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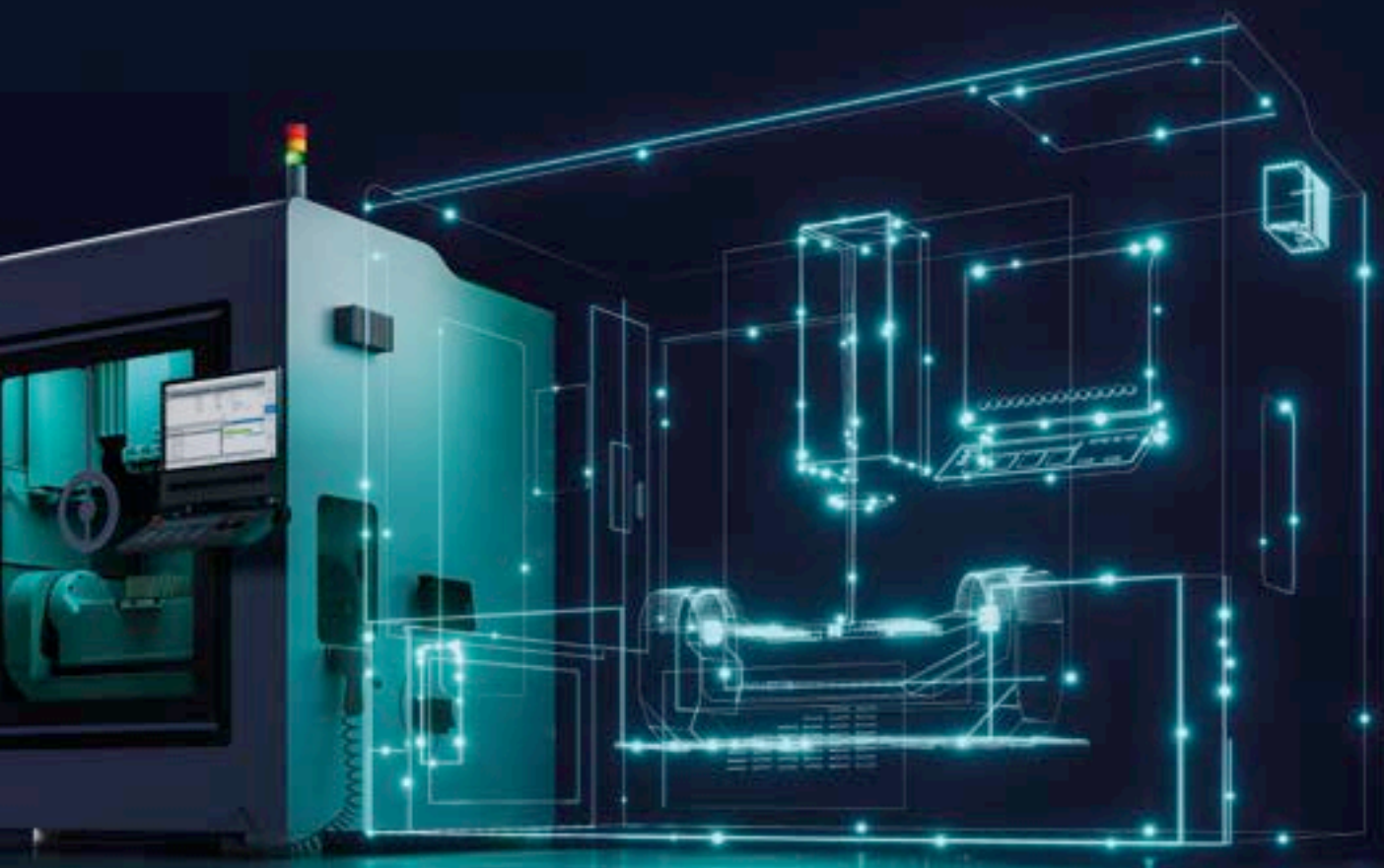


Edition
2021

INTELLIGENT SOLUTIONS FOR MACHINE TOOLS

SINUMERIK

siemens.com/sinumerik

Increased productivity **with SINUMERIK**

Highly productive automation solutions are demanded for workshops, jobshops and large series production – that accompany and support users along the path to digitalization. SINUMERIK CNC solutions always provide companies, operating machine tools, with the optimum solution to address their specific requirements. Whether for individual parts or mass production – basic or complex workpieces.

Strong partner **in the world of machine tools**

Digitalization is changing all areas of our lives. Production and manufacturing companies must satisfy some essential requirements: shorter market launch times, higher degree of flexibility, higher quality and increased efficiency – as well as suitable and adequate safety measures. Sustainable competitiveness will only be able to be achieved by taking a holistic approach, which encompasses and digitizes the complete value-added chain. The Digital Enterprise Portfolio combines automation with all of the advantages provided by digital data.

Future of the machine tool industry
In close cooperation with machine builders, we want to successfully shape the future of the machine tool industry and master the next phase of the digital transformation. Trends and developments in the IT environment – such as artificial intelligence, machine learning and digital marketplaces as well as new forms of collaboration represent new impetus and change workflows in industrial landscapes.

The benefits of the digital twin

The digital twin simulates and optimizes all areas of the value-added chain: Product, production and performance. This is the next step in the digital transformation for machine builders and users – allowing them to reach the next level of productivity.

Productivity benchmark

This is why a SINUMERIK CNC is the first choice when new, revolutionary machine concepts must be implemented – and if the absolute maximum productivity is demanded for a machine tool application. Siemens Machine Tool Systems – with the power of innovation of a unique and experienced development team in the market – is there to ensure that also in the future highly productive machine concepts can be implemented based on SINUMERIK CNCs.

SINUMERIK – the CNC portfolio for the global machine tool market

SINUMERIK 808
The entry-level CNC for basic, standard machines

SINUMERIK 808
- Panel-based compact CNC
- Up to 6 axes/spindles
- 1 machining channel
- 8.4" color display
- SIMATIC S7-200-based PLC

SINAMICS V70
SIMOTICS S-1FL6

SINUMERIK 828
The compact CNC for standard machines

SINUMERIK 828
- 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-based PLC

SINAMICS S120/S120 Combi
SIMOTICS

SINUMERIK MC
The CNC for special machine tool technologies

SINUMERIK MC
- PC-based CNC
- Open user interface design based on WinCC or Run MyHMI /3GL
- Up to 8 axes/spindles
- Up to 4 machining channels
- Modular panel concept
- SIMATIC S7-1500F PLC

SINAMICS S120 Booskize with CU320, SINAMICS S210
SIMOTICS

From basic, standard CNC machines through standardized machine tools up to modular, high-end machine concepts – SINUMERIK CNCs offer the optimum solution for each and every machine concept. Whether individual part or mass production, basic or complex workpieces – SINUMERIK is the highly productive automation solution across all production domains. These extend from prototype and tool building through mold making up to large series production.

SINUMERIK 840
The open CNC for modular machine concepts

SINUMERIK 840
- Drive-based, modular CNC
- 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

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

SINAMICS S120 Booksize/Combi/Chassis
SIMOTICS

SINUMERIK ONE
The digital native CNC – the next level of the digital transformation

SINUMERIK ONE
- Digital twin as integral component of the CNC
- 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" multitouch color display
- SIMATIC S7-1500F PLC

SINAMICS S120 Booksize/Combi/Chassis
SIMOTICS

SINUMERIK 808 – outstanding performance, simply intelligent

SINUMERIK 808D ADVANCED brings impetus into basic turning and milling machines. CNC technology from the global leader – teamed-up with a revolutionary operating concept – make the SINUMERIK 808D ADVANCED the perfect entry point into the world of CNC.

Compact and rugged

Thanks to a panel-based CNC design with few interfaces and an operator panel with IP65 degree of protection, SINUMERIK 808D ADVANCED is the perfect answer for applications in harsh environmental conditions. The small dimensions of these units allow them to be used in compact machines.

Optimized for basic turning and milling applications

As a result of its technology-specific versions, the SINUMERIK 808D ADVANCED control is perfectly preconfigured for milling and turning. The range of applications addressed extends from basic, standard milling machines or simple machining centers through cycle-controlled lathes up to basic full CNC lathes. Based on its hardware and software expansions, SINUMERIK 808D ADVANCED offers sufficient performance for moldmaking and toolmaking for basic milling functions.

Ideal for entry-level machine operators

Based on the standard SINUMERIK operating and programming philosophy, SINUMERIK 808D ADVANCED is the optimum partner when entering the world of CNC. Commissioning is also explained interactively in a graphic form.

SINUMERIK 828 – the powerhouse in the compact class

With its unique CNC performance, our SINUMERIK 828D control sets productivity benchmarks when it comes to milling and turning on standard machines as well as functions to simply automate grinding machines.

Rugged and maintenance free

Their die-cast magnesium operator panel fronts, the panel-based CNC design with just a few interfaces, as well as a high degree of protection, make SINUMERIK 828 controls a dependable partner even in harsh production environments. SINUMERIK 828D has no fan, no hard disk, and an NV-RAM memory without a buffer battery, which makes it a completely maintenance-free CNC.

User-friendly

Equipped with a full QWERTY CNC keyboard with short-stroke keys and a high resolution 10.4" TFT color display / 15.6" touch display, SINUMERIK 828 CNCs are extremely simple to operate. Equipped with USB, CF card (for 10.4") and RJ45 interfaces at the operator panel front, CNC data is quickly and easily transferred.

Optimum scalability

Based on the three CNC performance versions (SW24x, SW26x and SW28x) favorably-priced compact as well as more complex machines with additional axes/spindles and 2 machining channels can be implemented.

SINUMERIK 840 – Well-proven performance

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

Maximum performance

Thanks to the drive-based high-performance NCUs (Numerical Control Units), the SINUMERIK 840 D sl – equipped with state-of-the art multicore processor technology – allows up to 93 axes in 30 machining channels to be controlled in the NCU link. Machine concepts with fewer axes benefit from the performance of the SINUMERIK 840D sl as a result of the highest degree of machining precision with the shortest machining times.

Open and communicative at all levels

For instance, based on the system openness of SINUMERIK 840D sl, operation can be supplemented and adapted, or even robots and handling systems can be integrated. SINUMERIK 840D sl is perfectly embedded in the Siemens automation environment using PROFINET. Totally Integrated Automation ensures optimum interoperability of all components within the automation solution – allowing you to achieve maximum transparency and availability of your production landscape.

Intuitive and scalable

SINUMERIK panels make operation and visualization easier for machine operators. With their touch screens, they pave the way to create new and unique machine operating philosophies. In addition to scalable NCU performance, SINUMERIK 840D sl has a high degree of modularity when it comes to the operating components. With a flexible M:N operating concept, SINUMERIK 840D sl ideally fits the operating philosophy of any machine – from compact up to high-end machine tools in the premium class.

SINUMERIK ONE – The digital native CNC

With SINUMERIK ONE, Siemens has created the first CNC control system worldwide, which was developed from the ground up to master the challenges of digital transformation in the machine tool industry. This results in a paradigm change: The digital twin becomes an integral component of the control system and the command variable for taking real action. Machining processes and machine behavior can be simulated in detail in conditions close to those met in reality.

Maximize productivity

SINUMERIK ONE offers future-proof, state-of-the-art hardware and software platforms, which form the basis to massively boost machine and machining performance. Especially in the mold making domain productivity has been boosted by up to a double-digit percentage. Tasks such as collision monitoring that take up a lot of CPU time can now be executed during machining without any restrictions.

Innovate faster

Virtual processes and digital twins become the basis for taking real action. Based on the SINUMERIK ONE digital twin, machine development and commissioning, production planning and workpiece machining, machine expansions and services achieve a completely new level of quality and precision.

Discover a new way of thinking with digitalization

For the first time, machine users can access to a true and consequential "Digital first" strategy. This means that central processes in the production landscape (such as programming, production planning and process optimization) are always simulated at the digital twin, providing a detailed virtual image of the control system and machining process.

PPU 1740

NCU 1740

NCU 1750 / 1760

Increased performance

Thanks to the drive-based high-performance NCUs (Numerical Control Units), it allows to operate up to 31 axes in 10 machining channels.

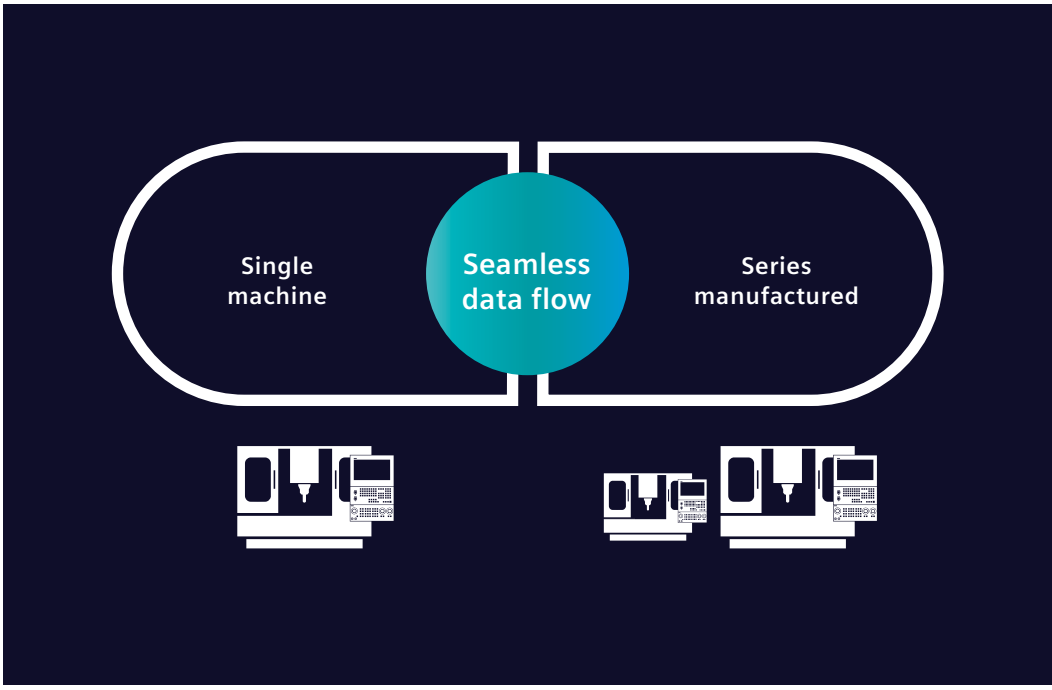
The performance of the SINUMERIK ONE is characterized by the highest degree of machining precision with the shortest machining times.

Intuitive and scalable

SINUMERIK ONE offers ultimate scalability for modular and compact machines thanks the high degree of modularity of its operating components.

With SINUMERIK panels PPU (Panel Processing Units) from 15" to 24" both in landscape and portrait version make operation and visualization easier for machine operators.

Moreover, its scalable NCU performance philosophy makes SINUMERIK ONE the ideal fit to any machine – from compact up to high-end machine tools in the premium class.



New powerful technology packages

With the software version CNC-SW 6.15 CNC users benefit further with SINUMERIK ONE Dynamics – three technology software packages to increase efficiency when programming in the shopfloor and executing CAM-generated CNC programs:

- ONE Dynamics Operate
- ONE Dynamics 3-axis milling
- ONE Dynamics 5-axis milling

The new software functions contained in the technology packages support users to adjust the performance of their machine with regards to accuracy, velocity and surface quality levels to achieve maximum productivity.

Efficient engineering workflow

Thanks to the comprehensive and highly intuitive functionality of the TIA Portal engineering framework users can benefit from faster time to market and efficient programming.

TIA Portal as the center providing seamless data flow for all engineering phases. No matter if it is a single machine or a series-manufactured machine TIA Portal ensures always the most efficient engineering.

The standardized interfaces and powerful Openness-API of TIA Portal in combination with the SINUMERIK Engineering Workflow allows an automated engineering of individual and modular machines in a very fast and easy way.

SINUMERIK MC
For special technologies

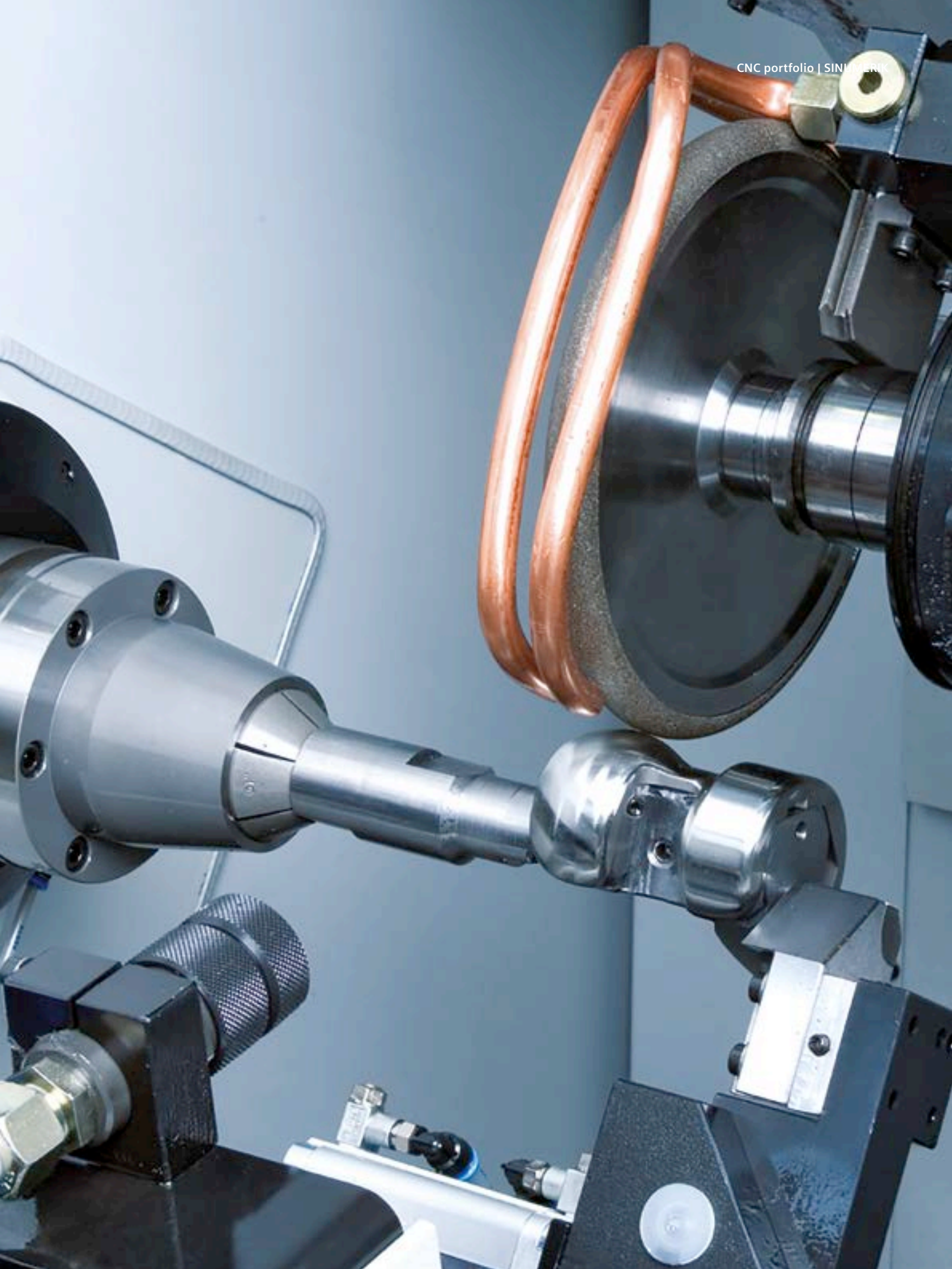
With integrated SINUMERIK CNC, SIMATIC controller as well as Windows® 10 operating system, the SINUMERIK MC is the optimum solution for processing machines with customized user interface.

Application areas
Applications extend from wood, stone and glass processing through applying adhesive up to basic grinding applications and special machine tool technologies. These include sheet metal cutting, laser and water jet cutting as well as Additive Manufacturing, for example.

Maximum openness
With the integrated Windows® operating system, it is 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 the open-loop machine control. Further, the short response times of the SIMATIC S7-1500F PLC facilitate higher machining speeds and significantly boost the automation performance.

Simple engineering
Symbolic programming, state-of-the-art programming languages and comprehensive toolboxes to implement standard applications mean that engineering in the TIA Portal is both simple and efficient. This results in lower commissioning times and costs.



Drives and motors – everything from a single source

SINAMICS V70

SINAMICS S120 Combi

SINAMICS S120 Booksize

SINAMICS S120 Chassis

Drives

SINAMICS V70 – small and powerful

The SINAMICS V70 with SINUMERIK 808D concept is simply unbeatable when it comes to price-sensitive entry-level machines. The compact design of the single-axis, fanless 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 machine tools. 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 φ = 1). The SINAMICS S120 allows the power unit and control module to be mounted separately, which means that this drive system can be perfectly adapted to address the widest range of drive applications.

SINAMICS S120 Combi – the ideal drive for compact machines

SINAMICS S120 Combi (frame type 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 in one housing. This drive is the ideal basis for compact standardized machine concepts with a spindle power of up to 15 kW and can control up to five feed axes.

SINAMICS S120 Booksize – minimal footprint for the control cabinet

The new SINAMICS S120 Booksize devices have a 300 percent overload capability and combine compactness with power density. The width can be reduced for applications that are dimensioned for maximum current with high acceleration levels – or for positioning axes demanding a high dynamic performance. The height required in a control cabinet has also been reduced as a result of a new motor connection/ shield concept for the module.

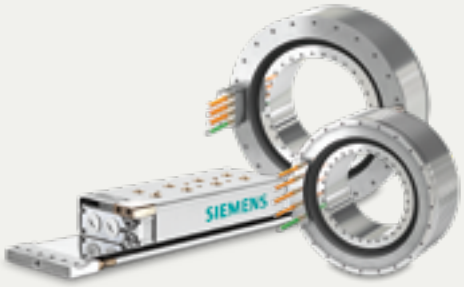
SINAMICS S120 Chassis

The SINAMICS S120 converter in the chassis format has been expanded up to high power ratings of 300 kW and currents up to 490 A – allowing these devices to perfectly address applications with the highest demands relating to power and performance.

www.siemens.com/sinamics

SINUMERIK control systems, in conjunction with SINAMICS drives and SIMOTICS motors, are optimally designed to address the requirements of machine tools. The complete SINAMICS drive family addresses all of the performance levels and sets itself apart as a result of the highest degree of flexibility, functionality and efficiency. SIMOTICS motors for motion control applications and SINAMICS drives are the driving force for SINUMERIK CNCs, which sets the standard for maximum precision and speed.

SIMOTICS servomotors



SIMOTICS linear and torque motors

SIMOTICS main spindle motors

SIMOTICS motion control motors

SIMOTICS servomotors

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

For price-sensitive entry-level machines with SINUMERIK 808D control system, the SIMOTICS S-1FL6 motor with enclosure ensures a rugged solution. The new SIMOTICS S-1FT2 is the ideal complement to the SIMOTICS S-1FK2 and expands the common fields of application with numerous applications – forming together a new series of powerful servomotors.

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 methods.

Our portfolio of servomotors has been expanded to include compact SIMOTICS S-1FG1 servo geared 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 a high dynamic performance, SIMOTICS T-1FW6 and T-1FW67 built-in torque motors can also be used for rotary and swiveling tables for precise 5-axis machining as well as new technology domains such as turning on milling machines with the SIMOTICS T-1FW6 High Speed torque motor.

www.siemens.com/motion-control-motors

SIMOTICS main spindle motors

An outstanding portfolio is obtained by teaming up the high level of competence in spindle design and construction of Weiss Spindeltechnologie GmbH with Siemens long tradition of building electric motors. This unique portfolio supports all types of spindle solutions – from classic mechanical spindles with SIMOTICS M-1PH8, M-1PH3 or M-1PH1 mounted spindle motors, SIMOTICS M-1FE1, M-1FE2 built-in synchronous spindle motors or SIMOTICS M-1PH2 induction motors up to hybrid and high-performance motor spindles.

www.siemens.com/spindles

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

Every sector has its own specific requirements. Whether standardized automation concepts for the automotive sector or a holistic approach across all phases of the product and production lifecycle – all the way up to aerospace. Siemens Machine Tool Systems has been a partner to the machine tool industry for many years, and offers sector solutions that are deployed around the globe.

Many years of industry expertise is convincing

Based on our unique experience and the sector know-how that we have built up over the years, we can provide optimum solutions for cost-effective component production in the automotive, aerospace, power generation and electronics domains.

Partner for automating machine tools all the way up to complete production landscapes

Throughout decades of direct contact with end users in key sectors, we clearly understand the requirements that are placed on current generations of machines – and those in the future. This know-how flows directly into our product development. That ensures that SINUMERIK control systems are closely aligned to address market requirements. As full-line supplier, in addition to automating machine tools, Siemens can act as the general contractor for the manufacturing automation of your entire plant. Customers will also benefit from this as a result of integrated and seamless automation solutions from a single source – ultimately helping you to achieve a highly-productive manufacturing environment.

Setting trends in the production landscape

Siemens Machine Tool Systems is seen as innovation leader in the machine tool market. The development of innovative, cutting-edge solutions is a given for us. Our digitalization solutions ensure maximum productivity, flexibility and availability.

www.siemens.com/machinetools

Leverage the bandwidth of machining technologies

With SINUMERIK, every manufacturing environment is optimally equipped to address technological challenges – today and in the future. SINUMERIK is powerful when it comes to turning, milling, grinding – as well as nibbling, laser machining and gear wheel machining. Further, it is open for new technological concepts, such as multitasking, Additive Manufacturing and machining composites.

Turning

Highest precision and productivity from cycle-controlled and standard CNC turning through milling on lathes up to multichannel and multi-tasking machining.

Milling

Superlative milling with SINUMERIK Top Surface, Top Speed as well as Collision Avoidance. From 3-axis milling through 5-axis simultaneous machining up to multitasking machining.

Multitasking

Based on SINUMERIK Operate, multitasking machining is seamlessly supported across all technologies – whether in series production or in a workshop environment. For efficient and highly productive CNC machining.

Nibbling, laser, water jet and plasma machining

Going beyond standard technologies, the openness of our SINUMERIK system allows nibbling, laser, water jet and plasma machining solutions to be engineered.

Machining composites

When it comes to machining composites, the quality of the final product is absolutely decisive. Depending on the particular material, production techniques such as laser machining, milling or grinding are used – all of which can be flexibly controlled by SINUMERIK.

Additive Manufacturing

In additive techniques, such as material extrusion or laser cladding, the 5-axis technology of SINUMERIK – in conjunction with the appropriate SINAMICS drive system and SIMOTICS motors - facilitates precise and dynamic motion control.

Grinding

SINUMERIK offers the optimum solution – from basic up to high-end grinding applications.

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.

Automated cell

Robots must be able to be simply integrated into machine tools 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 robot kinematics.

My production? Fit for the future.

With SINUMERIK, you can use all machining technologies	SINUMERIK 808	SINUMERIK 828	SINUMERIK 840	SINUMERIK ONE	SINUMERIK MC
Turning	✓	✓	✓	✓	–
Milling	✓	✓	✓	✓	–
Grinding	–	✓	✓	✓	✓
Multitasking	–	–	✓	✓	–
Additive Manufacturing	–	–	✓	✓	✓
Gear machining	–	✓[1)]	✓	✓	–
Nibbling, laser, water jet and plasma machining	–	–	✓	✓	✓
Machining composites	–	–	✓	✓	–
Automated cell	–	✓	✓	✓	✓

1) Option: CP-Comfort

Always achieve the maximum **CNC performance**

Productivity. Precision. Availability. These are the decisive drivers in the machine tool market. Packed with special functions, SINUMERIK controls precisely satisfy these requirements – helping to accomplish a high CNC performance.

Wide ranging possibilities to achieve high productivity

Robot integration, intelligent motion control as well as continuous optimization are the relevant buzz words when it comes to leveraging the wide-ranging possibilities of boosting productivity.

All the facets of robot integration

The demand for automation solutions for machine tools teamed up with high precision industrial robots is increasing at a rapid pace. This applies equally to handling – as well as high-precision and complex machining tasks. With SINUMERIK, Siemens has a CNC system for robot integration: From a simple connection via the user-friendly integration for handling tasks – up to the complete integration of robot kinematics in a system.

Optimum machining speed and quality

With the combination of the Top Surface and Top Speed functions, SINUMERIK offers optimum path planning and speed control for milling applications – providing the highest surface quality and machining speed.

Continuous optimization

Maximum machine dynamic performance is achieved by automatically optimizing machine parameters as a function of the load and axis positions using the Intelligent Load Control and Intelligent Dynamic Control functions. As a consequence, the best machining result is achieved for any workpiece weight and at any position in the machining area of the machine tool. The result – shorter machining times and a higher machining quality.

Precision in the production landscape

The high degree of precision achieved using SINUMERIK also comes from functions such as its 80-bit NANO computation accuracy. This is supplemented by innovative software-based compensation of various mechanical effects.

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, and at the same time, allows 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 the velocity. This allows a consistently high contour accuracy and workpiece precision to be achieved.

Volumetric compensation (VCS)

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

Increasing the availability

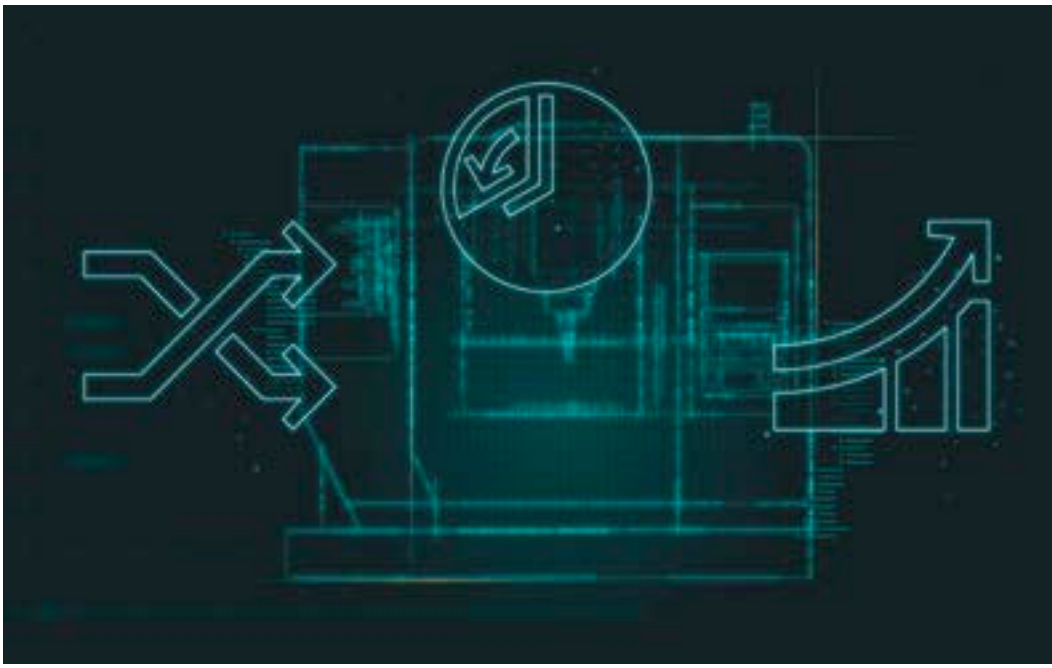
High availability of machine tools is achieved through collision avoidance and condition monitoring.

Collision avoidance

SINUMERIK collision avoidance functions offer extensive collision protection for the 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 SINUMERIK system performance can be utilized.

Condition monitoring

SINUMERIK condition monitoring status information is captured using machine fingerprints and the machine condition 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 user program and protecting against malware are two essential aspects when it comes to the system integrity of SINUMERIK.

Know-how protection

Using the SINUMERIK Lock MyCycles function, user cycles are saved to the control system so that they are 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. Antivirus and whitelisting software protect against manipulation – preventing malware from influencing PC-based systems.

Optimizing processes using the digital twin

The digital twin plays a decisive role when it comes to optimizing the widest range of 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 machining, optimizes the utilization levels of machine tools. Unproductive machine periods are reduced to a minimum and consequentially shifted into production planning. This makes way for new business models.

www.siemens.com/sinumerik-digitaltwin

User-friendly **operation and programming**

Operation

A wealth of functions in SINUMERIK Operate ensure a high degree of operator-friendliness of SINUMERIK controls. These include state-of-the-art touch and gesture control as well as working in several panes.

Touch and gesture operation

The SINUMERIK generation of touch panels with projected capacitive touch technology offers the highest degree of performance for demanding PC-based visualization tasks. This comes along with an attractive front panel design. The scratch-proof, non-reflecting surface with brilliant display supports operation even in harsh ambient conditions.

Animated Elements

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

Display Manager

Using the Display Manager, the display area can be subdivided into three or four panes, allowing large screens to be effectively used. Customized and flexible machine operation is facilitated as additional information can be selected and displayed.

Setting-up

Based on an intelligent JOG mode and intuitive tool management in SINUMERIK Operate, all of the typical setup functions can be graphically and interactively supported. This keeps unproductive times to an absolute minimum.

Measuring

The measurement of tools and workpieces is optimally supported in the intelligent JOG mode: It is 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. The geometry is transferred into the tool offset memory of the CNC by simply pressing a button. Logging measurement results is simplified using standard or user logs.

Zero points

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

Tool management

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

Protection for personnel

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 instance, when setting up the machine with the protective door opened. Users have an integrated F-PLC at their disposal with SINUMERIK Safety Integrated plus. The safety relevant logic is programmed in the TIA Portal. When commissioning the SINUMERIK 840D sl, application engineers can use various innovative functions, for example, the ability to graphically configure safety functions and the transparent diagnostic screen forms. For Safety Integrated and Safety Integrated plus, once commissioning has been completed, a prompted, partially automated acceptance test can be performed in SINUMERIK Operate.

Programming

SINUMERIK Operate offers the optimum programming for each and every task: DIN ISO for large series production and shortest cycle times – as well as graphic programming, so that 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 simply mastered. The SINUMERIK high-level language comes into its own precisely where graphic 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 the CAD data format and direct transfer into the CNC program. Programming times can be slashed by up to 90 percent as the DXF reader is used to transfer data. DXF files can be directly opened on the CNC, and transferred to the CNC program with a simple mouse click. The DXF reader can be called up in the contour editor, and for positions, can also be called in programGUIDE as well as when programming machining steps in ShopMill/ ShopTurn.

ProgramGUIDE

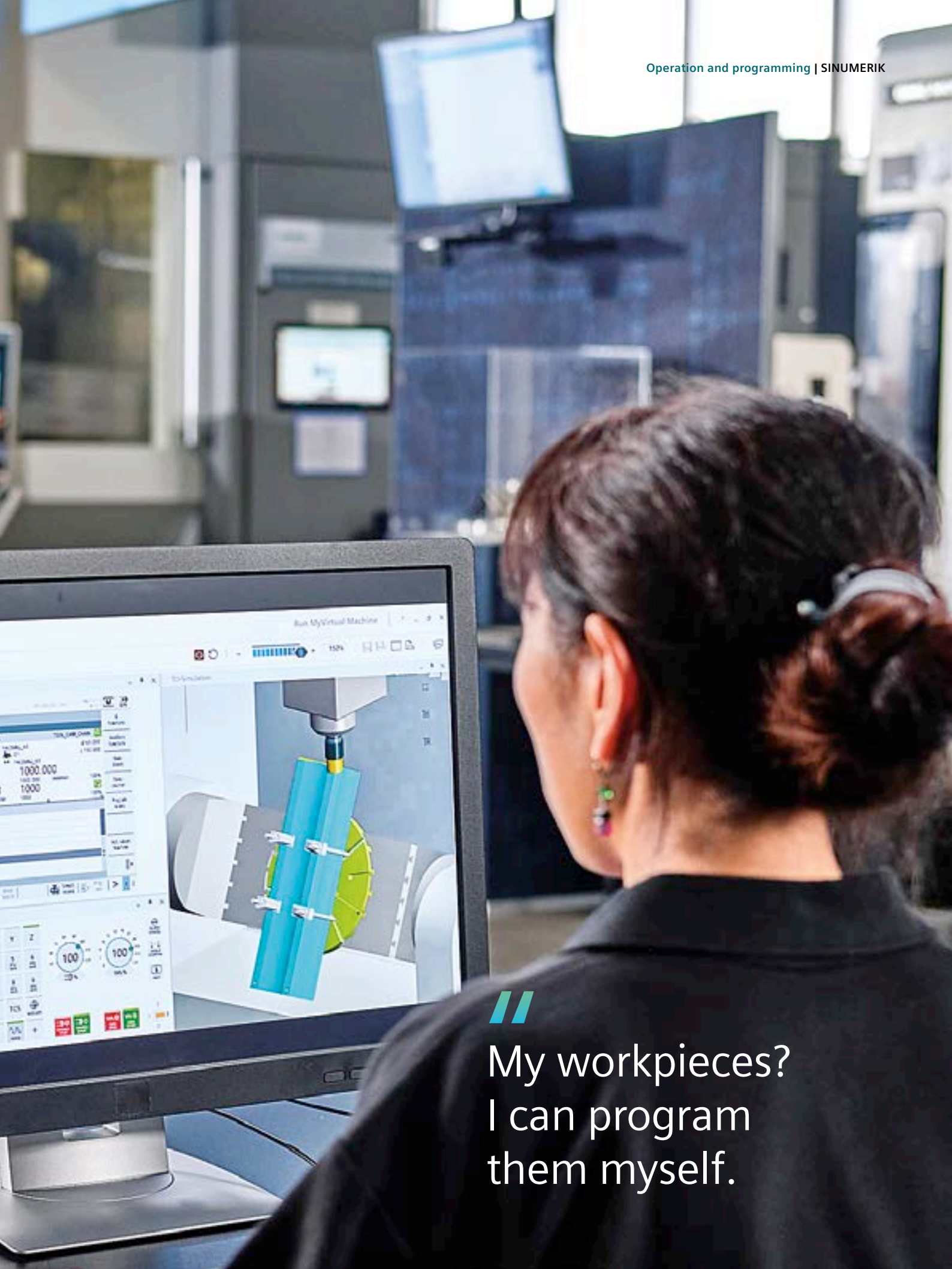
In programGUIDE, G-code programs can be combined with powerful SINUMERIK technology and measuring cycles in a user-friendly fashion. Even classic ISO codes can be programmed. As a result, SINUMERIK is especially attractive for machine operators who prefer this classic programming method.

Machining step programming

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

Diagnostics

Especially in large series production, machine downtimes result in enormous production losses. SINUMERIK Operate offers intelligent diagnostics if problems arise so that machine operation can be resumed as quickly as possible. In addition to bus diagnostic tools for drive, peripheral and network components, there is also a powerful trace function. This is used to trace and troubleshoot NC, PLC and drive signals.



"My workpieces? I can program them myself.

"My machine? Highly productive thanks to the digital twin.

On track to achieve higher productivity with CNC Shop-floor Management Software

Through digitalization, machine builders and companies operating machines can respond more flexibly to market demands – and at the same time boost their productivity.
CNC Shopfloor Management Software specifically addresses the requirements in the machine tool domain. It facilitates the management, analysis and optimization of machine tools – independent of the manufacturer of the control system being used.

Digitalization for machine builders

Higher engineering productivity

There are two main objectives when it comes to machine construction. On one hand, a higher degree of efficiency and flexibility in development, e.g. with consequential virtualization in the development process. On the other hand, supplementing portfolios to digitalize the customer production environments – all the way up to new business models.

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

The 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 virtual image of the machine can be made available to the company operating the machine for production planning purposes.

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machine tool digitalization

Digitalization for machine users

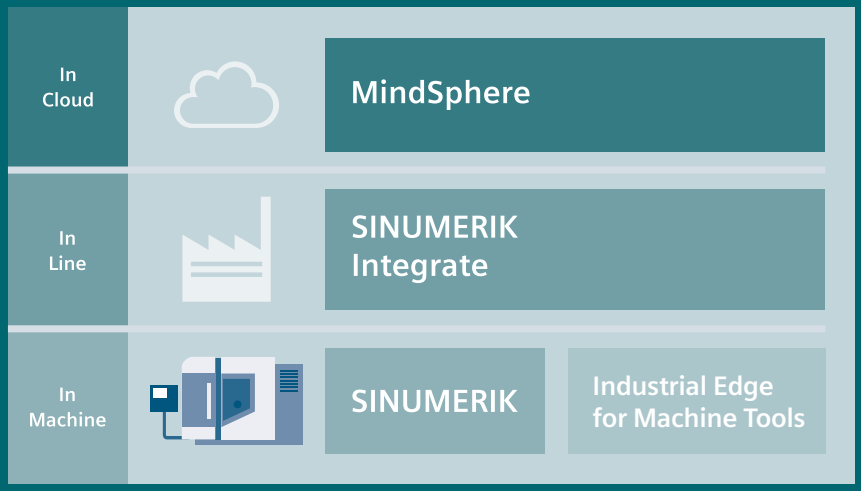
Higher productivity in production

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

The digital twin in production

Programming and setting up operations are virtually shifted from the real production environment into the office. The machine does not have to be at a standstill to identify whether components can be actually machined. CNC programs can be tested in advance for potential collision of the tool with clamping equipment or machine parts. CNC programs for new production orders can be run-in "off-line" as long as the machine is still in productive operation. Further, new operating personal can be trained without blocking the machine. Unproductive times at the machine are therefore reduced to a minimum and consequentially shifted into production planning. This boosts the productivity and availability of the real machine.

CNC Shopfloor Management Software – ecosystem
A leading-edge IT architecture is created based on the 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 field up into the Cloud.
This is complemented by the opportunity of creating new business models, in the service domain, for instance. Leveraging digitalization, potential for optimization, unknown up until now can be tapped into so that productivity and competitiveness can be sustainably increased.



Left: Analyze MyMachine /Condition to determine the mechanical condition of the machine tool;
Right: Analyze MyWorkpiece /Toolpath to visualize and analyze workpiece data

MindSphere

Digitalization with cloud-based applications – optimally networked

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

SINUMERIK Integrate

Wide-ranging applications to optimize availability and productivity

However, the advantages of a digital landscape can be utilized even without a connection to the cloud. The SINUMERIK Integrate platform hosts a wide range of applications that provide functions adapted to 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

The Industrial Edge for Machine Tools is a reliable and high-performance hardware and software solution for machine-related use (Edge computing). This especially allows high-frequency process data to be processed and analyzed right at the machine tool in the field while production is still running. Using customized EdgeApps, processes and the machine's overall condition can be monitored and optimized.

Furthermore, with the provided Application Software Development Kit for EdgeApps (AppSDK) users can enable the quick creation of new applications to fit individual needs and additional use cases.

Motion Control Services – digitalization of machine tools and optimization of production landscapes

Digital services – the path to a digital production environment

Based on the CNC Shopfloor Management Software, Motion Control Services represents a partial or full digitalization of the mechanical production workflow. We offer a complete solution from a single source. This extends from the requirement analysis and the resulting concept through installation up to implementation of optimization measures and ensuring 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 concrete recommendations when it comes to networking machines in production IT systems. Machine data are continuously captured and evaluated in a standardized way while the machines remain operational.

Digitalization preparation

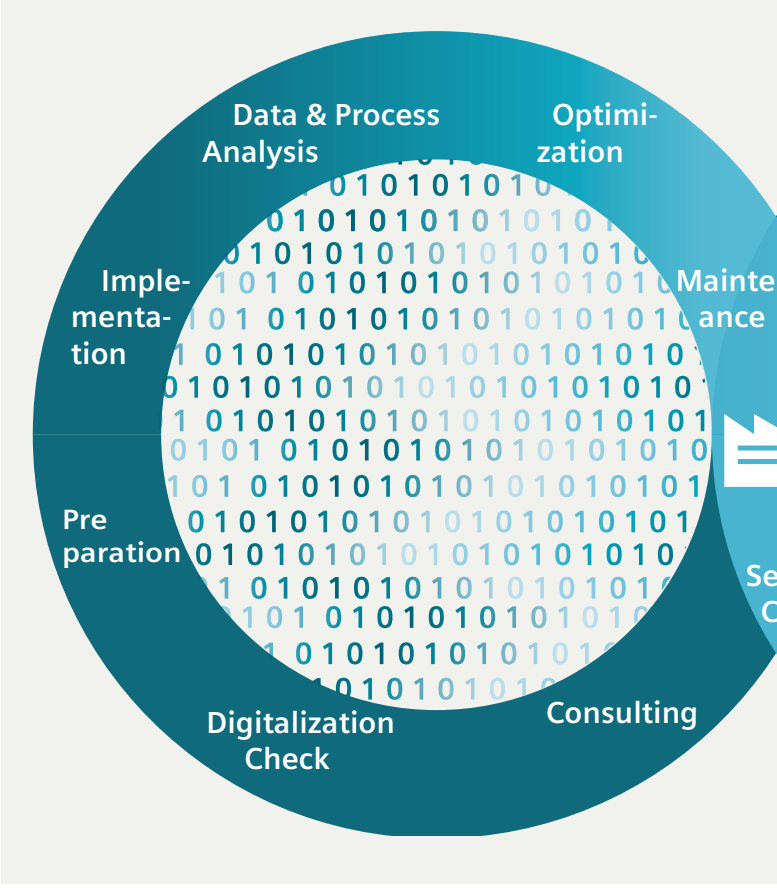
Machine tools are updated to represent state-of-the-art technology and made ready for digitalization. Irrespective of whether greenfield or brownfield systems, using Brownfield Connectivity Services, software updates, hardware upgrades or retrofits, machine fleets are made fit for digitalization.

Implementation

Specialists from Motion Control Services support you when configuring and commissioning the various software modules. This makes your production more efficient, more profitable and increases your security of investment. Training programs ensure that your personnel know how to use the application.

Data & Process Analysis

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



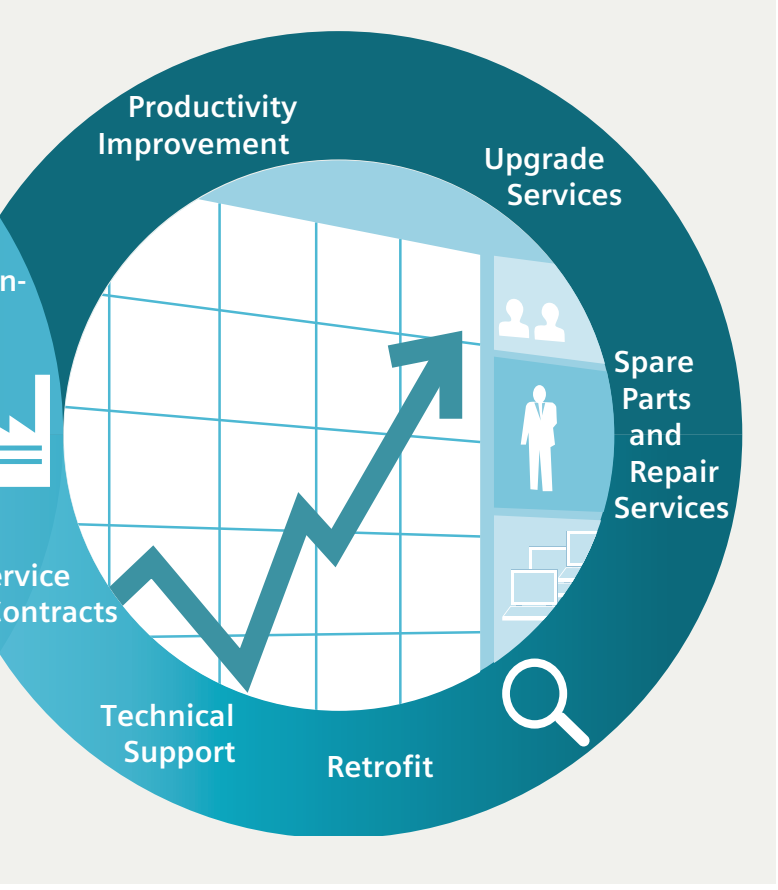
Optimization

Optimization measures are implemented to fully leverage the potential of machine fleets. In addition to productivity boosting 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 downtimes.

Motion Control Services provide support to dealers or machine operators over the complete lifecycle of production systems – for drives, motors, or controls. The emphasis is on increasing transparency so that all types of resources and machines can be used more efficiently, productively and flexibly – and of course to increase machine availability.



Classic services – the basis for continuous improvement

Service Contracts
Harmonized and aligned to specific requirements and business objectives, our service contracts are modular and allow companies operating machines to create a customized service concept to reduce their machine downtimes. Here, customers can integrate digital service options. These include remote access and the use of service applications to achieve an even better machine availability.

Technical Support
Competent hotline experts answer every question related to SINUMERIK – in your time zone and in your language.

Spare Parts & Repair Services
A closely meshed, flexible spare parts and repair service network ensures that spare parts are quickly available at reasonable prices at over 150 service locations around the globe. Not only this, 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 machine tools that are used intensively with high utilization levels, fully leveraging the machine capacity to its maximum has significant economic benefits. With Productivity Improvement we optimize the production potential for machine tools equipped with SINUMERIK 840D sl or SINUMERIK 840D pl.

Retrofit
A CNC retrofit is the cost-effective alternative when compared 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 no longer represents state-of-the-art technology. As part of this service, we upgrade specific components to reflect latest state-of-the-art technology. Cycle times can be significantly reduced and quality optimized by just upgrading the control system.

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More about SINUMERIK CNCs can be found at: siemens.com/sinumerik

To secure plants, systems and machines as well as networks against cyber attacks, a holistic industrial security concept must be implemented (and continuously updated) corresponding to current state-of-the-art technology. Products and solutions from Siemens are just one component of such a concept. You can find additional information about industrial security at siemens.com/industrialsecurity.