SINUMERIK 840D sl & SINAMICS
The powerful system platform for the highest standards

The new SINUMERIK 840D sl offers you modularity, openness, flexibility, a uniform structure for operation, programming, visualization and optimum integration into networks.

It provides a system platform with trend-setting functions for almost all technologies. 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 new complete digital system that is best suited for the mid to upper performance range. SINUMERIK and SINAMICS S120 are enhanced by a wide range of motors. Whether synchronous or asynchronous, all motor types are optimally supported by SINAMICS S120.

The SINUMERIK 840D sl can be used worldwide for the technologies 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, for mass production and JobShop production.
The SINUMERIK 840DE sl is available as an export version for use in countries where approval is required.
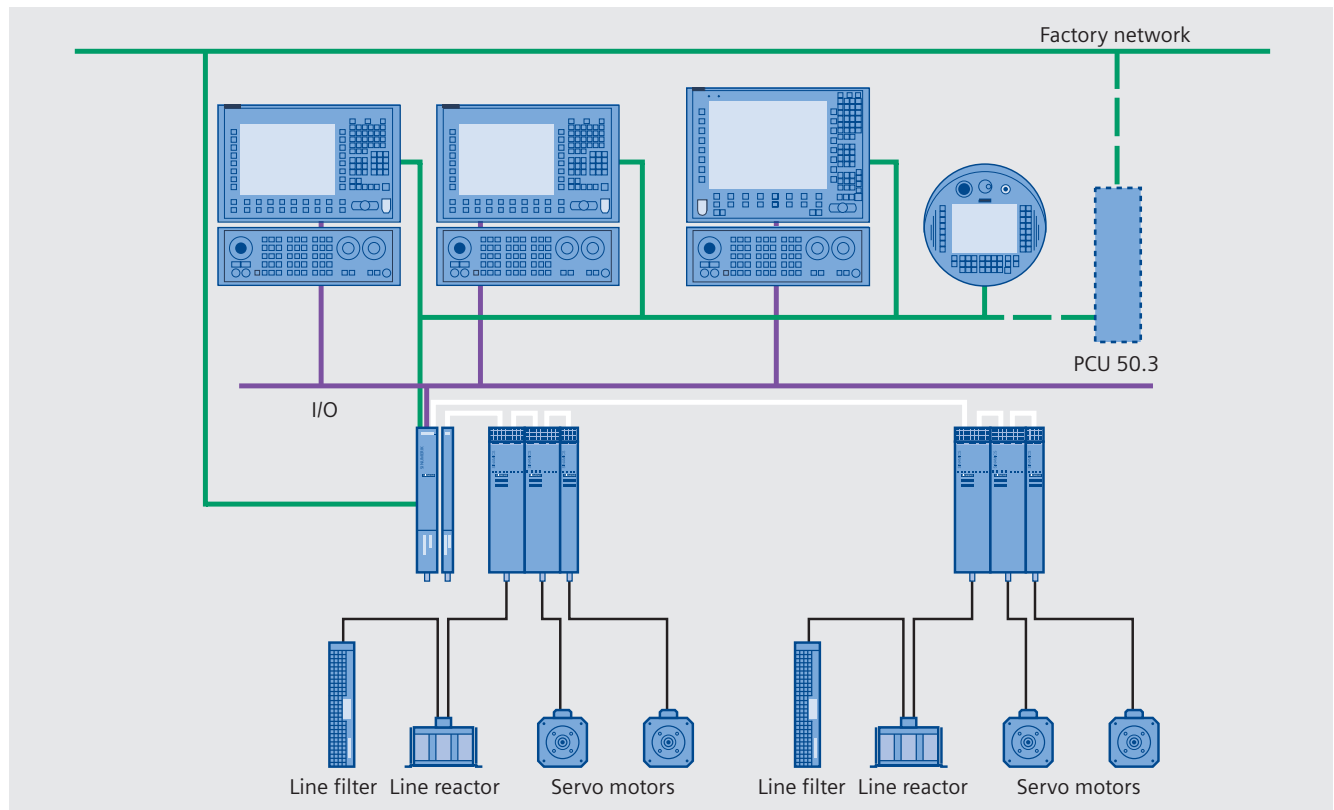
sinumerik
840D sl

SIEMENS

SINUMERIK 840D sl
The powerful system platform

Structure

SINUMERIK 840D sl combines CNC, HMI, PLC, closed-loop control and communication tasks on one SINUMERIK NC unit (NCU). For increased performance in the HMI sector, you can use the industrial PC SINUMERIK PCU 50.3. You can operate up to 4 distributed OPs on one NCU/PCU at a distance of up to 100 m. You can also set up the powerful NCU multiprocessor module remotely from the SINAMICS S120 at a distance of up to 100 m.

Factory network

PCU 50.3

I/O

Line filter Line reactor Servo motors   Line filter Line reactor Servo motors

Topology of the SINUMERIK 840D sl

Functions

Performance and flexibility

The scalability of the hardware and software – both in the CNC and control area – provides exceptional conditions for the use of the SINUMERIK 840D sl in many sectors. The possibilities range from simple positioning tasks up to complex multi-axis systems.
We offer different types of NCU for your machining tasks.

System-wide openness

Thanks to openness in HMI, CNC and PLC, users can apply their special know-how such that they achieve exactly the individual control solution desired. The SINUMERIK 840D sl offers openness all the way to the NC core. This open architecture and the high computing performance of the SINUMERIK 840D sl mean that adaptation of the CNC functions to many different innovative machine kinematics can be achieved flexibly, rapidly and cost-effectively.

Integrated safety functions

The SINUMERIK Safety Integrated provides integrated safety functions which allow highly efficient personnel and machine protection (awaiting prototype test). The safety functions comply with the requirements of category 3 of EU standard EN 954-1 and the safety integrity level SIL2 of IEC 61508. Essential requirements of functional safety can now be implemented easily and economically.

Well-proven operator software and programming software

The following are available for the optimum operation and programming of your machine tools:

- HMI Embedded or HMI Advanced, the cross-technology, multichannel operator interface software

  or

- ShopMill or ShopTurn for genuine workshop CNC

Functions (continued)

HMI Embedded/HMI Advanced

The cross-technology, multichannel operating interface software permits full and convenient operation of the machine tool using window technology. The creation of the parts programs is supported by a user-friendly, screenform-based text editor and the powerful contour calculator permits the programming and graphic representation of complex workpiece contours. Parts programs can be checked quickly using the integrated simulation.

Workshop production – ShopMill/ShopTurn
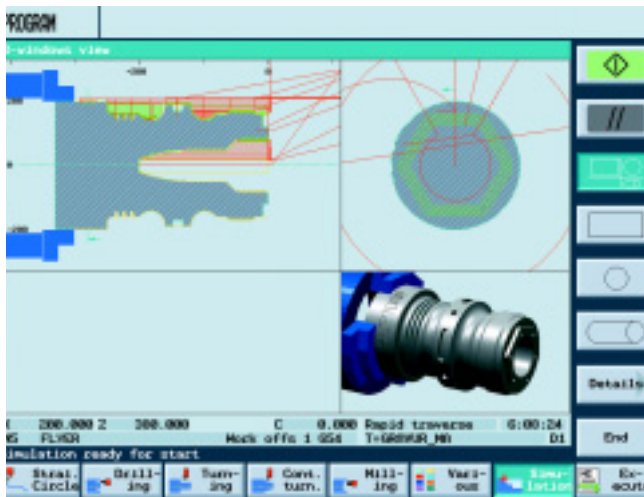
ShopMill and ShopTurn are operating and programming software packages that simplify machine operation and the programming of workpieces. Both are complete CNC solutions for the workshop area.
ShopMill for milling can be used on vertical and universal milling machines and ShopTurn for turning. Apart from an extensive cycle package, both offer a host of practical setup functions, such as measuring workpiece or tool, functions for data handling and a clear, user-friendly tool management.

Form and machine construction

Only those who know the practical requirements can develop tailor-made products and systems for different tasks. Siemens, for example, offers innovative and industry-specific control solutions for all aspects of mold and tool making on the principle of "Productivity in Motion". Speed, precision and perfect surface conditions without expensive reworking are the main objectives in mold and tool making. One particularly high-performance technology for solving demanding and complex production tasks with great precision is high-speed cutting (HSC).
The control offers you everything that is required in the high-productivity tool and mold-making industry.

Electronic rating plate in all components

All SINAMICS S120 components with a DRIVE-CLiQ interface have an electronic rating plate. This rating plate contains all relevant component data.
On commissioning or replacement, this data is automatically sent to the higher-level control or harmonized with it. This unique identification of the components used in the machine simplifies servicing enormously.

ePS Network Services – Innovation potential for service and maintenance

ePS Network Services supports company-wide service and support processes. To prevent faults and downtimes wherever possible, the ePS Network Services available to the factory maintenance department and the machine constructor permit cyclic evaluation of the machine status and of individual machine components. Test procedures – such as circularity or synchronization tests – based on standards are available for this purpose.

Using the trend analysis, the test results can be assessed throughout the entire life cycle of a machine. This ongoing evaluation means that maintenance measures can be scheduled on a predictive and selective basis and that inspection and maintenance procedures can be optimized.

Motion Control Information System MCIS – The key to higher productivity

The Motion Control Information System (MCIS) offers powerful software modules for the optimum integration of the machines in your data processing environment.
They help you to improve the productivity and reliability of your processing machines.

For production, this means:

- Smooth coordination of planning, scheduling and execution
- Shorter setup times and enhanced efficiency
- Reduced machine downtimes
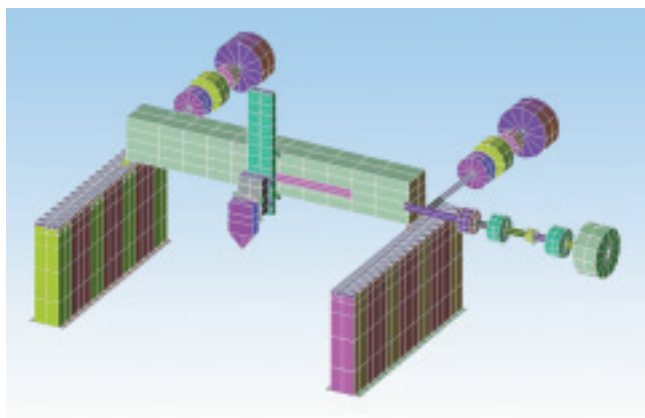- Simplified fault analysis
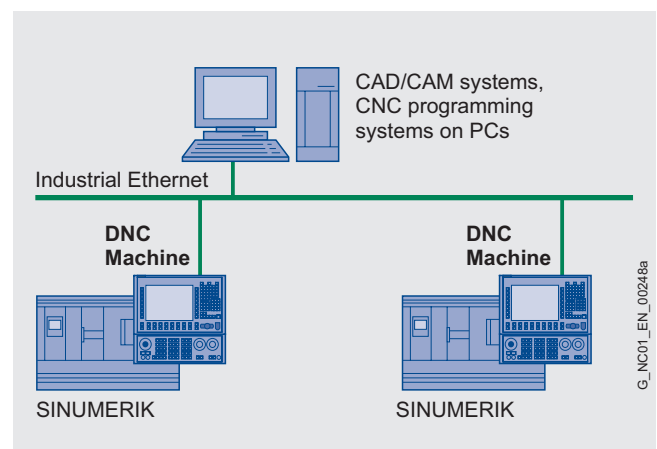
SINUMERIK 840D sl
Virtual prototyping for a shorter time to market

**Virtual prototyping –
Bundled competence for a faster and more efficient way to the perfect machine and the optimized work-piece**

Mechatronic Support

With our mechatronic approach, the development of efficient machines can be speded up considerably.

This in turn leads to a shorter time-to-market and thus greater competitiveness for the machine constructor and the end user.

Virtual Production

With Virtual Production, the simulated machining and optimization replaces the repeated test machining of the workpiece on the real machine.

This provides the opportunity for optimizing the production even at the preliminary stage.

Machine Simulator

With SINUMERIK Machine Simulator you can tap into the potential that is offered by modern computer simulations. You can exploit the optimization potential on the model of your machine even at the early stage of development.

This results in considerable savings of time and money during machine optimization and commissioning.

**PC-Tool SIZER –
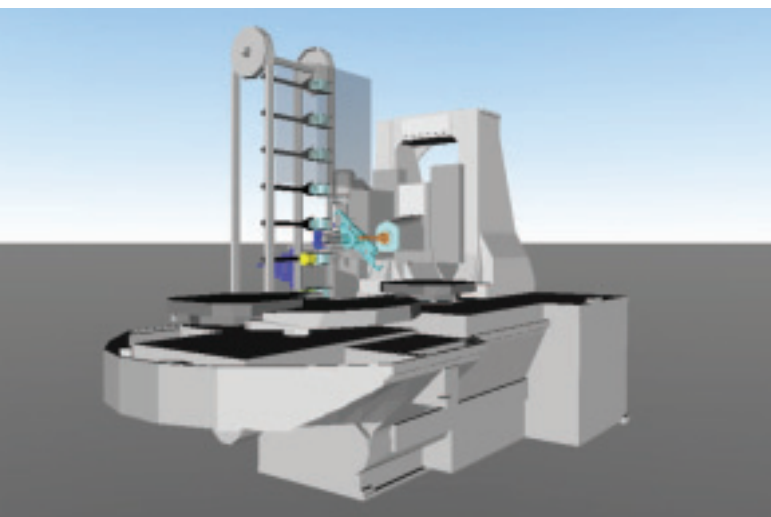Intelligent configuration**

The PC-Tool SIZER offers you convenient configuration of the SINAMICS series of drives and of the CNC.

SIZER helps in the technical layout of the necessary hardware and software components for drive and control tasks.

CNC functionality included in the basic scope of supply	●
Options or accessories	○

PLC

Modular CNC path control 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, for mass production and JobShop production. The controller consists of a 50mm wide module and optional external, intelligent operator panels to cover every requirement concerning convenience of operation.

Optimum, digital complete solution with SINAMICS S120	●
Up to ten operating mode groups, ten channels and 31 axes/spindles	○
Channel structure: Simultaneous, asynchronous processing of parts programs	○

Axis functions

Extensive axis functions, such as acceleration with jerk limitation, follow-up mode, separate path feed for roundings and chamfers, travel to fixed stop, trailing axes (TRAIL)	●
Feed and rapid traverse: 10^{-3} mm/min to 999 m/min	●
Rotary axis, turning endlessly	●
Velocity, max. 300 m/s	●
Programmable acceleration	●
Trailing axes (TRAIL)	●
Travel to fixed stop with Force Control	○
Pair of synchronized axes (gantry axes)	○
Master/slave for drives	○
Setpoint exchange	○
Tangential control	○
Position switching signals/cam controller	○

Spindle functions

Extensive spindle functions, such as different thread cutting functions, automatic gear stage selection, oriented spindle stop, on-the-fly axis synchronization	●
Synchronous spindle/multi-edge turning	○

Interpolations

Linear interpolating axes	●
Circle via center point and end point	●
Circle via interpolation point	●
Helical interpolation	●
Universal interpolator NURBS (non-uniform rational B-splines)	●
Continuous-path mode with programmable rounding clearance	●
Multi-axis interpolation (> 4 axes)	○
Spline interpolation (A, B and C splines/compressor) for 3/5-axis machining	○
Polynomial interpolation	○
Master-value coupling and curve table interpolation	○
Involute interpolation	○
Electronic gear unit	○
Axial coupling in the machine coordinate system (MCS coupling)	○
Continue machining at the contour (retrace support)	○

Transformations

Cartesian point-to-point (PTP) traveling	●
Concatenated transformations	●
Generic transformation	●
Numerous additional transformations such as TRANSMIT, inclined axis, transformation package handling, transformation shearing kinematics two axes ...	○

Measurement functions/measurement cycles

Measurement level 1: Two measurement inputs (switching) with/without deletion of distance-to-go	●
Measurement level 2: Logging of measurement results, measurement functions from synchronized actions, cyclic measurement	○
Measurement cycles for drilling/milling and turning Calibrate workpiece probe, workpiece measurement, tool measurement	○

Technologies

Oscillation functions (block-related, modal and asynchronous)	○
More than one feed in block (e.g. for calipers)	○
Handwheel override	○
Contour handwheel	●
Electronic transfer	○
Processing package for five axes: contains the multi-axis interpolation option	○
Machining package milling: Contains options: Machining package five axes, multi-axis interpolation, spline interpolation (A, B and C splines/compressor) for five-axis machining and 3D tool radius compensation	○

Motion-synchronous actions

High-speed CNC inputs/outputs	●
Synchronized action (max. 16) and high-speed auxiliary function output incl. 3 synchronous functions	●
Synchronized actions, stage 2	○
Positioning axes and spindles via synchronized actions (command axes)	●
Clearance control: 1D in interpolation cycle via synchronized action	●
Clearance control 1D/3D in position control cycle (including in the interpolation cycle), free direction	○
Evaluation of internal drive variables (prerequisite for Adaptive Control)	○
Continuous dressing (parallel dressing, online modification of the tool offset)	●
Asynchronous subroutine ASUP	●
Multiple mode actions (ASUPs and synchronized actions in all operating modes)	○

Open Architecture

Expand user interface	●
SINUMERIK HMI programming package (OEM contract required)	○
SINUMERIK HMI programming package WinCC flexible (OEM contract required)	○
OA-open NCK software	○

SINUMERIK 840D sl
Convincing performance data

CNC functionality included in the basic scope of supply	●
Options or accessories	○

Programming

CNC programming language

Easy to use programming language (DIN 66025 and high-level language extension) such as configurable user variables, macro technology, program jumps and branches, program coordination with WAIT, START, INIT, control structures IF-ELSE-ENDIF, WHILE, FOR, REPEAT, LOOP, STRING functions	●
Programming in parallel with machining	●
Dimensions can be specified as metric, in inch or mixed	●
Work offsets, programmable (frames)	●
Reference point approach by program	●
Look Ahead	●
Inclined-surface machining with frames	●
Program preprocessing	○
Dynamic preprocessing memory (FIFO)	●
Online ISO dialect interpreter	●
Program/workpiece management	●
NC user memory (RAM) 3 to 15 MB for parts programs, tool compensation, offsets	●
256 MB HMI user memory on the NCU	○

Programming support system

User-friendly program editor	●
Machining step programming	○
Multi-channel sequence programming	○
Programming support for geometry inputs and cycles	●
Process-oriented cycles for drilling/milling and turning	●
Programming and operating support for turning and milling machines with ShopTurn HMI and ShopMill HMI	●
CAD reader for PC, convert DXF files to contours and drilling templates	○
SinuTrain for PC, training software	○

Simulation

Simulation for turning and milling	●

Mode groups

AUTOMATIC	●
JOG (setup)	●
TEACH IN (program creation interactively with the machine)	●
MDA (process manual input block)	●
The operating modes are supplemented by machine functions:	
Repos (repositioning on the contour) • PRESET for setting a new coordinate reference point • Simultaneous traversing of axes with one or two handwheels • Overriding of machine functions in the setup and AUTOMATIC mode • Program selection via directory	●

Tools

Tool types for turning, drilling/milling, grinding and groove sawing	●
Configurable number of intermediate blocks for tool radius compensation	●
Tool radius compensations with approach and retract strategies	●
Tool length offset	●
3D tool radius compensation	○
Look-ahead detection of contour violations	●

Tools (continued)

Tool offset for grinding operations	●
Tool orientation interpolation	●
Online tool length compensation	●
Tool management with extensive functionality such as empty location search and place positioning, tool loading/unloading, tool life and workpiece count ...	○
TDI: Tool management functions	○
Connection of tool identification system MOBY E	○

Communication/data management

Data storage to storage medium on USB (e.g. disk drive, memory stick) and on the CF card of the NCU	●
Data backup on hard disk	●
Data backup to network via Ethernet	○
Direct Numeric Control (DNC): CNC program transmission via network, CNC program comparison, CNC program archiving	○
RPC SINUMERIK: Data exchange between CNC and host computer (computer link)	○
A&D Data Management (ADDM): Data storage system	○

Production data evaluation

MDA Machine Data Acquisition (machine and operating data acquisition)	○
PMT IFC (parts tracking)	○
PDA IFC (production data management)	○

Operation

Clear operation by means of operating areas each with eight horizontal/vertical softkeys	●
Control unit management: Same picture on all OPs with TCU, interlocking of simultaneous operation, activation/deactivation of MCP, up to four operator panel fronts on one PCU/NCU	●
Operator panel lock	●
User oriented, hierarchical access protection	●
OA-open user interface, configurable under Windows	○
Screen texts in several languages (English, German, Spanish, French, Italian, Chinese (simplified))	●
Other languages on request	○
Program window for block display	●
Position actual values in two to five times character size	●
Screensaver	●
Plain text display of operating states	●
Quick view for mold-making programs	●
HMI Embedded, cross-technology multichannel operator interface software for machine tools	●
ShopTurn HMI, user-friendly operating and programming interface for turning and milling	●
ShopMill HMI, user-friendly operating and programming interface for milling and drilling	●
Measurement cycles, measurement in JOG	○
HMI Advanced, cross-technology multichannel operator interface software for machine tools	○

Operator components	
Operator panel fronts (width 310 mm) • OP 08T (7.5" display, membrane keys) • OP 010S (10.4" display, mechanical keys)	○
Machine control panel (width 310 mm) • MCP 310C (membrane keys)	○
CNC full keyboard (width 310 mm) • KB 310C (mechanical keys)	○
Operator panel front (width 365 mm) • OP 012T (12.1" display, membrane keys)	○
Operator panel fronts (width 19") • OP 010 (10.4" display, membrane keys) • OP 010C (10.4" display, mechanical keys) • OP 012 (12.1" display, membrane keys) • OP 015 (15" display, membrane keys) • OP 015A/015AT (15" display, membrane keys) • TP 015A/015AT (15" display, touch, membrane keys)	○
CNC full keyboard KB 483C (width 19", mechanical keys)	○
Standard PC keyboard KBPC USB US	○

Machine control panel (width 19")
• MCP 483C, MCPC IE
  (mechanical keys, open user keys, ...)
• MCP 483
  (membrane keys, open user keys ...)
	○

Pushbutton panel (width 19") • MPP 483, MPP 483H, MPP 483A	○
Handheld unit	○
Handheld Terminal HT 8	○

SINUMERIK PCU 50.3
Industrial PC with 1.5 GHz/512 MB or 2.0 GHz/1024 MB
• 40 GB hard disk:
  12 GB for applications,
  15 GB for local backups and software
• Operating system Windows XP ProEmbSys SP2
• Ports: 2xEthernet, 4xUSB, 1xPROFIBUS
• Expansion slots: 2xPCI, 1xCF-Card
	○

Memory/memory devices • 3.5" disk drive, USB • CompactFlash card 512 MB • USB FlashDrive 512 MB	○

Monitoring functions	
Working area limitation	●
Software and hardware limit switch monitoring	●
Position monitoring	●
Downtimes monitoring	●
Clamping monitoring	●
2D/3D protection zones	●
Contour monitoring	●
Axis limitation from the PLC	●
Spindle speed limitation	●
Contour monitoring with tunnel function	○
Path length evaluation	○
PROFIBUS tool and process monitoring	○
Safety routines continuously active for overtemperature, battery, voltage, memory, fan monitor	●

Compensation	
Feedforward control, speed-dependent	●
Temperature compensation	●
Interpolation lead screw and measurement system error compensation	●
Backlash compensation	●
Quadrant error compensation per operation	●
Graphic control of the quadrant error compensation by means of circularity test	●
Sag compensation, multi-dimensional	○
Space error compensation (SEC) for kinematic transformations	○
Precontrol, acceleration-dependent	○

PLC	
Integrated SIMATIC S7-compatible CPU 317-2DP	●
STEP 7 programming language	●
Up to 32768 bit memories, 512 timers, 512 counters, 2048 FB/FC and 2047 DB	●
Distributed I/Os via PROFIBUS DP: Up to 128 distributed DP slaves	●
Program and data memory up to 768KB, expandable	○
Input/output I/Os expandable up to 4096 digital inputs/outputs	○
Programming in S7 HiGraph	○
Equipment for PLC programming and program test with PG/PC	○

Safety functions	
"Safe standstill" and "Safe brake control" integrated in drive	●
Safety Integrated	○

Drive	
SINAMICS S120 is a compact modular converter system with a revolutionary system architecture. The function units are systematically separated into intelligence and performance. The standardized, drive-internal digital interface DRIVE-CLiQ provides seamless communication between the system components, including the motors and encoders.	
Scalable in performance, functionality and mechanical design	●
Rated outputs to beyond 200 kW	○
Rated currents of the Motor Modules from 3 A to 200 A	○
Supply voltage levels from 380 V to 480 V 3 AC	●
System uniformity with "Totally Integrated Automation" at Siemens	●

SINUMERIK 840D sl
Convincing performance data

CNC functionality included in the basic scope of supply	●
Options or accessories	○

Motors

Feed motors coordinated for high-precision, dynamic applications
• Synchronous motors, permanently-excited 1 FT6, 1FK,
  Static torque of between 0.4 and 300 Nm,
  Rated speeds 1500 rpm to 6000 rpm
• Linear motors 1 FN
  with rated feedrate forces from 200 to 20700 N,
  Speeds of 58 to 736 m/min
• Torque motors 1FW.
  with static torques from 96 to 2450 Nm,
  Speeds 40 to 495 rpm
	○

Main Spindle Motors
• Compact, ready-to-install synchronous built-in motors 1FE
  With rated torques of 5 to 820 Nm and
  speeds up to 40000 rpm
• Depending on the design, air or water-cooled
  asynchronous motors in the power range from about 5 kW
  to 100 kW are available as 1PH complete
  motors and also as 1PM with drilled shaft for material feeding,
  clamping and cooling as well as a series of water-cooled
  built-in motors
	○

Commissioning

Commissioning software integrated in HMI advanced: Parameterizing and optimizing	○
Commissioning software on PC/PG	○
SinuCom NC: Parameterizig machine data on interactive basis, managing series commissioning files, integrated help, dynamic recording of variables and signals – optimizing, creating an image for the CF card, reading, deleting, inserting and modifying series commissioning files	○

Diagnostic functions

Alarms and messages	●
Trip recorder can be activated for diagnostic purposes	●
PLC status	●
SIMATIC STEP 7 for SINUMERIK hardware (for service functions)	○
Remote Control System (RCS)	○

Service and maintenance

ePS Network Services: Remote operation and observation of machine control, analyzing and processing machine faults, status-oriented maintenance	○
TPM Total Productive Maintenance (servicing and maintenance support)	○

Glossary of abbreviations

HMI – Human Machine Interface

MPI – Multi Point Interface

CNC – Computerized Numerical Control

PLC – Programmable Logic Control

OA   – Open Architecture

MCP – Machine Control Panel

MPP – Pushbutton Panel

KB   – Keyboard

Information on this product can be found on the Internet at:

http://www.siemens.com/sinumerik

You can find the address of your local contact at:
http://www.siemens.com/automation/partners

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