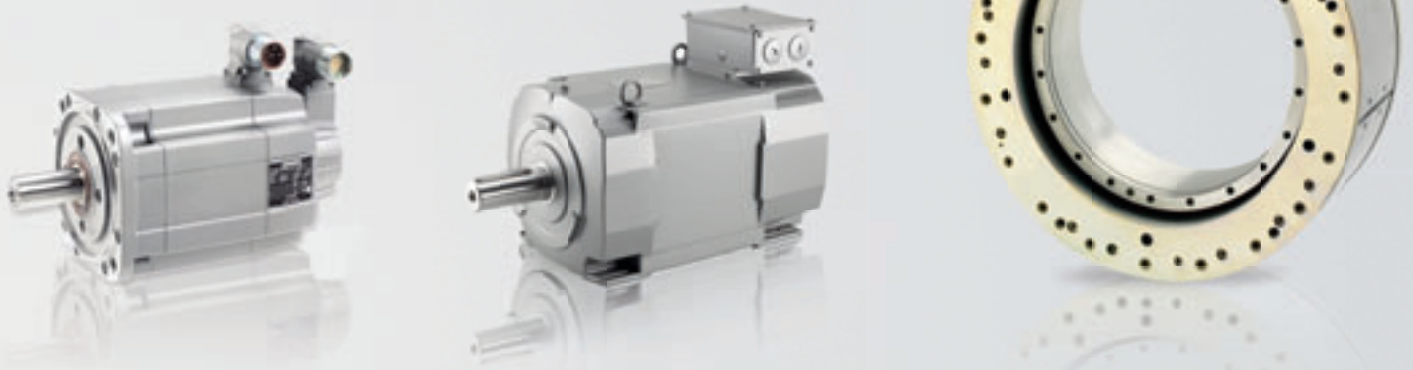
All components of SINAMICS S120 (including the motors and transducers) and of SINUMERIK are connected to one another via the DRIVE-CLiQ common interface. All components are equipped with an electronic type plate with all relevant technical data. This data is automatically acquired by the SINUMERIK control system via DRIVE-CLiQ and does not need to be entered during commissioning or when replacement is carried out (plug-and-play), which considerably shortens the commissioning time.

## Decentralized and flexible design

The consistent communication via DRIVE-CLiQ allows flexible, decentralized machine concepts. In decentralized construction, the individual components can be placed up to 100 meters (325 feet) apart from each other. With user solutions which employ a large number of axes of motion in the machine kinematics, the basic system units can be supplemented using the SINUMERIK NX10/NX15 extension components to increase the drive's computing power.

# Powerful motors to get your machine moving

From left: 1FT7, 1PH8, 1FW6



**The comprehensive range of motors offers the right type for every drive application, in a wide performance range.**

**This means it always ensures the right movement.**

## **The correct motor for every feed and auxiliary drive**

Whether it be high standstill torques or nominal power, high maximum permissible speeds or dynamics, air or water cooling, linear or rotatory movements, our comprehensive range of motors provides the right type for all drive applications in a wide performance range. This includes synchronous and asynchronous servo motors and highly innovative linear or rotatory direct drives.

- 1FK7 servomotors for standard applications
- 1FT7 servomotors for high-performance applications
- 1FN3 and 1FN linear motors
- 1FW6 torque motors

## **Main spindle motors for high-performance applications in machine tools**

Whether they be belt drives, hollow shaft motors, built-in motors or integrated motor spindles – main spindles in turning, milling and grinding machines can be driven in multiple ways. The main spindle drive provides high cutting ability, production precision and availability and is thus a major factor in the machine's productivity. Motor spindles are clearly gaining ground in this sector. Their benefits lie in very high maximum speeds combined with very low susceptibility to vibrations. The result: high productivity and surface quality.

- 1PH8 main spindle motor
- 1FE1 built-in motors
- 2SP1 motor spindles

# SINUMERIK Manufacturing Excellence



Wherever machine tools are constructed and used, the focus is on achieving the highest possible performance and effectiveness. With the consistent SINUMERIK automation platform, Siemens not only offers CNC solutions, it also provides solutions and services for machine tool optimization with SINUMERIK Manufacturing Excellence.

## At your disposal throughout the entire lifecycle

Siemens accompanies machines throughout their entire lifecycle – from the idea and conception through to operation and retrofitting. Innovative services for machines offer enormous potential for the optimization of lifecycle costs. Savings potential is not only provided by the purchase price for new machines and systems, but also (above all) by the development, engineering and operating costs. It is already possible to achieve considerably more cost-efficient overall structures and a higher level of productivity

when new machines are in the planning and construction phase. A central requirement in the production process is the reduction of the unit costs. These in turn are dependent on the running expenditures for the operation of systems in production. Examples of this are personnel and tools. The operating costs are essentially determined by the OEE (Overall Equipment Effectiveness) number, based on the availability of machines and systems, their productivity and quality. This is exactly where

SINUMERIK Manufacturing Excellence comes in, making an essential contribution to the optimization of your production – whatever technologies are used, what degree of automation is present and what planning and production strategies are in place. Your requirements determine which modules from our SINUMERIK Manufacturing Excellence service package will be used to create your individual solution.

SINUMERIK Manufacturing Excellence – the benefits at a glance:

**For machine tool builders:**

- Shortened machine development time
- Cost-optimized machine development
- Improved machine service
- Machines with optimum dynamics
- Allows new service potential to be tapped
- Reduced warranty costs

**For machine tool end-users:**

- Reduced unit costs
- Process optimization
- Improved productivity and increased availability
- Optimized quality



**1 Develop      2 Operate      3 Support**

**The service portfolio for the optimization of your production**

**Machine Development**

- Simulation and commissioning of machines
- Shortening of machine development times

**Manufacturing IT**

- Functions for planning and carrying out production
- Process optimization and transparency in the machine environment

**Condition Monitoring**

- Functions for status-oriented maintenance
- Reduction of machine downtimes

**Extended Machine Contracts**

- Lump-sum contracts for personnel and materials with arranged reaction times
- Protection of system availability

**Productivity Improvement**

- Optimization of machine processes
- Cycle time reduction and quality improvement

**Machine Retrofit**

- Modernization of automation technology and mechanisms
- Extension of machines' service life

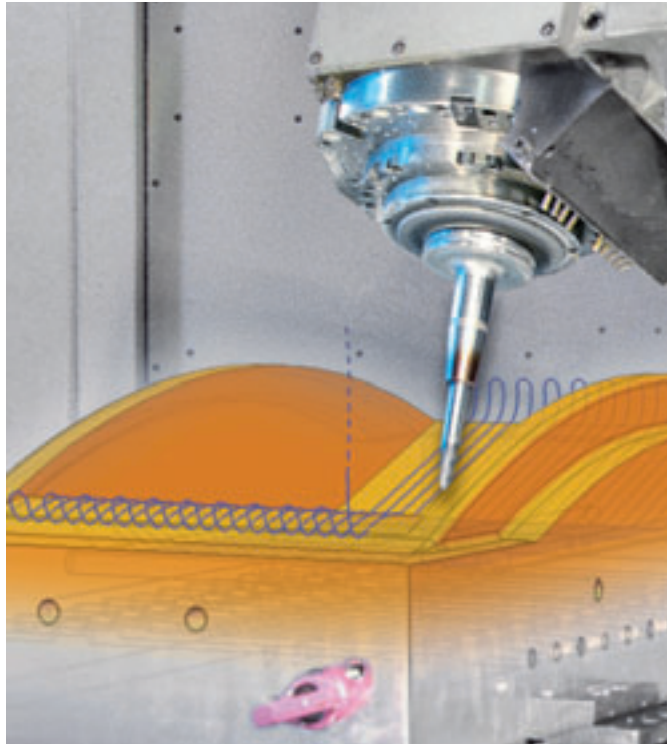
**Service and Support**

- Comprehensive service, e.g. replacement parts and on-site service
- High availability of machines and systems is ensured

# Software solutions for modern product lifecycle management

Product Lifecycle Management – the benefits at a glance:

- Comprehensive, scalable 3-D solution portfolio for global design, engineering and production planning
- Transform the process of machine tool development and manufacturing while incorporating your mechanical, electrical, electronics and software groups
- Reduce development time and prototyping costs
- Tightly integrate your planning, project management and production systems
- Offer new software-based products along with your machine enabling your customers to increase machine utilization and dramatically reduce setup time



**Our software portfolio offers comprehensive solutions for complex tasks in Product Lifetime Management for all aspects of machine tools. These include CPDM (Collaborative Product Data Management), computer-aided design (CAD/CAM/CAE) and software for simulating production processes.**

## **NX – a comprehensive program package for product development**

The NX™ suite of integrated CAD, CAM, CAE and PDM applications transforms the entire product development process by reducing waste, improving quality, shortening cycle time and delivering more innovative products.

With its Process Innovation functionality, you can streamline and integrate your planning, concept design, engineering, simulation and manufacturing teams. Lifecycle simulation enables you to streamline your simulation, validation and optimization processes and incorporate performance simulation early and often. With the integration of NX CAM and CNC, and with special optimization for SINUMERIK controllers, you can increase your NC programming efficiency and improve your final part quality.

## **Tecnomatix – defining a manufacturing plan for production**

Tecnomatix™ is a comprehensive portfolio of digital manufacturing solutions – from process layout and design, process simulation and validation, to documentation and manufacturing execution. Tecnomatix solutions cover various aspects of manufacturing including part manufacturing, assembly, robotics and automation as well as quality management, factory layout and material flow. Built upon Teamcenter™, the open product lifecycle management (PLM) foundation, Tecnomatix provides the most comprehensive set of manufacturing solutions on the market, thus

# Intelligent fire protection solutions with Sinorix al-deco STD



## Sinorix al-deco STD – the benefits at a glance:

- Extremely high operational safety thanks to current-free operation
- Online monitoring and alarms when events occur
- Comprehensive monitoring via recording of the safety-relevant data
- Data available via USB interface
- Operation-friendly maintenance

The European jurisdiction requires fire protection for machines and their associated devices which are susceptible to fire.

Sinorix™ al-deco STD offers an intelligent object protection system which can be used flexibly in machine tools.

The system is distinguished by current-free operation regarding detection and extinguishing, online monitoring and automatic recording of all safety-related functions. Visit [www.siemens.com/sinorix](http://www.siemens.com/sinorix) for more information.

## Extinguish fires quickly and safely

The Sinorix al-deco STD fire protection system uses pneumatic functions to detect fires and to trigger the extinguishing process. This makes the system impervious to technical interference, and enables it to detect and extinguish fires completely without electric power. For this purpose, a hose system is installed in the interior of a machine tool. This so-called Lifdes™ hose (Linear Fire Detection Source) acts as a linear fire sensor. It is under pressure and splits

open when the temperature exceeds 110 degrees Celsius. If pressure loss occurs in the hose, a connected valve triggers the extinguishing process. For comprehensive monitoring, all safety-relevant functions are monitored online, and unusual events are acoustically and visually displayed. These functions, like the operating data, are automatically recorded in a long-term memory and can be read via a USB interface.

# Value-adding partnership ...



We're right there when you need us. We have sites worldwide, allowing us to always provide you with the right solutions for your machine tools, or to guide you when it comes to CNC training.

## **SINUMERIK Solution Partner**

Our solution partners offer solutions to supplement SINUMERIK and possess in-depth knowledge in all aspects of machine tools and our CNC systems. When it comes to increasing the productivity, reliability and availability of your machine tools, then you're in safe hands with our certified partners.

## **Technology and Application Center**

Users and manufacturers of machine tools can find out about our products and solutions for machine tools through training and product demonstrations at our Technology and Application Center.

## **Practical CNC training**

In addition to the classic range of courses and seminars, we also offer additional services such as online learning modules, learning software and specialist literature. We offer everything you need for successful learning, from basic training, programming and operation, right through to professional training: practical and perfectly tailored to suit the various training levels you require.



[www.siemens.com/plm](http://www.siemens.com/plm)

### Velocity Series – PLM for mid-sized manufacturers

combining best-in-breed data management and leading applications to plan and optimize manufacturing systems. Tecnomatix improves planning efficiency by providing a collaborative environment in which manufacturing planners can access the latest product data, define and optimize manufacturing processes. In its managed environment Tecnomatix supports the re-use of best-practice processes, standardization, change management etc. Tecnomatix' simulation capabilities allow for validation and optimization of manufacturing lines in a digital environment before they even exist, thus enabling manufacturers to minimize risk and maximize manufacturing productivity.

Velocity Series™ is a comprehensive family of modular, yet integrated solutions addressing the product lifecycle management (PLM) needs of the mid-market. Consisting of a pre-configured family of digital product design, analysis NC programming and data management software offerings, Velocity Series™ leverages the industry's best practices to provide significant breakthroughs in ease-of-use and deployment.

The portfolio features:

- Solid Edge, with Synchronous Technology, technically robust, 3D CAD software and the premier design-centric solution in the CAD industry
- Teamcenter Express, an easy-to-use, pre-configured and easy-to-deploy collaborative product data management solution
- Femap, a pre- and post-processor finite element modeling application known for its tight integration with Nastran, the most extensive and reputable CAE solver in the industry
- CAM Express, a CAD neutral, numerical control (NC) programming application

## Get more information

Everything you want to know about SINUMERIK CNC systems:  
[www.siemens.com/sinumerik](http://www.siemens.com/sinumerik)

Everything having to do with job shop production:  
[www.siemens.com/cnc4you](http://www.siemens.com/cnc4you)

Everything about the SINUMERIK  
Manufacturing Excellence service portfolio:  
[www.siemens.com/sinumerik/manufacturing-excellence](http://www.siemens.com/sinumerik/manufacturing-excellence)

Information about CNC training:  
[www.siemens.com/sinumerik/training](http://www.siemens.com/sinumerik/training)

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