

SINUMERIK 840D –
The Digital CNC System
for Complex Tasks

sinumerik 840D



SIEMENS

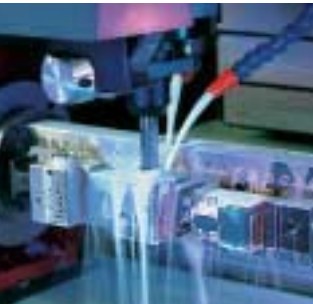
SINUMERIK Motion Control Systems: The Recognized Standard from Europe for the Whole World of Machine Tools



The market is a hard taskmaster. In the machine tool sector, too, constant improvements in compactness, speed and precision are expected, at increasingly lower prices and with shorter delivery times.

This can only be achieved with standard machines. And the right CNCs. Standard CNCs which can be individually put together from only a few components and to which machine manufacturers can readily add their own specific know-how.

And that is how the SINUMERIK control concept came into being – together with our partners in Europe's machine tool industry.





SINUMERIK® motion control systems can be put together from just a few components for a whole range of different performance ranges and technologies. With the modularity and open-endedness that only a few can offer. And a convincing uniform structure for operation, programming and visualization.

A concept setting the standard worldwide

The highlight of our concept is the SINUMERIK 840D – the sophisticated system platform with trend-setting functions for almost all technologies. Together with the SIMODRIVE® 611 Digital converter system and the SIMATIC® S7 programmable controller, the SINUMERIK 840D provides a complete digital system which is suitable for complex machining tasks and which excels with its fine dynamics and precision.

The standard system offers a wide range of specialized functions for drilling, turning, milling, grinding and handling technologies – as it also does for nibbling, punching or laser machining technologies.

One system – lots of possibilities

With the SINUMERIK 840D, you have an integrated control solution which makes it possible for you, the entrepreneur, to manufacture more efficiently.

Because the same basic control modules are used both for several machining technologies and for placement and handling, production is much more transparent and economic.

Integrated control solutions of this type for nearly all technologies also mean advantages when it comes to maintenance and training of the operators: Fewer parts to be stocked and a reduced training requirement.

The scalability of hardware and software means that you can use the SINUMERIK 840D for a whole range of different applications, whether for a simple positioning task or for complex multiple-axis systems. Scalable hardware components in the SINUMERIK 840D – both in the NC and in the operating area – make it possible to control many more machining technologies.

Investing in the future

The intelligent SINUMERIK is a digital system with which you can get more out of your machine tools, with which you can manufacture more flexibly and economically and respond to customer requirements more quickly. Today and in the future.

Due to its open architecture, the machine manufacturer can incorporate his/her own know-how in such a way that the user is always sure of a system tailored to his/her individual needs – with the NC at the center of it. We offer compatibility wherever it is needed – in the PLC (programmable logic controller), in the HMI (human machine interface) or in the NC kernel.

The dimensions of the 840D are incredibly compact (a complete system for a milling machine configuration, for example, takes up only a sensational 41 liters!). And costs are kept to a minimum, too – by reducing the number of interfaces and making multiple use of the same standard hardware modules and components.

And not only have we included today's standards (such as Windows), but we have also made sure that we are ready for tomorrow's processors.



SINUMERIK 840D: The Digital System for Almost All Applications ...

The SINUMERIK 840D offers a convincing range of innovative technology-specific functions.

Standard cycles are available for frequently recurring machining operations in the drilling, milling and turning technologies.

And even extremely exacting applications, like 5-axis milling in the manufacture of tools and molds, are no problem for the SINUMERIK generation. The continuity from the CAD system right through to the workpiece and intelligent motion control allow fast, precise production of even highly complex parts. The separation of geometry and technology with RTCP (remote tool center point) and 3D tool offset simplifies alterations. And the prompt machine stop facility, in the event of tool breakage, for example, protects both machine and workpiece.

Solving digital tasks fast and professionally

The standard SINUMERIK 840D control includes tailor-made functions for high productivity and precision for grinding, flexible axis movements with the aid of positioning axes and reciprocating functions, short machining times using multiple feed values in a block and fast set-up by means of handwheel overlay.

Time-critical process signals are connected to direct CNC inputs/outputs and programmed by synchronous actions. Special axis couplings can be defined using cam tables, e.g. for swing-frame grinding. Transformation of an inclined axis also permits inclined bed applications, and tool compensation is included on-line to permit simultaneous grinding and dressing (continuous dressing).

In conjunction with adaptive control, the SINUMERIK 840D enables optimum utilization of spindle power, prevents overload, protects the workpiece, reduces machining times and improves surface quality without the need for additional hardware.

Handling tasks, such as work-piece manipulation, machine loading, packaging and palletizing, can be easily performed by connecting the handheld terminal (HT 6).

In the same way, an "electronic gear with non-linear coupling" is also possible. In addition to the manufacture of convex gear tooth surfaces, it is thus possible to compensate for nonlinear characteristics of the process.



... with a Modularity that Enables You to Implement Customer Requirements Quickly

The performance of the SINUMERIK 840D does not stand still. It is based on just a handful of modules that can all be combined to cover the whole machine spectrum.

Operator control, monitoring and programming

You can choose between a number of different slimline operator panels to provide exactly the right amount of operator convenience for your application. Handling and teaching tasks are perfectly executed with the HT 6 Handheld Terminal.

Variable CNC performance

We offer you the same variety when it comes to the NCUs. The range of scalable NCU hardware ranges from simple positioning tasks in two axes to NCUs with 31 axes, of which 12 axes can interpolate in an NC channel.

The special technology functions – for example for laser machining or handling – are supplied in the form of extended NCU system software on PC cards.

The NCUs feature a PROFIBUS-DP interface and can be operated on the bus either as a master or slave.

The medium and upper performance ranges are covered by the SINUMERIK 840D power-line, for which the term performance explosion is no exaggeration. For this innovation – in conjunction with the HMI software – consists of the correspondingly most powerful NCU modules that SINUMERIK has to offer. This means, for example, in the case of the NCU 572.4, a two-and-a-half-fold increase in relative performance over its predecessor. An increase that immediately benefits your productivity.

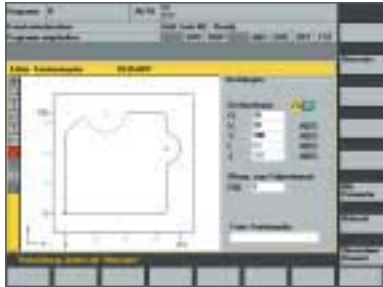
Integrated hardware for integrated applications

Consistent configuring, standardized PLC machine programs and communications bring with them the advantages of integrated hardware and PLC functionality and of the application itself.

And then the control does not have to be configured until quite late in the proceedings – it may not need to be adapted to the task at hand until the machine itself is already being assembled.



For Programming Too: The Greatest Measure of Freedom for You ...



Contour programming



Cycle programming



Simulation

Its open-system philosophy is the SINUMERIK 840D's real selling point. Standard systems with a wide range of NC functions which are configured on the NC language level and which can be adapted to your machine with familiar SIMATIC tools via the PLC are the first step towards an open system.

In the operating areas, you can integrate your own menu trees, as well as input forms and help displays for specific machining operations. Machine tool manufacturers can alter the HMI however they want and implement their special operating philosophy using Windows technology.

One important feature of the open systems philosophy of the SINUMERIK 840D is that user-specific system cycles and function macros can be configured in the NC kernel with standard development tools. The object-oriented programming language C++ is used in this task. The basis of the CNC programming language is DIN 66025.

But the 840D is also at home with other languages. We have implemented a CNC high-level language for the various technological demands of modern machine tools which offers a great degree of freedom.

Programming options

Part programming is performed using the editor of the respective HMI module. With this easy-to-use editor, you can program cycles and contours directly and then check the results in the graphic dynamic machining simulation. You can select side view, top view and 3D simulation in the views with/without tool path display or with the zoom function, either from the workpiece directory or from the editor.

Problem-free programming

The SINUMERIK system includes an extremely powerful geometry processor which allows you to make corrections at any time and at any point in a finished program, dispensing with the need for separate programming workstations. DIN input is also possible, so that the program code is available if required.

The system software of the SINUMERIK 840D contains a wide range of unusual NC functions that you are not likely to find in comparable NC controls.

You can, for example, interpolate using a variety of different methods: linear, circular, spline, polynomial or helical interpolation – or many other state-of-the-art functions.

With the universal interpolator NURBS you can interpolate nearly anything – measured points, freeform surfaces, any curve that can be described mathematically (parabola, hyperbola, ellipse etc.). NURBS performs the control-internal motion guidance and path interpolation and with it complicated arithmetic and programming tasks. Not to mention the fact that B-splines form the basis of most CAD systems – which will make their integration into the control that much simpler.

... for the Most Varied Jobs, including Workshops

Another example of the more unusual functions is FRAME – a description in Cartesian space for free, combined transformation (off-setting, rotating, scaling, mirroring) of coordinate systems. Used with swiveling tools, FRAME makes machining much more flexible.

Comprehensive motion control functions of the SINUMERIK 840D make your machine tool much faster, more accurate and smoother. The function "Look Ahead", for example, "sees" a parameterizable number of traverse blocks in advance and optimizes their machining velocity. On sharp changes of direction, the velocity is reduced beyond block boundaries thus preventing beveling of the contour. Tangential block transitions are machined even beyond block boundaries without any loss in speed.

Simply more productive

The Spline Interpolation, Look Ahead, and FRAME functions, together with the integrated compressor for converting linear blocks to spline blocks, make the SINUMERIK 840D appreciably faster than comparable controls, so that in many cases machining times can be halved or parts production doubled with no loss of quality.

In addition to the velocity-dependent feed-forward control as basic function, we have implemented the acceleration-dependent feed-forward control thanks to the digital link. It eliminates contour deviations which can be caused by following errors, for example. Result: the utmost precision is possible even at a high tool path velocity.

With the basic function "Jerk Limitation", you can protect mechanical parts and optimize travel behavior.

The new continuous dressing function is designed to maximize productivity in grinding. It enables grinding and dressing to be carried out simultaneously, which speeds up the rate of metal removal and also improves surface quality.

ManualTurn, AutoTurn, ShopMill and ShopTurn: to turn your SINUMERIK into a real shopfloor NC

We know what is needed in the factory. That's why we have developed four very efficient tools tailored for the skilled machinist for typical workshop tasks and machines:

ManualTurn – the user software for turning;

ShopMill – the user and programming software for milling and drilling;

ShopTurn – the operating and programming software for turning and milling.

These JobShop products are a huge advantage for all tasks in the workshop as they combine two important aspects: The productivity of a Siemens CNC – and a whole range of features for simple, fast machining. We have devised a machining block concept with which you will save so much time and effort in programming and operation, and setting up the tool or workpiece, that you can respond extremely flexibly to varied and demanding tasks. You will bridge the gap between the drawing and the workpiece that much quicker. Even for really small batches.



ManualTurn



ShopMill



ShopTurn



Open Human-Machine Communication. Operating for Intuition and Intelligence

Everything fits with SINUMERIK 840D: The central controllers and operating panels with various levels of performance, the corresponding I/O modules and the software.

Operator control and visualization

The intelligence for the communication lies in the highly integrated PCs (SINUMERIK PCUs) that are available with different levels of performance. When combined with a SINUMERIK operating panel, a powerful, intelligent and rugged operator control and visualization system with an impressively compact and low-profile design is produced.

Even the interfaces for communication with the process are already on board, leaving the slots (in the PCU 50) free for other applications. The USB interface on both the front and rear panels permits hot swapping of a standard PC keyboard and mouse. And best of all: the new SINUMERIK operating panels are available with various display sizes and with a membrane or mechanical keyboard, so that the new SINUMERIK operator panels can be operated individually as required.

For machine operation, the operator panels can be supplemented with a machine control panel. The multipoint interface (MPI) provides the link to the CNC as well as the data transfer to and from the machine control panel, programming units or PCs.

Easy-to-use operator interface

The operator interfaces combine an easy-to-use editor, menu-driven commissioning, detailed system diagnostics and data traffic via serial interface, diskette drive and network.

The operator interface is divided into very clearly delineated operating areas. Thanks to the Windows-oriented technology, the user can easily keep an eye on the entire process.

The soft keys are simply structured and the menu hierarchies are flat. The operator interface is open to customer-specific modification using the integral editor.

Individually customized operator interface

It goes without saying that machine tool manufacturers can also incorporate their own know-how into the controller – and create a customized operator interface.

By the way, if you need more than one system language – we offer a total of eighteen, five of which are standard: English, German, French, Italian and Spanish. And there are more European and Asiatic language versions available.

Unique advances in functionality: NC and handling all in one!

We can give you an all-in-one NC and handling control. Fully digital, extremely easy to use and multifunctional.

SINUMERIK 840D is the only control that combines NC plus handling – to the international NC standard. It also has a range of additional NC functions: Spline interpolation and Look Ahead for really fast traversing. And jerk limitation makes sure that motion sequences are always smooth even at high speeds.

Thanks to sophisticated control algorithms, the tool moves along the programmed path with high precision. Compensation tables allow you to compensate for imprecision in the mechanics.





For Perfect Networking of Your Production Facility: The IT Solutions Integration Concept

The IT Solutions integration concept is our contribution to integrated networking of your production facility – in short, the problem-free exchange of data between production planning, operations planning and scheduling, and machine tool. For you, that means shorter setting-up times, reduced machine downtimes, and simplified fault analysis.

Network your CNC quickly and reliably

The SinDNC software module adds your SINUMERIK to any standard network faster, easier and more cost-effectively – and establishes reliable connections with Windows PCs and UNIX workstations. NC program transfers are extremely user-friendly, and transfers between the SINUMERIK's CNC archive and the computers are lightning-fast thanks to Ethernet, which can complete such transfers 100 times faster than a standard serial connection.

The following function ranges are supported:

- Transfer, management and archiving of NC programs
- Machine data and production data acquisition
- Computer interface module for production control

Production data acquisition right on the machine control's display

The WinBDE IT software module for SINUMERIK turns the control into an input and acquisition device for production data, thus drastically reducing hardcopy order forms and giving you direct access to all production data and related information.

Optimum tool management

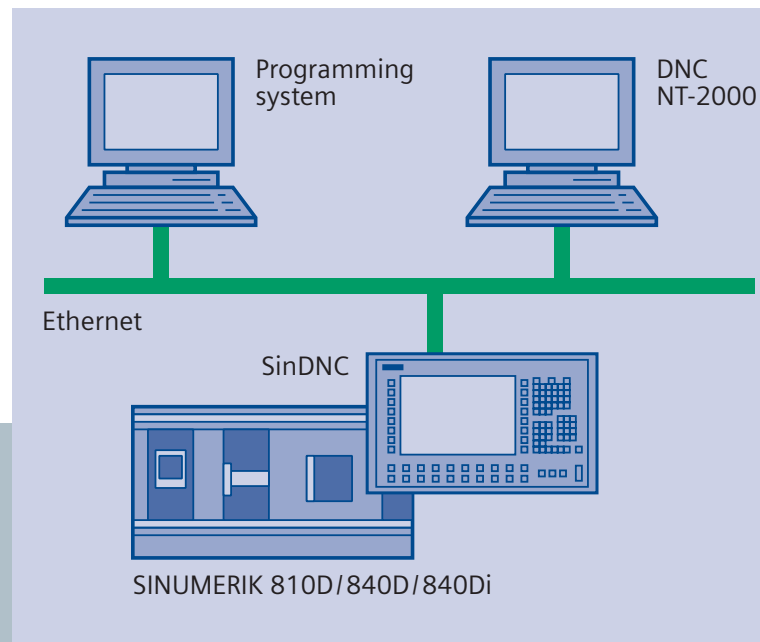
By using tool management and the SinTDI (SINUMERIK tool data information) software, you can reduce machine downtimes and at the same time improve productivity and achieve integrated tool data flow from production planning to the CNC machine.

Communication with the host computer

The SinCOM communication tool is equipped with an interface for interchanging CNC data with the host computer. This makes it possible to easily integrate SINUMERIK in customized host computer solutions using the TCP/IP protocol.

Efficient maintenance

The WinTPM software module improves plant efficiency. It makes production less susceptible to faults and provides reliable reminders when inspections, cleaning, maintenance and service are due.



For Higher Availability and More Safety: @Event and SINUMERIK Safety Integrated



Remote diagnostics reduce downtimes

When the distances between SINUMERIK systems are considerable, high-speed remote online diagnostics over telephone, Ethernet and Internet (e-mail alarms and SMS messages) are exactly what you need. Remote diagnosis saves costs, makes it possible to avoid expensive service calls, reduces downtimes and increases machine availability. A new dimension in teleservice for SINUMERIK controls – worldwide, seven days a week, 24 hours a day.

“@Event”: the alarm e-mail software for better service logistics

“@Event”, a revolutionary alarm e-mail software from Siemens for machine tool controls, opens a whole new perspective on minimizing downtimes and implementing more efficient service logistics thanks to immediate fault messaging. @Event brings preventive maintenance full circle. With comparatively simple means, the machine control can send e-mails to signal virtually any kind of impending event. Alarms and messages reach service personnel immediately, and downtimes are reduced.

We set standards in safety: SINUMERIK Safety Integrated

“Safety Integrated”, our preventive, precautionary safety software, reduces installation overhead on the machine and “slims down” the control cabinet. Because all safety functions are integrated in the control and drive technology, “Safety Integrated” protects both personnel and machines.

All safety functions meet the requirements of Safety Category 3 to EN 954-1.

This has resulted in a new standard that makes machines safer and more flexible for the task at hand and which increases plant availability.

Direct connection of two-channel I/O signals

More functions have been integrated into the safety package “Safety Integrated” so that it is now possible to connect two-channel I/O signals directly, e.g. for emergency stop push-buttons or light barriers.

Mastering extreme conditions professionally

All safety-relevant faults in the system cause the dangerous movement to be brought to a halt or result in fast contactless isolation from the motor.

This means greater operator protection during set-up mode and additional protection for the machine, tool and workpiece in automatic mode.



Take Your Machine Where You Want it: With Digital Drives You'll Reach Your Destination Quickly

The SIMODRIVE range of drives has been especially designed by us to interact with SINUMERIK controls, to achieve high contour precision and short downtimes. SIMODRIVE drives have a low moment of inertia and therefore operate with high dynamics and always produce maximum torque even at zero speed.

The profiles of our SINUMERIK and SIMODRIVE products focus on a high level of profitability and the highest possible machine tool productivity.

The SIMODRIVE 611 transistor pulse converter and digital controls are a compact modular system with a digital link. With this system, machine tools can be equipped with closed-loop control feed drives and main spindle drives to form a drive combination which can be configured flexibly.

The SIMODRIVE 611 system makes sparing use of both the mains power and the machine operator's power-factor correction.

Perfectly tailored to the SIMODRIVE 611 and digital controls: 1FK, 1FT6 three-phase feed motors, 1FW6 torque motors, 1FN linear motors and 1PH, 1PM, 1FE three-phase main spindle motors

1FK motors are used for handling devices, portals, wood-processing machines and simple machine tools as well as for auxiliary axes.

The 1FT6 is a compact feed motor with brute strength. Its high natural torsional frequencies, true running quality and smoothness are outstanding guarantees for the surface quality of the workpiece.

SIMODRIVE linear motors: Real acceleration

The 1FN linear motors offer enhanced dynamic response and speed – thanks to the simple design of the drive. There is also a water-cooled version for applications where, in addition to enhanced dynamic response and speed, maximum precision is required. The two-loop cooling system keeps the inter-connecting parts between motor and machine cool.

As a result, velocities of up to 300 m/min and accelerations of up to 45 g are theoretically possible. In practice, today's machine tools already reach feedrates of 100 m/min and accelerations of 1.5 g.

High power density with simultaneous compact machine design can be achieved by using the powerful rare-earth magnetic material in the 1FK, 1FT, 1FN and 1FE1 synchronous motors. But that is not all: The design of our drives meets all the demands placed on reliability and load capability, so that even use in a hostile environment will not cause any problems.





High power density with 1FE built-in motors

In addition, the 1FE built-in motors are shrunk directly onto the motor spindle, for example, thus drastically reducing the entire spindle head volume despite having the same performance. Our 1FE1 synchronous built-in motors with their exceptionally high power density and speeds of up to 30,000 rpm come into operation wherever higher demands are placed on machining quality, precision and smooth running. The permanently excited motor spindles (PE spindles) and liquid cooling make a major contribution here. The optimum combination of 1FE1 drive, drive control and CNC control offers further rationalization potential – higher productivity, lower part-processing times and less installation space are the pleasing results.



Technical Specifications: Impressive Performance Data

Control type

Modular 32-bit microprocessor CNC continuous-path control for turning, drilling, milling and grinding machines and handling with integrated powerful PLC.

The control consists of a 50-mm-wide module and a choice of external intelligent operator panels to meet all types of operator requirements.

Function overview

- x Drilling, turning, milling, grinding, nibbling, punching, laser machining and handling technologies
- x Optimum, complete digital solution with SIMODRIVE 611 digital
- o Up to 10 mode groups, 10 channels and 31 axes/spindles
- o Channel structure: Simultaneous asynchronous processing of parts programs
- o OA open-ended NCK software
- x Feedrate and rapid traverse: 103 mm/min to 999 m/min
- x Endlessly rotating rotary axes
- x 2D+n helical interpolation
- x Spindle package with extensive range of functions, for example, various thread cutting functions, variable pulse evaluation, oriented spindle stop
- o 5-axis machining package with 5-axis transformation, 5-axis tool compensation, oriented tool retraction (RETTOOL) remote tool center point (RTCP)
- o Spline interpolation
- o Polynomial interpolation of the third degree
- o Control value linking and curve table interpolation
- o Electronic gearbox
- o Link axis
- o Axis container
- o Electronic transfer
- o Axis and spindle movements from synchronous actions
- o Speed-dependent analog value output
- o Sensor-controlled 3D distance control

- o Evaluation of internal drive variables
- o Continuous dressing
- x Acceleration with jerk limitation
- x Programmable acceleration
- x Synchronized actions (SYNACT)
- x Coordinate transformation and inclined-surface machining with FRAME
- o Fast retraction from the contour with RETT routines
- x Direct/indirect measuring system switchover for high degree of precision and fast positioning
- o Extensive motion control for very fast machining with Look Ahead function and dynamic feed-forward control
- x Travel to limit stop with adaptable force or limited torque
- x Follow-up mode
- x Advanced detection of contour violations
- o Tool-oriented RTCP
- x Configurable number of intermediate blocks with tool radius compensation
- x Tool radius compensation with approach and exit strategies and calculation of intersection
- o Tool length compensation
- o Interpolation leadscrew error compensation and measuring system error compensation
- o Multidimensional sag compensation
- x Backlash compensation
- x Quadrant error compensation
- o Automatic quadrant error compensation with neuronal network
- x Safety routines permanently active for measuring circuits, overtemperature, battery, voltage, memory, limit switch, fan monitoring, EPROM
- x Working area limitation
- x Software limit switch
- x Contour monitoring
- x Spindle monitoring
- x Diagnostic functions from interface, PLC and NC with plaintext displays on screen
- o Interrupt routines with fast retraction from the contour
- o Safety Integrated

PLC

- x Integrated SIMATIC S7-compatible CPU 315-2DP or 314C-2DP
- o Program and data memory expandable to 288 KB or 460 KB
- x Programming language STEP 7
- o I/O modules expandable to 2048 digital inputs/outputs
- x Max. 4096 flags, 128 or 256 timers, 64 or 256 counters, 256 FBs/FCs and 399 DBs
- o Servo or step motor PLC positioning axis
- o S7 HiGraph programming
- o Distributed I/Os via PROFIBUS-DP

Operating components

The operator panels are modular in structure and can be assembled to provide specific levels of performance.

- o OP 010S operator panel (310 mm wide), 10.4" TFT display, VGA (640 x 480), mechanical keys
- o Machine control panel (310 mm wide) with 16 customer keys, 1 slot 22 mm dia. and 6 slots 16 mm dia.
- o Full CNC keyboard (310 mm wide)
- o OP 010 operator panel (19" wide), 10.4" STN color display, membrane keyboard
- o OP 010C operator panel (19" wide), 10.4" TFT color display, mechanical keys
- o OP 012/OP 015A operator panel (19" wide), 12.1"/15" TFT color display, membrane key board and integral mouse, vertical soft keys can be used as direct keys in the PLC
- o OP 015 operator panel (19" wide), 15" TFT color display, membrane keyboard
- o TP 012 touch operator panel (400 mm wide)
- o Machine control panel (19" wide) with 30 customer keys and key-switches
- o MPI interface module for customer machine control panel
- o Full CNC keyboard (19" wide)

- o MFII PC standard PC keyboard
- o OP 030 slimline operator panel (280 mm wide)
- o Handheld control terminal
- o HT6 handheld terminal
- o PCU 20
 - COM 1 (V.24/TTY), COM 2 (V.24)
 - PS/2 keyboard
 - Multipoint 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)
- o PCU 50
 - Industrial PC with 566 MHz/128 MB SDRAM or 1.2 GHz/256 MB SDRAM
 - Removable hard disk with transportation lock (1 Gbyte for user data)
 - Microsoft Windows NT 4.0 (US) or XP operating system
 - COM 1 (V.24/TTY), COM 2 (V.24)
 - LPT1 parallel port
 - PS/2 mouse, PS/2 keyboard
 - Multipoint 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
- o PCU 70
 - Expansion slots: 1 x PCI/ISA + 3 x PCI (otherwise the PCU 70 is exactly as the PCU 50)

Operation and displays

- x Clear operation with operating areas with 8 horizontal and vertical softkeys each
- x Operator panel disable
- x User-oriented hierarchical access protection
- x Supplement operator interface (user-specific)
- o OA Windows operator interface configurable
- o Control unit management (up to 8 PCUs to max. 8 NCUs)

Operating modes:

- x AUTOMATIC
- x JOG (set-up)
- x TEACH IN (program generation interactively with the machine)
- x MDA (processes manually entered block)
- x The operating modes are supplemented by the machine functions:
 - PRESET to set a new coordinate reference point
 - Simultaneous traversing of axes with up to 2 handwheels
 - Overstoring machine functions in setup mode and AUTOMATIC mode
 - Program selection via directory

Displays:

- o Screen text in several languages (English, German, Spanish, French, Italian), other languages on request
- x Program window for block display
- x Positional actual values, 2- to 5-fold character size
- x Screen saver
- x Plaintext display for operating status

Programming:

- x User-friendly programming language editor to DIN 66025 with comprehensive range of high-level language elements
- o Technology cycles for drilling, turning and milling
- x Tapping without compensation chuck
- x Dimension input metric, inch or mixed
- x Extensive parameter technology
- x Program generation parallel to machining
- x Reference point approach acc. to program
- o Measuring cycles, measurement in JOG mode
- x Fast NC-PLC data exchange via dualport RAM
- x Contour and cycle programming
- x Simulation for turning and milling
- o AutoTurn – programming software for simple turned parts
- o ManualTurn – simple operating and programming interface for turning
- o ShopTurn – convenient operating and programming interface for turning and milling

- o ShopMill – convenient operating and programming interface for milling and drilling
- o SinuTrain
- o On-line ISO dialect interpreter
- o CAD reader, converts DFX files into drilling patterns and contours
- x Dynamic block buffer (FIFO)
- x Configurable number of zero offsets
- x Up to 2.5 MB NC user memory (RAM) for parts programs, tool offsets, offsets

Communication

- x RS232C (V.24)/TTY universal operator interface, configuration via plaintext screenforms
- x Read in/read out via universal interface during machining
- x Extensive archiving procedures
- o Serial data transmission with SinuCom PCIN
- o Archive and transmit data with DNC NT 2000
- o Data transmission via standard network with SinDNC
- o Communication of tool requirement via SinTDI
- o Communication to host computer via SinCOM
- o Data exchange between production planning and manufacturing via WinBDE
- x Program coordination via CNC high-level language
- x CNC-PCU multipoint interface
- x 2nd serial interface (HMI via external PC)
- o I/O interface via PROFIBUS-DP (master or slave)

Key

- x CNC functions included in the basic configuration
- o Option or Accessory
 - HMI – Human machine interface
 - MPI – Multi Point Interface
 - NC – Numeric control
 - OA – Open architecture
 - PLC – Programmable logic controller

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