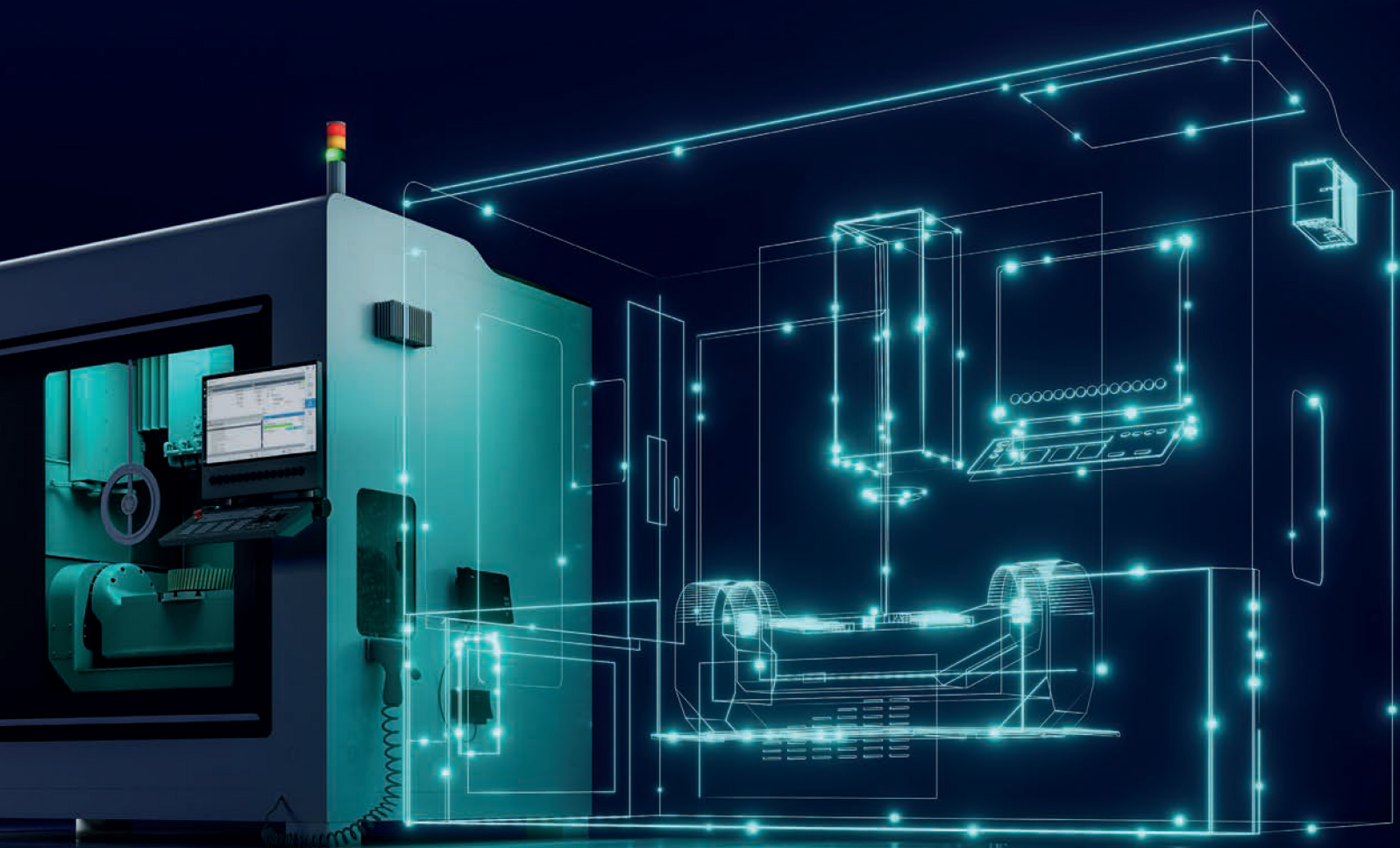




SIEMENS



Edition
2022

INTELLIGENT SOLUTIONS FOR MACHINE TOOLS

SINUMERIK

usa.siemens.com/cnc

SKAZEMCNC

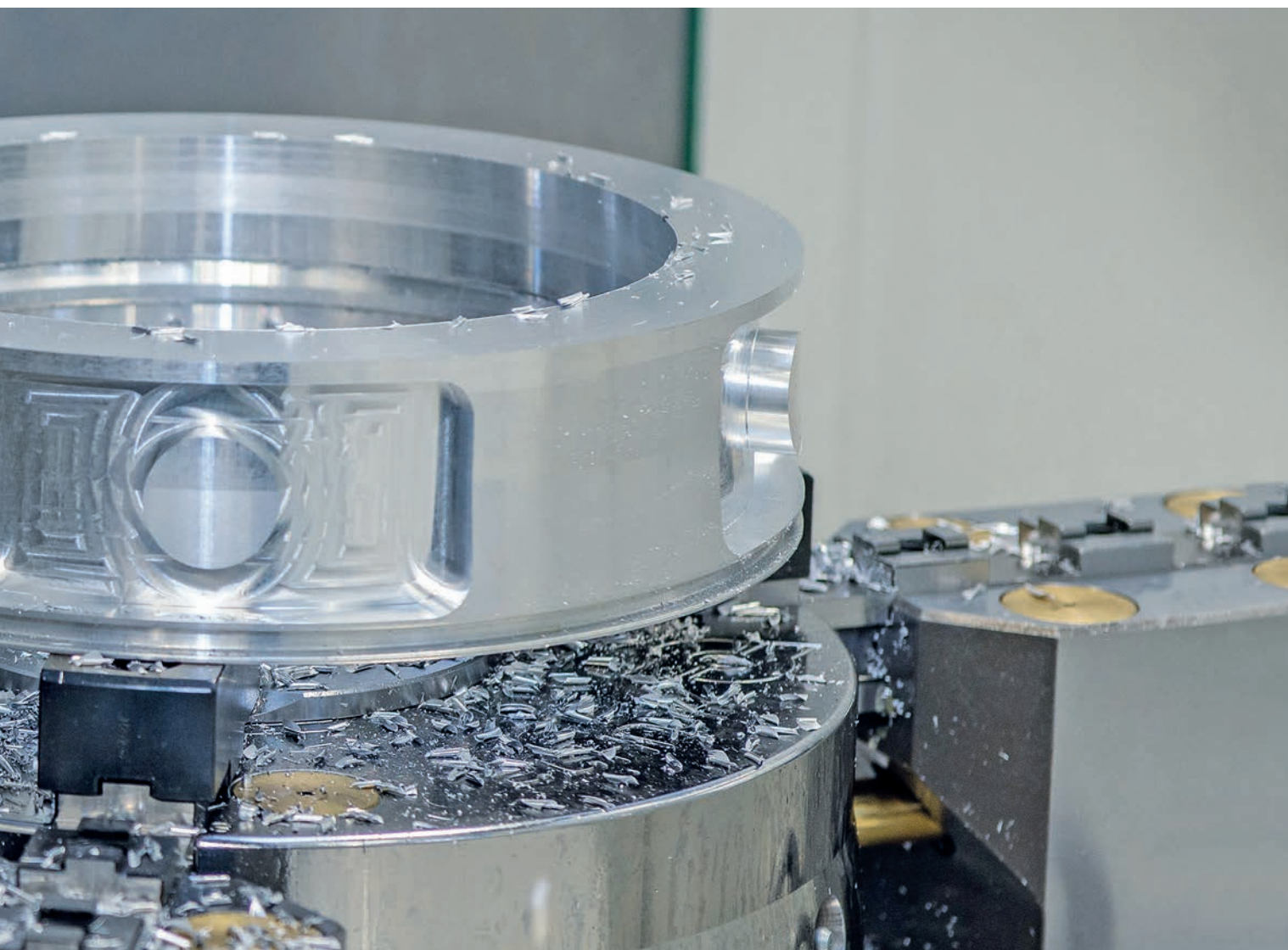
skazemcnc.ir

Increased productivity with SINUMERIK

Manufacturers have their own very individual requirements — whether standardized automation concepts for the automotive industry or special technologies such as automated tape laying used in aerospace. As a long-time and trusted partner of machine tool builders and users, Siemens provides automation and digitalization solutions that will increase your manufacturing productivity and accelerate your business growth. **SINUMERIK delivers the greatest return on CNC.**



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| **Your partner** in the machine tool industry

Leading-edge solutions for digitalization and automation

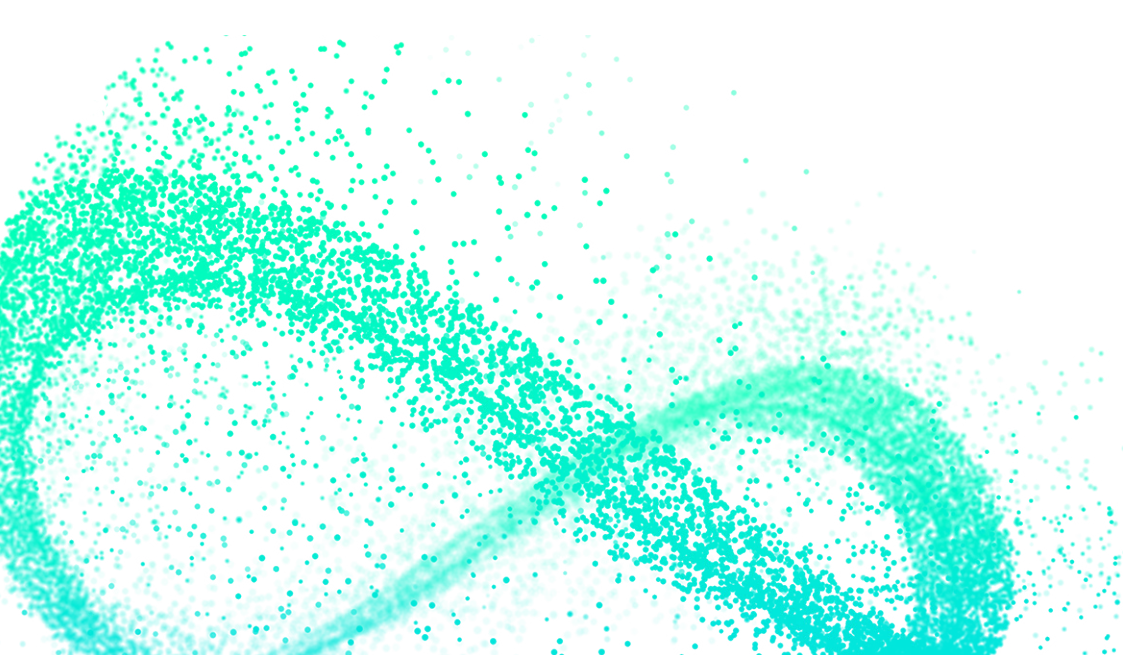
From the concept of a new machine, to faster times to market—from greater flexibility to increased quality and efficiency—the machine tool industry is constantly demanding leading-edge solutions from its suppliers.

To answer these challenges, Siemens offers you an integrated portfolio of automation and digitalization solutions, along with the technological expertise to support machine tool builders and end-users.

By choosing Siemens and SINUMERIK, you'll have a greater return on your machines, your operations and your people.

Digitalization creates infinite opportunities from infinite data

We see the future of manufacturing as having infinite possibilities by connecting the real world with the digital world. By creating the most comprehensive tool set, Siemens enables you to create digital twins of your products, your production and your performance—making it possible for you to create innovative and flexible solutions to your manufacturing challenges.



**Siemens is constantly striving for quality**

We are continually improving our development, production and test processes in order to secure maximum availability of our hardware and software. This includes short response times to address customer requirements, testing to secure a high degree of ruggedness—as well as high-quality software. Through the use of the digital twin, machine builders and users can take their first steps towards increasing their manufacturing productivity and accelerating their businesses.

We are the benchmark in productivity

Siemens has become the standard in the machine tool industry for more than 60 years. In fact, the SINUMERIK control is the first choice when new, revolutionary machine concepts need to be implemented—and when maximum machining productivity is required.

We have an innovative, unique and extremely experienced development team to ensure that highly productive machines equipped with SINUMERIK CNCs, can be implemented now and well into the future.

SINUMERIK—the CNC portfolio for the machine tool industry

SINUMERIK controls offer the perfect solution for each and every machine design. No matter if you're manufacturing individual parts or mass producing, basic or complex workpieces, SINUMERIK delivers the greatest return on your CNC investment.



SINUMERIK 808

The entry-level CNC for basic machines

- Panel-based compact CNC
- Up to 6 axes/spindles
- 1 machining channel
- 8.4" color display
- SIMATIC S7-200-based PLC
- SINAMICS V70 drive, SIMOTICS S-1FL6 motor



SINUMERIK 828

The compact and advanced CNC for standard machines

- Panel-based compact CNC
- Up to 10 axes/spindles and 2 auxiliary axes
- Up to 2 machining channels T, M, G
- 10.4" display or 15.6" touch display
- SIMATIC S7-200 PLC
- SINAMICS S120 Booksize / Combi drives, SIMOTICS motors



SINUMERIK 840

The open CNC for modular machine tool designs

- Drive-based, modular controller
- Multi-technology CNC
- Up to 31 axes/spindles per NCU* and any number of PLC axes
- Up to 10 machining channels per NCU*
- Modular panel concept up to 24" color display
- SIMATIC S7-300 PLC
- SINAMICS S120 Booksize/Combi/Chassis drive, SIMOTICS motors

*Up to 3 NCUs can be connected via NCU-Link



SINUMERIK ONE

The first-ever digital-native CNC—
the next level of digital transformation

- Digital twin as an integral component of the controller
- Drive- and panel-based modular CNC
- Multi-technology CNC
- Up to 31 axes/spindles and any number of PLC axes
- Up to 10 machining channels
- Modular panel concept up to 24" multi-touch color display
- SIMATIC S7-1500F PLC
- SINAMICS S120 Booksize/Combi/Chassis drive, SIMOTICS motors



SINUMERIK MC

The CNC for special manufacturing technologies

- Industrial PC-based control
- Open user interface design based upon WinCC or Run MyHMI/3GL
- Up to 8 axes/spindles
- Up to 4 machining channels
- Modular panel concept
- SIMATIC S7-1500F PLC
- SINAMICS S120 Booksize with CU320, SINAMICS S210 drives, SIMOTICS motors

SINUMERIK 808

The entry-level CNC for basic machines

With its revolutionary operating system and graphical user interface—combined with easy operation, commissioning and maintenance—SINUMERIK 808D ADVANCED is the ideal control for basic milling and turning machines.

Compact and rugged

Thanks to its panel-based CNC design, very few interfaces and an operator panel with IP65 degree of protection, SINUMERIK 808D ADVANCED is the perfect answer every machine tool application. The small dimensions of these units allow them to be used in compact machines.

Optimized for basic milling and turning applications

As a result of its technology-specific versions, SINUMERIK 808D ADVANCED is pre-configured for milling and turning. The range of applications extends from basic, standard milling machines or simple machining centers, through cycle-controlled lathes, up to basic, full CNC lathes. Based upon its hardware and software expansions, SINUMERIK 808D ADVANCED offers you the right amount of performance for simple machining functions found in tool- and mold-making.

Ideal for entry-level machine tool operators

Based upon standard Siemens operation and programming methods, SINUMERIK 808D ADVANCED is ideal for machine tool professionals entering the world of CNC. Commissioning is explained interactively in a graphical format, as well.



SINUMERIK 828

The compact and advanced CNC for standard, mid-range machines

The unique performance of the SINUMERIK 828D control sets new productivity benchmarks when it comes to milling and turning on standard machines, including functions that automate grinding machines.

Rugged and maintenance-free

With its die-cast magnesium operator panel front, plus its panel-based CNC design with minimal interfaces, as well as a high degree of protection, SINUMERIK 828 is the perfect CNC even in harsh environments.

With no fan and no hard disk, and NV-RAM memory without a battery, SINUMERIK 828 is a completely maintenance-free CNC system.

User-friendly

SINUMERIK 828 is very easy to operate thanks to a full QWERTY CNC keyboard with short-stroke keys and a high-resolution 10.4" TFT color display or 15.6" touch-screen.

Equipped with USB, CF card (for 10.4") and RJ45 interfaces on the front of the operator panel, CNC data can be transferred quickly and easily.

Optimum scalability

In addition to the three high-performance versions of the CNC, SINUMERIK 828D represents an entry into not only favorably-priced job shop machines, but also more complex machine tools with additional axes/spindles and two machining channels.



SINUMERIK 840

The ultimate CNC in machine tool performance

SINUMERIK 840D sl is considered to be the standard in premium-class CNCs. Maximum machine tool performance, along with a high degree of flexibility and openness, form the basis for almost any machine concept.



Maximum performance

SINUMERIK 840D sl offers a performance potential never seen before thanks to its drive-based, high-performance NCUs (Numerical Control Units) with state-of-the-art, multi-core processor technology. This means that up to 93 axes in 30 machining channels can be controlled in the NCU link. Machines with fewer axes also benefit from the 840D's performance as a result of the highest degree of precision with the shortest machining times.

Open architecture and communication at every level

SINUMERIK 840D sl allows it to be adapted to the machine tool's technology. For example, the operating system can be supplemented and adapted, and robots and handling systems can also be integrated. Using PROFINET, the 840D is perfectly embedded in the Siemens Totally Integrated Automation (TIA) environment. This guarantees that every component works perfectly with each other, ultimately allowing you to achieve maximum availability of your production process.

Scalable and modular with intuitive operation

In addition to scalable NCU performance, SINUMERIK 840D sl has a high degree of component modularity. Any operator panel can be combined with the NCU, making the 840D the ideal solution for high-end CNC machines. SINUMERIK operator panels make programming and operation easy for everyone. With its intuitive graphical user interface, multi-touch and gesture operation are possible on the manufacturing floor.

SINUMERIK ONE

The first-ever, digital-native CNC

Developed from the ground up, SINUMERIK ONE is the first CNC system to master the challenges of digital transformation in the machine tool industry. Real-world machining processes and machine tool behavior can now be simulated in the virtual world thanks to the digital twin of the control.



Maximize your productivity

SINUMERIK ONE is setting standards in machine productivity, flexibility, efficiency, speed and quality. This new CNC system maximizes productivity through state-of-the-art hardware and software—especially in applications like mold-making. Tasks such as collision monitoring that require heavy CPU resources can now be executed during machining without restriction. Speed is also a crucial factor throughout the lifecycle of a CNC machine. SINUMERIK ONE helps optimize engineering processes based upon consistent, end-to-end workflows, thanks to the complete integration in the Totally Integrated Automation (TIA) Portal.

Innovate faster

With SINUMERIK ONE, virtual processes and digital twins are crucial factors for the machine builder and the CNC machine user. Based upon the digital twin of the control, not only do machine development and commissioning achieve all new levels of quality and efficiency, but production planning, workpiece machining, machine expansions and services do, too.

Discover a new way of thinking—with digitalization

SINUMERIK ONE offers machine tool users a true “Digital First” strategy. This means that central processes such as programming, production planning and process optimization are always simulated in the digital twin. This provides users with a detailed virtual image of the CNC system and machining process instead of performing them directly at the machine. And thanks to virtualization, work is performed offline and non-productive times are eliminated.

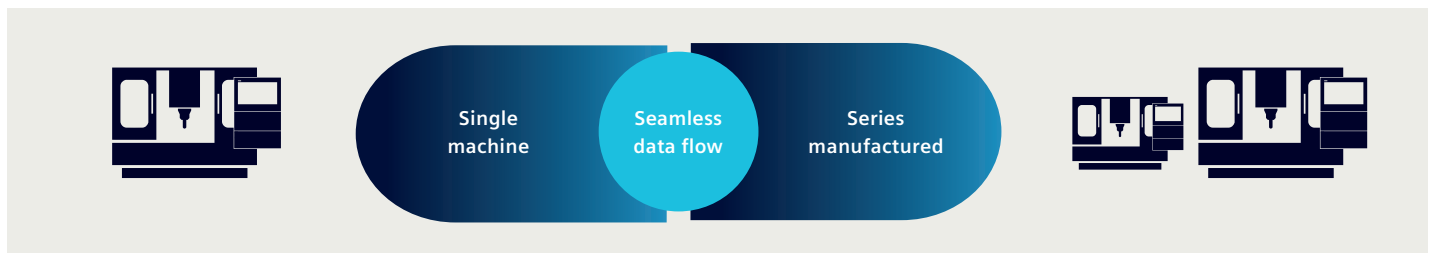
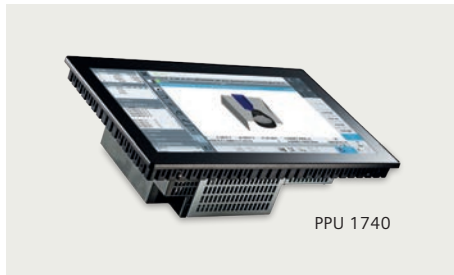


SINUMERIK ONE increases performance

Thanks to the drive-based high-performance Numerical Control Units (NCUs), SINUMERIK ONE can operate up to 31 axes in 10 machining channels. Performance is characterized by the highest degree of machining precision with the shortest machining times.

SINUMERIK ONE offers the ultimate when it comes to scalability and modularity

Panel Processing Units (PPUs) are operator panels that range from 15" to 24" in horizontal and vertical variants, making machine tool operation and visualization even easier.



New and powerful technology packages

With CNC software version 6.15, machine tool users benefit even further with SINUMERIK ONE Dynamics. These three technology software packages increase efficiency when programming on the shopfloor and executing CAM-generated CNC programs. They include:

- One Dynamics Operate
- One Dynamics 3-axis milling
- One Dynamics 5-axis milling

New software functions found in these technology packages adjust the performance of the machine when it comes to accuracy, velocity and surface quality levels—allowing users to achieve maximum productivity.

Efficient engineering workflow

Thanks to the comprehensive and highly intuitive functionality of the TIA Portal engineering framework, machine tool builders benefit from faster time-to-market and efficient programming.

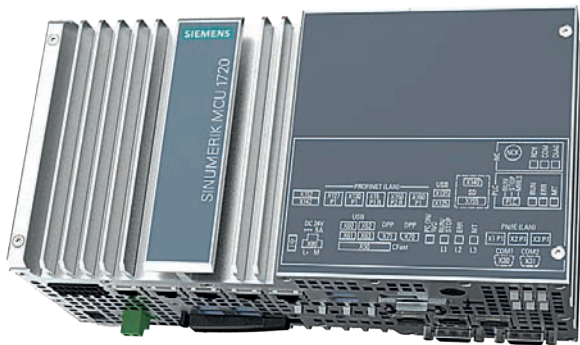
TIA Portal provides a seamless data flow for every engineering phase. No matter if it's a single machine or a series-manufactured machine you're building, TIA Portal always guarantees the most efficient engineering possible.

Standardized interfaces and the powerful Openness-API of TIA Portal, in conjunction with the SINUMERIK Engineering Workflow, allows the automated engineering of individual and modular machines in a very quick, easy and efficient manner.

SINUMERIK MC

Industrial PC-based control for special manufacturing technologies

With its integrated CNC, PLC and Windows® 10 operating system, SINUMERIK MC is the new industrial PC-based solution for machine tools and fabrication machines that require a customizable user interface and powerful motion control.



Fabrication and manufacturing technologies

From basic grinding and wood, to stone- and sheet-metal cutting, to laser, water jet and even additive manufacturing applications—SINUMERIK MC is the ideal control system for customized machine solutions.

Maximum openness

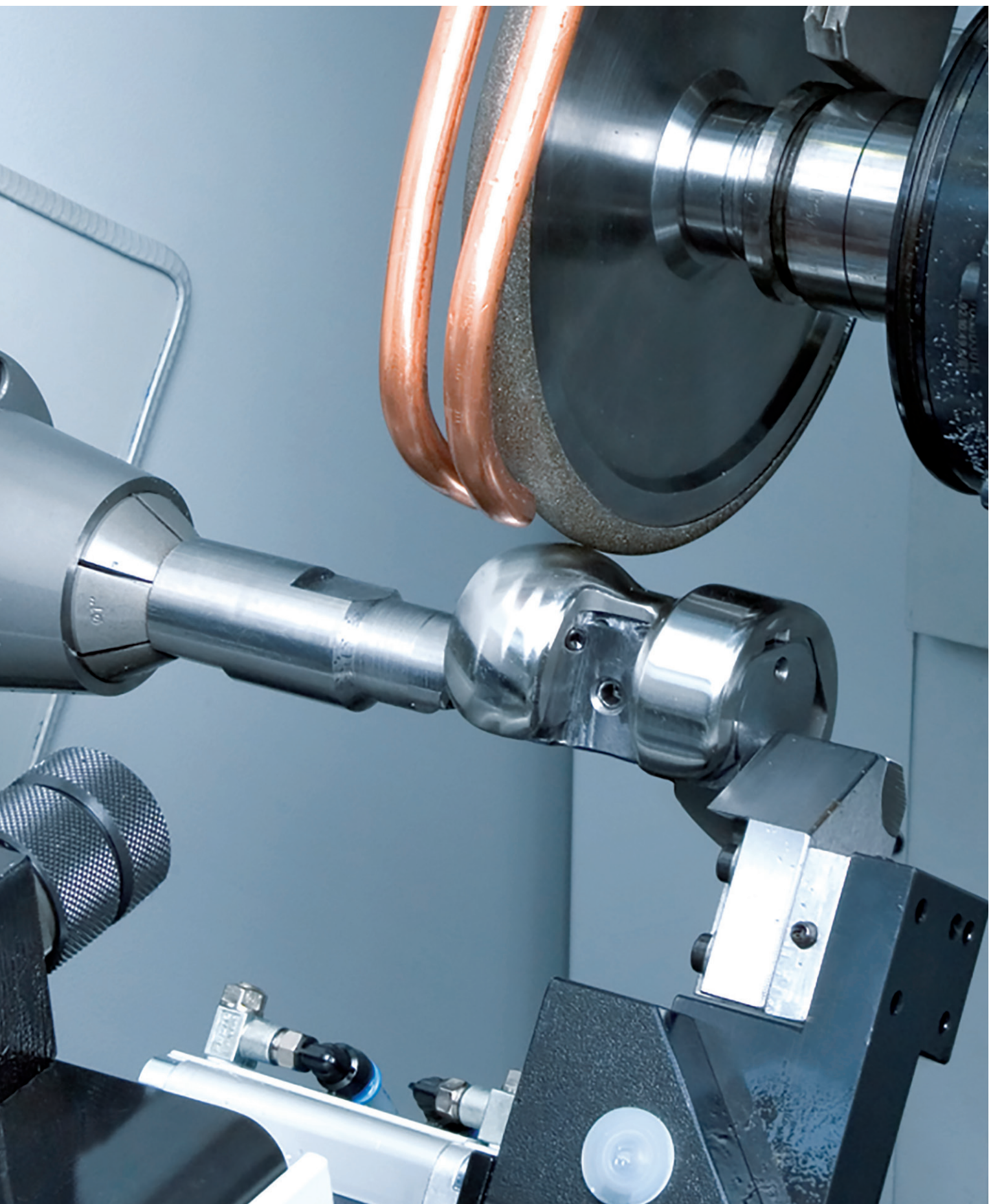
With the integrated Windows® operating system, it's simple to create customized user interfaces. The open operating concept and extensive interfaces mean that SINUMERIK MC is a seamlessly integrated and open control system.

Excellent motion control and high automation performance

SINUMERIK's well-proven CNC technology facilitates the highest motion control precision—and thanks to G-code programming, a high degree of flexibility and versatility when it comes to open-loop machine control.

Simple engineering

Symbolic programming, state-of-the-art programming languages and comprehensive toolboxes to implement standard applications mean that engineering in the Siemens TIA Portal is both simple and efficient. Ultimately, this results in reduced machine commissioning time and reduced cost.



Drives and motors

Everything from a single source



SINAMICS V70



SINAMICS S120 Combi



SINAMICS S120 Booksize



SINAMICS S120 Chassis

SINAMICS drives

This complete and integrated SINAMICS family of drives addresses every level of performance and sets itself apart thanks to its highest degree of flexibility, functionality and efficiency.

SINAMICS V70—small, yet powerful SINAMICS V70 drives with SINUMERIK 808D is unbeatable when it comes to price-sensitive, simple machines. The compact design of the single-axis, fan-less motor modules ensures the highest degree of ruggedness. The motor modules can be quickly adapted to the requirements of the feed axes by simply setting a few parameters.

SINAMICS S120—providing the highest degree of flexibility SINAMICS S120 is synonymous with performance and flexibility when it comes to equipping CNC machines. In addition to a wide range of motor modules, various infeed options are available with functions such as energy recovery and controlled DC link. This ensures the shortest spindle acceleration times and facilitates perfect reactive power compensation for the complete machine ($\cos \varphi = 1$). S120 drives allow the power unit and control module to be mounted separately, which means that this system can be perfectly adapted to address the widest range of drive applications.

SINAMICS S120 Combi—the ideal drive for compact machine tools SINAMICS S120 Combi (frame types A and B) combines the performance of the modular SINAMICS S120 in a compact, rugged design. One infeed and up to four motor modules are integrated into one housing. It's the ideal drive for compact, standard CNC machines with a spindle power of up to 15 kW and it can control up to five feed axes.

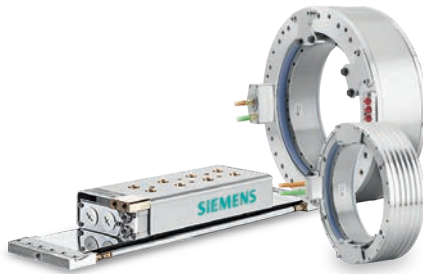
SINAMICS S120 Booksize—minimal footprint for the control cabinet The new SINAMICS S120 Booksize drives have a 300 percent overload capability and combine compactness with power density. The width can be reduced for machine tool applications that are dimensioned for maximum current with high acceleration levels—or for positioning axes that call for high dynamic performance. The height needed in a control cabinet has also been reduced thanks a new motor connection/shield concept for the module.

SINAMICS S120 Chassis SINAMICS S120 Chassis drives have been expanded to include power ratings up 300 kW and currents up to 490 A—allowing these devices to perfectly address applications with the highest demands when it comes to power and performance.

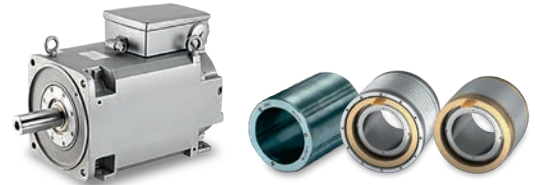
usa.siemens.com/sinamics-drives



SIMOTICS servomotors



SIMOTICS linear and torque motors



SIMOTICS main spindle motors

SIMOTICS motion control motors

SIMOTICS motors for motion control applications are the driving force for the SINUMERIK CNC family—setting the standard for maximum precision and speed.

SIMOTICS servomotors High stall torques, high encoder accuracy and perfect, smooth-running operation make SIMOTICS servomotors the optimum feed drive for CNC machine tools.

For price-sensitive, simple milling and turning machines equipped with SINUMERIK 808D, the SIMOTICS S-1FL6 motor with enclosure ensures a rugged solution.

For standard applications with the SINUMERIK 828D control system, the SIMOTICS S-1FK2 is the ideal servomotor. SIMOTICS S-1FK7 is synonymous for flexibility when it comes to equipping machine tools, and is available with various rated speeds, encoder types and moments of inertia. With 400 percent overload capability, SIMOTICS S-1FT7 motors offer the highest performance and are available with various cooling options.

Our portfolio of servomotors has also been expanded to include compact SIMOTICS S-1FG1 servo-gearred motors.

usa.siemens.com/motion-control-motors

SIMOTICS linear and torque motors Going beyond conventional rotary motor principles, the SIMOTICS range also encompasses linear and torque motors with a high dynamic performance. Using SIMOTICS L-1FN3 linear motors, elasticity, backlash and friction in the machine drive train can be almost completely eliminated—and along with mechanical transmission elements—allows the highest degree of precision to be achieved.

In addition to positioning tables with high dynamic performance, SIMOTICS T-1FW6 built-in torque motors can also be used for rotary and swiveling tables for precise 5-axis machining—as well as new machining technologies such as turning on milling machines with the SIMOTICS T-1FW6 High-Speed torque motor.

SIMOTICS main spindle motors An outstanding portfolio is obtained by teaming up the expertise in spindle design and construction of Weiss Spindles with the long-standing tradition of building electric motors from Siemens.

This unique portfolio supports every type of spindle solution—from classic mechanical spindles with SIMOTICS M-1PH8, M-1PH3 or M-1PH1 mounted spindle motors; to SIMOTICS M-1FE1, M-1FE2 built-in synchronous spindle motors; to SIMOTICS M-1PH2 induction motors—up to hybrid and even high-performance motor spindles.

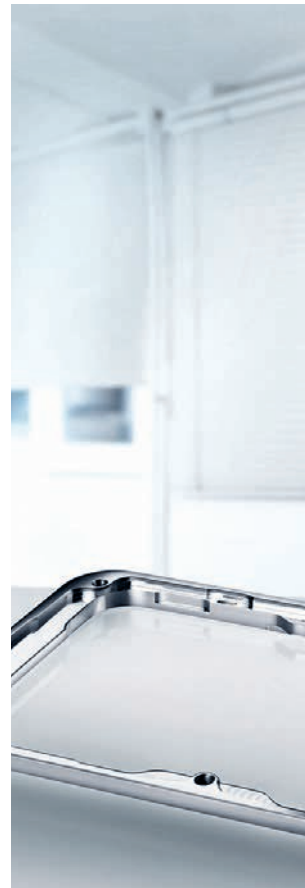
usa.siemens.com/spindles

Solutions for every manufacturing industry that are **fit for the future**

Every manufacturing industry has its own specific requirements—whether standardized automation concepts for the automotive sector or a holistic approach across every phase of the product and production lifecycle in aerospace. **Siemens has been a leading partner to the machine tool industry for many years and offers industry-specific solutions that are deployed around the globe.**

Many years of industrial expertise is quite a reputation

Based upon our unique experience and the industry know-how that we have built over the years, we can provide the most ideal solutions for cost-effective production in the automotive, aerospace, power generation and electronics manufacturing industries.



We are your partner for machine tool automation

Throughout decades of direct contact with end-users in key manufacturing industries, we clearly understand the requirements that are placed upon current generations of machines—and those of the future. This know-how flows directly into our product development, which ensures that SINUMERIK CNC systems are closely aligned to address specific market requirements.

In addition to machine tool automation, Siemens can act as the general contractor for the automation of your entire manufacturing facility. Customers will also benefit from Siemens as their single-source supplier—ultimately helping you achieve a highly-productive manufacturing environment.

Setting trends in manufacturing

Siemens is viewed as an innovation leader in the machine tool industry. The development of cutting-edge automation is natural for us—and our digitalization solutions guarantee maximum productivity, efficiency, flexibility and availability.

usa.siemens.com/machine-tools


















Leverage the bandwidth of machining technologies

With SINUMERIK, every manufacturing environment is optimally equipped to address technological challenges—today and in the future. **The SINUMERIK control is very powerful when it comes to turning, milling and grinding—as well as nibbling, laser machining and gear wheel machining.** In addition, it's open for new manufacturing technologies, such as multi-tasking, additive manufacturing and composites machining.



“My production?
It’s fit for the future.”

With SINUMERIK, every machining technology is available to you

SINUMERIK	808	828	840	ONE	MC
Turning Highest precision and productivity from cycle-controlled and standard CNC turning through milling on lathes up to multi-channel and multi-tasking machining.					—
Milling Superlative milling with SINUMERIK MDynamics, Advanced Surface and Top Surface along with Collision Avoidance—from 3-axis milling through 5-axis simultaneous machining, up to multi-tasking machining.					—
Grinding SINUMERIK offers the ideal solution to increase machine productivity and reduce profiling times—from basic to high-end grinding applications.	—				
Multi-tasking Based upon SINUMERIK Operate, multi-tasking machining is seamlessly supported across every technology—whether in series production or in the job shop. Best for efficient and highly-productive CNC machining.	—	—			—
Additive manufacturing In additive processes, such as material extrusion or laser cladding, the 5-axis technology of our SINUMERIK 840D sl— in conjunction with the SINAMICS S120 drive system and SIMOTICS motors— results in precise and dynamic motion control.	—	—			
Gear machining Machining gears is a complex process that demands the highest degree of precision. The advantages of SINUMERIK controls are fully leveraged when it comes to turning a gear wheel, cutting gears with a hobbing cutter—along with the final beveling and chamfering.	—	 ¹⁾			—
Nibbling, laser, water jet and plasma machining Going beyond standard technologies, the openness of the SINUMERIK CNC system allows nibbling, laser, water jet and plasma machining solutions to be engineered.	—	—			
Composites machining When it comes to machining composites, the quality of the final product is absolutely decisive. Depending upon the particular material, production techniques such as laser machining, milling or grinding are used—all of which can be flexibly controlled by SINUMERIK.	—	—			—
Automated cell Robots must be able to be easily integrated into CNC machines and production workflows. SINUMERIK Run MyRobot offers solutions that range from a simple connection via the user-friendly integration for handling tasks—up to high-precision motion control of machines using robotic kinematics.	—				

¹⁾Option: CP-Comfort



Always achieve maximum **machine tool** **and CNC performance**

Productivity, precision, availability, costs. These are the decisive factors in the machine tool market. Packed with special functions, **SINUMERIK controls precisely satisfy these requirements**—helping to accomplish maximum CNC performance.

Achieve high productivity through a wide range of possibilities

Robotic integration, intelligent motion control and continuous optimization are the keywords when it comes to leveraging the wide-ranging possibilities of increasing your manufacturing productivity and growing your business.

Robotic integration

On the production floor, robots are increasingly being used for not only handling tasks, but also high-precision and complex machining. Thanks to SINUMERIK, you now have a CNC system that offers robotic integration—from a simple connection for handling, up to the complete integration of robotic kinematics. Idle times, especially where the machine is no longer productive, are a thing of the past.

Intelligent motion control

With its intelligent Advanced Surface and Top Surface motion control functions, the SINUMERIK CNC can achieve the best workpiece surface finish with the highest machining speed.

Continuous optimization

Maximum dynamic performance and precision of machine axes are achieved using the Auto Servo Tuning (AST) functionality of SINUMERIK Operate, which allows control parameters to be optimized automatically. This simplifies commissioning of the machine, and during operation, the machine can be optimized on a regular basis. This ensures maximum machine tool precision over the complete lifecycle.

Precision during manufacturing

SINUMERIK is highly-precise thanks to the software used to compensate mechanical effects. These include functions such as nodding compensation, 80-bit NANO accuracy, as well as friction compensation.

Precision

SINUMERIK CNCs and SINAMICS drives compute with high-performance 80-bit NANO accuracy. This eliminates rounding errors and results in an extremely high internal computational accuracy in the complete controller circuit.

Nodding compensation

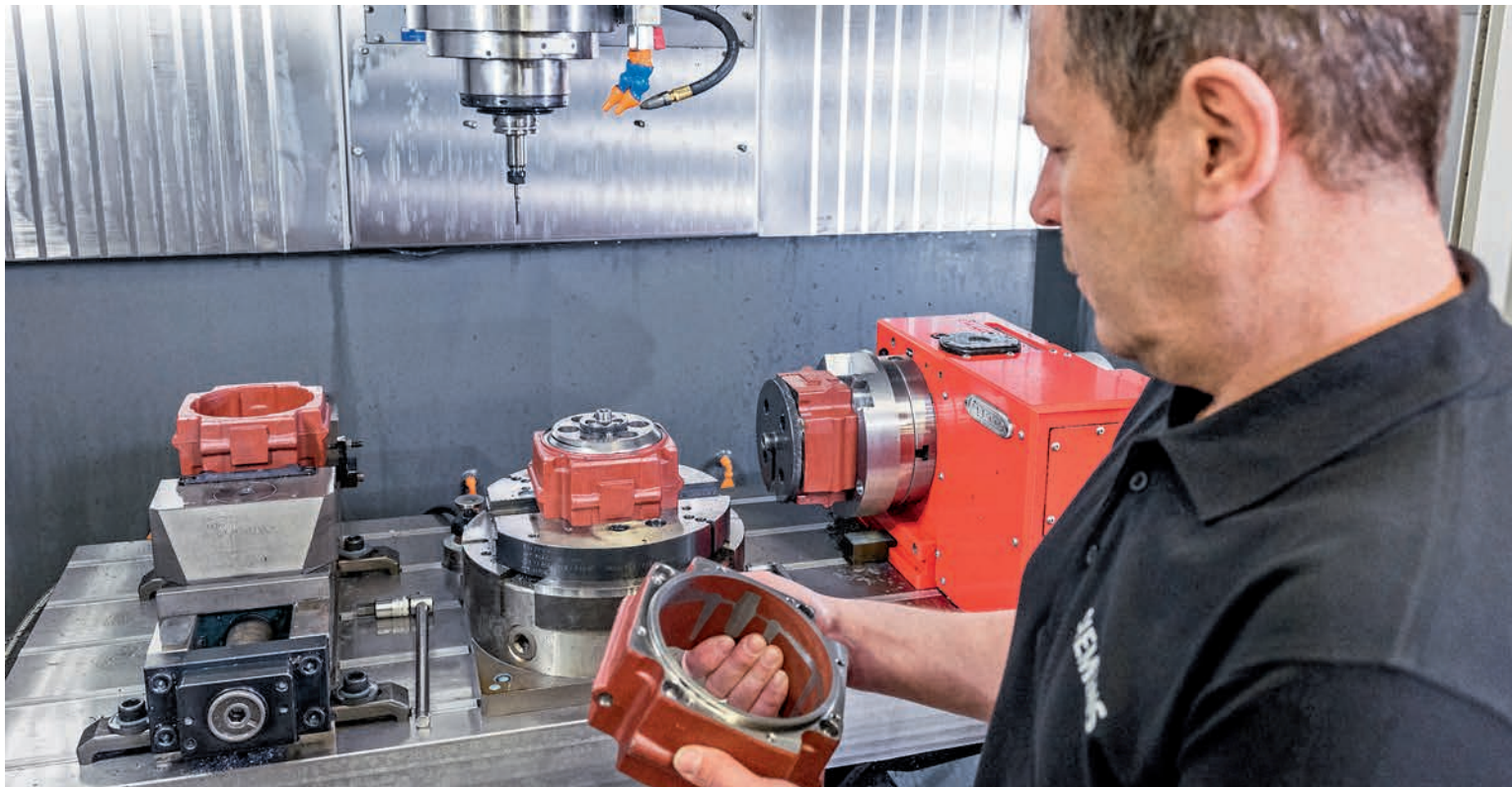
Nodding compensation is used to compensate dynamic position deviations that occur when machine axes accelerate. This improves machining quality, while simultaneously allowing higher jerk and acceleration values to be reached.

Friction compensation

Friction-related path errors are even more effectively eliminated by compensating the effects of friction as a function of velocity. This allows consistently high contour accuracy and workpiece precision.

Volumetric compensation (VCS)

VCS allows geometrical deviations of linear and rotary axes to be compensated regarding how they influence the tool center point—directly resulting in greater machining precision.



Increase the availability of your machines

High machine tool availability is achieved by quickly identifying faults and errors in a simple and straightforward user interface. SINUMERIK provides functions such as collision avoidance and condition monitoring for exactly this purpose.

Collision avoidance

SINUMERIK collision avoidance functions offer extensive collision protection for the CNC machine, the workpiece, clamping equipment and the tool. Using Industrial Edge for Machine Tools, collision monitoring functionality can be shifted out, so that the full performance of the SINUMERIK CNC system can be utilized.

Condition monitoring

SINUMERIK condition monitoring status information is captured using machine fingerprints and the machine condition is evaluated. This allows valid statements to be directly made about the machine quality and possible hidden problems and issues.

Increasing security

Protecting intellectual know-how in the part program and protecting against malware are two essential elements when it comes to the system integrity of the SINUMERIK control.

Know-how protection

Using the SINUMERIK Lock MyCycles function, user cycles are saved to the control system so they're protected. Password-protected SIMATIC STEP 7 program blocks safeguard intellectual property and know-how.

Security

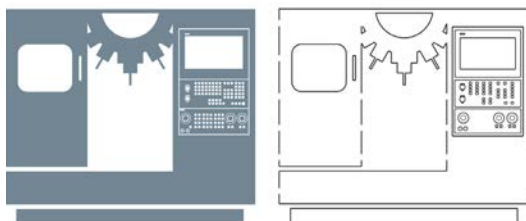
PC-based systems and the control-level must be protected against cyber attacks. Anti-virus and software whitelisting protect against manipulation and prevent PC-based systems from being infected by malware.

Optimizing processes using the digital twin

The digital twin plays a decisive role when it comes to optimizing the widest range of machining processes while the machine is operational. With different digital twin variants, a range of tasks can be shifted from the real world into the virtual world.

Run MyVirtual Machine, the digital twin for CNC users, optimizes machine utilization levels and significantly reduces unproductive times—paving the way for new business models.

usa.siemens.com/cnc-digital-twin



User-friendly operation and programming

Machine operation

A wealth of functionality in SINUMERIK Operate ensure a high degree of user-friendliness. This includes state-of-the-art touch and gesture control, as well as the ability to work in several panes and the use of animated elements.

Touch and gesture operation

The new generation of SINUMERIK touch-panels with projected capacitive touch technology offers you the highest degree of performance for demanding, PC-based visualization tasks. This comes along with an attractive front panel design. With its scratch-proof, non-reflecting surface and brilliant display, SINUMERIK-equipped machines can be operated even in harsh manufacturing environments.

Animated Elements

SINUMERIK Operate makes it very easy to enter parameters. With its unique moving image sequences, Animated Elements make machine tool operation even more user-friendly.

Display Manager

Using the Display Manager, the display area can be sub-divided into three or four panes—allowing large screens to be used effectively. Additional information can be selected and displayed making machine operation customized and flexible.





Machine setup

Based upon an intelligent JOG mode and intuitive tool management found in SINUMERIK Operate, typical setup functions are supported graphically and interactively. This keeps unproductive times to an absolute minimum.

Measurement

Tool and workpiece measurement is supported in the intelligent JOG mode. It's sufficient to just probe an edge, corner or hole to determine the clamping position including the basic rotation of the tool—even in swiveled workpiece planes. By pressing just one key, the geometry is transferred into the CNC's tool offset memory. Logging measurement results is made easy by using standard or user logs.

Zero points

Integrated measuring cycles guarantee workpiece precision during the machining process. Tool geometries and work offsets are automatically corrected so that the required production tolerances are maintained, even for large- batch quantities.

Tool management

Tool data and magazine location information are clearly displayed on the screen. Selecting a suitable magazine location is fully automatic—simply select a tool, press a key and SINUMERIK does the rest. It goes without saying that tool life is monitored, and when required, the appropriate replacement tool is loaded. This reduces the amount of time needed for machine tool setup.

Protection of your people

The intelligent SINUMERIK Safety Integrated system functions allow user-friendly operation, with the highest degree of safety for the operator and the machine itself—for example, when setting up the machine with the protective door opened. Users have an integrated Failsafe PLC at their disposal with SINUMERIK Safety Integrated plus. Safety-relevant logic is programmed in the TIA Portal.

When commissioning the SINUMERIK 840D sl, application engineers can use various innovative functions, such as the ability to graphically configure safety functions and the transparent diagnostic screen forms.

For Safety Integrated and Safety Integrated plus, as soon as commissioning is completed, a prompted, partially automated acceptance test can be performed in SINUMERIK Operate.



The image shows a Siemens SINUMERIK control system interface. The screen displays the following information:

- SIEMENS SINUMERIK ONE** header.
- ACTUAL** section showing position coordinates:

Axis	Position [mm]
X	-88.18318
Y	174.42633
Z	12.16749
- TOOL** section showing tool data:

Tool	Length [mm]	Radius [mm]
T 12	12.0000	0.0000
- NC/PLC VARIABLES** section showing a list of variables and their values.
- PROGRAM RUNTIME** section showing program status and time.
- TOOL LIFE** section showing tool life data.
- Workpieces** section showing a list of workpieces:

Workpiece	Position [mm]	Length [mm]
X	-20.000	0.000
Y	165.440	0.000
Z	4.446	0.000
- NC/WORKTEST** section showing a list of workpieces:

Workpiece	Position [mm]	Length [mm]
N10	12.0000	0.0000
N20	12.0000	0.0000
N30	12.0000	0.0000
N40	12.0000	0.0000
N50	12.0000	0.0000
N60	12.0000	0.0000
N70	12.0000	0.0000
N80	12.0000	0.0000

The person is wearing a dark blue shirt and is seen from the side, looking at the monitor. The control panel features a red emergency stop button and a yellow start button.

“My workpieces?
I program them myself.”

Programming

SINUMERIK Operate offers the ideal programming for each and every task: DIN ISO for large-series production and the shortest cycle times—as well as graphical programming, so individual parts and components can be programmed even faster.

High-level CNC language

The SINUMERIK high-level language means that the variance associated with families of parts or special tools can be easily mastered. The SINUMERIK high-level language comes into play precisely where graphical programming, DIN ISO and cycle programming reach their limits. Quickly programming workpieces with a wide range of variance means that the complete range of workpieces can be flexibly addressed—which is what makes it so unique.

DXF reader

The DXF reader supports the display of CAD data and the direct transfer into the part program. Programming times can be slashed by up to 90 percent as the CAD reader is used to transfer data. DXF files can be directly opened on the CNC and transferred to the part program with a simple click of the mouse. The DXF reader can be called up in the contour editor, and for positions, it can also be called in programGUIDE, as well as ShopMill/ShopTurn.

programGUIDE

Using programGUIDE, G-code part programs can be easily combined with SINUMERIK CNC technology and measuring cycles—even classic ISO codes can be programmed, too. As a result, SINUMERIK is especially attractive for machinists who prefer this classical method of machine tool programming.

Machining step programming

Machining step programming (ShopMill/ShopTurn) ensures that demanding and complex parts and components can be quickly and easily programmed. Using the SINUMERIK contour computer, each contour can be entered and programmed directly at the machine. This results in maximum machine tool productivity when it comes to programming and operation.

Diagnostics

Especially in large series production, machine downtimes can result in an enormous loss of manufacturing efficiency. SINUMERIK Operate offers intelligent diagnostics if problems arise so that machine operation can be resumed as quickly as possible.

In addition to the bus diagnostic tools for drive, peripheral and network components, there is also a powerful trace function, which is used to trace and troubleshoot NC, PLC and drive signals.

Achieve increased productivity through Digitalization

Through digitalization, machine builders and machine users can respond more flexibly to changing market demands while simultaneously increasing their productivity.

CNC Shopfloor Management Software addresses your specific CNC machine requirements. It facilitates the management, analysis and optimization of your machine tools— independent of the control system manufacturer being used.

Digitalization for machine builders

Increased productivity in engineering

There are two main objectives when it comes to machine building: a higher degree of efficiency and flexibility during development—for example, with virtualization in the development process—and supplementing portfolios to digitalize the end-customer's manufacturing environments.

The digital twin—end-to-end development and new business models

Closed-loop engineering allows machine builders to create a seamless workflow from the original idea, through engineering, up to the virtual commissioning of the machine. As a potential business model, the digital twin of the machine can be made available to the end-customer for production planning purposes.

Digitalization for machine users

Increased productivity during manufacturing

Machine tools are integrated intelligently into production processes. The pre-condition is that production planning and actual production— along with the various machines—are networked on three different platforms depending upon the specific requirement. This allows part programs and data to be transferred error-free.

The digital twin in production

Programming and setup are shifted virtually from the real production environment into the office. The machine doesn't have to be at a standstill to identify whether parts can be actually produced. Part programs can be tested in advance for potential collisions of the tool. For new production orders, programs can be run "offline" while the machine is in operation. New machinists can even be trained without blocking the real machine, and unproductive times are reduced to a minimum and shifted into your production planning. All of this increases your manufacturing productivity and accelerates business growth.

usa.siemens.com/machine-tool-digitalization



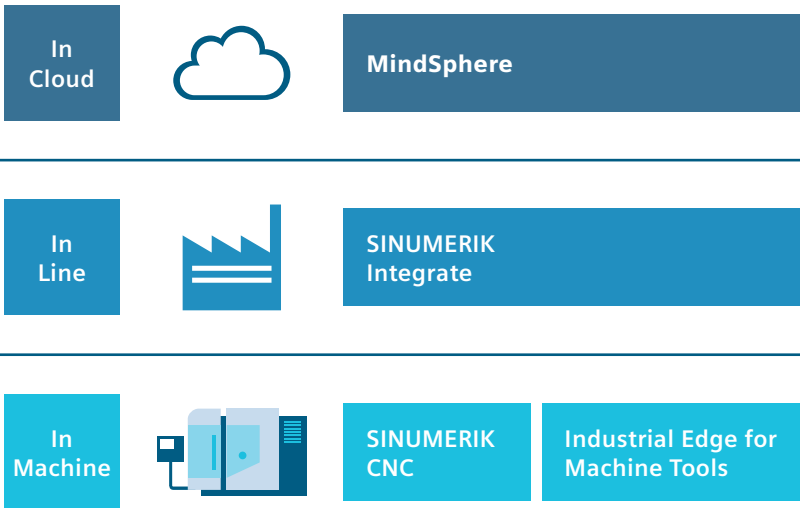
My machine?
**It's highly productive
thanks to the digital twin."**



The ecosystem of CNC Shopfloor Management Software

A leading-edge IT architecture is created and based upon CNC Shopfloor Management Software—and more specifically—at three levels: “In Cloud”, “In Line” and “In Machine.” These levels correspond to the three platforms MindSphere, SINUMERIK Integrate and SINUMERIK EDGE with many customized functions that extend from the shopfloor up into the Cloud.

This is complemented by the opportunity of creating new business models, in service, for example. By leveraging digitalization, the potential for optimization not known until now can be tapped into so that productivity and competitiveness can be sustainably increased.





MindSphere

Digitalization with Cloud-based applications—optimally networked

Cloud-based applications offer all of the advantages when working with a common database. Intelligent tools are used for networking design, production planning and machine tools across various sites and locations to create seamless production processes with the highest degree of efficiency. Production and machines are continually analyzed. The captured data is evaluated, creating a high degree of transparency. This allows the possibility for optimization, unknown up until now, to be identified and fully utilized.

SINUMERIK Integrate

Wide-ranging applications to optimize machine availability and increase productivity

The advantages of a digital landscape can be utilized even without a connection to the Cloud. SINUMERIK Integrate hosts a wide range of applications that provide functions adapted to machine tool engineering and production—for example, tool and program management.

Industrial Edge for Machine Tools

Capturing, analyzing and processing high-frequency data close to the machine

Industrial Edge for Machine Tools is a reliable and high-performance hardware and software solution for machine-related use (Edge computing). This allows high-frequency data to be processed and analyzed essentially in real-time on the shopfloor while your production is running. With the provided Application Software Development Kit (AppSDK), customized EdgeApps can be created to monitor and optimize not only your production processes, but your CNC machine, as well.

Motion Control Services—machine tool digitalization and production optimization

Digital services—the path to a digital production environment

Based upon CNC Shopfloor Management Software, Motion Control Services represents a partial or full digitalization of the mechanical production workflow. Siemens can offer you a complete solution from a single source—extending from the requirement analysis—through the installation with subsequent customer training—all the way up to the implementation of optimization measures to ensure continuous system availability.

Consulting

Analysis and development of a digitalization strategy tailored to address specific customer requirements within the scope of professional consulting services.

Digitalization check as a service

This local service provides definitive recommendations when it comes to networking machines in production IT systems. Machine data is continuously captured and evaluated in a standardized way while your machines remain operational.

Digitalization preparation

CNC machines are updated to state-of-the-art technology and prepared for digitalization. Irrespective of whether greenfield or brownfield systems, using Brownfield Connectivity Services, software updates, hardware upgrades or retrofits, fleets of machines are made fit for the future.

Implementation

Specialists from Siemens support you when configuring and commissioning the various software modules—making your production more efficient and more profitable while increasing the security of your investment. Training programs ensure that your personnel know how to use the application.

Data and process analysis

Individual measures and activities to optimize production are derived based upon captured and analyzed data.

Optimization

Optimization measures are implemented to fully leverage the potential of machine fleets. In addition to productivity increasing measures, this also involves increasing the availability and leveraging cost-saving potential.

Maintenance

This service ensures that IT systems remain operational, to secure operating time, as well as resolve faults in the case of non-scheduled machine downtimes.

For controls, drives and motors, Siemens provides support to machine tool dealers, importers and end-users during the entire lifecycle of your production systems.

The emphasis is on increasing transparency so that every type of resource and machine can be used more efficiently, productively and flexibly—while increasing your overall machine availability.

Classic services—the basis for continuous improvement

Service contracts

Harmonized and aligned to specific customer requirements and business objectives, our service contracts are modular and allow manufacturers to create a customized service plan to reduce their machine downtimes. Here, customers can integrate digital service options. These include remote access and the use of service applications to achieve even greater availability of their machines.

Technical support

In more than 25 regions around the world, our hotline experts answer every question related to the SINUMERIK control—in your time zone and in your language.

Spare parts and repair services

A closely meshed, flexible spare parts and repair service network ensures that spare parts are available quickly and at reasonable prices in over 150 service locations around the globe. For selected components, the Long-Life Repair option can extend service availability for up to 25 years.

Upgrade services

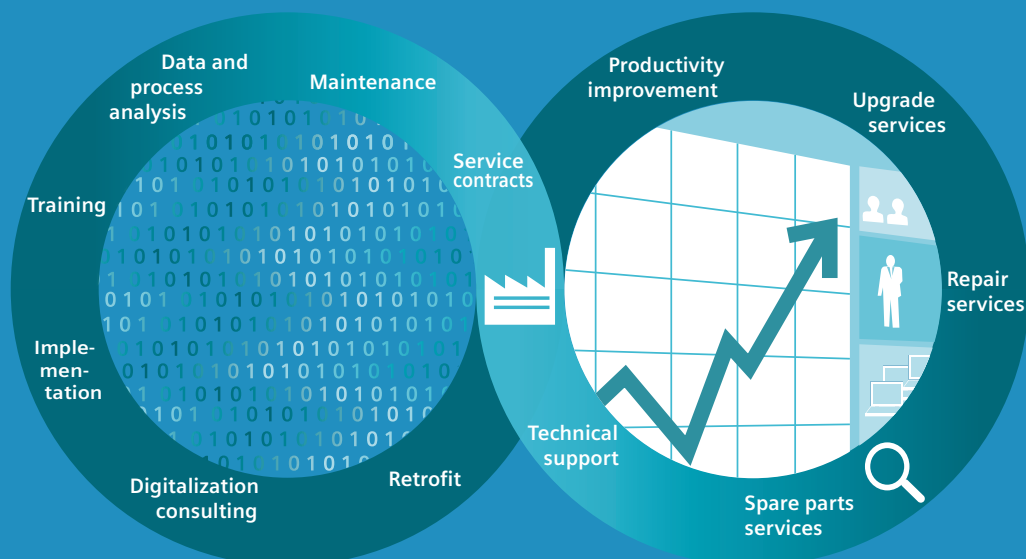
Component upgrades extend system and machine usage times to secure investments over the long term.

Productivity Improvement

Especially when it comes to CNC machines that are used intensively with high utilization levels, fully leveraging the machine's capacity to its maximum has significant economic benefits. With Productivity Improvement, we will optimize the production potential of your machines equipped with SINUMERIK 840D sl or SINUMERIK 840D powerline.

Retrofit

CNC retrofit is the cost-effective alternative to purchasing a new machine. This is the case if the mechanical system of a machine tool is still in a good condition—however, the control or drive system are no longer state-of-the-art. As part of this service, we upgrade specific components to the latest technology. Cycle times can be significantly reduced and quality optimized simply by upgrading the control system.



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