SIEMENS

SINUMERIK 840Di

System Overview **02.2001 Edition**

SIEMENS

SINUMERIK 840Di

System Overview

Applies to

Control system		*Software version*
SINUMERIK 840Di		1.0
SINUMERIK 840DiE	(export variant)	1.0
SINUMERIK 840Di		1.1
SINUMERIK 840DiE	(export variant)	1.1
SINUMERIK 840Di		1.2
SINUMERIK 840DiE	(export variant)	1.2

02.2001 Edition

SINUMERIK® documentation

Printing history

Brief details of this edition and previous editions are listed below.

The status of each edition is shown by the code in the "Remarks" column.

Status codes in the "Remarks" column:

A .... New documentation.
B .... Unrevised reprint with new order number.
C .... Revised edition with new status.
If factual changes have been made on the page since the last edition, this is indicated by a new edition coding in the header on that page.

Edition	Order No.	Remarks
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This document is included in the documentation on CD-ROM (**DOCONCD**).

Edition	Order No.	Remark
08.01	6FC5298-6CA00-0BG1	**C**

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This publication was produced with WinWord V 8.0 and Designer V 6.0, as well as with the DocTool AutWinDoc.

Other functions not described in this documentation might be executable in the control. This does not, however, represent an obligation to supply such functions with a new control or when servicing.

We have checked that the contents of this document correspond to the hardware and software described. Nonetheless, differences might exist and therefore we cannot guarantee that they are completely identical. The information contained in this document is, however, reviewed regularly and necessary changes will be included in the next edition. We welcome suggestions for improvement.

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Contents

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Introduction

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Control systems based on industrial PC are used in many fields of automation technology. Moreover, the trend towards control systems completely based on PC is to be found in many areas, such as woodworking, packaging, handling, bending, spark erosion, as well as in the field of machine tools and other production machines. The application and acceptance of control systems in the individual automation sectors and regions is developed to a different degree, but it is expected to increase further in future.

Integration
Siemens has taken the first step towards PC based control systems in the area of the operation with the CNCs SINUMERIK 840C and SINUMERIK 810D/840D. The new control system SINUMERIK 840Di now represents the consistent continuation of the SINUMERIK 810D/840D. In addition to the operating functionality, the CNC functionality is also integrated in the PC.

Decentralization
Another trend in the world of automation is decentralization. More and more components are relocated from the control cubicle to the system/installation, thus being as much as possible near the machine. As a result, this provides, on the one hand, reduced wiring expenditure and, on the other hand, increased flexibility and reliability. This pertains not only to the I/O modules for input/output signals, but to an increasing degree also to the drive units.

With the SINUMERIK 840Di, SIEMENS now offers a completely PC integrated control system that uniformly controls the drive units and I/Os via the standard PROFIBUS DP with Motion Control functionality, facilitating a distributed design of the whole system.

The most important features of the SINUMERIK 840Di and the provided automation components are described in the following Sections.

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System Overview

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2.1 The SINUMERIK 840Di

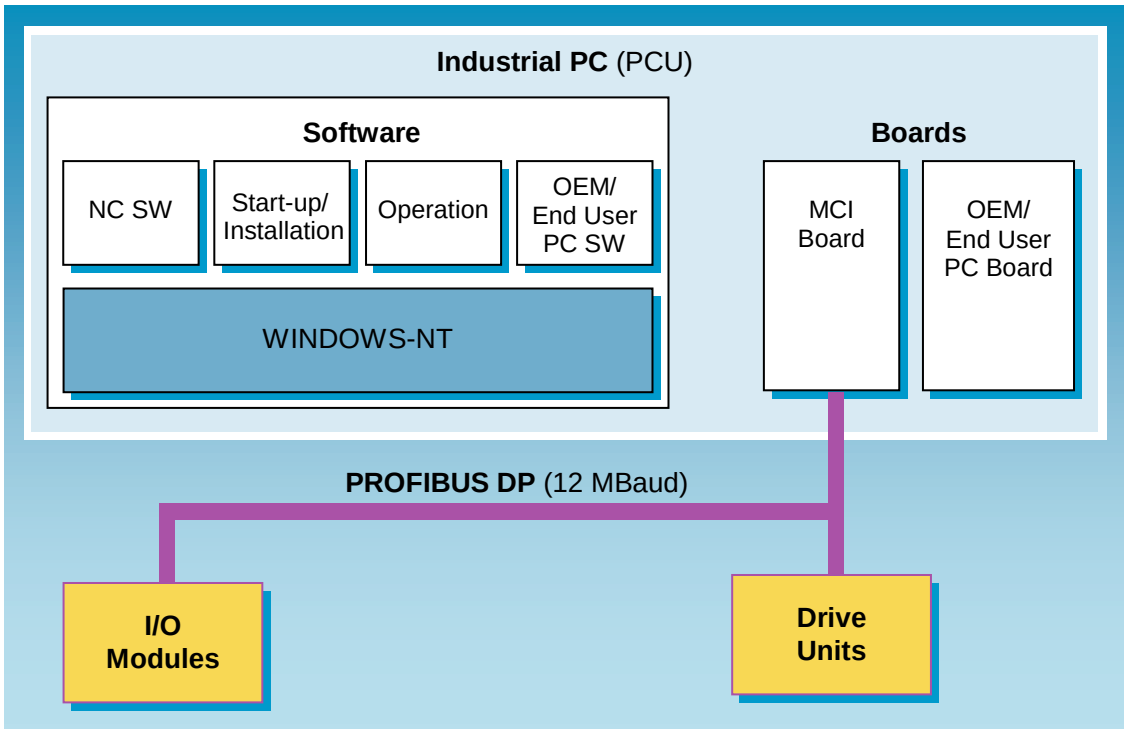


Fig.2-1 Overview of the SINUMERIK 840Di

Hardware basis

The hardware basis of the SINUMERIK 840Di is a SIEMENS industrial PC in conjunction with a PCI plug-in board, the so-called MCI Board (Motion Control Interface), which has been developed by Siemens. Depending on the variant of the industrial PC used, a different number of OEM or end user PC boards (PCI or ISA) can be plugged optionally.

Drive units and I/Os can be connected to the SINUMERIK 840DI via PROFIBUS DP with Motion Control functionality (both clocked and in equidistant mode) both centrally and decentralized.

Software basis

The software basis is the WINDOWS NT standard operating system. In addition, a software method developed by Siemens allows the operation of the NC software in real time mode parallel to WINDOWS NT. NC and PLC software, as well as installation/start-up and operation are already integrated in the system software.

In addition, the open concept allows specific extensions by the OEM or end user PC software (see also Section "Certification").

2.2 Fields of application

The SINUMERIK 840Di supplements the product spectrum of the SINUMERIK control systems. Generally, it is suited, in particular for applications

- for which decentralized automation solutions in the field of PLC and the drives are required
- or a completely PC-integrated control system is given preference (e.g. if a PC is anyway needed for tasks, such as visualization or networking).

Technological area of application

The technological area of application of the SINUMERIK 840Di ranges from simple Motion Control tasks (positioning and linear interpolation) via applications, such as woodworking centers, handling, installation/mounting - also in the field of packaging - up to machine tools and machine tool-related applications.

Experience has shown that the SINUMERIK 840Di is of special importance for those who produce their control systems themselves. For lack of suitable standard control systems, these people have already been accustomed to use the openness of the PC technology in hardware and software for their automation systems for a long time. Nowadays, in view of a generation change in the control technology, anyone designing and producing the control system himself is provided with a comprehensive basic system in the form of the SINUMERIK 840Di:

- Thanks to this openness, he can implement his technology with a minimum of his own, additional engineering (time, costs).
- In the terms of an operational optimum, he can thus fully concentrate on his technological core competencies.
- He will reduce the logistic expenditure for the PC technology as such (procurement, qualification).
- He will benefit from the advantage that Siemens is well known and spread all over the world (sales/marketing and service).

Consistency to the SINUMERIK 840D

A special feature of the SINUMERIK 840Di is the consistency to the SINUMERIK 840D. This pertains, in particular, to:

- the compatibility of the NC and PLC programs,
- the various possibilities of the openness and
- the usability of the same components, such as PCU, operator panel fronts, SIMATIC I/Os, motors and various accessories.

This consistency provides the user with more flexibility when choosing the control system meeting his specific requirements optimally.

2.3 System hardware

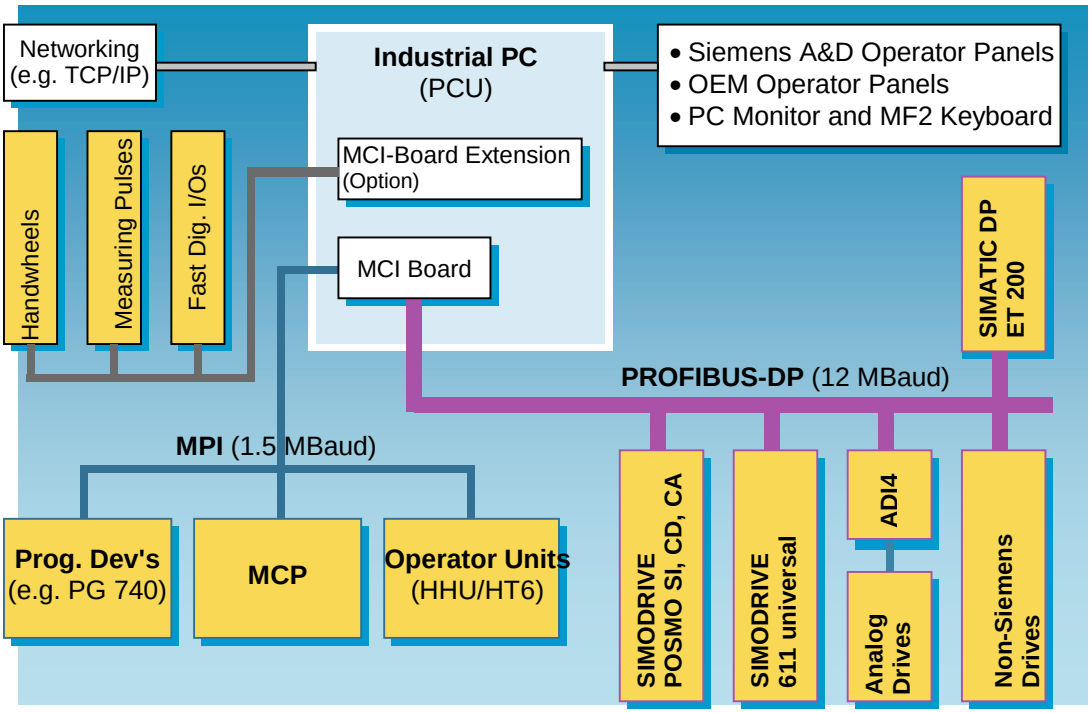


Fig.2-2 The SINUMERIK 840Di hardware (system overview)

Hardware basic variant

The basic variant of the SINUMERIK 840Di is a compact SIEMENS industrial PC and a PCI plug-in board, the so-called MCI Board (Motion Control Interface), which has been developed by Siemens.

PCU (industrial PC)

In view of different cases of applications, PC variants with a differentiated scope of performance and expandability are planned. The first product stage envisages the PCU 50 (PC Unit), a built-in industrial PC with a free ISA/PCI slot for hardware expansions in two variants (Pentium II/III at 333MHz/500MHZ) for the SINUMERIK 840Di.

A PCU variant with additional free PCI slots is available soon.

MCI Board

Together with the PCU, the MCI Board constitutes the hardware basis for the SINUMERIK 840Di. The most important components installed on the MCI Board are:

- PLC: SIMATIC S7 CPU 315-2DP
- SRAM for retentive NC and PLC data
- an MPI interface (Multi-Point Interface) (1.5 MBaud)
- a PROFIBUS-DP interface (12 MBaud, electrical)
- an MCI-Board Extension interface

PROFIBUS DP
The PROFIBUS-DP interface of the MCI Board is used to connect the SINUMERIK 840Di to the drives and the I/Os.

- **Drive systems**
  Either the modular converter system SIMODRIVE 611 or the distributed drive system POSMO A, SI, CD/CA can be used as the drive system. Drives with an analog setpoint interface can also be connected to PROFIBUS DP via the interface module ADI4 (Analog Drive Interface for 4 Axes) (available soon).
- **I/Os**
  Either the range of the SIMATIC DP ET 200 modules (for the connected loads, see SIMATIC Documentation) or the I/O module PP 72/48 (3x24 dig. inputs, 3x16 dig. outputs) can be used as I/Os.

MPI
The MPI interface of the MCI Board serves for optional connection of additional operator components, such as of a machine control panel, a handheld unit (handheld operator or programming unit) or of an external programming device (PG) for programming or diagnosing the PLC.

MCI Board Extension

An MCI-Board Extension Board is offered as an option. Using this expansion board for the MCI Board, sensing probes, handwheels and fast digital I/Os can be connected via a SINUMERIK cable distributor.

Operator components

As operator components, the new operator panel fronts from the SINUMERIK family (OP 010, OP 010C, OP 010S, OP 012, OP 015) are available optionally.

Further components that can be connected optionally are PS/2 mouse, PS/2 standard or CNC full keyboard. It is also possible to connect a standard PC monitor via the VGA interface.

2.4 System software

Operating system

The operating system installed is Windows NT 4.0 (US version).

NC software

The NC software runs on the PC in real time mode parallel to Windows NT. To achieve this, a solution has been developed which ensures the processing of real time tasks at a high reliability, allowing Windows NT applications to run without influencing any other applications.

HMI software (Human Machine Interface)

Scope of supply

To start-up, program and operate the SINUMERIK 840Di, the following Windows NT applications are already included in the scope of supply:

- **SINUMERIK 840Di-StartUp**, a straightforward user interface for visualizing the control states, as well for creating, loading and managing part programs
- **SinuCom NC**, the NC start-up tool of the SINUMERIK 840Di
- **SimoCom U**, the drive start-up tool for SIMODRIVE 611 and SIMODRIVE POSMO drive systems

Options

For the user-specific programming and configuration of user interfaces, the following software packages are offered as options:

- **HMI Programming Package** (option and OEM agreement required)
  Using the standard development tool Microsoft Visual Studio 6 and the HMI basic software, you can use the HMI Programming Package to implement your own operating philosophies and concepts.
- **HMI Configuring Package** (option and OEM agreement required)
  With the HMI Configuring Package and based on ProTool/Pro with the SINUMERIK option, you can configure simple screenforms quickly.

For machine tools, a comprehensive standard user interface is provided with HMI Advanced (option):

- **HMI Advanced** (option)
  HMI Advanced is a user interface running under Windows NT, which has been designed especially for machine tools, regardless of the technology. It offers a user-friendly and complete window-oriented operation of the machine.

PLC software

To create the PLC user program and to configure the PLC integrated in the MCI Board, STEP 7, the standard tool for all SIMATIC S7 based automation systems is used.

The STEP 7 software can run either, as usual, run on SIMATIC programming devices PG 720, PG 740 or PG 760, or also directly on the PCU of the SINUMERIK 840Di.

As the programming language, STEP 7 offers the following, tried and tested, non-conforming PLC programming languages:

- Statement list (STL)
- Ladder diagram (LAD)
- Control system flowchart (CSF)

2.5 System advantages

The SINUMERIK 840Di has an open software and hardware architecture and stands out by the following features:

A ready-to-use configured and tested system from a single source

The ready-to-use configured and tested system equipped with Siemens-certified components is free of the risk of system integration and helps save you your own engineering overhead. With the open NC software of the SINUMERIK 840Di, a comprehensive, expandable functionality compatible with the A&D world is also offered for everyone who today makes his own NCs.

In addition, SINUMERIK 840Di as part of the known automation systems from SIEMENS (SINUMERIK, SIMODRIVE and SIMATIC) also offers the advantage that already existing know-how can be used in many places, resulting in a reduction of the costs required for training and qualification of staff.

Distribution with PROFIBUS DP

Drives and I/Os are controlled consistently via the PROFIBUS DP with Motion Control functionality. Both the drive and the I/Os can thus be arranged either centralized or distributed.

The following components are provided for connection to PROFIBUS DP:

Drives

- the highly dynamic modular converter system SIMODRIVE 611 with digital closed-loop control modules SIMODRIVE 611 universal and the option module PROFIBUS DP with Motion Control;
- the completely distributed drive system SIMODRIVE POSMO CD/CA (with/without its own mains infeed) with integrated converter and control unit for high-performance servo applications;
- the distributed 1-axis servo drive SIMODRIVE POSMO SI as a separate, fully functional Mechatronic unit with centralized mains infeed;
- the intelligent distributed positioning motor SIMODRIVE POSMO A as a simple and compact drive unit.
- the ADI4 interface module (Analog Drive Interface for 4 Axes, available soon) for connecting drives with analog setpoint interface.

I/O modules

- the known SIMATIC I/O modules of the ET 200 series;
- the low-cost I/O module PP72/48 with 72 digital inputs and 48 digital outputs.

Higher reliability through industrial quality (referred to standard PCs)

- Higher ambient temperature (between 5° and 55°C)
- Higher mechanical stressability (e.g. special hard disk suspension)
- EMC in line with the industrial requirements
- Developed acc. to stringent SIMATIC and SINUMERIK boundary conditions
- Qualified components from renowned manufacturers
- In-house series production
- DIN ISO 9001 certification
- Standardized type tests
- 48-hrs. run-in test at 40°C

This results in safe operation in industrial environments without cost-intensive additional measures and ensures high availability of the SINUMERIK 840Di.

Investment reliability through PC models available in the longer run (referred to standard PCs)

- Use of units and components with high MTBF
- Product updates in line with the relevant technology standard at regular intervals
- Long-term availability with function compatibility
- Long-term spare parts supply (5 years function-compatible spare parts)

These aspects secure investments in the long run and reduce the operating costs of a machine or installation.

Worldwide support

- Worldwide marketing network
- Regional service departments all over the world
- Spare parts logistic infrastructure
- Engineering
- Software application
- Support for machine availability

Siemens' worldwide support for machine and system manufacturers improves the chances on the world market and offers the end user more safety through competent local support.

- We adapt control system and drive for your particular technological task, reduce planning times for new machines and eliminate potential error sources in advance.
- We create user-specific programs and user interfaces, and we also create the control functionality aimed at differentiation in competition and technology adaptation.

In addition, effective service and maintenance agreements after expiration of the warranty ensure that all automation systems - from the individual machine to interlinked systems throughout the world - operate efficiently. Service and response times can be adapted to the specific requirements in a flexible manner.

■

Hardware

3

3.1 SIEMENS industrial PCs

The SINUMERIK 840Di consists of a compact SIEMENS industrial PC with a plug-in board (MCI Board) as an interface board for the Motion Control and PLC tasks, which has been developed by Siemens.

Fig 3-1 PC PCU 50

Features

The current PC variant named PCU 50 is offered in 2 different performance classes and provides the following features:

- Mobile Intel Pentium-II processor at 333 MHz or Mobile Intel Pentium-III processor at 500MHz
- Hard disk (min. 4.8 GB) with dampened suspension suitable for use in industry
- 128 MB SDRAM (max. 256 MB)
- 1 expansion slot with PCI interface (occupied by the MCI board)
- 1 shared ISA/PCI expansion slot (max. 175 mm long)
  - occupied by the MCI Board Extension option slot variant
  - free, with MCI Board Extension option external variant
- Robust design (continuous operation, high noise immunity)
- Space-saving installation thanks to compact dimensions (LxWxH): 296x267x100 mm
- Easy-to-service design
- Easy to install by means of four screws on the rear side of the operator panel front
- Mounting location and position to a large degree variable
- Comprehensive fire protection (to EN60950)
- Steel sheet built-in housing with vacuum ventilation (suck-off type)

Interfaces

The following interfaces are provided:

- Parallel interface LPT1
- Serial interfaces 1 x V.24, 1 x V.24/TTY
- PS/2 keyboard interface
- PS/2 mouse interface

- MPI/PROFIBUS DP (max. 12 MBaud)
- VGA interface for external monitor
- Ethernet connection 10/100 MBaud, RJ45
- 2 slots: 1 x PCI and 1 x shared PCI/ISA
- Interfaces to the operator panel:
  - LVDS interface for SINUMERIK OP,
  - USB interface for SINUMERIK OP (internal)
- USB interface (currently, only keyboard and mouse are supported)
- Cardbus interface, 1 slot (type III)

Options

The following options are offered:

- 128 MB memory extension
- External floppy disk drive (see Catalog NC 60·2000/2001)
- PC standard keyboard MF-II (PS/2 interface)
- 19" CNC full keyboard (PS/2 interface)

3.2 MCI Board

The MCI Board is a 2/3 long PCI plug-in board. As the Motion Control interface, it provides the required interfaces to the system environment and the functionality not available in the hardware and software of the PCU. These are:

- PLC: SIMATIC S7 CPU 315-2DP
- PROFIBUS-DP with Motion Control functionality
- MPI (Multiple Point Interface)
- SRAM for retentive NC and PLC data
- Internal logic (e.g. PROFIBUS clock generation, watchdog, etc.)

Fig. 3-2 MCI Board

PLC

The hardware of the PLC functionality has been implemented by a SIMATIC S7 CPU 315-2 DP integrated in the MCI Board. Therefore, it is compatible with the PLC submodule of the SINUMERIK 840D. The connection of the I/Os is carried out via the PROFIBUS-DP interface of the MCI Board.

The PLC provides a class 1 DP master (central PLC) at PROFIBUS DP.

PROFIBUS-DP interface

The PROFIBUS-DP interface (max. 12MBaud, electrical) of the MCI Board is used to connect the SINUMERIK 840Di to the drives and the I/Os.

The PROFIBUS-DP connection with Motion Control functionality comprises the extended PROFIBUS profile PROFIDrive, which defines the synchronous and equidistant communication at PROFIBUS DP for speed-variable drives.

For the specification of this profile, please refer to:

PROFIDrive Profile, Drive Technology, Draft V1.4.2, 01st Sept., 00

With the SINUMERIK 840Di, it is thus possible to control drives from the NC in speed/torque control mode and from the PLC in Positioning mode. To achieve this, NC and PLC can internally access the PROFIBUS-DP interface of the MCI Board at the same time.

With the SINUMERIK 840Di, the data transfer rate at PROFIBUS DP is set to 12 MBaud by default.The PROFIBUS-DP interface is designed as a 9-pin SUB D female connector.

MPI interface

The MPI interface of the MCI Board can be used to connect the SINUMERIK 840Di with the optional components:

- machine control panel
- programming device (e.g. PG 740)
- PP 031-MC pushbutton panel
- HT6 handheld terminal

With the SINUMERIK 840Di, the data transfer rate at the MPI bus is set to 1.5 MBaud by default. The MPI interface is designed as a 9-pin SUB D female connector.

3.3 MCI Board Extension

The MCI-Board Extension is an optional expansion board for the MCI Board, which has the dimensions of a short PCI plug-in board. The following components can be connected via a SINUMERIK cable distributor:

- 2 handwheels (either differential or TTL handwheels)
- 2 sensing probes
- 4 fast digital inputs/outputs each

The electrical connection to the MCI Board is provided via a 26-pin ribbon cable.

Fig. 3-3 MCI Board Extension

The MCI-Board Extension is available in 2 installation variants:

- MCI-Board Extension internal
- MCI-Board Extension backpack

For mechanical fastening, the MCI-Board Extension internal variant is plugged into the second PCI slot.

If the second slot is needed for supplementary or option boards (OEM or end user), the MCI-Board Extension backpack variant can be used. This module is mechanically fastened using a modified housing cover virtually "outside" the PCU 50.

Fig. 3-4 PCU 50 with MCI-Board Extension, external variant

3.4 Operator panel fronts

The new operator panel fronts can be connected via the PCU interfaces for TFT and STN displays:

- SINUMERIK operator panel front OP 010
- SINUMERIK operator panel front OP 010C
- SINUMERIK operator panel front OP 010S
- SINUMERIK operator panel front OP 012
- SINUMERIK operator panel front OP 015

The most important features of the new operator panel fronts are:

- STN or TFT color display in sizes of 10.4", 12.1" and 15"
- Mechanical and membrane keyboards
- USB connection for keyboard or mouse on the front side of all operator panel fronts
- Some of the panels possess an integrated mouse

An alternative to the connection of a SINUMERIK operator panel front is the connection of a VGA monitor, a PC standard keyboard (MF-II) or a mouse.

The USB connection is intended for future applications and, in its first stage, it will exclusively be intended for keyboard and mouse.

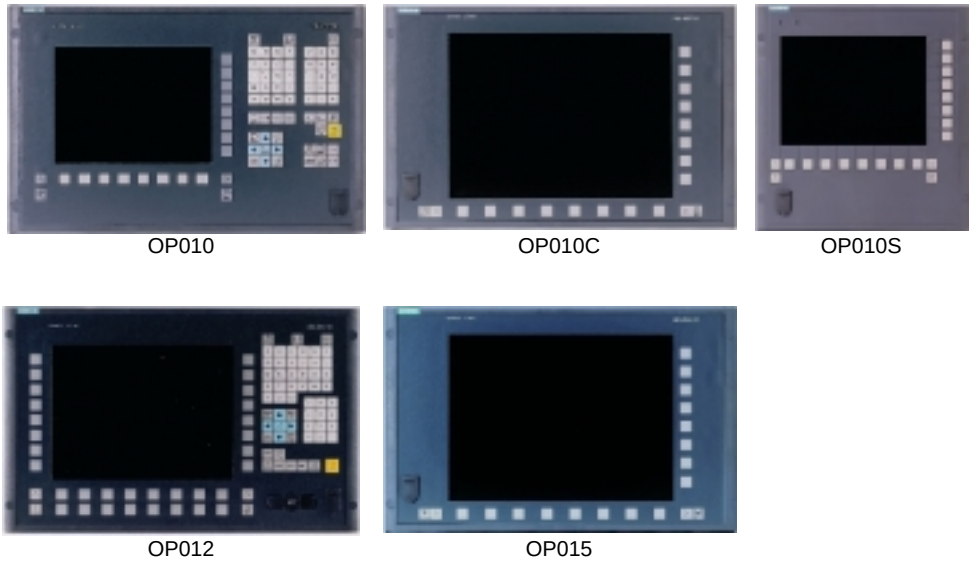


Fig. 3-5 SINUMERIK operator panels

3.5 Handheld operator and programming units

Handheld operator and programming units are connected to the SINUMERIK 840Di via the MPI interface of the MCI Board.

The following components are offered as options:

- Handheld unit (HHU), B-MPI type
- HT 6 Terminal (handheld operator and programming unit)

Handheld unit (HHU), B-MPI type

Handheld terminal HT 6

Fig. 3-6 SINUMERIK handheld operator and programming units

3.6 Machine control panels

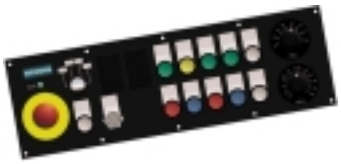
A machine control panel is connected to the SINUMERIK 840Di via the MPI interface of the MCI Board.

The following components are offered as options:

- 19" machine control panel
- OP 32S machine control panel
- PP 031-MC pushbutton panel
- MPI interface (interface for customized machine control panels)

19" machine control panel

OP32S machine control panel



PP031-MC pushbutton panel

MPI interface

Fig. 3-7 SINUMERIK Machine control panels

3.7 Drives

The connection between the SINUMERIK 840Di and the drives is exclusively carried out via the PROFIBUS-DP with Motion Control functionality in accordance with the Drive Technology PROFIDrive (draft V1.4.2, 01st Sept., 00).

Essential features of the Motion Control functionality are:

- Cyclic communication for a synchronous and equidistant transmission of the setpoints and actual values between DP master (SINUMERIK 840Di) and DP slave (drives).
- Acceptance of the new setpoint into the drive controller time-synchronously for all drives (speed/torque control mode).
- Lateral communication for decentralized data exchange between the DP slaves.
- Acyclic communication in parallel to the cyclic communication, e.g. for the transmission of parameter jobs, as well as for operator control and process monitoring of drives.

Digital drive systems

The following digital drive systems are offered for the SINUMERIK 840Di:

- **SIMODRIVE 611**
  The converter system SIMODRIVE 611 with the closed-loop control modules SIMODRIVE 611 universal and universal E, each with the optional plug-in module "Motion Control with PROFIBUS DP" is offered as a drive system in central design.
- **SIMODRIVE POSMO**
  The drive modules SIMODRIVE POSMO A and SIMODRIVE POSMO SI, CD/CA, are offered as a drive system in distributed design.

Detailed information on the converter system SIMODRIVE 611 and the closed-loop control/drive modules is to be found in the Catalog NC 60·2000/2001.

SIMODRIVE 611

SIMODRIVE 611
With the SIMODRIVE 611, Siemens offers a converter system that meets highest requirements with regard to the dynamic response, speed setting range and true running properties in the drive system. Thanks to the modular design, drive configurations with almost any number of axes or main spindles can be implemented.

The modules of the converter system come in enclosed and EMC-compliant housings acc. to DIN EN 60529 (IEC 60529). The electrical system has been dimensioned acc. to EN 50178 (VDE 0160) and EN 60204. CE Certificates of Conformity are available.

Fig. 3-8 SIMODRIVE 611

The SIMODRIVE 611 converter system has been designed for operation in industrial areas at earthed TN-S and TN-C systems (VDE 0100, Part 300).

SIMODRIVE 611 universal

SIMODRIVE 611 universal is a closed-loop control module with a digital speed setpoint interface (optional plug-in module "Motion Control with PROFIBUS DP" required) and optional positioning functionality with motor frequencies up to 1,400 Hz for the following motors:

- Synchronous motors: 1FT6, 1FK6, 1FE1
- Linear motors: 1FN
- Asynchronous motors: 1PH., 1LA. with/without encoder
- Non-Siemens motors if these are suitable for converter mode.

SIMODRIVE 611 universal E

SIMODRIVE 611 universal E is a closed-loop control module without positioning functionality and a reduced number of interfaces and encoder connection possibilities, which generally corresponds to the SIMODRIVE 611 universal.

SIMODRIVE POSMO

SIMODRIVE POSMO A

SIMODRIVE POSMO A is an intelligent positioning motor with the following features:

- Power section and complete motion control in the motor
- Coupling via communication and power bus

Fields of application are to be found wherever simple positioning tasks are to be solved decentralized in the machine/automation system.

Fig. 3-9 SIMODRIVE POSMO A

SIMODRIVE POSMO SI

SIMODRIVE POSMO SI as a single-axis servodrive system constitutes a separate, fully featured mechatronical unit. The drive system provides both a digital speed setpoint interface (Motion Control with PROFIBUS DP) and a comprehensive integrated positioning functionality.

The connection of the supply voltage is provided via a 600 V DC mains infeed with decentralized generation of the 24 V DC electronic power supply internally in the device.

Fig. 3-10 SIMODRIVE POSMO SI

Typical fields of application are:

- Servo axes in handling devices
- Independent positioning axes in machines
- Auxiliary axes in machine tools

SIMODRIVE POSMO CD/CA
SIMODRIVE POSMO CD (without mains infeed) and SIMODRIVE POSMO CA (with mains infeed) are complete converter and control units. They provide both a digital speed setpoint interface (Motion Control with PROFIBUS DP) and a comprehensive integrated positioning functionality.

Fig. 3-11 SIMODRIVE POSMO CD/CA

The connection of the supply voltage is provided via a mains infeed of 600 V DC (with CD) or directly via a 3AC 400 V - 480 V power supply (with CA). The 24 V DC electronic power supply is generated distributed in the device.

Typical fields of application are:

- High-performance servo applications in packaging, textile and woodworking machines
- Feed axes on machine tools

Analog drive systems

Drives with an analog setpoint interface can be connected to PROFIBUS DP via the interface module ADI4 (Analog Drive Interface for 4 Axes). The interface module provides the following features:

- PROFIBUS-DP interface
- 4 servo interfaces
  - Inputs: TTL/SSI for incremental or absolute measuring systems
  - Outputs: ±10V analog
  - Drive-specific digital input/output signals

3.8 I/Os

For connection to the SINUMERIK 840Di, the following components are offered as I/Os:

- the distributed I/O system SIMATIC ET 200
- the I/O module PP 72/48

The distributed I/O system SIMATIC ET 200

From the range of devices of the distributed I/O system SIMATIC ET 200, all I/O devices can be used which support a data transfer rate of 12MBaud to be set with the SINUMERIK 840Di at PROFIBUS DP. These are currently the following I/O devices:

- ET 200M
- ET 200B
- ET 200X
- ET 200S

As an example for the SIMATIC I/O devices mentioned above, the I/O device ET 200M will be introduced here in brief.

ET 200M
The ET 200M is a modular I/O device designed acc. to the degree of protection IP 20. It consists of:

- a PROFIBUS DP interface module IM 153
- I/O modules
- a power supply (from case to case).

Fig. 3-12 SIMATIC ET 200M

The I/O device ET 200M can be extended with a maximum number of 8 I/O modules of the S7-300 automation system. No slot rules apply for the extension. The I/O modules can be combined as desired.

The following module types are offered:

- Standard signal modules of the S7-300 design technology (with module diagnosis)
- Diagnosable instrumentation and control I/O modules (with channel and module diagnosis)
- Redundant modules (with channel and module diagnosis)
- Ex input/output modules for the coupling of signals from the Ex area (with channel and module diagnosis)

The I/O module PP 72/48

The I/O module PP72/48 is a simple and cost-effective module for connecting digital inputs/outputs to PROFIBUS-DP. The module possesses the following features:

- PROFIBUS interface (max. 12 MBaud)
- 72 digital inputs
- 48 digital outputs
- On-Board status display
- 24V power supply

Fig. 3-13 I/O Module PP72/48

3.9 Uninterruptible power supply (UPS)

An uninterruptible power supply (UPS) is absolutely necessary if the SINUMERIK 840Di is generally switched off on the machine or on the automation system without first shutting down Windows NT correctly. The Windows NT installation can be damaged due to this procedure so that Windows NT will then no longer start up.

The UPS system will back up the supply voltage of the PCU for several minutes and will report the power failure to Windows NT and/or to the PLC. The appropriate functionality for the PLC user program is provided by Windows NT or the PLC/SINUMERIK 840Di; now, the control system can be shut down correctly.

To create a suitable UPS system, e.g. the following components can be used:

- SITOP POWER DC UPS MODULE 15 (with/without RS 232)
- SITOP POWER LEAD-ACID BATTERY MODULE 24V DC / 10A / 3.2AH (option)

For detailed information on these and further UPS components, please refer to the Catalog KT 10.1.

■

4 Software

4.1 Windows NT

The operating system basis of the SINUMERIK 840Di is Windows NT 4.0 (US version). Since, however, it is well known that Windows NT is only conditionally real-time capable (the term 'smooth real time' is used in this context), Siemens has developed a method enabling the NC system software to be operated under hard real time conditions, without modifying Windows NT.

Computation time distribution

Windows NT and the NCK (Numerical Control Kernel), which is part of the system software and realizes the real time capability of the SINUMERIK 840Di, share the available PCU processor performance provided by the SINUMERIK 840Di at a defined ratio.

By default, 65% of the computation time are assigned to the NCK. This value, however, is the maximum value claimed by the NCK in the worst case only. If the NCK requires less computation time, it will give this dynamically to Windows NT.

Fatal exception (blue screen)

If Windows NT detects a fatal exception during the operation of the NC system software, the following steps are carried out:

- The execution of Windows NT will stop.
- An error message appears on the screen.
- NC and PLC **continue to operate as normal.**
- The NC reports the detected fatal exception to the PLC.

Depending on the current machining situation, the PLC user program or the operator can decide locally whether the machining is continued without any negative effects or whether it is terminated.

4.2 NC software

It is well known that the SINUMERIK 840Di possesses a very powerful NC software. With the exception of some special hardware and drive-specific functions, as well as a few options, the NC functionality corresponds to that of the SINUMERIK 840D.

The following functions will be mentioned as examples for the fields machining organization and motion control:

- Flexible channel structure for parallel execution of part programs
- Summary of channels in mode groups

- Dynamic axis/spindle functions
- Programmable acceleration response
- Freely programmable motion-synchronized actions
- Freely selectable path and time-optimized changeover methods between traversing blocks
- Optimized interpolation methods (NURBS, spline, polynominal interpolation)
- Electronic gear functions
- Kinematic transformations (TRANSMIT, 3 to 5-axis and cylinder peripheral surface transformations etc., interlinked transformations)
- Compensations (backlash/leadscrew/quadrant error compensation, etc.)
- Channel and axis-specific measuring functions
- Integrated high-level language commands (control structures, program coordination, etc.)

A complete list of all NC functions provided for the SINUMERIK 840Di by default or optionally is to be found in:

Catalog NC 60·2000/2001, Chapter 2, Overview of Functions

4.3 HMI software

To start up, program and operate the SINUMERIK 840Di, comprehensive applications from the so-called HMI modular system are available. This HMI modular system is conceived as an open architecture system providing several configurations:

- **SINUMERIK 840Di Startup**, a straightforward user interface to become acquainted with the SINUMERIK 840Di
- **HMI Advanced**, the standard user interface for machine tools (option)
- **HMI Configuring Package** based on SIMATIC ProTool/Pro and ProTool/Pro SINUMERIK Option (option)
- **HMI Programming Package** based on COM/OPC (option)

840Di Startup

The 840Di-Startup user interface is intended to become acquainted with the SINUMERIK 840Di functionality. It is part of the scope of supply of the SINUMERIK 840Di and is already preinstalled on the hard disk of the PCU.

840Di Startup as a real Windows application is designed fully window-oriented and includes the following functions:

- Display of main screens
- Display of alarms and messages

- Part program management
- ASCII editor for editing part programs
- NC, PLC and PROFIBUS diagnosis
- Start-up functionality for NC and PLC
- Log book

Information that can be displayed each in separate windows, such as:

- general channel data
- axis actual values
- current block display
- program control
- G/H functions
- program pointer

can be activated separately using menu commands and can be arranged in the form of a customized user interface.

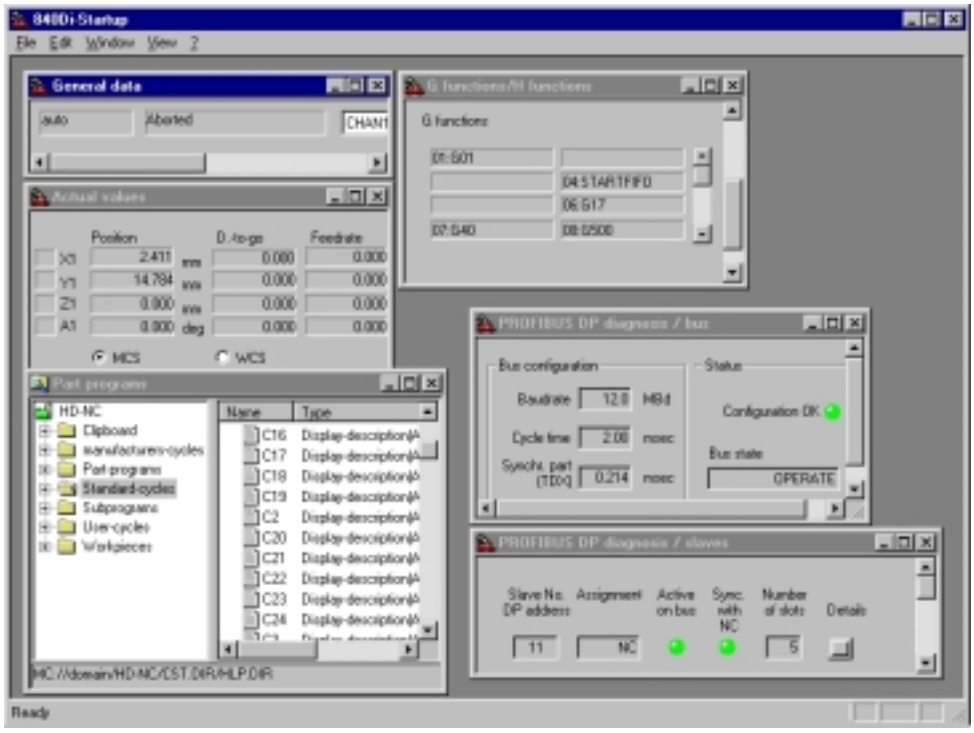


Fig.4-1 SINUMERIK 840Di Startup

HMI Advanced (option)

HMI Advanced is a user interface running under Windows NT, which has been designed especially for machine tools, regardless of the technology. It features a user-friendly and complete operation of the machine in the standard window technology. The user interface can be operated either via the softkeys and the cursor keys of the appropriate operator panel, or using the mouse (if any).

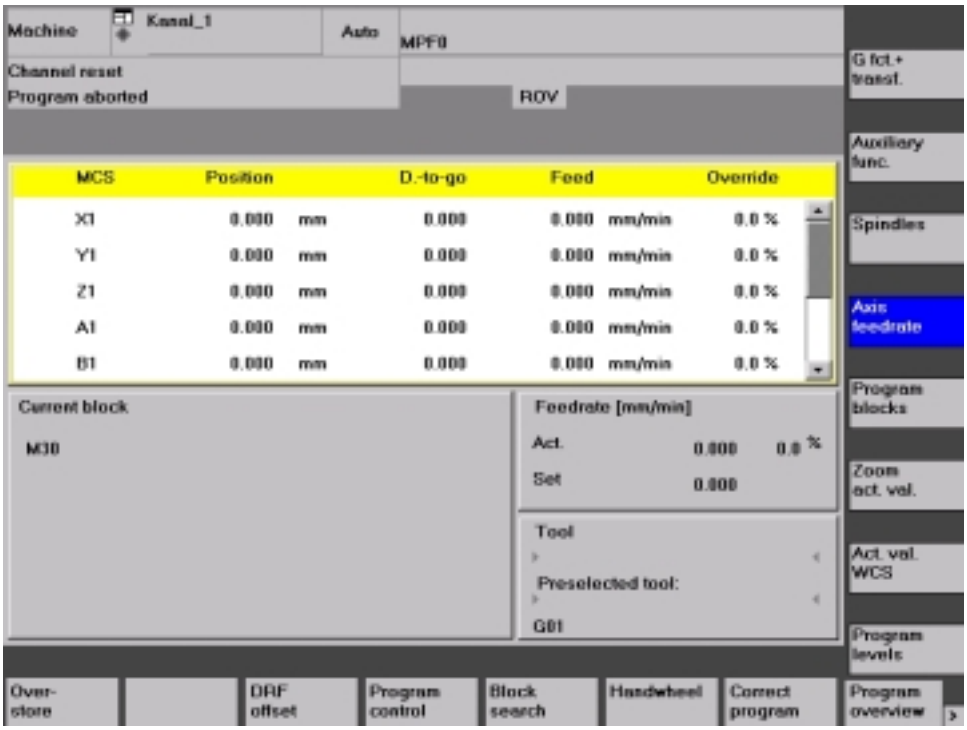


Fig.4-2 HMI Advanced

HMI Advanced is divided into the following operating areas providing each a comprehensive functionality:

- **Machine**
  In the "Machine" operating area, current states and values of the control system are displayed, such as the channel-specific display of axis actual values and setpoints, the current channel and part program status, the active part program, the spindle-specific power display, etc.
- **Parameters**
  In the "Parameters" operating area, tool compensation data, R parameters, setting data, user data, etc. are displayed and entered.
- **Program**
  The "Program" operating area is used to create and manage workpieces, part programs, user cycles, etc.
- **Services**
  The "Services" operating area provides functions required for series machine start-up and software upgrade.
- **Diagnosis**
  The "Diagnosis" operating area features a detailed version display of the NC and HMI software installed.

- **Start-up**
  The "Start-up" operating area serves for the machine-specific parameterization of the control system. In addition, diagnostic functions for drive optimization are provided.

The user interface can be modified easily or redesigned for adaptation to customer-specific requirements:

- **Integrated editor**
  With the integrated editor, the user interface of the basic version can be extended by a maximum of 20 screens using predefined softkeys. Using these softkeys, machine-specific screenforms, screens or menu trees can be implemented. The programming support, e.g. cycle support, can be modified and extended using the "Supplement user interface" feature. The configuration is carried out using simple text files.
- **HMI Configuring Package** (option and OEM agreement required)
  The HMI Configuring Package based on SIMATIC ProTool/Pro has been conceived for the visualization and operation of machines and small installations/systems. The additional SINUMERIK option is required to configure a SINUMERIK 840Di and the operator panels of this control system using ProTool/Pro.
- **HMI Programming Package** (option and OEM Agreement required)
  Using the standard development tool Microsoft Visual Studio 6 and the HMI basic software, you can use the HMI Programming Package to implement your own operating philosophies and concepts.

  The HMI Programming Package based on COM/OPC, together with the standard development tool Microsoft Visual Studio 6 and the HMI basis software, can be used to realize technology-specific programming systems and dedicated, consistent operating philosophies.

  Thanks to the use of OPC (OLE for Process Communication), cascaded systems can communicate with the HMI application created.

To be able to use one or several of these possibilities, except the HMI Programming Package, one Open Architecture copying license (option) each is required per PCU. If the integrated editor is used, this is only required from the 21st screen onwards.

HMI Configuring Package

The branch and technology-neutral HMI software SIMATIC ProTool/Pro has been designed for the visualization and operation of machines and small installations/systems. It can therefore be used in all automation applications.
The SINUMERIK option is required to configure a SINUMERIK 840Di and the operator panels of this automation system using ProTool/Pro.

To be able to use the software created using the HMI Programming Package on a PCU, one Open Architecture copying license each is required per PCU.

The prerequisite is the conclusion of an OEM agreement.

HMI Programming Package

The HMI Programming Package based on the COM/OPC architecture grants access to data and events in the SINUMERIK 840Di. Technology-specific programming systems and dedicated, consistent operating philosophies can thus be implemented, just as it is possible to simulate existing or known user interfaces or special diagnostic functions.

To this aim, the HMI Programming Package offers several methods to access the data of the SINUMERIK 840Di:

- ActiveX Controls and Microsoft Visual Basic
- Other OLE applications
- the OPC interface (OLE for Process Communication)

The integrated OPC servers:

- OPC-Data Server
- OPC-Event Server

allow OPC clients to display and modify data, as well as to display messages and states of the SINUMERIK 840Di.

In addition, the HMI Programming Package also includes:

- specific ActiveX Controls, such as Fileviewer, NC editor, etc.
- SINUMERIK standard-HMI COM server

To use the software created using the HMI Programming Package on a PCU, no Open Architecture copying license option is required in conjunction with the SINUMERIK 840Di.

The prerequisite is the conclusion of an OEM agreement.

4.4 Power OFF and behavior in case of power failure

The reliable operation of the SINUMERIK 840Di requires a correct shutdown of Windows NT. This means that Windows NT is shut down either as usual via the NT taskbar: Start > Shutdown or via a special PLC interface signal "PC shutdown". In addition to shutting down Windows NT and all active applications, the retentive NC and PLC data are saved both on the SRAM of the MCI Board and on the hard disk of the PCU.

When the SINUMERIK 840Di is restarted, the saved data having the status of the last correct shutdown will thus be available again. In certain service situations, these data can be accessed to allow the SINUMERIK 840Di to continue work without time-consuming re-startup:

- Change of the backup battery of the MCI Board
- Change of the MCI Board (new)
- Change of the PCU (new) or reinstallation/update of the 840Di software
- Change of the PCU or the MCI Board (from another 840Di)
- Copying of a backup copy of the 840Di software
- Power failure

Power failure

If the SINUMERIK 840Di is switched off by the user or as a result of a power failure so that a correct shutdown of Windows NT is no longer possible, the retentive NC and PLC data can only be stored in the SRAM of the MCI Board, but no longer on the hard disk of the PCU.

If then servicing is required so that the NC and PLC data must be recopied from the SRAM map of the PCU hard disk, a re-startup/reinstallation of NC and PLC is required.

If Windows NT is not shutdown correctly, the Windows NT installation may be damaged.

Uninterruptible power supply (UPS)

Optionally, the SINUMERIK 840Di can be connected via an uninterruptible power supply (UPS). In case of a power failure or when the SINUMERIK 840Di is powered off without first shutting down Windows NT correctly, the UPS backs up the power supply for several minutes and initiates a correct shutdown of Windows NT.

An UPS is absolutely necessary if the user generally powers off the control system without first shutting down Windows NT correctly.

4.5 Supplementary conditions regards software and hardware

As it is generally known, Windows NT is not an operating system designed for hard real time requirements whereby the term 'hard real time requirements' is to be understood in this context as a defined response time of the operating system due to an external event in the range of a few µ seconds.

One of the advantages provided by the method developed by Siemens is that the real time capability of the operating system can be achieved with Windows NT standard facilities so that the compatibility with Windows NT is fully maintained. To this aim, the NC system software is integrated in Windows NT using via a specific Kernel Mode driver, thus integrating its own real time system providing for the appropriate real time requirements parallel to Windows NT.

Real time violations

A PC is generally an open system whose hardware and software can be extended and modified by components of different manufacturers. Real time violations can therefore occur if inappropriate PC components or configurations influence the system behavior such that the NC system software cannot be activated at the defined time.

The term 'inappropriate PC components' denotes in this conjunction drivers or hardware extensions that have a negative influence on the real time behavior due to interrupt blocking times too long or PCI bus locks in conjunction with PCI bus mastering or DMA mode. In case of real-time violations from 200µs up, the operational reliability of the NC system software is no longer guaranteed. Depending on the size of the real time violation, the system response can be as follows:

- Display of an error message
- Alarm with the axes stopped by the NC
- Alarm and drive-independent stopping of the axes

The real time behavior of a SINUMERIK 840Di can be watched using the NC/PLC system diagnosis included in the 840Di-Startup user interface.

Certification of extensions

To be able to offer high quality and reliability performance of the whole system, a SINUMERIK 840Di is supplied completely configured and ready to operate.

To this aim, the system components used are subject to a certification procedure at SIEMENS as the system manufacturer. Within the framework of this certification procedure, the observance of the real time capability of the entire configuration is proven and documented in all relevant operating modes.

In the case of modifications to or extensions of PC components (hardware and/or software) by any third persons, no mandatory statements can be made by Siemens

with regard to the observance of the product properties. This is therefore the sole responsibility of the OEM or the user who has made the modifications.

But even a PC constitutes a generally open system, and extensions of or modifications to the system are inevitable in such cases to achieve a certain functionality. Therefore, Siemens offers to check and document the real time capability of system configurations deviating from the delivery form as a service (see also Section "Services").

■

Start-up, Service and Maintenance

5

5.1 Starting up the SINUMERIK 840Di

The start-up of the SINUMERIK 840Di comprises mainly the parameterization of the NC depending on the current machine configuration by setting the relevant machine data and the loading of a SIMATIC S7 project into the PLC via STEP 7.

STEP 7 is the basic package required to configure and program SIMATIC automation systems. STEP 7 is not included in the scope of supply of the SINUMERIK 840Di and must be acquired separately.

Basic start-up

After a SINUMERIK 840Di has been turned on for the first time, a basic start-up of the control system has to be carried out which includes the installation of the system software on the PCU and the parameterization of NC and PLC with predefined default values such that a first test of the system can be carried out with, naturally, simulated machine axes.

Starting up the NC

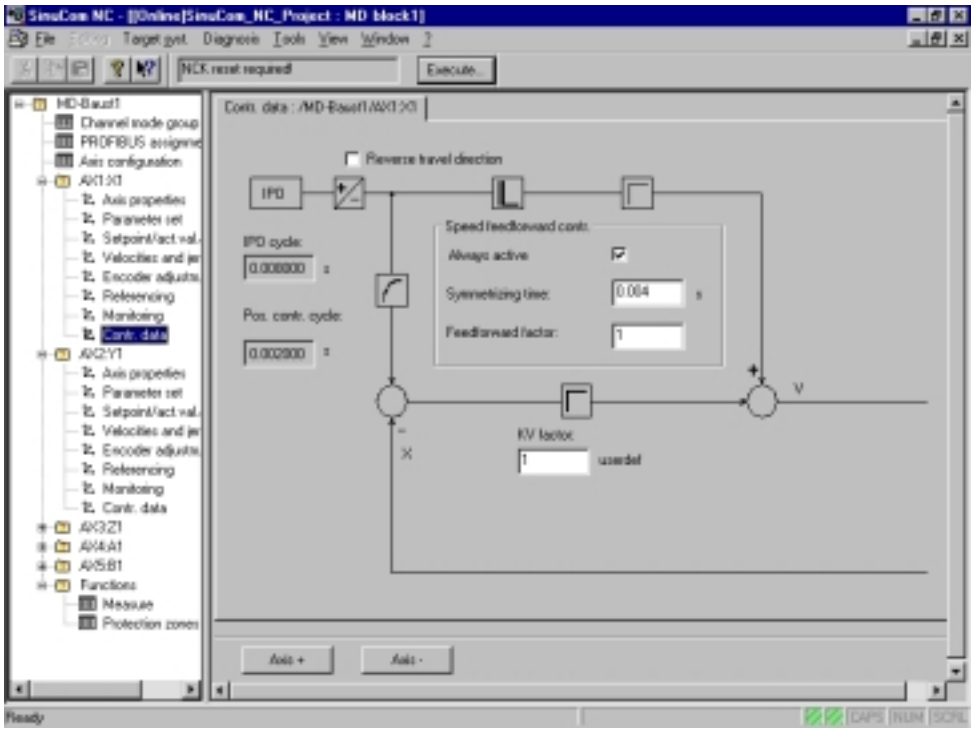


Fig.5-1 SinuCom NC start-up tool

The actual start-up of the NC, i.e. the adaptation of the NC to the current machine configuration or to the automation process, is carried out by entering appropriate values in so-called machine data. When doing so, the machine data can be edited

either directly in the form of lists or, more user-friendly, using the new Windows-oriented start-up tool **SinuCom NC** via topic-oriented interactive screenforms.

Starting up the PLC

To start up the PLC, a S7 project consisting of the PLC user program and the hardware configuration, must be created using STEP 7 (option) and be loaded into the PLC. STEP 7 can run either on an external programming unit, such as PG740, or directly on the PCU of the SINUMERIK 840Di.

The communication of STEP 7 with the PLC is carried out in both cases via the MPI interface of the MCI Board.

The basic PLC program providing the data and function blocks for the basic communication between PLC and NC is included in the scope of supply of the SINUMERIK 840Di in the form of a SIMATIC S7 library.

In addition, the scope of supply of the SINUMERIK 840Di also includes a sample hardware configuration which can serve as an example or extendable basis to create the final configuration.

Series machine start-up

The series machine start-up function serves to simplify the start-up of control systems of similar machines of a specific series. To this aim, the user interface of SinuCom NC provides the possibility of storing the relevant start-up data of NC and PLC in so-called series machine start-up files after the first control systems have been started up.

After the series machine start-up files have been transferred to a SINUMERIK 840Di, this control system is started up by simply loading the series machine start-up file into the appropriate component (NC or PLC) using SinuCom NC.

5.2 Starting up the drives

All drives offered by Siemens for the SINUMERIK 840Di

- SIMODRIVE 611 universal
- SIMODRIVE 611 universal E
- SIMODRIVE POSMO SI
- SIMODRIVE POSMO CD/CA
- SIMODRIVE POSMO A

are started up using the SimoCom U start-up tool, except the SIMODRIVE POSMO A.

SIMODRIVE 611 universal / E and POSMO SI, CD/CA

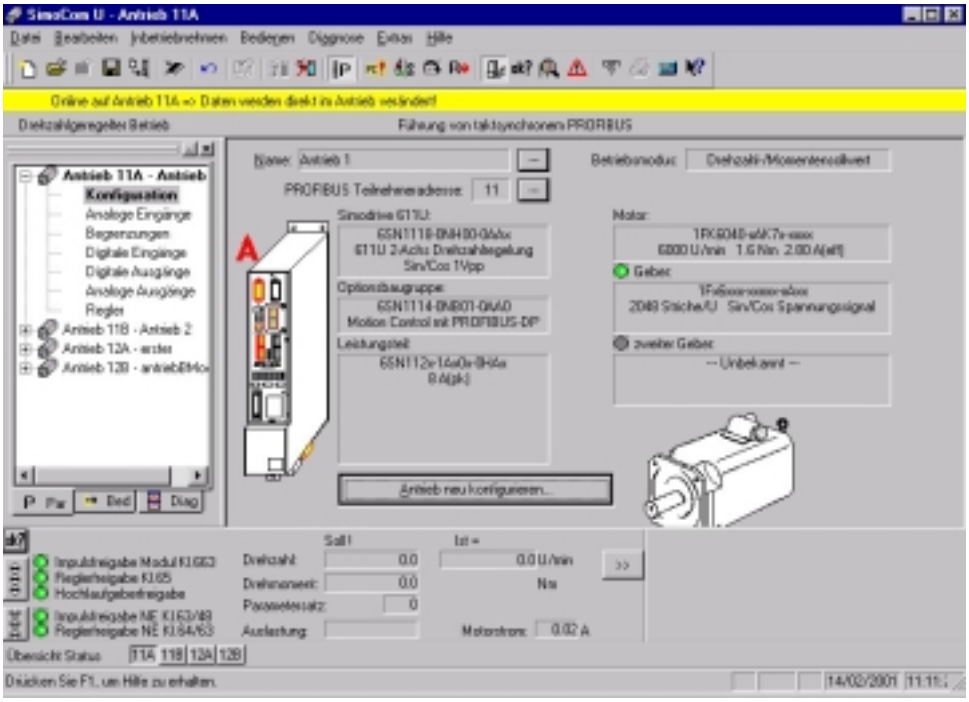


Fig.5-2 The SimoCom U start-up tool

The SimoCom U start-up tool is part of the 611U toolbox supplied with the SINUMERIK 840Di and can additionally also be acquired by downloading from the following address:

http://www.ad.siemens.de/mc/html_00/info/download/

The most important functions of this start-up tool are:

- Establishment of an online connection to the drives
- Firmware upgrades
- Optimization of control parameters
- Traversing of axes
- Diagnosing the drive status
- Saving and loading of parameters
- Comparison of parameter sets
- Resetting to the factory default settings

SIMODRIVE POSMO A

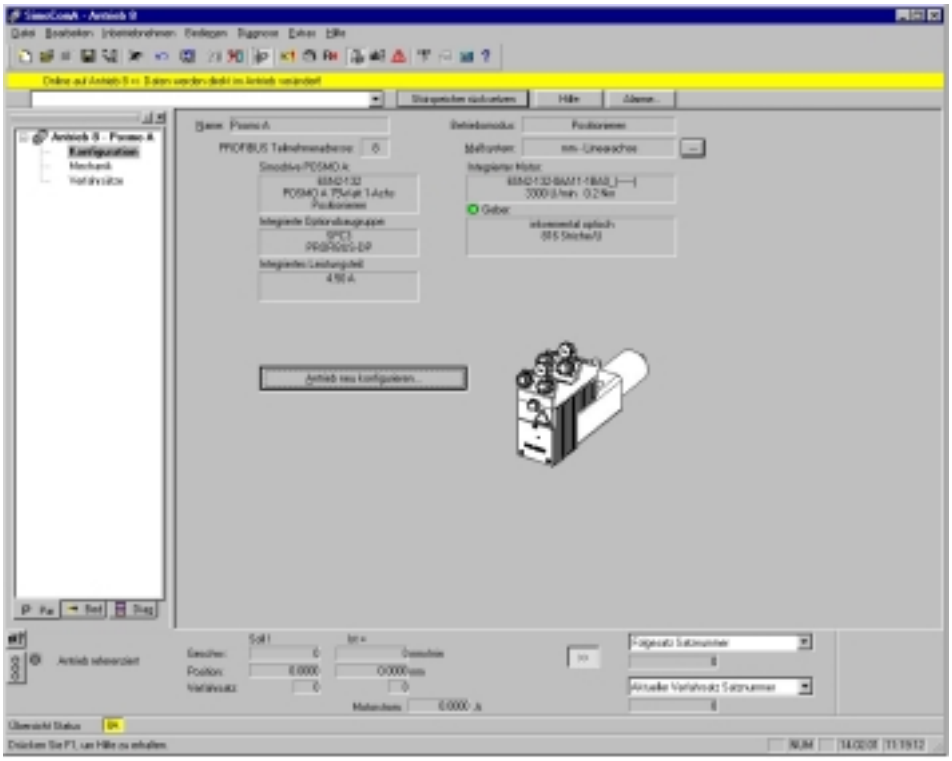


Fig.5-3 The SimoCom A start-up tool

SIMODRIVE POSMO A drives are started up with the separate start-up tool SIMODRIVE POSMO A PROFIBUS MASTER.
This start-up tool allows the data exchange between a programming device (PG), PC or notebook with a SIMODRIVE POSMO A via the PROFIBUS DP.

The start-up tool is available free of charge via the appropriate Siemens branch office (sales partner) or by downloading at the following address:

http://www.ad.siemens.de/mc/html_00/info/download/

The most important functions of this start-up tool are:

- Controlling of the SIMODRIVE POSMO A via control signals
- Display of status signals
- Programming, selection and starting of traversing blocks
- Reading and writing of any single parameters
- Saving and loading of parameters
- Resetting to the factory default settings

Non-Siemens drives

If drives from competitors are used, the sole responsibility for the start-up and integration lies with the OEM or the user.

5.3 Service information

To record and visualize service information, the SINUMERIK 840Di keeps a continuos log book recording all events pertaining to the NC and PLC. These are, e.g.:

- Installation of NC and PLC software updates
- Messages with regard to the NC/PLC SRAM data handling
- Exceeding of temperature limit values
- Voltage dips and power failure events

5.4 Data backup

For reasons of the general data integrity, the hard disk of the SINUMERIK 840Di has been divided into 4 different partitions with the following contents:

- 1st partition / drive C: MS DOS 6.2, Service menu
- 2nd partition / drive D: contains, e.g. the "Images" directory with the preinstalled and self-created images
- 3rd partition / drive E: Windows NT 4.0
- 4th partition / drive F: SINUMERIK 840Di system software and possibly further Windows NT applications, such as SIMATIC STEP7, OEM applications, etc.

For user-friendly and comprehensive data backup and recovery, the SINUMERIK 840Di includes the Service menu (MS-DOS application created by Siemens and the backup software Norton Ghost already in the standard version.

Using the Service menu, the data to be saved, individual partitions or even the entire hard disk are selected with menu assistance, and the backup software is parameterized. Norton Ghost will then create the appropriate, naturally packed images. These can be transferred either to an external computer or be stored locally on the hard disk of the PCU.

In case of servicing, for test purposes or during the start-up, the images can be reloaded to the hard disk of the PCU via the Service menu, thus providing an optimum and consistent handling of large data volumes.

5.5 Remote diagnosis

For remote diagnosis of the SINUMERIK 840Di, the optional software product from Siemens with the same name grants direct access to the control system from any PC. To do so, the appropriate software must be installed on both systems (viewer PC and control system). The viewer software must be installed on the PC from which you wish the remote diagnosis to carry out, and the host variant on the SINUMERIK 840Di.

Functions

The following functions are provided for the remote diagnosis:

- remote process control and monitoring
- chat mode for mutual transmission of textual information
- file transfer for automatic readout and transfer of individual files
- an effective safety concept to prevent unauthorized access (log-in and password, confirmation by the operator or callback to a previously defined connection)

Note:
The PLC remote diagnosis requires a SIMATIC STEP / version (option) installed on the SINUMERIK 840Di.

Transmission media

The following transmission media can be used for the remote diagnosis:

- Direct connection between PC and control system
- Modem-to-modem connection via the public telephone network (fixed and cellular telephone network)
- Local Network (LAN)
- Wide Area Network (WAN)
- Internet

Network security and network connections

To realize comprehensive IT solutions, SIMATIC NET offers a comprehensive range of products and services, e.g. in the field of Remote Access, under the generic term ***Itlution***®.

Remote Access is intended for the universal coupling of Industrial Ethernet and other Ethernet networks using TCP/IP via WAN (Wide Area Network). Such Wide Area Networks are, e.g. analog telephone networks, digital telephone networks, such as ISDN, and the Internet.

Remote Access from SIMATIC NET features security through:

- encrypted password query
- callback to a defined number
- access protection through Firewall features
- encrypted data transmission.

Remote Access Service
Remote Access Service (RAS) is a module within the framework of ***Itlution***® and serves for the communication between two Ethernet networks via WAN across several locations.

Remote Access Service provides the following possibilities, e.g.:

- remote diagnosis on installations/systems equipped with different terminals
- remote access to large installations/systems
- connection of the automation equipment to a remote location using WEB technology and e-mail
- access to data bases
- file transfer
- transmission of audio and video data

Services
SIMATIC NET offers services in the fields of planning and realization of customized safety solutions for Remote Access.

The task definition is analyzed, and possible solutions are shown already during the conception phase. SIMATIC NET specialists offer, e.g. support in creating a safety concept. The realization phase includes the efficient, cost-effective and fast implementation of the solutions created.

Manufacturer neutrality and the know-how acquired in the automation environment guarantee that the optimum safety technology is used.

But SIMATIC NET offers appropriate services, such as maintenance concepts, safety audits or training courses even after the start-up.

■

6 Services

6.1 Services offered by SIEMENS

SIEMENS offers the following services with regard to the SINUMERIK 840Di and beyond this automation system.

- analysis of automation tasks, consulting services and creation of automation concepts
- Customer care
- Creation of customer-specific applications
- Integration and certification of customized extensions
- Service agreements

Customer care

Customer care is offered for the following project phases:
- Project design
- Installation and startup support
- Technology support
- Later start-up of functions on the machines already involved in the production process.

Creation of customer-specific applications

The creation of customer-specific applications is offered for the following fields:
- User-specific user interfaces (high-level applications or configurations using Protool/Pro)
- STEP 7 programs
- User-specific NC part programs

Integration and certification of customized extensions

We understand this term as engineering services required for verifying and documenting the real-time response of a system configuration deviating from the system delivered.

Service agreements

Service agreements can be concluded for the following areas:
- Repair/service agreements for machine manufacturers
- Service agreements for end customers

The regional SIEMENS sales partners are contact partners for these services. ■

7 Information and Training

7.1 Documentation

The user can only use a high-performance programmable controller or drive system optimally if he has learned the performance of the individual components in intensive training courses and by reading a good documentation created by experts.

For the SINUMERIK/SIMODRIVE products, a comprehensive documentation is available both on paper and electronically.

The documentation is divided into 3 levels:

- General documentation
  - Advertising materials/catalogs
- User documentation
  - Operation: Short Guide, Operator's Guide
  - Programming: Short Guide, Programming Guide, Fundamentals, and Programming Guide, Production Planning
- Manufacturer/Service Documentation
  - Hardware Descriptions, Descriptions of Functions and Service Descriptions

Documentation on paper

A complete overview of the entire documentation for SINUMERIK/SIMODRIVE products in the languages available is contained in:

Catalog NC 60·2000/2001, Chapter 11: Documentation

The central document for the SINUMERIK 840Di, the SINUMERIK 840Di Manual, contains an overview of documents relevant especially for this automation system in the Appendix.

Electronic documentation

In the electronic form, the SINUMERIK/SIMODRIVE documentation is available on:

- CD ROM
- Internet: available soon

CD ROM
All SINUMERIK/SIMODRIVE publications are available on CD ROM in PDF format in the languages German and English under the product designation "DOConCD".

Note:
A version of Acrobat Reader™ required to view the documents is contained on the CD ROM free of charge.

Easy-to-handle navigation aids with regard to the contents, topic areas and keywords grant fast access to the desired information.
A full-text search is provided so that also complex inquiries can be processed using wildcards and Boolean combinations.

Internet
The SINUMERIK/SIMODRIVE documentation will also be available in the scope and functionality of the DOConCD described above on the Internet.

The relevant Internet site is currently still "under construction".

7.2 Internet

Up-to-date general information on the SINUMERIK 840Di can be found on the Internet at:

www.ad.siemens.de/mc/html_00/products/sinumerik/sinumerik_840di/index.htm

For technical data, order and accessories data, please refer to the interactive online catalog of Siemens A&D at:

www3.ad.siemens.de/ca01online

You will find the appropriate information, coming from the start page and then branching to:

Automation Systems -> SINUMERIK Automation Systems & SIMODRIVE -> CNC Control Systems -> SINUMERIK 840DiE/840Di

7.3 Training

The economic use of programmable controllers includes the knowledge and expertise of specialists who can operate, program and service these devices.

Our SINUMERIK and SIMODRIVE training is carried out on specially designed and extraordinarily well-equipped training devices.

The courses consist of individual modules and are tailored to the individual target groups to meet specific customer wishes. We offer courses for operators, programmers, design planning engineers, service specialists or service and maintenance staff.

If you have any questions, e.g. with regard to the current course offer for the SINUMERIK 840Di, please contact your Siemens sales partner or directly the course office:

Infoline +49 (0) 1805 - 235611

or visit us on the Internet

www.sitrain.com

■

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E-mail: motioncontrol.docu@.siemens.de)

Suggestions

Corrections

for Documentation/Manual:

SINUMERIK 840Di

System Overview

From

Name:

Address of your company/department

Street: _____

Zip code: _____ City: _____

Telephone: _____ / _____

Telefax: _____ / _____

Order No.:6FC5298-6AE40-0BP0
Edition: 02.2001 Edition

Should you come across any printing errors when reading this publication, we would be grateful if you could inform us accordingly, using this form. We would also welcome any suggestions you may have in the way of improvement.

Suggestions and/or corrections