



# The Compact Digital Wizard

**SINUMERIK 810D**

Answers for industry.

**SIEMENS**

# The Digital SINUMERIK 810D

## To Beat Today's and Tomorrow's Competition

Are you, too, looking for new ways and worthwhile opportunities to increase your competitiveness in the marketplace? As an entrepreneur, you're far better off securing your own real growth by increasing manufacturing productivity. You can increase your profits and reduce the costs of turning, milling, and drilling operations, for example. We can supply you with the patent recipe to achieve these objectives:

**it is called SINUMERIK® 810D – and it's extremely compact and simply a digital dream!**

### **A real innovation which demonstrates our system competence**

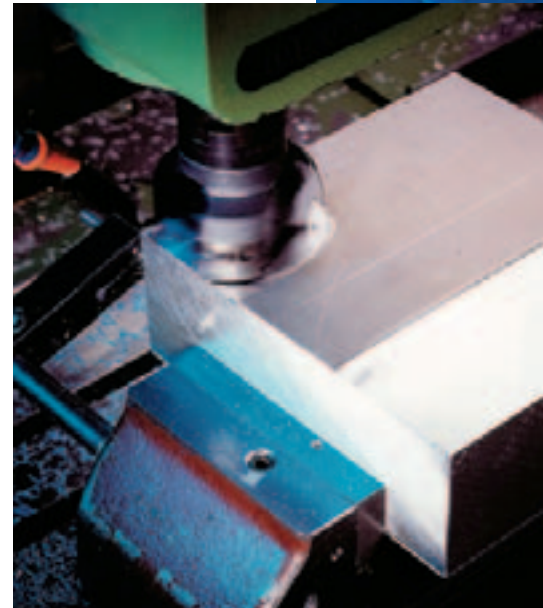
We have packed a lot of innovative technology into the SINUMERIK 810D: a digital manufacturing control with NC, PLC, and digital 6-axis closed-loop control on board. Add to this a power section box with three integrated power sections for one spindle and two axes, for example. Or there's an optional CCU box with two power sections available. The box can be cooled either internally or externally. And all this is packed into a compact housing that's just 150 mm wide.

A CNC and drive control have been implemented on the same board as inseparable partners at the digital level. This is achieved through maximum and consistent integration on a multilayer board. The entire control hardware and software is located on ASICs. These control up to 6 axes superbly. Or even 4 axes and two spindles – whatever your requirement. In addition to our standard motors, the synchronous spindles, linear motors, and torque motors from our product range can be operated.

### **Welcome to the digital system:**

Simply digital – that's our motto. Operation and programming have never been this easy.

We have made turning, milling, and drilling fast, accurate, and economical. Take a power supply module, add on one or two additional power sections from the SIMODRIVE® 611 range, take two axis expansion modules and already you are fully equipped to get the most from your machine tools.







# A New Digital Class:

## No Drive Interface. Compact. Complete.

### Compact and integrated

Because we have packaged the drive control and the numerical control on the same board, you benefit from compact technology. This, and full access to the modular range of SINUMERIK components, provides an optimum mix. It is precisely this advantage that sets the digital 810D apart from its competitors. And the same applies to the operator control and programming of the hardware and software components.

Here, the user can comfortably access the system pool of the time-proven SINUMERIK 840D, for instance. So if the existing maximum number of 6 axes should prove insufficient, all you have to do is change to the modular 840D system. This is an elegant solution to the problem, because the operator control and programming units and the interfaces are exactly the same.

### Integrated in the automation network of tomorrow: the SIMATIC S7 modules

The integrated PLC is based entirely on the world standard of the SIMATIC® S7 modules. This provides you with a high degree of hardware integration and PLC performance. And gives you perfectly matched automation solutions for your machine tools.

### Exclusive standard features included – complete and ready to start!

Our compact digital SINUMERIK 810D package has everything that other control manufacturers can only dream of. And these capabilities are already included in the standard package and do not involve surcharges. We are talking here about a solid base of production-related functions that you'll go a long way to find in other compact controls. Here are a few examples.



Smoothed acceleration with jerk limitation is a standard function that noticeably reduces wear on mechanical parts and optimizes travel response. This adds a good few years to the service life of your machine, taking the pressure off your investment budget. In addition, the look-ahead feature, which makes a high-speed control out of a compact control.

The contouring mode with programmed corner rounding helps you to navigate corners faster during milling. This is a real time-saving factor in your NC production.

Or get to know FIFO, the dynamic preprocessing buffer. This feature increases the rate of program execution. And time is money, especially when it comes to production.





The FRAME concept is a major example of a special set of functions included in the standard on-board configuration of our digital high-flyer. These features allow movements to be defined in Cartesian space for free, combined transformations, i.e. for relocating, rotating, scaling, and mirroring of coordinate systems. When used in conjunction with swivel tools, FRAME makes the programming of even complex parts considerably more flexible.

A range of further standard functions on the digital 810D makes the production life of your NC machine much easier.

#### **A taste of our NC software options**

When it comes to software options in the SINUMERIK 810D, a wide range of outstanding features is waiting to give you the competitive edge you've been looking for.

For example complete tool management, spline interpolation with A, B, C splines and polynomial interpolation up to the 5th degree ensure smooth transitions while compressor functions increase the speed of the SINUMERIK 810D/810DE. This is, of course, supplemented by temperature compensation for maintaining the exactness of the parts at different temperatures. Last but not least, technological cycles are also available for drilling, milling, and turning as well as the retrace function for plasma arc and water jet cutting.

#### **SINUMERIK 810D implemented in handling**

SINUMERIK 810D is particularly suited for handling tasks. For communication with a control system or distributed I/O you can use an internal PROFIBUS-DP interface. Thus the simple exchange of PLC data is guaranteed.

The optimum unit for handling and teaching tasks is the SINUMERIK HT6 handheld terminal.

#### **Even for grinding, your digital 810D has everything you need**

For example, it provides oscillation functions which are asynchronous, modal, and non-modal. It also supports multiple feeds in one block, tangential control, and an inclined axis.

But that's not all: speed is one of the strengths of the digital 810D. High-speed CNC inputs are provided with NCU terminal expansion. This is combined with high-speed CNC input/output functions such as variable feed in a block, program jumps, and axis-specific deletion of distance-to-go.

Finally, two further beneficial features are also included in the standard configuration of the 810D: a workpiece-oriented actual value system and grinding-specific tool compensation with grinding wheel peripheral speed.



#### **Easy entry to the CNC world: ShopMill, ShopTurn, and ManualTurn**

To be a successful job shopper today, you need to offer more than just precisely-manufactured workpieces. Other persuasive arguments you need up your sleeve are flexibility and price credibility. That is precisely what ShopMill, ShopTurn, and ManualTurn, the shopfloor-oriented interfaces for SINUMERIK 810D, give you.

You save so much overhead on programming, operation, and tool and workpiece setup that you have greater flexibility when reacting to a wide variety of complex jobs.

You can greatly shorten lead time from the drawing to the workpiece. Even with very small batches.



**SINUMERIK 810D –**  
a Perfect System from A–Z



# Performance Data for the SINUMERIK 810D/DE

## System configuration:

- Operator control components
- SINUMERIK 810D integrated in SIMODRIVE packaging
- Compact 32-bit microprocessor CNC continuous-path control
  - SIMATIC S7 CPU
  - Up to 6 digital SIMODRIVE 611 drive controls
  - 2 or 3 SIMODRIVE power sections
- Add SIMODRIVE 611 power supply modules and power modules, if required, for a complete system
- 1FT6, 1FK, 1PH, 1FN, 1FE, 1FW6, 2SP1, 1LA motors
- SINUMERIK 64E/32A simple I/O module
- SIMATIC S7 I/O modules in S7-300 design and PROFIBUS I/O

## Control design:

The control is packaged in a 150-mm-wide SIMODRIVE 611 housing and consists of two components: the CCU module (Compact Control Unit) and the CCU power section box. A range of intelligent, external operator panels for a wide variety of operator requirements complete the control system line-up. The SINUMERIK handheld terminal extends the area of application of the operator elements for handling.

## Functionality:

- Drilling, milling, turning, grinding technologies
- Handling
- Retrace (retrace support)
- Additional second channel
- 6 on-board measuring circuits
- Comprehensive motion control for high-speed machining with look-ahead function and dynamic feed-forward control
- Axis/spindle exchange
- Program preprocessing
- Coordinate transformation and inclined machining with FRAME
- Direct/indirect measurement system switchover for high precision and high-speed positioning
- Endlessly turning rotary axes
- Programmable acceleration
- Acceleration with jerk limitation
- Follow-up mode
- Gantry
- Coupled axes motion
- Master/slave for drives
- Tangential control
- Position switching signals/cam controller
- Spindle package with comprehensive functionality, including various thread-cutting functions, variable pulse evaluation, oriented spindle stop
- Synchronous spindle/multi-edge turning
- NURBS universal interpolator
- 2D+2 helical interpolation

- Spline interpolation for 3-axis machining
- Polynomial interpolation up to the 5th degree
- Master value coupling and curve table interpolation
- Involute interpolation
- Cartesian PTP travel
- Transmit/peripheral surface transformation
- Inclined axis
- Reciprocating functions
- Axis and spindle movements from synchronized actions
- Evaluation of internal drive variables
- Continuous dressing
- Multi-mode actions (ASUBs)
- Time-reciprocal feed

## Operating modes:

- AUTOMATIC
- JOG (set-up)
- TEACH-IN (interactive program development with machine)
- MDA (execute manual input block)
- The operating modes are supported by machine functions:
  - PRESET for setting a new coordinate reference point
  - Simultaneous traversing of axes with up to 2 handwheels
  - Overstore of machine functions in set-up and AUTOMATIC mode
  - Program selection via directory
- Automatic teach-in via SINUMERIK handheld terminal

## Contours and compensations:

- Contour violation prediction system
- Configurable number of intermediate blocks for tool radius compensation
- Tool radius compensation with approach and retraction strategies and intersection point calculation
- Interpolatory spindle pitch and measurement system error compensation
- Backlash compensation
- Quadrant error compensation
- Quadrant error compensation, automatic
- Electronic counterweight
- Acceleration-dependent feed-forward control
- Temperature compensation
- Multi-dimensional sag compensation

## Safety functions:

- Safety routines continuously active for measurement circuits, excess temperature, battery, voltage, memory, limit switches, fan monitoring, EPROM
- Working area limitation
- Two software limit switches
- Contour monitoring
- Spindle monitoring
- Diagnostic functions for interface, PLC, and NC with plain-text display on screen





### Programming:

- Convenient DIN 66025 programming language editor with comprehensive high-level language elements
- Technology cycles for drilling, milling, and turning
- Measuring cycles
- Rigid tapping
- Measurement specification in meters, inches, or mixed
- Comprehensive parameter assignment features
- Program development parallel to machining
- Fast NC-PLC data exchange via dual-port RAM
- Contour and cycle programming
- Reference point approach via program
- Interactive programming on PCU 50/70 with graphical contour generation, technology memory, user-configured displays
- Simulation for turning and milling on PCU 50/70
- ManualTurn, simple operating software for semi-automatic turning machines, operator-friendly programming with simulation and contour calculator
- ShopTurn, user-friendly operating and programming interface for single-slide CNC turning machines, also with C axis and rotating tools
- ShopMill, simple operating and programming software for 21/2 D machining on vertical and universal milling machines with simulation and contour calculator
- SinuTrain/JobShop on PC
- On-line ISO dialect interpreter
- Dynamic FIFO preprocessing buffer
- Configurable number of zero offsets
- NC user memory (RAM) up to 2.5 MB for part programs, tool compensations, offsets

### PLC:

- Integrated SIMATIC S7-compatible CPU
- Program and data memory expandable up to 288/480 Kbytes
- STEP 7 programming language
- I/O peripherals expandable up to 768 digital I/Os
- I/O peripherals with PROFIBUS-DP expandable up to 2048 digital I/Os
- Position or stepper motor for PLC positioning axis
- HiGraph programming
- Up to 4096 flags, 64/256 counters, 128/256 timers, 256 FBs/FCs, and 399 DBs

### Operator control components:

The operator panels are modular in structure and can be combined for specific performance requirements.

- OP 010S operator panel (19" wide), 10.4" TFT color display, membrane keyboard
- OP 010S operator panel (310 mm wide), 10.4" TFT color display (VGA), mechanical keys
- OP 010C operator panel (19" wide), 10.4" TFT color display, mechanical keys
- OP 012 operator panel (19" wide), 12.1" TFT color display, membrane keyboard, and integral mouse, vertical softkeys can be used as direct keys in the PLC
- TP 012 touch panel (400 mm wide)
- OP 015/OP 015A operator panel (19" wide), 15" TFT color display, membrane keyboard,
- TP 015A touch panel
- OP 030 slimline operator panel (280 mm wide)
- Machine control panel (19" wide) with 30 unlabeled customer keys and key switch
- MPI interface module for customer machine control panel
- Full CNC keyboard (19" wide)
- MFII standard PC keyboard
- Handheld unit
- HT6 handheld control and programming unit
- PCU 20
  - COM 1 (V.24/TTY), COM 2 (V.24)
  - PS/2 mouse, PS/2 keyboard
  - Multi-point interface (MPI)
  - USB, 2 channels (1 x internal/1 x external)
  - Ethernet 10/100 Mbit/s (optional)
  - Cardbus (max. Type III)
  - Disk drive interface (option)
- PCU 50
  - Removable hard disk with transportation lock (1 GB for user data), Microsoft Windows XP operating system
  - COM 1 (V.24/TTY), COM 2 (V.24)
  - LPT1 parallel interface
  - PS/2 mouse, PS/2 keyboard
  - Multi-point interface (MPI)
  - USB, 2 channels (1 x internal/1 x external)
  - Ethernet 10/100 Mbit/s (option)
  - Cardbus (max. Type III)
  - Disk drive interface
  - Expansion slots: 1 x PCI/ISA + 1 x PCI
- PCU 70
  - Same as PCU 50, except:
    - 1 x PCI/ISA + 3 x PCI

### Displays:

- Screen texts in several languages, switchover function between any two (English, German, Spanish, French, Italian, Chinese). Other languages on request
- Program window for block display
- Actual position value in 2- to 5-fold character size
- Screen saver
- Plain text display of operational states

### Operation:

- Transparent operation: operating areas with both horizontal and vertical softkeys
- Operator panel disable
- User-oriented, hierarchical access protection
- OA, open user interface configurable under Windows
- Complete user interface (user-specific)

### Communication:

- Universal RS232C (V.24)/TTY interface, configuration via plain-text screen
- Reading in/out via universal interface parallel to operation
- Comprehensive archiving
- CNC networking with NC program management DNC (direct numerical control)
- Tool data information (TDI)
- Machine data acquisition (MDA)
- Remote procedure call (RPC)
- Total productive management
- Minimizing downtimes with service management RCS (remote control system)
- Program coordination by means of CNC high-level language
- Multi-point interface (MPI)
- Second serial interface (HMI via external PC)
- Data exchange between channels
- I/O interface via PROFIBUS-DP (CCU as master or slave)
- e/PS network services

### Tools:

- SIMATIC STEP 7 for SINUMERIK hardware
- Ghost – data backup to CD-R with PC/PG
- SinuCom NC – Program package for simple and effective commissioning
- Commissioning tool for SIMODRIVE 611 digital (included with HMI Advanced)

### Symbols and abbreviations:

- CNC functionality included in standard package of CCU
- Optional extras or accessories

CCU – **C**ompact **C**ontrol **U**nit  
HMI – **H**uman-**M**achine **I**nterface  
MPI – **M**ulti-**P**oint **I**nterface  
NC – **N**umerical **C**ontrol  
PLC – **P**rogrammable **L**ogic **C**ontrol  
PCU – **P**ersonal **C**omputer **U**nit  
OA – **O**pen **A**rchitecture  
OP – **O**perator **P**anel  
TP – **T**ouch **O**perator **P**anel

Would you like more information about the SINUMERIK 810D? Upon request we will gladly send you further information free of charge.





### **Everything a machine needs: digital control for tomorrow's world markets**

Wherever your NC machines operate, the 810D fully equips you for all your tasks. Think of China and Korea, for example, where only low-cost, high-performance machines with high-quality controls have a chance in the marketplace. Even there, the SINUMERIK 810D masters the pictographic languages in its user interface. We can already provide you with simplified Chinese and Korean languages.

Not only that, but a simple keystroke suffices to change the user interface from an Asiatic pictographic language to a European language. You can choose between English, French, Italian, Spanish, or German.

For HMI and programming you have, for example, the option of a 310-mm slimline OP 010S operator panel with a color TFT display – ideal where space is at a premium.

### **The digital 810D – simply brilliant! A perfect system from application to service**

Servicing is also an important consideration with applications all over the world. In practice this means you won't find any complex wiring in the digital 810D. If servicing is required, you simply replace the board – and your NC is ready to run again. So you can forget long downtimes.

And where there are no conductors, faults are unlikely to occur anyway. In other words, our 810D enjoys a really good reputation for reliability.

### **Simplicity is the key**

The new digital 810D is a universal genius for your NC machine. Regardless of whether you are using a digital system for the first time or replacing a control from another manufacturer. The main thing is, you will be simply digital tomorrow!

# The SINUMERIK 810D

## Available at a location near you

### In 130 countries around the world

You can always depend on Siemens. As one of the world's leading electro-technology companies, we are close to virtually all our customers, wherever they may be located. We have branch offices in 130 countries and in more than 450 cities.

A support network in which you will always find a personal contact.

Hotline: +49 (0)180-50 50 222

### Get more information

Comprehensive online support, information about applications, products, FAQs, forums and more are available on the online portal: [www.siemens.com/sinumerik](http://www.siemens.com/sinumerik)

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