

# SINUMERIK 840D sl

Open, flexible, strong. Strongly innovative.



## SINUMERIK

Answers for industry.

# SIEMENS


# SINUMERIK 840D sl

Open, flexible, strong. Strongly innovative.

The SINUMERIK 840D sl offers you openness, flexibility, a uniform structure for operation, programming and visualization, and optimum integration into networks. It provides a system platform with trendsetting functions for almost all technologies. SINUMERIK 840D sl – strongly innovative.

Integrated into the compact, modular SINAMICS S120 drive system with a high power density and complemented by the SIMATIC S7-300 automation system, SINUMERIK 840D sl is a powerful complete system that is best suited for the mid to upper performance range.

SINUMERIK and SINAMICS S120 are supplemented by a wide range of motors. Whether synchronous or asynchronous, all motor types are optimally supported by SINAMICS S120.

<p>HMI</p>	 <p>OP 08T    OP 010C    OP 012    OP 015A OP 015AT TP 015A TP 015AT</p> <p>MCP MPP</p> <p>HT 2    HT 8</p>
<p>PCU</p>	 <p>PCU 50.3-C    PCU 50.3-P</p>
<p>NCU</p>	 <p>NCU 710.2    NCU 720.2 NCU 720.2 PN    NCU 730.2 NCU 730.2 PN</p>
<p>Drive</p>	 <p>Blocksize    Booksize SINAMICS S120    Chassis</p>
<p>Motors</p>	 <p>1FK7    1FN3    1PH8    1FT7    1FE1    1FW6    2SP1</p>

### Benefits

SINUMERIK 840D sl, the powerful CNC system for demanding solutions is

- **efficient** in terms of programming, installation, commissioning and design
- **innovative** in terms of NC functions, communication, operation and openness
- **uniform** in terms of programming, operating philosophy, machine interfaces and motors

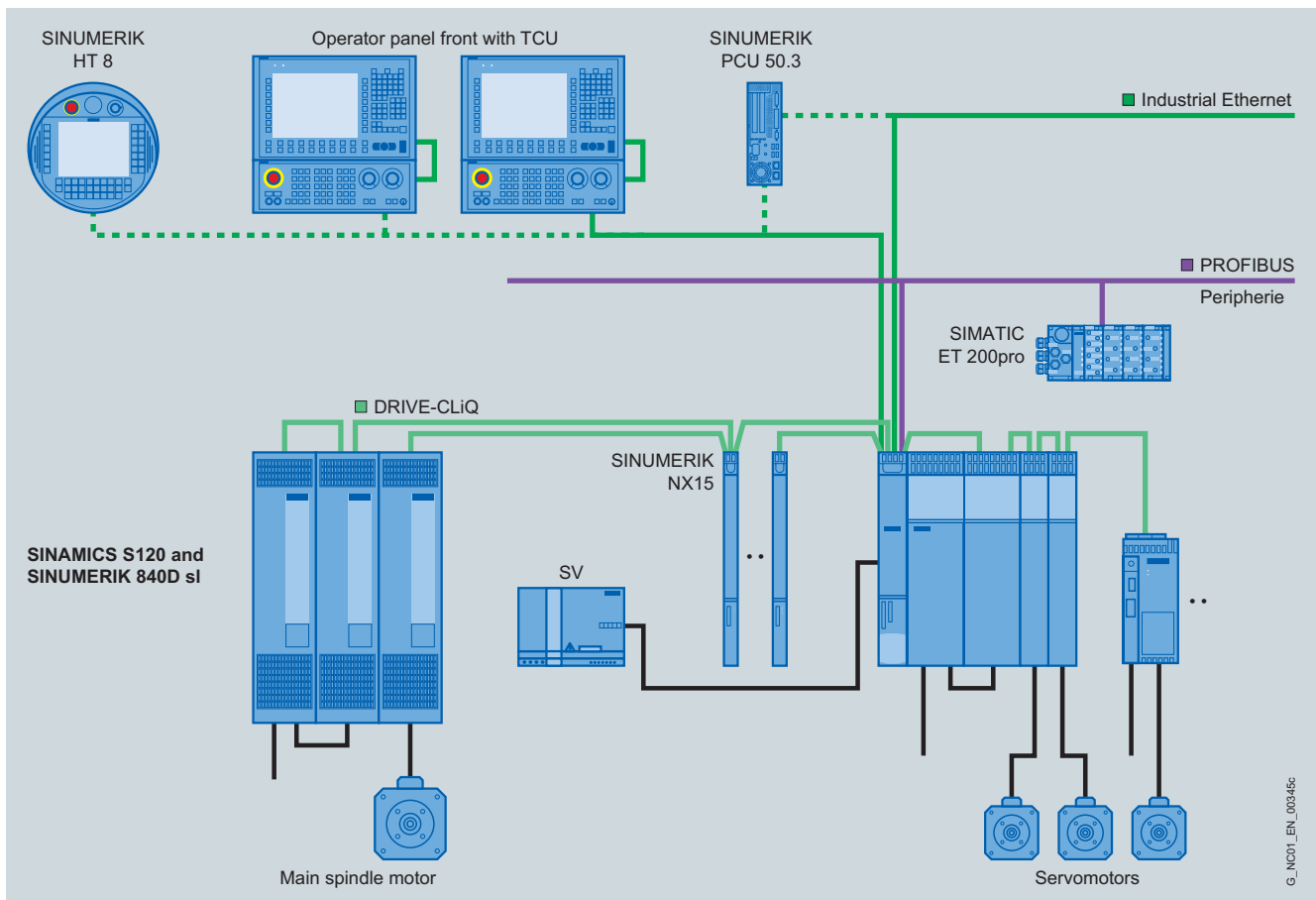
### Area of application

The SINUMERIK 840D sl can be used worldwide for turning, drilling, milling, grinding, laser machining, nibbling, punching, in tool and mold making, for high-speed cutting applications, for wood and glass processing, for handling operations, in transfer lines, and rotary indexing machines as well as for mass production and shopfloor.

The SINUMERIK 840DE sl is available as an export version for use in countries where approval is required.

### Design

SINUMERIK 840D sl combines CNC, HMI, PLC, closed-loop control and communication tasks on one SINUMERIK NC unit (NCU). For increased performance in the operating area (HMI), you can use the SINUMERIK PCU 50.3 industrial PC. You can operate up to 4 distributed OPs on one NCU/PCU at a distance of up to 100 m. You can operate up to 4 distributed OPs on one NCU/PCU at a distance of up to 100 m. Furthermore, an intelligent displacement mechanism allows you to run more than four operator panels. You can also set up the powerful NCU multiprocessor module remotely from the SINAMICS S120 at a distance of up to 100 m.



Topology of the SINUMERIK 840D sl

# SINUMERIK 840D sl

## The CNC system for demanding solutions

### Open and flexible user interface and CNC

One important feature of the SINUMERIK 840D sl is the distributed and simplified system design – fully integrated into the design and communications structure of our SINAMICS S120 drive system.

The hardware and software can be scaled separately from one another. The drive-internal communication DRIVE-CLiQ allows in combination with hubs a significant reduction in the costs for machine wiring, e.g. the festoon cable system. You also benefit from an extremely flexible operating concept with Thin Client units. The consistently modular CNC concept allows you to implement innovative and custom-tailored machines.

Thanks to the openness in the HMI and NCK, you can add your special expertise and specifically design machines and user interfaces, and perfectly adapt them to the individual needs of your customers. Images, software or individual technological expertise can be easily incorporated into the CNC.

Both the embedded and the Windows systems can be programmed in the same way. SINUMERIK 840D sl's standard communication solution is Ethernet-based. Thanks to Ethernet onboard, there is no need for additional CPs. The powerful PLC/PLC communication via CBA provides flexible networking options, and operator stations can be dynamically connected.

### According to your wishes: in any case, a rugged CNC solution

With SINUMERIK 840D sl, embedded and Windows systems can be identically programmed and tool input screens can be flexibly adapted. Thanks to distributed components for operation, drive and peripherals, the rugged CNC system platform offers considerable freedom in the positioning of components in the machine. The components can be positioned up to 100 meters from each other.

### Dynamic and precise

SINUMERIK 840D sl ensures more dynamics with the SINAMICS S120 drive system on basis of the highly dynamic DSC (dynamic servo control) closed-loop position control and through the use of innovative linear motors.

Adaptive current controllers also ensure maximum utilization of servomotors.

Machine resonances are suppressed by software filters and the controlled DC-link voltage of the Active Line Module prevents voltage dips.

With SINUMERIK 840D sl, precise surfaces can be achieved – regardless of whether the workpieces are simple or complex. Our well-founded expertise and SINUMERIK's tried and tested use in practice also make it the perfect solution for tool- and mold-making. Our technological highlights stand for precision and fast machining processes:

- Optimum milling with the SINUMERIK MDynamics (3-axis/5-axis) technology package
- Advanced Surface gives an optimum surface
- Excellent synchronous operation thanks to low torque ripple
- High-resolution actual position value in the single-digit nanometer range
- Measurement and compensation of geometric errors, even for rotary axes
- Spatial compensation by means of Volumetric Compensation System „VCS plus“

### Operating and programming made easy

SINUMERIK operator components provide uniform operation and highly innovative solutions, such as simple but rugged operation with the HT 2 handheld unit or the fully adequate HT 8 Touch handheld unit. Flexible operating solutions, such as parallel tool loading and multi-user operation, can be easily implemented with the available components.

The new multi-channel, technology-independent SINUMERIK operating and programming interface is well-arranged, facilitates innovative operation, and possesses a large number of powerful, new functions. It combines the best from HMI-Advanced, ShopMill and ShopTurn.

- Easy operation with a uniform look & feel for universal, milling and turning
- Can be operated uniformly by touch, and with innovative functions, such as a virtual keyboard for entry fields
- Made efficient by practicable setup functions, user-friendly tool management, 3D simulation, and a graphic tool display
- Integrated sequence and high-level language programming supported by „ProgramGUIDE“ make programming fast and easy
- Innovative „Animated Elements“ make everything clear, because they show the machining step as an animated simulation in advance



Programming of contour

### With certainty, more than just more safety

SINUMERIK Safety Integrated is a comprehensive safety package. It helps to protect both people and machines – in an extremely efficient and economic way – by completely integrating the safety functions in the control and drive technology. Additionally, it makes operating your machine safe and practicable under all required operating conditions. For example in set-up and test modes with the protective door open. The safety functions fulfill the requirements of DIN EN 61508 for use up to and including SIL 2 (Safety Integrated Level) and category 3, as well as PL L (Performance Level) according to DIN EN ISO 13849. This enables important requirements of the EC Machinery Directive to be implemented easily and economically. The range of functions includes, for example:

- Functions for the safe monitoring of velocity and standstill
- Functions for safe working range and protection zone delimitation, and for range recognition
- Direct connection of all safety-related signals and their internal logic operations
- Two-channel braking signal and cyclical brake test
- Semi-automated acceptance test for all safety-related functions

Your data is permanently protected as well by means of encrypting OEM cycles, for example. The high degree of security by means of an integrated firewall in the NCU and PCU and the separation of system and plant networks ensure high safety standards in production.

### Naturally good – ecology-minded solutions for your machine tool

With SINUMERIK and the SINAMICS S120 drive system, Siemens offers an energy-efficient solution with a high degree of efficiency, targeted energy management and power regeneration.

#### Other environmental protection highlights

- Flow reduction for asynchronous motors
- Automatic reactive power compensation
- Reusable packaging matched to your production logistics
- Easy, problem-free disposal

### Innovations and future-proof standards

SINUMERIK 840D sl relies on tried and tested standards – such as PC technology, Windows and Linux, SIMATIC STEP 7, Ethernet, PROFINET/PROFIBUS and USB technology. This makes your systems highly future-proof.

One CNC system, many options – SINUMERIK follows this concept in its design, programming and operation. The use of Thin Client Units (TCUs instead of PCUs), Ethernet onboard instead of additional CPs and new, distributed drive concepts with individual axes and high performance provide flexible solutions for the widest variety of requirements. The uniform look and feel in terms of operation and the high degree of safety for personnel and machines are common standards.



*SINUMERIK Safety Integrated*

# SINUMERIK 840D sl

## Convincing performance data

An overview of the most important functions of the SINUMERIK 840D sl, excerpt from the overview of functions

<b>Optimum, digital all-in-one solution with SINAMICS S120</b>	<b>Motion-synchronous actions</b>
Up to <ul style="list-style-type: none"> <li>• 10 mode groups</li> <li>• 10 channels</li> <li>• 31 axes/spindles</li> </ul>	<ul style="list-style-type: none"> <li>• High-speed CNC inputs/outputs</li> <li>• Synchronized action and high-speed auxiliary function output incl. 3 synchronous functions</li> <li>• Positioning axes and spindles via synchronized actions</li> <li>• Clearance control</li> <li>• Continuous dressing (parallel dressing, online modification of the tool offset)</li> <li>• Asynchronous subprograms</li> <li>• Overlapping functions of different operating modes</li> </ul>
<b>Channel structure:</b> <ul style="list-style-type: none"> <li>• Simultaneous, asynchronous processing of part programs</li> </ul>	<b>Open Architecture</b> <ul style="list-style-type: none"> <li>• User interface expansion</li> <li>• SINUMERIK HMI programming package (OEM contract required)</li> <li>• OA package NCK (OEM contract required)</li> </ul>
<b>Axis functions</b> <ul style="list-style-type: none"> <li>• Acceleration with jerk limitation</li> <li>• Follow-up mode</li> <li>• Separate path feed for corners and chamfers</li> <li>• Travel to fixed stop</li> <li>• Trailing axes (TRAIL)</li> </ul>	<b>Programming</b>
<b>Spindle functions</b> <ul style="list-style-type: none"> <li>• Various thread-cutting functions</li> <li>• Automatic gear stage selection</li> <li>• Oriented spindle stop</li> <li>• Axis synchronization on the fly</li> </ul>	<b>CNC programming language:</b> <ul style="list-style-type: none"> <li>• User-friendly programming language (DIN 66025 and high-level language expansion) such as               <ul style="list-style-type: none"> <li>– configurable user variables</li> <li>– macrotechnology</li> </ul> </li> <li>• Program jumps and branches</li> <li>• Program coordination with WAIT, START, INIT</li> <li>• Control structures IF-ELSE-ENDIF, WHILE, FOR, REPEAT, LOOP</li> <li>• STRING functions</li> <li>• Programming in parallel with machining</li> <li>• Zero offsets</li> <li>• Look ahead</li> <li>• Program/workpiece management</li> </ul>
<b>Interpolations</b> <ul style="list-style-type: none"> <li>• Linear interpolating axes</li> <li>• Circle via center point and end point, or via interpolation point</li> <li>• Helical interpolation</li> <li>• Universal interpolator NURBS (non-uniform rational basis splines)</li> <li>• Continuous-path mode with programmable rounding clearance</li> <li>• Spline, polynom and evolvent interpolation</li> </ul>	<b>Programming support:</b> <ul style="list-style-type: none"> <li>• User-friendly program editor</li> <li>• Programming support for geometry inputs and cycles</li> <li>• Process-oriented cycles for drilling/milling and turning</li> <li>• Programming and operating support for turning and milling machines with ShopTurn/ShopMill</li> </ul>
<b>Transformations</b> <ul style="list-style-type: none"> <li>• Cartesian point-to-point (PTP) travel</li> <li>• Concatenated transformations</li> <li>• Generic transformation</li> </ul>	<b>Simulation</b>
<b>Measuring functions/measuring cycles</b>	<ul style="list-style-type: none"> <li>• Up to 10 channels can be sequentially simulated</li> <li>• Quickview for mold-making programs (HMI-Advanced)</li> <li>• Drawing, simulation for turning and milling</li> </ul>
<b>Measurement level 1:</b> <ul style="list-style-type: none"> <li>• Two measuring inputs (switching) with/without deletion of distance to go</li> </ul> <b>Measurement level 2:</b> <ul style="list-style-type: none"> <li>• Logging of measurement results</li> <li>• Measurement functions from synchronized actions</li> <li>• Cyclic measuring</li> </ul>	<b>Modes</b>
<b>Technologies</b> <ul style="list-style-type: none"> <li>• Punch and nibble functions</li> <li>• Oscillation functions</li> <li>• More than one feed in block (e.g. for calipers)</li> <li>• Handwheel override</li> <li>• Electronic transfer</li> <li>• Machining package milling</li> <li>• SINUMERIK MDynamics, 3-axis</li> <li>• SINUMERIK MDynamics, 5-axis</li> </ul>	<ul style="list-style-type: none"> <li>• AUTOMATIC, JOG, TEACH IN and MDA are supported by Repos (repositioning)</li> </ul>

Tools
<b>Tool types:</b> <ul style="list-style-type: none"> <li>• Turning</li> <li>• Drilling/milling</li> <li>• Grinding</li> <li>• Groove sawing</li> </ul>
<ul style="list-style-type: none"> <li>• Tool radius compensation</li> <li>• Tool change via tool number</li> <li>• Tool management</li> <li>• TDI tool management functions</li> </ul>
Communication/data management
<ul style="list-style-type: none"> <li>• Data storage/data backup floppy disk, memory stick, CompactFlash Card, hard disk, Ethernet</li> <li>• DNC machine CNC program transfer</li> </ul>
Operation
<ul style="list-style-type: none"> <li>• Clearly laid-out operation</li> <li>• Control unit management</li> <li>• User-oriented, hierarchical access protection</li> <li>• Screen texts in several languages</li> <li>• Plain text display of operating states</li> </ul>
Operator components
<ul style="list-style-type: none"> <li>• Operator panel fronts with a display diagonal of 7.5" to 15" (optionally with Touch)</li> <li>• Membrane keyboard or mechanical keys</li> <li>• Machine control panels</li> <li>• Full CNC keyboards</li> <li>• Standard PC keyboard</li> <li>• Handheld units</li> <li>• Handwheels</li> </ul>
Monitoring functions
<ul style="list-style-type: none"> <li>• Working area limitation</li> <li>• Limit switch monitoring</li> <li>• Position monitoring</li> <li>• 2D/3D protection zones</li> <li>• Spindle speed limitation</li> <li>• Safety routines (continuously active for overtemperature, battery, voltage, memory, fan monitor)</li> <li>• Integrated tool monitoring and diagnostics via Solution Partner</li> </ul>
Compensation
<ul style="list-style-type: none"> <li>• Pre-control (velocity-dependent)</li> <li>• Temperature compensation</li> <li>• Quadrant error compensation</li> <li>• Sag compensation</li> <li>• Spatial compensation (VCS plus)</li> <li>• Vibration extinction VIBX</li> </ul>

PLC
<ul style="list-style-type: none"> <li>• Integrated SIMATIC S7-compatible CPU 317-2DP/319-3PN/DP</li> <li>• STEP 7 programming language</li> <li>• Distributed I/O via PROFIBUS DP</li> </ul>
Safety functions
<ul style="list-style-type: none"> <li>• SINUMERIK Safety Integrated for the personnel and machine protection</li> </ul>
Drive
<ul style="list-style-type: none"> <li>• SINAMICS S120 booksize format</li> <li>• SINAMICS S120 chassis format</li> <li>• SINAMICS S120 blocksize format</li> </ul>
Motors
<b>Synchronous motors (adapted to high-precision, dynamic applications):</b> <ul style="list-style-type: none"> <li>• 1FT7, 1FK7 motors</li> <li>• 1FE1 built-in motors, 1FW6 built-in torque motors</li> <li>• 2PN1 motor spindles</li> <li>• 1FN3/FN6 linear motors</li> </ul>
<b>Asynchronous motors:</b> <ul style="list-style-type: none"> <li>• 1PH4 motors with solid shaft/water cooling</li> <li>• 1PH7 motors with solid shaft/forced ventilation</li> <li>• 1PH8 motors with solid or hollow shaft/forced ventilation or water cooling</li> <li>• 1PM4 motors with hollow shaft/oil cooling/water cooling</li> <li>• 1PM6 motors with hollow shaft/forced ventilation</li> </ul>
Commissioning
<ul style="list-style-type: none"> <li>• Startup software</li> <li>• Startup trace</li> <li>• SinuCom Update Agent/Installer (for series production and software update)</li> </ul>
Diagnostic functions
<ul style="list-style-type: none"> <li>• Alarms and messages</li> <li>• Action log can be activated for diagnostic purposes</li> <li>• PLC status</li> <li>• Remote diagnostics</li> </ul>
Service and maintenance
<ul style="list-style-type: none"> <li>• ePS Network Services</li> <li>• TPM Total Productive Maintenance</li> </ul>

## Further information

All information about the SINUMERIK CNC equipment:

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

More detailed technical documentation at our

Service & Support portal:

[www.siemens.com/automation/support](http://www.siemens.com/automation/support)

Use the A&D Mall to place orders electronically via the Internet:

[www.siemens.com/automation/mall](http://www.siemens.com/automation/mall)

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