

SIEMENS

Motion Control Information System

Tool Data Information (TDI)

Operator's Guide

Valid for

Control *Software version*
Motion Control Information System 1

06/2005 Edition

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SINUMERIK® Documentation

Printing history

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

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

Status code in the "Remarks" column:

- A** New documentation.
- B** Unrevised reprint with new order No.
- C** Revised edition with new status.

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This document has been created using WinWord V 8.0 and Designer V 7.0 and the documentation tool AutWinDoc.

Other functions not described in this documentation may 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 the contents of this manual for agreement with the hardware and software described. Nevertheless, differences might exist and we cannot, therefore, guarantee that they are completely identical. However, the data in this manual are reviewed regularly and any necessary corrections included in subsequent editions. We would be grateful for any recommendations or suggestions.

Preface

SINUMERIK Documentation

SINUMERIK documentation is organized in 3 parts:

- General documentation
- User documentation
- Manufacturer/Service Documentation

Please contact your local Siemens office for more detailed information about other SINUMERIK 840D sl/840D/840Di/810D publications and publications that apply to all SINUMERIK controls (e.g. universal interface, measuring cycles, etc.).

An overview of publications (updated monthly) indicating the language versions available can be found on the Internet at:

<http://www.siemens.com/motioncontrol>

Select "Support" → "Technical Documentation" → "Overview of Documents".

The Internet version of DOConCD (DOConWEB) is available at:

<http://www.automation.siemens.com/doconweb>

Structure of the documentation

The description includes details of areas of application as well as the scope of functions provided by the **Motion Control Information System Tool Data Information (MCIS TDI)**.

The documentation is divided into the following parts:

- Area of application and function of TDI
- Installation and configuration of TDI
- Tool data overview
- Tool handling
- Tool planning
- Server solution
- Stand-alone solution on the machine
- Tool plan generation
- Statistics

Target group

This documentation is intended for manufacturers of machine tools with SINUMERIK 840D, SINUMERIK 810D and SIMODRIVE 611D, and for TDI operators.

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Finding information

A table of contents and an index have been provided to help you find your way around the manual.

Safety information

This manual contains notices that you should observe to ensure your own personal safety, as well as to protect the product and connected equipment. Notices referring to your personal safety are highlighted in the manual by a safety alert symbol; notices referring to property damage only have no safety alert symbol. The warnings are shown below in decreasing order of danger.



Danger

Indicates an imminently hazardous situation which, if not avoided, **will** result in death or serious injury or in substantial property damage.



Warning

Indicates a potentially hazardous situation which, if not avoided, **could** result in death or serious injury or in substantial property damage.



Caution

Used with the safety alert symbol indicates a potentially hazardous situation which, if not avoided, **may** result in minor or moderate injury or in property damage.

Caution

Used without safety alert symbol indicates a potentially hazardous situation which, if not avoided, **may** result in property damage.

Notice

Used without the safety alert symbol indicates a potential situation which, if not avoided, **may** result in an undesirable result or state.

If several hazards of different degrees occur, the hazard with the highest degree must always be given priority. If a warning note with a warning triangle warns of personal injury, the same warning note can also contain a warning of material damage.

Qualified personnel

Start-up and operation of the device/equipment/system in question must only be performed using this documentation. The device/system must only be started and operated by **qualified personnel**. Qualified personnel as referred to in the safety guidelines in this documentation are those who are authorized to start up, earth and label units, systems and circuits in accordance with the relevant safety standards.

Correct usage

Note the following:

**Warning**

The unit may be used only for the applications described in the catalog or the technical description, and only in combination with the equipment, components and devices of other manufacturers where recommended or permitted by Siemens. This product can only function correctly and safely if it is transported, stored, set up, and installed correctly, and operated and maintained as recommended.



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1

1 System Overview

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1.1 Tool Data Information (TDI)

The **T**ool **D**ata **I**nformation (TDI) package is part of the **M**otion **C**ontrol Information System (MCIS) for machine tools.

1.1.1 Motion Control Information System (MCIS)

The **M**otion **C**ontrol **I**nformation **S**ystem (MCIS) is a reliable, flexible, and user-oriented information system for applications in mechanical production. It includes interfacing features with numerical controls and programmable controllers, which can be used to network machine tools, cells, lines, and even whole plants. As an integrated solution covering several task areas, MCIS provides a single control, recording, and evaluation platform within the production process.

Automated production systems comprise a number of different areas:

- Machining centers, CNC series machines
- Flexible lines
- Transfer lines
- Special machines
- Assembly lines
- Loaders and gantries

MCIS is made up of function packages, which are used both in pre-production and directly on production units. The individual packages are scalable, functionally harmonized, and can be mixed and matched to meet specific functional requirements.

Use these packages in production to make your production facility an integral part of your IT environment.

The MCIS packages provide a modern solution concept that uses both internationally accepted technologies in the hardware and worldwide standards in the software modules, methods, and interfaces. A range of process interfaces provides ideal support for the networking and integration of automation and production equipment. Standardized interfaces used in conjunction with standard software ensure investment protection and subsequent expandability.

This information network provides all the production data and information you need on each workstation at planning and production level both quickly and in a format that is always up-to-date.

This enhances the utilization and availability of machines and the efficiency of the whole plant as well as boosting productivity.

The following function packages are available:



Fig. 1-1 Overview of the MCIS function packages

Production Data Acquisition (PDA)

Production data management for the acquisition, evaluation, and visualization of machine, part, and order-related data and information.

Benefits: Production transparency.

Direct Numeric Control (DNC)

NC program management for the administration, archiving, and transmission of NC programs.

Benefits: Reduces the cost of NC program organization.

Tool Data Information (TDI)

Tool management for the visualization of tool stock and the timely provision of the necessary tools on the machine.

Benefits: Reduces tool stock in transit and minimizes machine downtimes.

Total Productive Maintenance (TPM)

Maintenance management to support preventive maintenance on the plant.

Benefits: Increases machine availability.

Remote Control System (RCS)

Service management for worldwide control access and automatic fault notification via e-mail or SMS in the event of a service being required.
Reduces downtimes by responding quickly to faults.

Benefits:

This information network provides all the production data and information you need at workstations at planning and production level both quickly and in a format that is always up-to-date. This enhances the utilization and availability of machines and the efficiency of the whole plant as well as boosting productivity.

1.2 Tool Data Information (TDI) system

Objective

Tool data management is one of the central tasks of CNC production. It requires smooth tool handling and a high degree of rationalization.

The Motion Control Information System Tool Data Information (MCIS TDI) provides the ideal solution for this task. It makes this rationalization potential transparent and provides functions that help take advantage of the potential savings revealed. It is suitable for use.

- On a single machine, flexible transfer line or an entire machine park,
- on highly-automated SINUMERIK 810D/840D/840Di NC controls or SIMATIC S7 controllers,
- for integrating tool setting stations or factory-wide tool management systems such as TDM by TDM Systems

MCIS TDI has the right connection concepts and functions for a complete overview of the tools used and for a closed tool data circuit in production.

1.2.1 Overview of modules

MCIS TDI is a modular system that can provide you with the ideal combination of tool management functions for every level of automation.

The following modules are available:

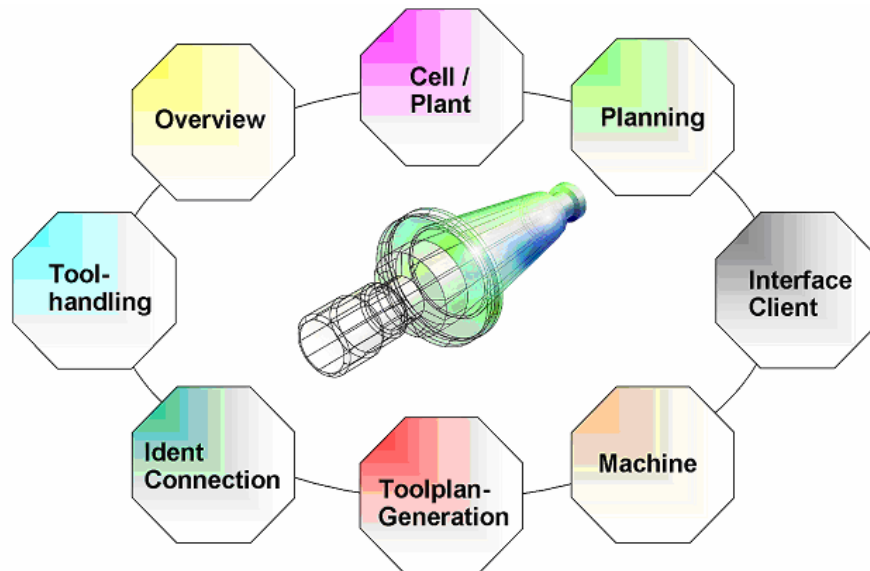


Fig. 1-2 MCIS-TDI module overview

TDI Cell/Plant

All available functions combined on a single server and network-wide operation of client-based interfaces.

- **TDI HMI:** An additional user interface for TDI Plant on a client PC

TDI Overview

Acquisition of actual data for the tool, evaluation options for the current tool stock with filters, and manual control of actual data for the tool.

TDI Tool Handling

Operator-controlled loading and unloading of tools on SINUMERIK 810D/840D/840Di and automatic data transfer in conjunction with the interface to the tool setting station.

TDI Planning

Planning of tool requirements based on current tool stock.

TDI Interface Client

Connection of external tool management and planning systems.

TDI Ident Connection

Connection of tool ID systems to SINUMERIK 810D/840D/840Di via Profibus or RS-232-C for reading and writing tool data.

TDI Machine

Stand-alone non-network-compatible function package for the actual tool data overview, tool planning and connection to tool setting stations for tool data transfer.

TDI Toolplan Generation

Help module for generating tool plans based on simulation of the corresponding NC programs.

1.2.2 Applications

All TDI modules have been designed to run both on single machines and on networks.

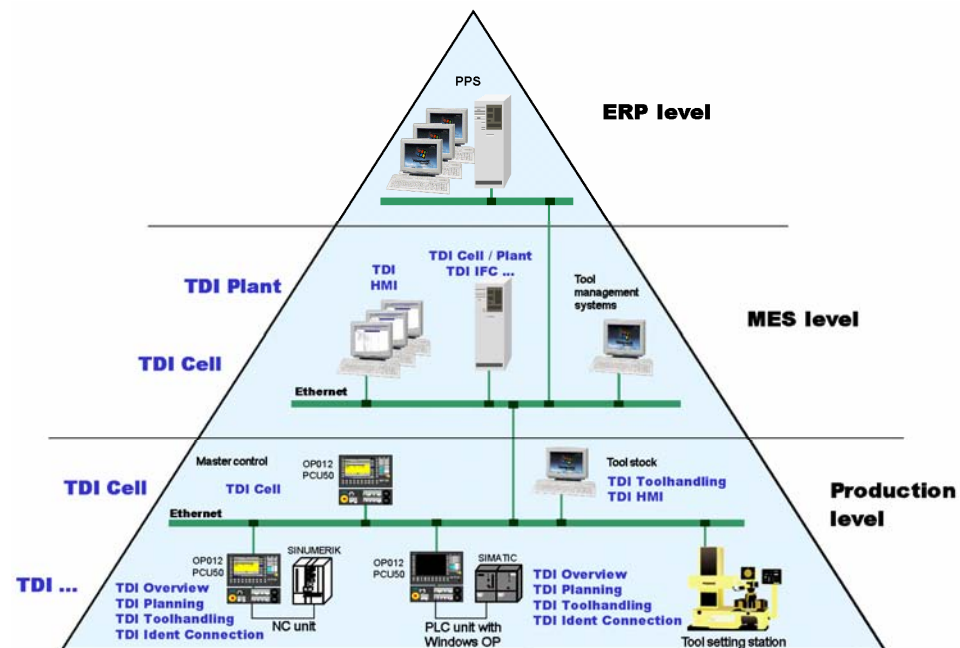


Fig. 1-3 Possible applications

As the system has been designed consistently as a client-server solution and features the use of the latest communication mechanisms based on HTTP/XML, it is possible to vary the distribution of the modules in the network and to access them from any position. This means up-to-date information can always be accessed wherever it is needed.

Production level

At production level, all MCIS TDI modules can be used. The modules provide both integrated interfaces for communicating with controllers and interfaces that can be used to access information about all tool data, to plan the use of tools, and to use data to move tools.

Shop floor level

Depending on the size of the plant, the server functions (central database, network compatibility of all installed TDI modules) can be installed on a single computer at this level. Here too, the operator can call up all the functions of individual modules (with the exception of the TDI Ident Connection).

Via the TDI Interface Clients, it is possible to provide interfaces to other shop floor systems, such as higher-level tool management systems (e.g., TDM by TDM Systems) or order planning systems (MCIS PDA).

ERP (Enterprise Resources Planning) level

The ERP level consists of a higher-level server system with a database, e.g., the SAP production planning system (PPS).

The ERP level handles customer order processing, accounting, production planning, and human resource planning.

Tool data can be made available on a project-specific basis at this level via TDI Interface Clients.

1.2.3 Solution versions

MCIS TDI modules can also be combined to create expanded configurations. This provides operators with optimum solutions for their requirements. In each configuration, the Customizing function ("online" as well as "offline" on PG/PC) provides a user-friendly means of making basic settings and enabling functions.

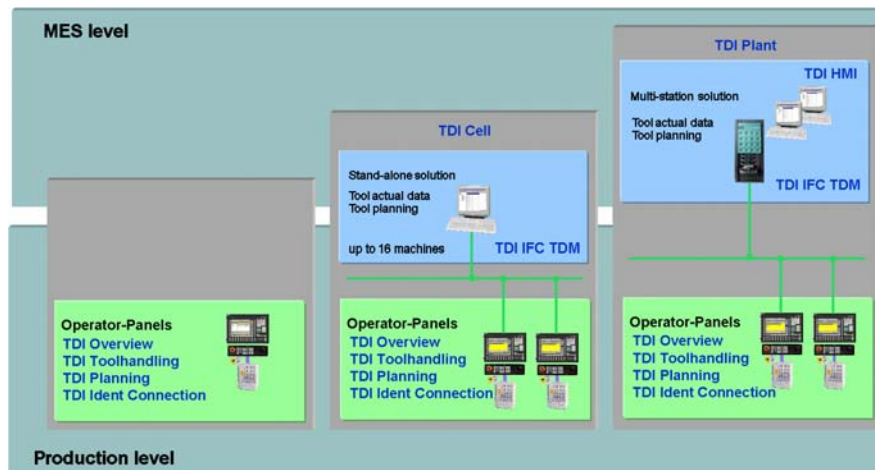


Fig. 1-4 MCIS TDI solution concept

Based on the existing TDI modules, the server functionality enables all units to be networked in such a way that for example an overview of all actual tool data can be displayed on a master control or on a control system. In addition, the functionality can be expanded via the TDI Interface Client (IFC) to include connection to other systems (e.g., PDA).

Two versions of the TDI Cell/Plant module are available:

1. TDI Cell: Single-user system for the connection of up to 16 machines
2. TDI Plant: Multi-user system with the option to interconnect a number of TDI cells

TDI Cell/Plant provides evaluation and monitoring functions not only at control room or office level but also across the entire network. Its modular structure permits the implementation of small or large systems distributed over several production areas.

In this type of networked solution, all functions installed in the system can be installed on other client PCs as operator front-ends using the TDI Plant module with the TDI HMI module.

1.2.4 Fundamentals

All TDI modules have been designed to run both on single machines and on networks. The separation of machine and group functions means that functions can run where they are required and the structure of a plant can be mapped precisely in the TDI area. The configurable interface design means that the interfaces can run both on a Windows PC and on Sinumerik operator panels under Standard or Transline HMI Pro.

The screenshot displays the TDI interface with the following elements:

- Top status bar: MCIS-TDI, CHAN1, JOG Ref, MPF0, Channel reset, Program aborted, ROV.
- Right sidebar: Filter >>, Details >>, Tool life 100%, Lock tool, Explorer off.
- Main area: [1] Actual Tool Data table.
- Left sidebar: System overview tree with Machine 7, Chain 1, WZSP T01, and BEMA T01.

C No.	Place	Tool identifier	Duplo no.	State	Planned batch size
2	1	Form cutter	1	F	300
2	2	Drill 10mm	1	F	250
2	3				
2	4	Roughing tool	1	F	480
2	5				
2	6	Special tool	1	F	1000
2	7	Drill 12mm	1	G	350
2	8	T-slot cutter 14mm	1	V	130
2	9				
2	10				
2	11				
2	12				

Bottom status bar: Actual tool data, TDI 1.0.80

Fig. 1-5 Operational layout in the standard Sinumerik 840D environment

Operation via softkeys can also be selected on the PC version under "Options":

1.2 Tool Data Information (TDI) system

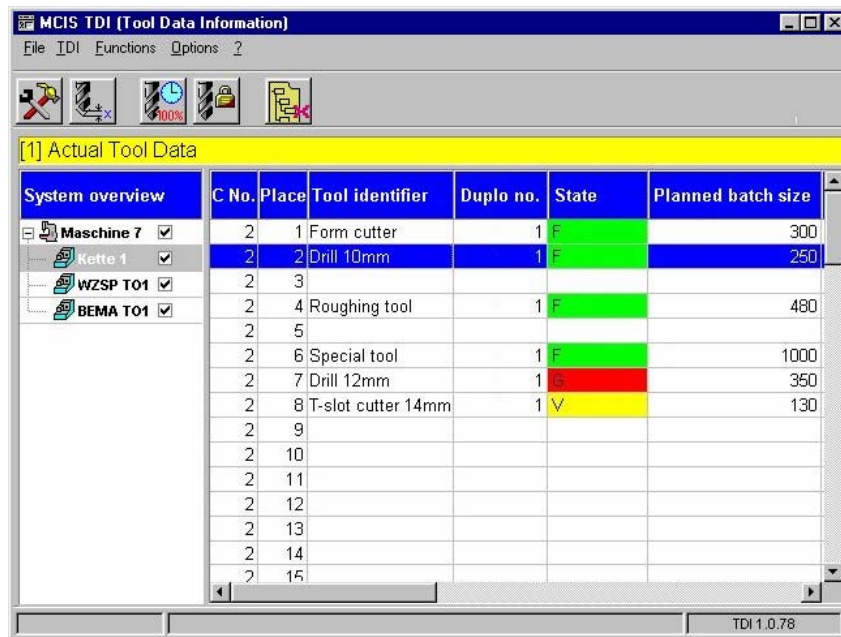


Fig. 1-6 Operational layout on a Windows PC

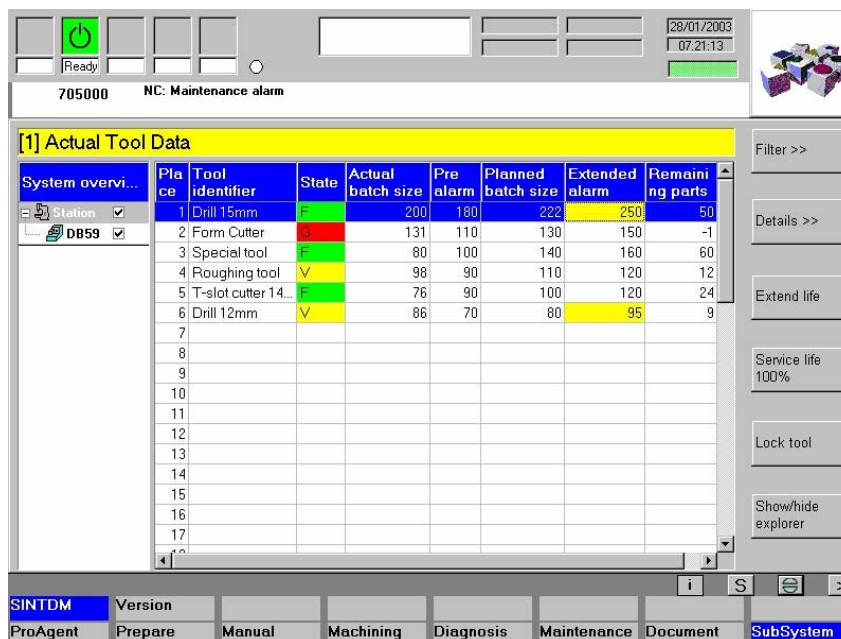


Fig. 1-7 Operational layout of Transline HMI Pro on Sinumerik 840D

Network operation

TDI Cell/Plant can be used to establish communication between individual modules via Ethernet and to collect acquired data in a central database. In addition to standard data, the module also has features for managing tool master data, tool plans, and orders.

TDI Cell

TDI Cell can be installed on a host computer or a master control under MS Windows NT or XP. Up to 16 machines can be connected to one TDI cell.

TDI Plant

TDI Plant also provides functions for large production plants (interconnection of a number of TDI cells or single-user machines).

TDI HMI can be used to install the interfaces of the installed modules on other operator clients on the network.

Plant structure

The individual components to be managed are defined in the module. The plant configuration can consist of up to 5 levels.

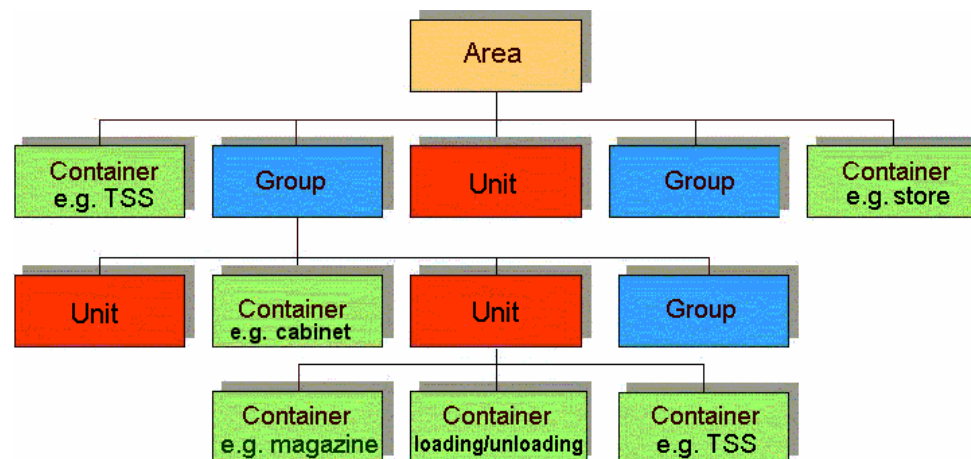


Fig. 1-8 Plant configuration

1. Level:

Entire plant (max. 1 area per plant)
Overview of all connected units.

2. Level:

Group level (max. 20 groups per plant)
Grouping of individual machines and tool store/tool setting stations for whole groups as well as individual machines.

3. Level:

Unit level (max. 200 units per plant)

Individual machines, subgroups, and tool stores/tool setting stations for whole machines.

4. Level:

Machine magazine (max. 600 containers per plant)

Image of the machine magazines on a machine and its directly assigned external magazines.

Note

The scalability of the server and its ability to be distributed over several PCs makes for improvements in performance and fail-safety within the plant in projects through Customizing.

Plant components

The following plant components can be managed in TDI:

- Sinumerik 840D/840DI/810D with standard tool management (integration is project-specific for systems without tool management or with customized tool management).
- SIMATIC S7 with DB 59 via OPC server.
- Non-Siemens controls via OPC server (must be adapted to specific project).
- PC-based control systems (e.g., MCIS PDA or TDM by TDM Systems)
- External tool stock (e.g., preset tools or second-hand tools without machine assignment).

1.2.5 Scope of supply

MCIS TDI is supplied on CD. The CD contains all modules whose functions can be used once an appropriate license has been purchased, including online help.



2

2 Installation/Configuration

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2.1 System requirements

The MCIS TDI module interfaces have been designed to run and operate both on a SINUMERIK platform (function keys) and on a PC platform (pull-down menus).

A prerequisite for SINUMERIK 810D/840D/840Di is the installation of default tool management. SINUMERIK systems without default tool management/machine manufacturer-specific tool management can be configured as S7-based machines or must be connected on a project-specific basis.

In the case of non-Siemens controls, the manageable tool data are reduced to a simplified tool data structure (see Chapter 3: Configuration, tool magazine with PLC-based tool management). A basic precondition is that the component must be Windows-based, the control must be accessible via Ethernet, and the interface must be OPC-compatible.

If you want TDI to acquire and manage tools stored in tool cabinets, you must assign the storage location a TDI tool handling user interface for loading and unloading tools (e.g., a Windows PC on the network).

2.1.1 Requirements

Table 2-1 General system requirements

NC unit (production level)	<ul style="list-style-type: none"> • SINUMERIK 810D / 840D / 840Di • PCU 50 / 70 (min. 256 Mbyte RAM) • OP 010 / OP 012 / TP 012 / OP 015 / OP 015A • MS-Windows NT 4.0 SP6a: <ul style="list-style-type: none"> - HMI Advanced 6.0, 6.1, 6.2 - HMI PRO 3.2, 6.1 (optional) • MS-Windows XP Professional: <ul style="list-style-type: none"> - HMI Advanced 6.3 - HMI PRO from 6.1 (optional) • Standard tool manager or DB59
PLC unit (production level)	<ul style="list-style-type: none"> • SIMATIC S7-300 / S7-400 / WinAC • PCU 50 / 70 (min. 256 Mbyte RAM) • OP 010 / OP 012 / TP 012 / OP 015 / OP 015A • MS-Windows NT 4.0 SP6a: <ul style="list-style-type: none"> - HMI Advanced 6.0, 6.1, 6.2 - HMI PRO 3.2, 6.1 (optional) • MS-Windows XP Professional: <ul style="list-style-type: none"> - HMI Advanced 6.3 - HMI PRO from 6.1 (optional)

PCU (production level)	<ul style="list-style-type: none"> • PCU or actual standard PC (min. 256 Mbyte RAM) • PROFIBUS DP/MPI or Ethernet interface • MS-Windows NT 4.0 SP6a Workstation / Server (in addition, client access licenses) • MS-Windows 2000 Professional / Server (in addition, client access licenses) • MS-Windows XP Professional (in addition, client access licenses) • OPC server (SIMATIC NET SOFTNET-S7)
Server hardware (Shop floor level)	<ul style="list-style-type: none"> • Server multi-CPU's depending on the requirement (min. 1Gbyte RAM) • Hard disk acc. to the requirements (e.g., Cell: from 1 GB and above, Plant: 3x 36GB (RAID 5)) • MS-Windows 2000 Server (in addition, client access licenses) • MS-Windows Server 2003 (in addition, client access licenses) • Server database system (ORACLE 9 or SQL server) • Internet Explorer
Client PC (Shop floor level) HMI	<ul style="list-style-type: none"> • Standard PC (Pentium III or higher, min. 256 Mbyte RAM) • MS-Windows 2000 Professional • MS-Windows XP Professional • Internet Explorer
To integrate existing machines:	
SINUMERIK with MMC103 (Production level) IFC, machine	<ul style="list-style-type: none"> • SINUMERK 810D / 840D • MMC 103 (min.64 Mbyte RAM) • PC/ISA adapter with Ethernet interface • OP 031 / OP 032 • MS-Windows 95: <ul style="list-style-type: none"> - MMC software release 4.4, 5.3 - TDI Ident Connection, only from 5.3 and above • Standard tool manager or DB59

2.1.2 Constraints

- Unrestricted administrator rights are required for installation on a PC or PCU/MMC.
- Microsoft Internet Explorer 5.0 or higher is required to run MCIS TDI. You will find version 5.5 with SP2 for MS Windows 9x, NT 4.0 in folder "IE55SP2" on the installation CD.
- Adobe Acrobat Reader is required for reading the online documentation. You can find it on the installation CD in folder "ADOBE".
- Microsoft Winsock 2 must be installed for MMC 103 with Windows 95. You can find the setup on the installation CD in folder "Winsock2".
- The TCP/IP protocol must be installed and it must be possible to enable drives.
- If an SQL database is to be used (e.g., TDI Cell, external tool magazine) and no SQL server is available locally or on the network, MSDE must be installed on one computer. You can find the setup on the installation CD in folder: "SQL/MSDE".
Current versions of the operating systems (the service packs you need) can be found in Siemensd.txt on the installation CD.
- Before updating the MCIS TDI software, you must terminate the running TDI service "TDI-Server". After the update, the service must be restarted.
- When operating at the machine, NUMLOCK must be switched off.
- During PC installation of MCIS-TDI, power management must be de-activated on the PC. Otherwise the services required by MCIS TDI may not be available.
- If additional magazines (RPC, PLC or SQL) are to be configured on a control with auto configuration, the auto configuration for this control must first be switched off I in "TDI configuration".
- On the master computer, the default host name "localhost" must be changed into either an IP address, the PC name or a DNS alias.

The default host name "localhost" has been determined on the part of MCIS TDI for the following reasons:

- the acquired IP address might change if a DHCP is used
- the PC name might possibly not be resolved via a router.

For HMI PRO installation, MCIS TDI must only be installed in a version intended for HMI Pro. Please ask your Siemens support contact if you require this.

2.2 Installation

Note

As most controls do not have a CD-ROM drive, we recommend that you copy the content of the installation CD to a separate directory on the hard disk of the PCU via a PG and launch it from there.

This directory should be deleted once installation has been completed in order to free up additional memory space on the hard disk.

If the control is integrated in a network, installation can also be started from there. In accordance with the above restrictions, if necessary, the additional components described above should be installed in advance.

Installation process

Launch "setup.exe" and choose a setup language:



Fig. 2-1 Language selection

Confirm your selection with "OK".

The installation process starts once you have clicked OK in the welcome dialog box.



Fig. 2-2 Preparing setup

If this is a new installation, the license agreement will appear:

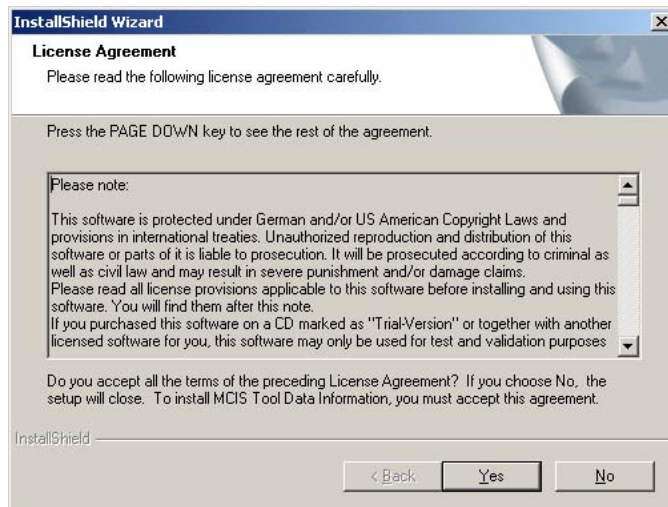


Fig. 2-3 License agreements

2.2.1 MCIS database preparation

All MCIS products use a common database, which is also used for the web-based type of all MCIS products. The MSDE is supplied as standard.

General

Selected interfaces are also available in a web-based form for all MCIS products. The MCIS web interfaces consist of an independent module and must be purchased separately. The interfaces are installed from a separate installation CD.

Installation

A common database is required for all MCIS products. With the "Standard database server" option, the MSDE will be installed and initialized, if not yet available.

The MSDE will not be installed with the option "...use existing server". In the next setup step, the connection parameters must be entered.

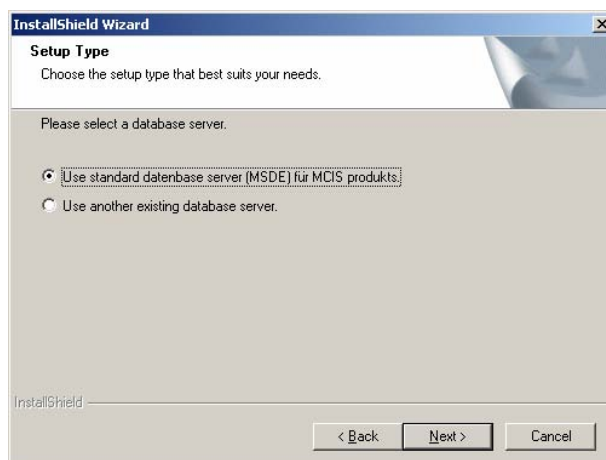


Fig. 2-4 Initializing MCIS database

If you click on "Next >" you will obtain a screen form in which you can enter the parameters for the required database.

Fig. 2-5 Entering parameters into the MCIS database

- "DB server"
Server selection
- "Name of the DB server / IP"
Server name or IP address of the SQL server
- "User"
Database user name (Note: Only required if you are not working with integrated security)
- "Password"
Password for database user name (Note: Only required if you are not working with integrated security)
- "Name of Database"
Name of the database that is to be used

After having entered all parameters, click on "Test connection".

The system now tries to establish a connection with the set parameters. If establishing the connection has been successful, MCIS and TDI-specific tables, functions and procedures will be set up, if not yet available.

If the connection has been successfully established and all tables are available, press the "Continue>" button and continue the installation with "Install programs".

2.2.2 Installing programs

After you have confirmed your acceptance of the license agreement, you can install the necessary programs.

Special steps for PG/PC

If the software is installed on a PG/PC, you have the option (as opposed to when software is installed on a SINUMERIK 840D) of choosing whether to install the MCIS TDI configuration in addition to the components for MCIS TDI. Operators can make their selections by checking the boxes in front of the two options.

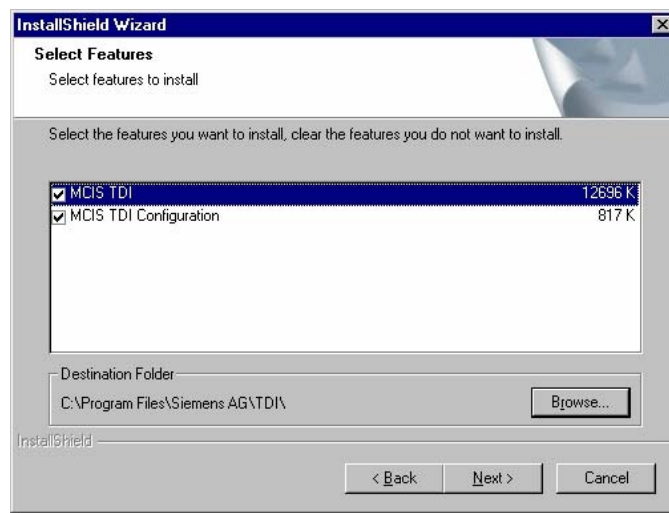


Fig. 2-6 Selecting components to install

Click "Next" to activate the "Start Copying Files" screen. If the program is being installed on a CNC, the "Start Copying Files" screen will appear once you have accepted the license agreement. The current settings and installation paths appear for you to check.

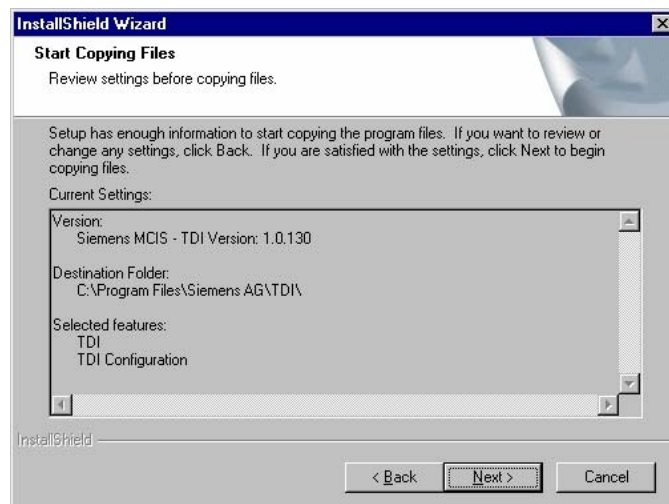


Fig. 2-7 Copying files

Click "Next >" to start the installation or "< Back" to make a correction to your settings.

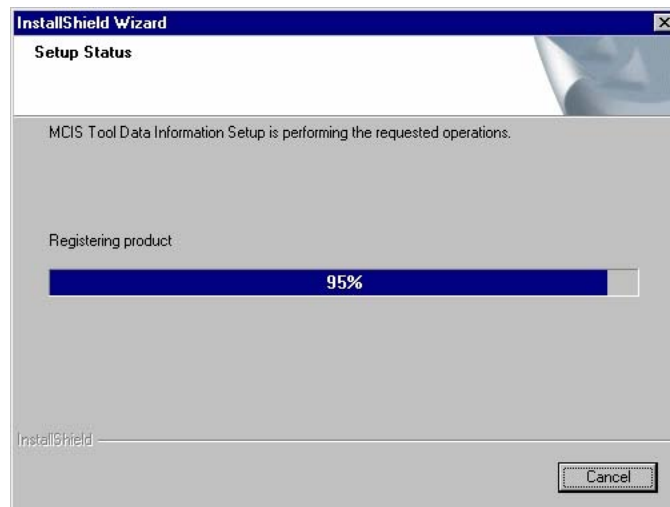


Fig. 2-8 Setup status display

The "InstallShield Wizard Complete" screen indicates the end of the setup process. Click on "Finish".

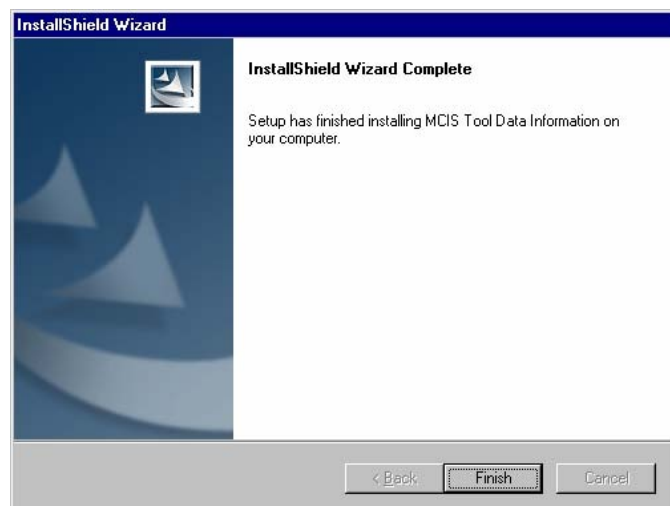


Fig. 2-9 Installation complete

Note

On an MMC103 or PCU 50/70, MCIS TDI is part of HMI Advanced. The next free task number is identified and suggested by MCIS TDI. You can either accept the suggested task number or change it. If you decide to change the task number, you must make sure that the new number is not already in use by other programs. This affects the following files:

..\add_on\regie.ini	Task number entry
..\add_on\language\re_gr.ini	Language-dependent labeling of corresponding softkey

In the event of subsequent changes, the task number can also be modified manually (following software installation). To do this, modify the "regie.ini" and the ini file for the appropriate language (e.g., re_gr.ini) in the language directory.



Important

A system reset may be required on some systems following installation of the Microsoft® database access components. In this case, Windows® must be restarted in service mode on the machine. Setup is subsequently restarted with the /continue parameter from the point at which the installation process was interrupted.

Note

If a dialog box suggesting a Windows® restart appears at the end of the installation process, you should restart Windows®. Setup will automatically restart Windows® when you click on "OK" in this dialog box.

2.2.3 Changing, repairing, uninstalling programs

Should you wish to modify, repair or remove programs following successful setup, you can proceed in either of two ways:

1. Launch setup.exe again from the CD.
2. Via the Windows Control Panel: Settings -> Control Panel -> Add or Remove Programs -> Change or Remove Programs -> MCIS Tool Data Information -> Change/Remove.

Whichever method you choose, a screen will appear in which the following functions can be selected:

Changing a program

This window allows you to re-install or remove MCIS TDI components.



Fig. 2-10 Changing programs

Repairing programs

If MCIS TDI components are damaged, this function can be used to restore them to their initial status.

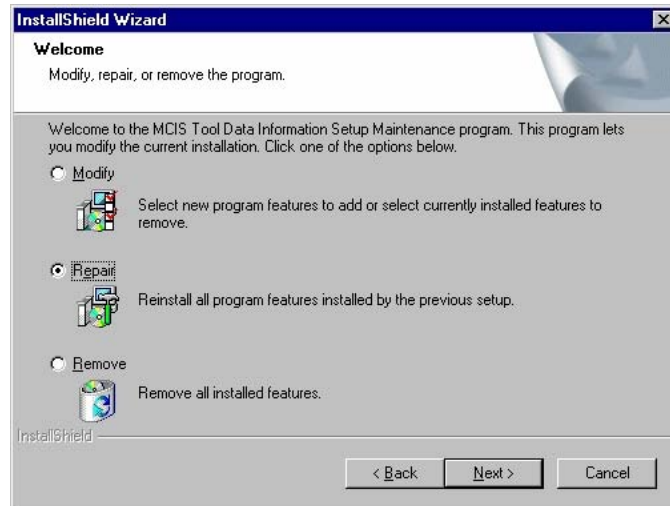


Fig. 2-11 Repairing programs

In order to save the configuration data, you must save the MCIS TDI folders in the "States" and "Data" installation paths before initiating this action.

Deleting programs

This function can be used to uninstall all programs.



Fig. 2-12 Removing programs

You can then choose whether or not to maintain the user settings (states and data configuration, user setting and user management folders) or to remove TDI completely.



Fig. 2-13 Keeping the user settings

2.3 Configuration

2.3.1 General

The configuration tool provides a user-friendly Windows-based user interface for customizing the plant/single-user machine. It can be used to make all settings "offline" on a PG/PC or directly on the machine.

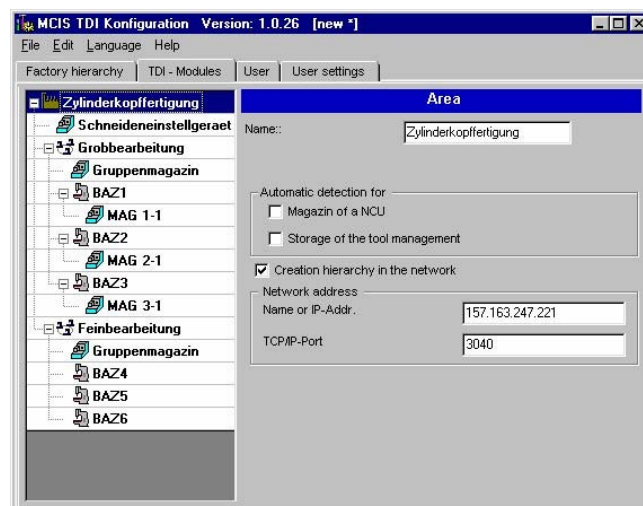


Fig. 2-14 TDI configuration on PC

The configuration tool comprises a number of areas.

Configure plant (tab sheet: Factory hierarchy)

The Explorer structure of the plant is configured in this area. New components such as

- Groups (e.g., CPU)
- Units (e.g., machine)
- Magazines

can be added or removed and the plant can be structured.

Enable TDI modules (tab sheet: TDI Modules)

In this window you can enable individual modules depending on the licenses you have purchased.

User management (tab sheet: Users and User settings)

Users/user groups are configured in this area and rights and default settings are specified for each user.

Depending on whether the configuration is being carried out on a PC or a PCU (HMI), a number of different plant components can be configured.

All components are available on a PG/PC:

- Groups (e.g.: CPU)
- Units (e.g., machine)
- Magazines (containers)

Note

Areas cannot be set up on the PCU (unit). An area can only be configured with TDI Cell/Plant.

Once the TDI configuration has been selected, the individual components of the unit/plant can be defined. The Explorer structure appears on the left-hand side of the screen. Depending on the components to be configured, prompts relating to settings appear on the right-hand side of the screen. One unit is set up as a default setting in the Explorer tree.

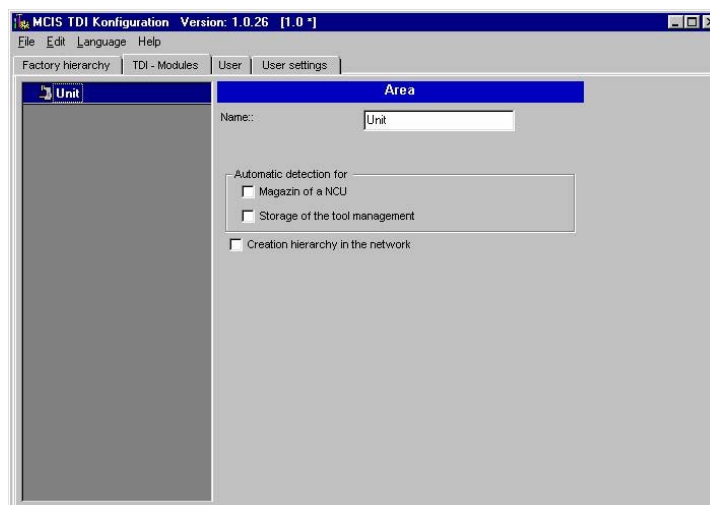


Fig. 2-15 Configuring a unit

Note

The process of making changes is usually completed by clicking the "Apply" or "Cancel" button. If this is not the case, when an attempt to save the data is made, a message box will appear, which must be acknowledged with "Yes", "No" or "Cancel".

The user can assign a version ID to the current configuration using the pull-down menu "Edit" and "Version of the configuration...". For the purposes of subsequent identification in the network in connection with TDI Cell/Plant, every configuration is assigned an ID stamp (CRC32).

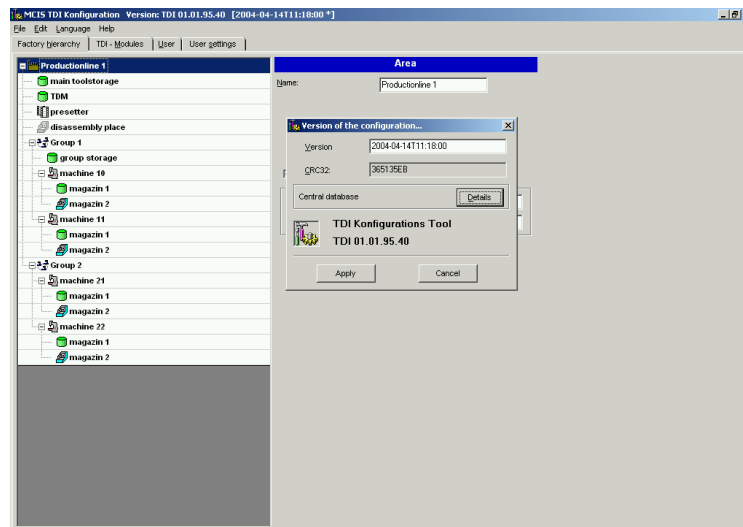


Fig. 2-16 Configuration properties

You obtain the following fields in the "Version of the configuration..." window:

- "Version"
Freely assignable version ID (Default: Date and time of the data save operation)
The version ID is saved using the "Apply" button and the entry is rejected with "Cancel".
- "CRC32"
Identification stamp from the configuration file
- "Details"
Calls the configuration data for the central database.
You obtain the following window by pressing the "Details" button:

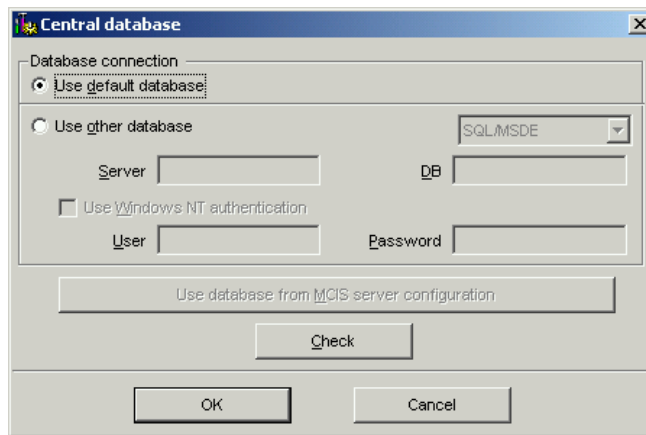


Fig. 2-17 Database access

- "Use default database"
When you select this option, the existing Microsoft Access database (AreaDB.mdb) in subdirectory "Data" in the installation directory on the target computer is used.
- "Use other database"
When you select this option, you can configure one of the following databases in the selection box.

SQL/MSDE or Oracle

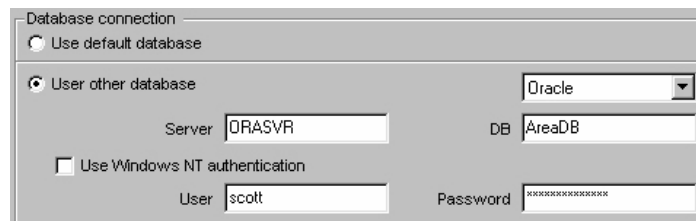


Fig. 2-18 Use Oracle database, PC

- "Server"
Server name or IP address of SQL server.
- "DB"
Name of database to be used.
- "Use Windows NT authentication"
This setting means that database login is handled according to MS Windows NT security mechanisms. The "User" and "Password" fields are deactivated accordingly.
- "User"
Database user name (Note: Required only if you are not working with integrated security).
- "Password"
Password for database user name (Note: Required only if you are not working with integrated security).

The database is checked for plausibility when pressing the "Check" button.

The version ID appears in the header between square brackets after the version of the configuration tool.

Note

There is only one version of the configuration. When you save the configuration using pull-down menu options "File" -> "Save", the existing configuration is always overwritten.

When you select pull-down menu options "File" -> "Reload", the configuration you last saved is restored again.

When you select pull-down menu options "File" -> "New", a new configuration with one unit is set up.

The configuration is not changed automatically if it has been modified by another application. The configuration is updated only when you restart the computer or select pull-down menu options "File" -> "Reload".

2.3.2 Configuring components on the PC

All components of a plant can be created and configured on a PC/PG. Once the configuration is complete, the configuration file can be transcribed to the relevant plant components,

see Chapter "Importing Existing Plant Components"/
"Exporting Created Configurations".

The default unit can be used as a starting point and other components added to it via the "Edit" function button or by selecting "Unit" and clicking with the right mouse button.

The following cases are possible:

Adding a group

This function can be used to create a new group with two additional new units using the default unit as a starting point. Clicking "Accept" automatically moves the default unit upwards (Group) in accordance with the plant hierarchy.

A new name can be allocated by selecting the relevant components.

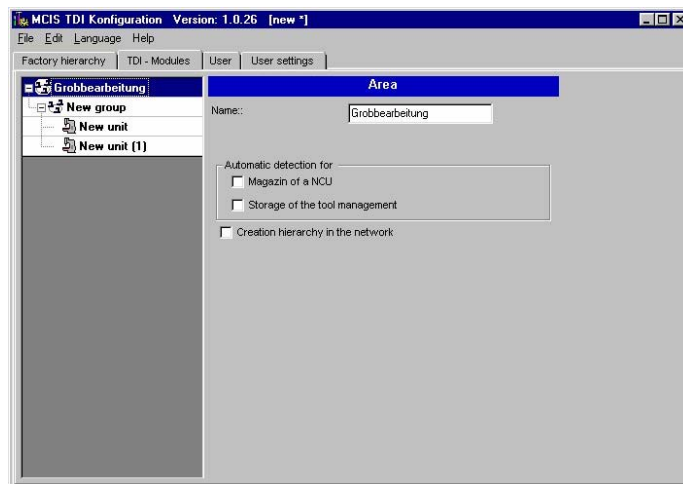


Fig. 2-19 Adding a group, PC

Adding a unit

This function can be used to add a new unit. The position of the unit within the Explorer hierarchy is determined by the position of the cursor when the unit is being added. The position of the component within the hierarchy can be modified subsequently by dragging and dropping.

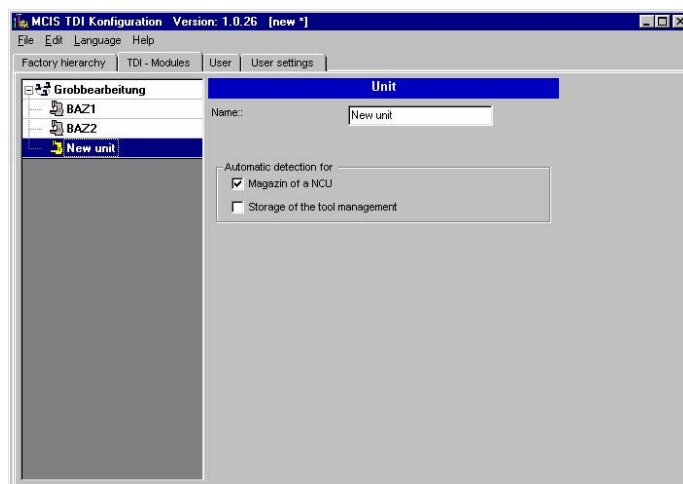


Fig. 2-20 Adding a unit, PC

If you are using the default tool management system, you can activate the "Automatic detection for" function for each unit by selecting:

- "Magazine of a NCU"
Automatic detection of all tool magazines active in the NCU (unit)
- "Storage of the tool management"
The default tool management cabinet appears as a stand-alone magazine in Explorer.

If one of the two options is activated, the color of the icon representing the unit changes from gray to yellow. You will not then be able to add any more magazines.

Note

If automatic magazine detection is activated, a magazine detection run will be executed (according to the selected option) every time you restart the control (Power Reset). Generally speaking, you can deactivate the options for "Automatic magazine detection" when you have finished the system startup.

If, when configuring the standard tool manager, a name was not assigned to the magazine, then instead of the general magazine names, TDI applies the magazine numbers.

Adding magazines

This function can be used to add a new tool magazine. The position of the magazine within the Explorer hierarchy is determined by the position of the cursor while the magazine is being added. The position of the component within the hierarchy can be modified subsequently by dragging and dropping.

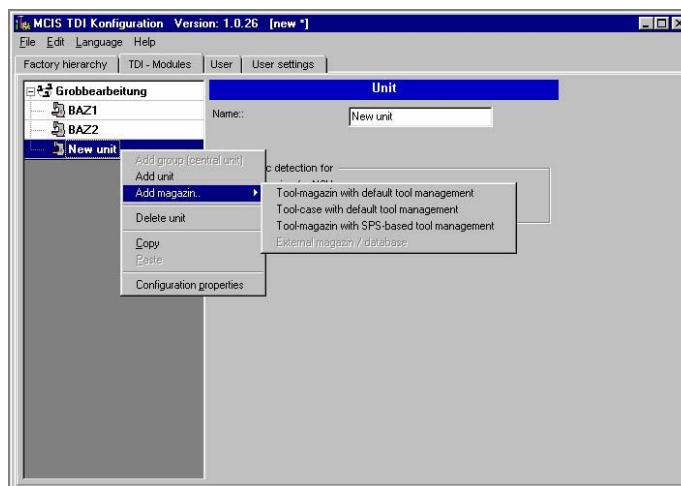


Fig. 2-21 Adding a magazine, PC

When adding a magazine, you must specify the type of tool magazine.

The following options are available:

- Tool-magazin with default tool management
- Tool-case with default tool management
- Tool-magazin with SPS-based tool management (e.g., in Transline HMI Pro with DB xx or machine manufacturer-specific tool management)
- External magazine/database
e.g., for machine manufacturer-specific tool management

Note:

If an external tool magazine does not have dedicated management, TDI will assume the tool management role.

On a unit with default tool management, unlike automatic and complete detection of all configured tool magazines, this function can be used to display specific individual magazines.

Note

If magazines have been configured for units on a PC, once the configuration is complete it must be exported to the units concerned (see Import/Export Functions).

The following configuration options are available for creating the various tool magazines in Explorer:

Creating a tool magazine with default tool management

The following settings must be made to create a unit magazine with default tool management as a magazine.

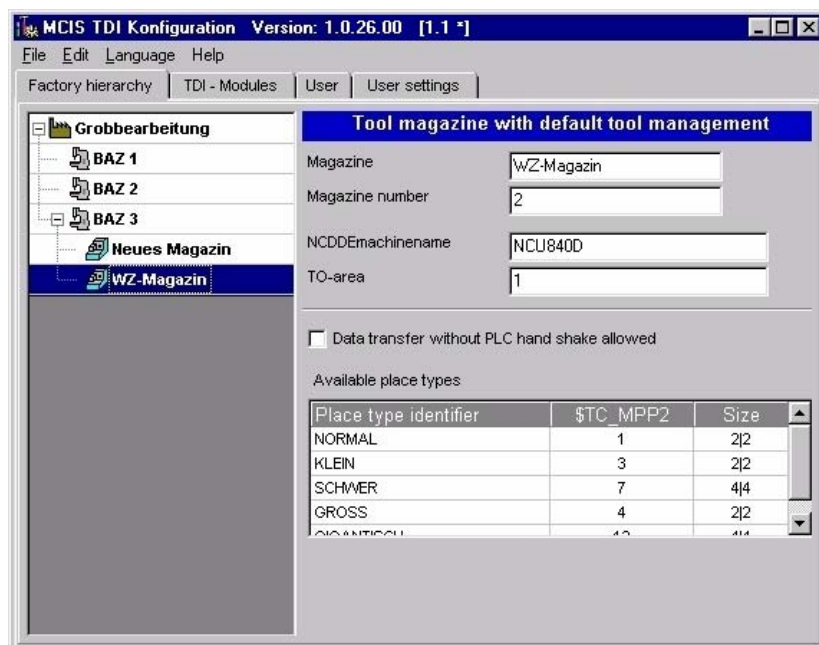


Fig. 2-22 Tool magazine with default tool management, PC

- "Magazine"
Specification of magazine name (Note: The name can be the same as the name of the corresponding magazine in default tool management, see TO-INI.INI in NC-active data \$ TC _ MAP2 [< Mag.No.>]=<Mag-Name>.)
- "Magazine number"
Specification of magazine number (Note: The number must be the same as the number of the corresponding magazine in default tool management, see TO-INI.INI in NC-active data on unit \$ TC _ MAPX [< Mag.No.>].)
- "NCDDEmachinename"
Specification of NCDDEMachineName (Note: The name must be identical to the entry in MMC.INI of the unit).

- "TO-area"
Definition of the TO area (Note: TO area in which the magazine is valid).
- "Data transfer without PLC handshake allowed"
If you add complete tool containers (e.g., tool cartridges) to the machine, or insert single tools directly in magazine locations, you can use this function to deactivate scanning of PLC acknowledgements. In other words, the tool data are entered directly in the magazine list when tools are managed with the TDI Tool Handling system. For further details, please refer to section TDI Tool Handling.
- "Available place types"
When automatic magazine detection is active, the magazine location types are detected for the default tool management and entered in the table for the relevant magazine. The table cannot be modified.

Note

The "Place type identifier" and the "Size" are read from the MS-ACCESS file "WZACCESS.MDB" in default tool management. If this information is not available, the table headings are empty.

The location type defines the kind of location in the magazine. With the allocation of location types to magazine locations, the magazine is subdivided into areas when the standard tool management system of the SINUMERIK 840D is configured.

It is only possible to load a tool to a location of the appropriate type. It is therefore possible to assign various types of special tool, e.g., "oversized", "heavy", to specific locations. There is no need to apply fixed location coding for this purpose. When you load a tool, you must ensure that the type of magazine location (\$TC_MPP2) matches the location type you entered in the tool-specific data (\$TC_TP7) of the tool setting station.

The machine manufacturer assigns location types when configuring / starting up the machines. In this context, ambiguities may arise between individual machines and manufacturers in relation to the following definitions:

- Name of location type
- Type of magazine location (\$TC_MPP2)
- Size and form of location in magazine.

The operator must check to ensure that all location types are clearly defined on all machines in the plant.

Table 2-2 Example illustrating ambiguities in location type definition:

Machine 1	Name of location type	Type of magazine location (\$TC_MPP2)	Size Total width Total height
	Normal	1	2/2
	Large	2	4/4
	Heavy	3	2/2
Machine 2	Normal	1	2/2
	Large	2	2/2
	Heavy	4	2/2

The example above illustrates the following problems:

- Different tool sizes are defined for location type "Large", i.e., if a tool is set with tool-specific data \$TC_DP7 = 2 for machine 1 and then loaded to machine 2, there is a risk of collision as the tool management in machine 2 is programmed to reserve only one magazine location for magazine location type \$TC_MPP2 = 2.
- Different magazine location types \$TC_MPP2 are defined for location type "Heavy", i.e., if a tool is set with tool-specific data \$TC_DP7 = 3 for machine 1, it will not be possible to load this tool to machine 2 because magazine location type 3 is not defined for the tool management in machine 2.

Creating a tool cabinet with default tool management

The following settings must be made in order to create the tool cabinet with default tool management as a magazine.

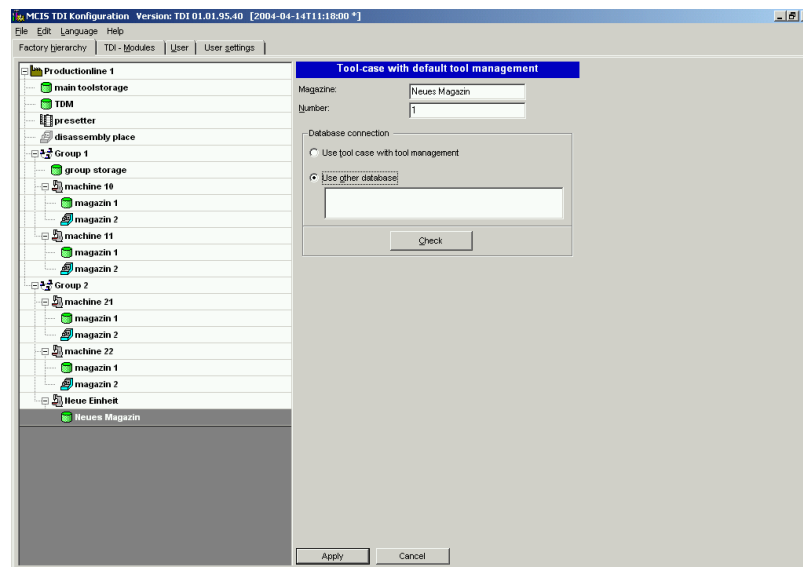


Fig. 2-23 Tool cabinet with default tool management, PC

- "Magazine"
Specification of magazine name (Note: Freely selectable).
- "Number"
Specification of magazine number (Note: You should accept the magazine number suggested by the TDI configuration).
- "Use tool case with tool management"
If this option is selected, TDI will use the default tool management data.
- "Use other database"
If the tool data is being managed in a database area other than that used by the default tool management, you can enter the database path for the tool magazine created here.

Example: Managing a tool cabinet on a PC:

Provider=Microsoft.Jet.4.0;Data Source=c:\EigeneDateien\WZACCESS.mdb

Note

A provider does not have to be supplied for MS ACCESS.

- "Check"
The data that have been entered are subject to a plausibility check. The entries can only be incorporated in the configuration file using the "Apply" button after this check has been successfully completed.

Creating a tool magazine with SPS based tool management

The following settings must/can be made to create a tool magazine for SPS-based tool management:

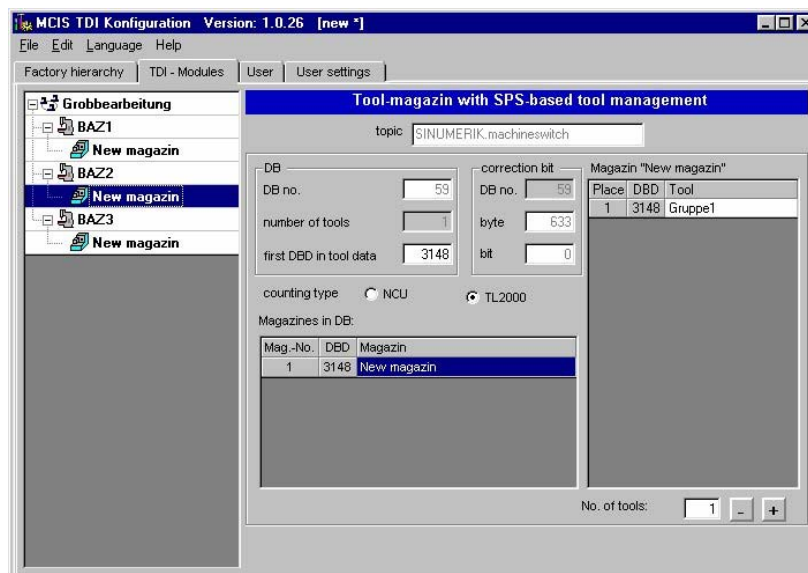


Fig. 2-24 Tool magazine with SPS-based tool management, PC

Setting data blocks

"Topic"

Information required for setting up OPC communication as a link to a specific NC or SIMATIC S7. A separate topic must be specified for each unit.

A protocol ID and a unique, protocol-specific connection name for the OPC server must be specified in the "Topic" input field for each station. This connection name is specified during Simatic S7 configuration.

Syntax example: S7:[S7-Connection-1]

More detailed information about the protocol ID and the connection name can be found in:

References: // SIMATIC NET – CD: Industrial Communication With PG/PC, Chapter OPC
Process Variables for SIMATIC NET -> S7 Communication.

Selecting data blocks:

By default, DB59 is used with a maximum of 96 tools. The tool data is stored starting at data word 3148 (if there are 48 tools, tool data is saved from data value 1908).

The following fields appear for information:

- "DB no."
- "number of tools"
- "first DBD in tool data"

Note

The following DBDs are used (= managed tool data in the DB) in the DB for each tool (see tool identifier assignments):

- DBD 1 = Actual value (actual value of tool life in Transline)
- DBD 2 = Prewarning limit (prewarning in Transline)
- DBD 3 = Extended alarm
- DBD 4 = Setpoint (alarm limit in Transline)

This assignment is also valid for other DBs.

Offset bit

The offset bit is set whenever changes are made to tool offsets/monitoring data under "Details" in the TDI Tool Actual Data Overview screen. The default setting for the address of DB59 is:

- DB no. = 59
- Byte = 633
- Bit = 0

This byte address can be changed, but only in accordance with the structure of DB59.

Counting type

There are a number of options for the tool life counting type in TDI:

- **Option: NCU**
The actual value is counted down from 100% (= setpoint) to 0.
- **Option: TL2000**
The actual value is counted up from 0 to 100% (= setpoint/extended alarm).

Assigning tool identifiers to machine magazines

The tools in the magazine must be added to the "Tool" column in the "New magazine" list box for each magazine with the tool identifier and on a location-specific basis.

Defining tools for magazine locations

The number of magazine locations required is defined in the "Number of tools" input field. The plausibility of the number of tools specified for each magazine is checked.

Creating additional magazines

If additional magazines are to be created in DB 59 within the selected unit, this is done by selecting the unit in the Explorer structure and adding the magazines.

The new magazine is added to the "Magazines in DB" list box.

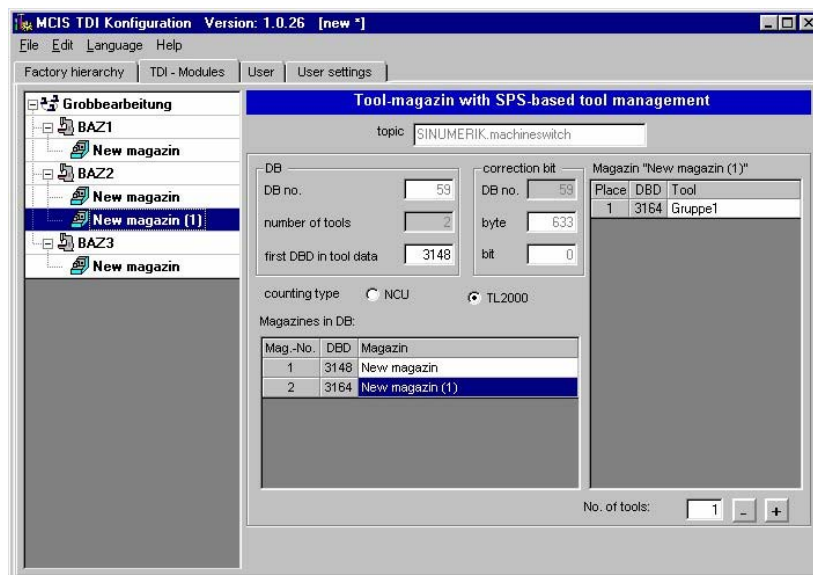


Fig. 2-25 Creating additional magazines, PC

Creating an external tool magazine / database

You must make the following settings if you intend to use an external tool cabinet or database (e.g., MSDE, Oracle, MS Access) to store tool data.

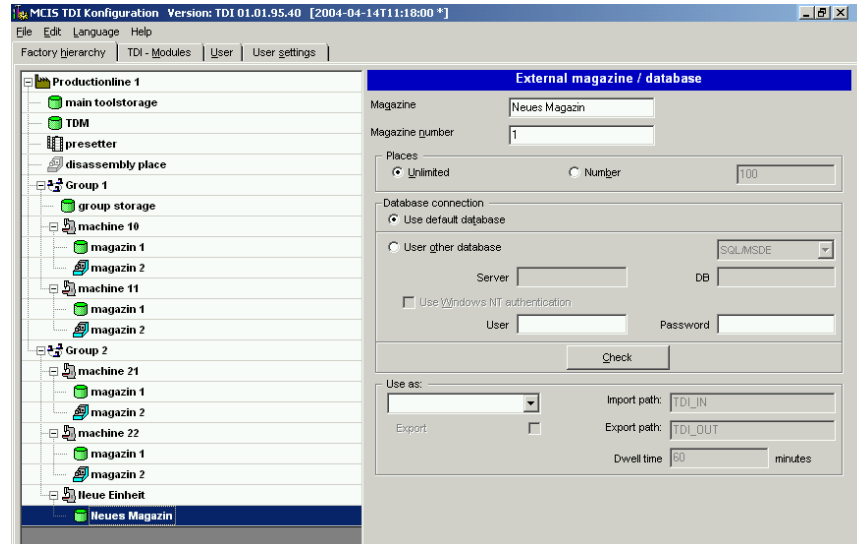


Fig. 2-26 External magazine / database, PC

- "Magazine"
Specification of magazine name (Note: Freely selectable).
- "Magazine number"
Specification of magazine number (Note: You should accept the magazine number suggested by the TDI configuration).
- "Places"
Define the number of magazine locations
 - "Unlimited" means no limit on the number of locations
 - "Number" limits the number of locations to the set number
- "Database connection"
 - "Use default database": When you select this option, the existing Microsoft Access database (AreaDB.mdb) in subdirectory "Data" in the installation directory on the target computer is used.



Fig. 2-27 Use default database, PC

- "Use other database"
When you select this option, you can configure one of the following databases in the selection box.

SQL/MSDE or Oracle

The screenshot shows a 'Database connection' dialog box. At the top, there are two radio buttons: 'Use default database' (unselected) and 'Use other database' (selected). Below the 'Use other database' option, there is a dropdown menu set to 'Oracle'. To the left of the dropdown is the 'Server' field containing 'ORASVR'. To the right of the dropdown is the 'DB' field containing 'AreaDB'. Below these fields is a checkbox for 'Use Windows NT authentication' which is unchecked. At the bottom, there are two text fields: 'User' containing 'scott' and 'Password' which is masked with asterisks.

Fig. 2-28 Use Oracle database, PC

- "Server"
Server name or IP address of SQL server.
- "DB"
Name of database to be used.
- "Use Windows NT authentication"
This setting means that database login is handled according to MS Windows NT security mechanisms. The "User" and "Password" fields are deactivated accordingly.
- "User"
Database user name (Note: Required only if you are not working with integrated security).
- "Password"
Password for database user name (Note: Required only if you are not working with integrated security).

MS Access

The screenshot shows a 'Database connection' dialog box. At the top, there are two radio buttons: 'Use default database' (unselected) and 'Use other database' (selected). Below the 'Use other database' option, there is a dropdown menu set to 'Access'. To the left of the dropdown is the 'Server' field, which is empty. To the right of the dropdown is the 'DB' field containing the full path 'F:\Add_on\TDI\data\Ar'. Below these fields is a checkbox for 'Use Windows NT authentication' which is unchecked. At the bottom, there are two text fields: 'User' containing 'ADMIN' and 'Password' which is masked with asterisks.

Fig. 2-29 Use Access database

- "DB"
Full path including filename (Note: Always refers to the local path of the target computer of the configuration).
- "User"
Database user name (Note: Only if required).

- "Password"
Password for database user name (Note: Only if required).
- "Check"
The data that have been entered are subject to a plausibility check. The entries can only be incorporated in the configuration file using the "Accept" button after this check has been successfully completed.

Create setting magazine

If TDI is to accept tool data from external devices (e.g., a tool setting station, higher-level tool management system), then an external magazine/database must be defined as setting magazine.

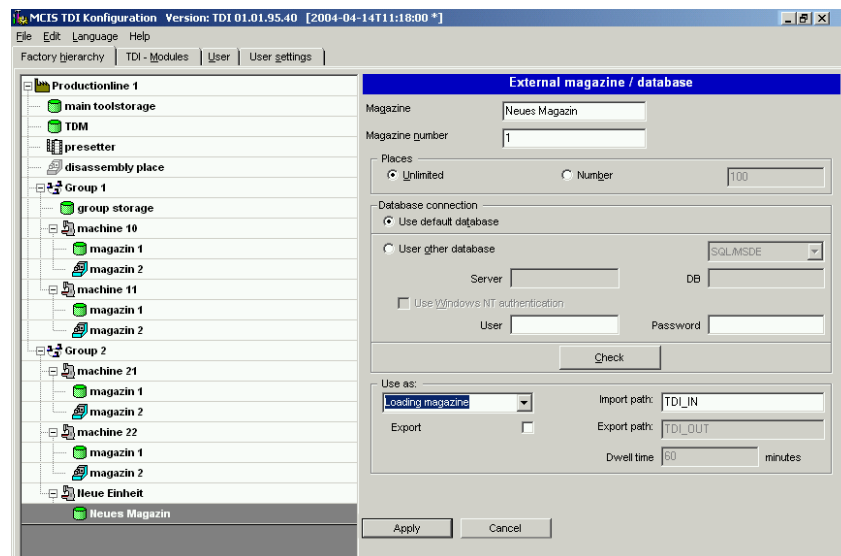


Fig. 2-30 Use setting magazine, PC

Note

If no setting magazine is configured when configuring a unit, balancing is only possible with restrictions. In that case, the calculated requirement for new tools on balance deallocation cannot be put into the setting list.

- "Import path"
Directory in which the tool data files (see also chapter "Connection of tool setting stations") uploaded from the tool setting station. The default entry "TDI_IN" is relative to the directory in which TDI is installed. Alternatively, you can specify a complete path.

Create a removal magazine

In conjunction with the TDI tool handling function, it is possible, for example, to unload worn tools to a removal magazine. If this is the case, an external magazine/database must be defined as removal magazine.

In conjunction with "TDI Planning" and the requested function "transfer balance deallocation to the tool setting station" (Chapter 5: Balance deallocation), an export path must be defined for the setting magazine.

In this path, the tool requirement is transferred as a file. The default entry "TDI_OUT" is relative to the directory in which TDI is installed. Alternatively, you can specify any complete path.

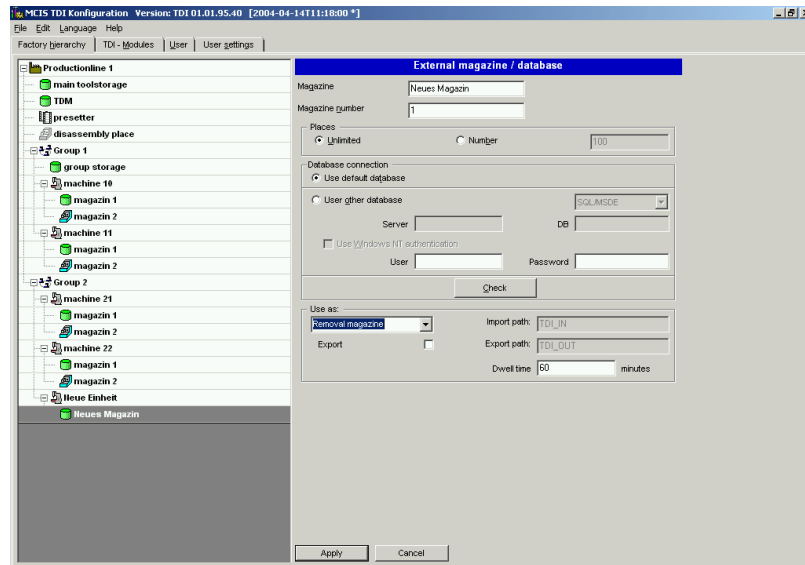


Fig. 2-31 Use removal magazine, PC

- "Export path"
Directory to which TDI saves the tool data files from the tool removal magazine. You must enter this setting if you want to store a tool data file. The default entry "TDI_OUT" is relative to the directory in which TDI is installed. Alternatively, you can specify any complete path.
- "Dwell time"
Time period (in minutes) after which a tool unloaded to the tool removal magazine is deleted automatically from this magazine (depending on setting) or stored as a tool data file in the export path.

2.3.3 Enabling TDI modules on the PC

The individual TDI modules are enabled via keys on the relevant target hardware.

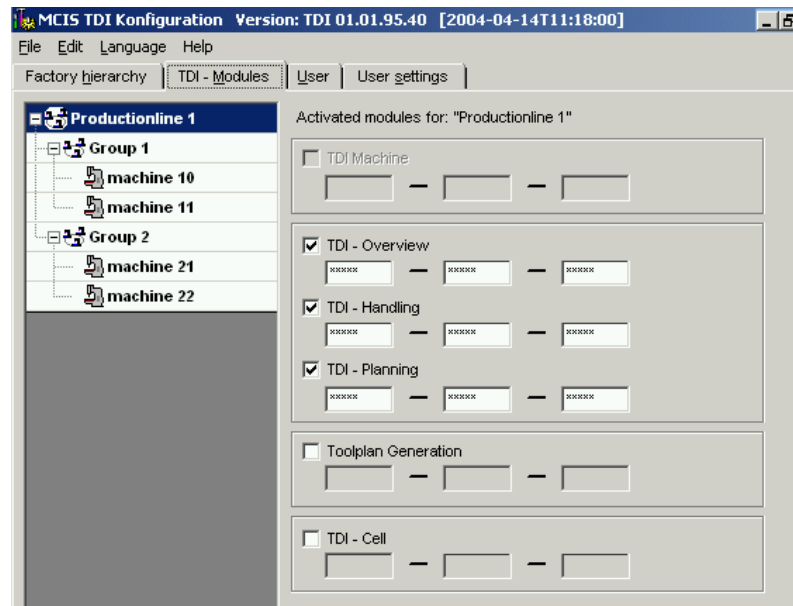


Fig. 2-32 Enabling TDI modules

You can find the key for the relevant TDI modules in the Remark field of the "Certification of License" document.

The stations you have selected in Explorer are then enabled. The enabling command becomes operative after it has been exported to the relevant target hardware.

The key is displayed in plain text as you are entering it. When you click the "Apply" button or open the screen again, the keys are displayed as asterisks (*).

Note

Modules are not installed as part of the enabling/export process.

Note

If the "TDI Machine" is enabled, this is an alternative to the modules "TDI Overview", "TDI Handling" and "TDI Planning".

Only one of the two enable blocks can be activated.

"TDI Toolplan Generation" can only be enabled if either "TDI Machine" or "TDI Planning" is enabled.

2.3.4 PC user management

User management settings can be used to control the views of the plant components and user rights.

User management is divided into two areas:

Tab 1 Users

Tab 2 User Groups

Note

User rights can only be changed on the computer on which the database is located.

Setting-up users

In the Users area, a password and a user group can be assigned to each of the fixed user levels.

A fixed user group is assigned to the user name:

ADMIN -> ADMIN
ADVANCED -> INFO
BASE -> USER

Note

In version V1.x the settings in the fields "User group", "Language", "Start area" have no effect.

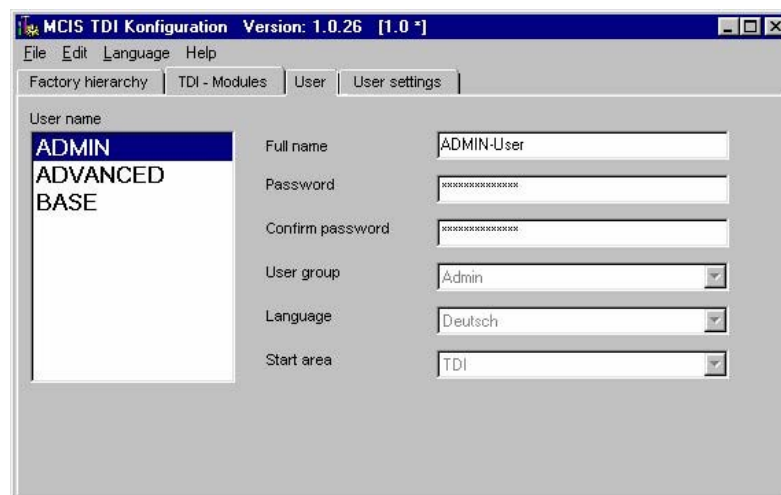


Fig. 2-33 Setting up users, PC

Note

When you log onto to TDI, you must enter the user name and password in the startup screen.

User groups

Within the user settings area, rights and default settings for individual functions can be assigned to the groups (ADMIN, INFO, USER).

Assigning user rights

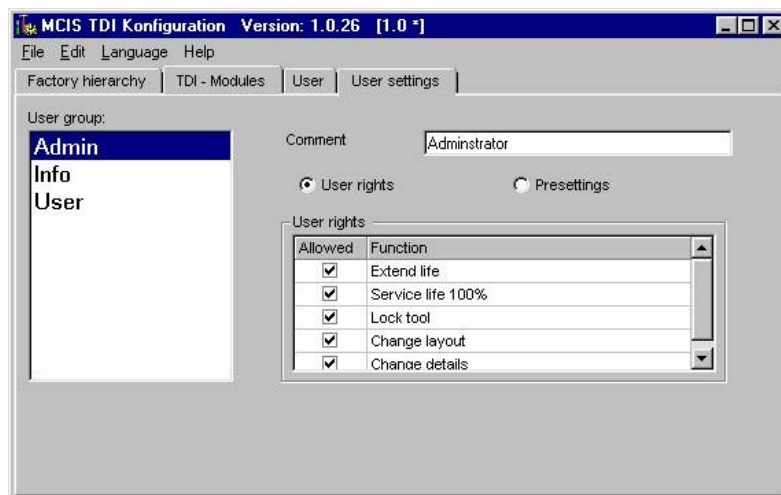


Fig. 2-34 Assigning user rights, PC

The right to execute the following functions can be assigned on a user-group-specific basis:

- Extend service life (only if you are using HMI Pro)
- Set service life to 100%
- Lock tool
- Change layout
- Change details
- Enable handling options
- Accept tool movement enabled

Functions that have not been enabled are disabled in the user interface.

For a precise description and effects, refer to

Chapter 3: "Overview" and Chapter 4: "TDI Tool Handling".

Default settings

In the default settings, the various views for Explorer can be specified for each user group and for the individual levels (area, group, unit).

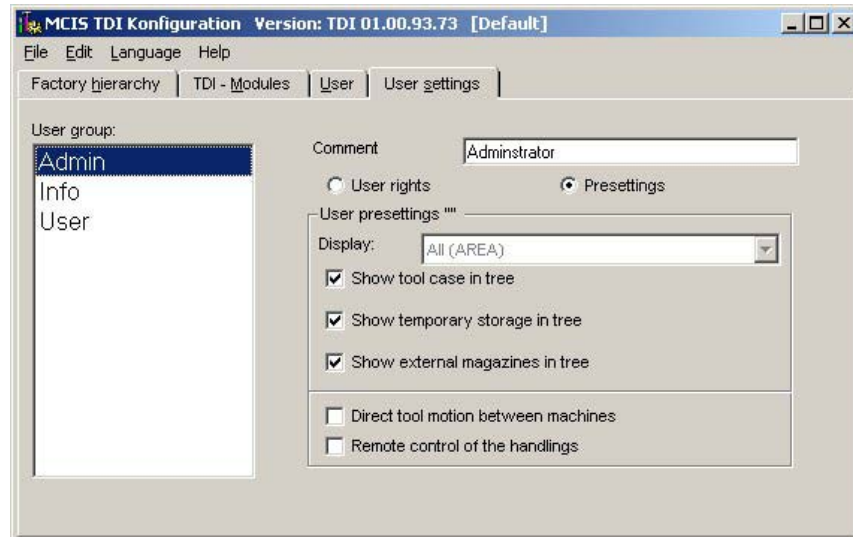


Fig. 2-35 User group default settings, PC

The following user default settings can be made:

- "Show tool case in tree"
- "Show temporary storage in tree" (only in conjunction with default tool management)
- "Show external magazines in tree"

If the appropriate selection has been made, these magazines will appear in the user interface (HMI). If not, they will not be visible and it will not be possible to select them.

Temporary storage is an exception to this rule. Even if a temporary storage is not visible in the Explorer tree, the tools it contains will be displayed in the TDI Overview.

- "Direct tool motion between machines"
This option allows tools to be moved directly between machine magazines that are managed by SINUMERIK 840D. If this option is not activated, tools can only be moved indirectly via an external magazine.
- "Remote control of the handlings"
This option allows tools to be moved between machine magazines from an external operator station (external PC). If this option is not activated, tools can be moved only from an operator station on one of the machines involved in the movement.

2.3.5 Moving magazines and units (PC / PCU)

Within a configuration, units and magazines can be moved using "drag and drop". The following rules apply:

- If a magazine is moved to a different magazine, it is inserted in front of the target magazine.
- If a magazine is moved to a unit, it is inserted as the last magazine in the target unit.
- If a unit is moved to a magazine, the unit is added to the unit belonging to the target magazine.
- If a unit is moved to a unit, the unit is added to the target unit.
- If the [SHIFT] key is pressed when a unit is moved to a unit, the unit is inserted in front of the target unit.

Not all units and magazines can be used as targets when moving. The mouse pointer icon will indicate whether or not a target is permissible.

2.3.6 Importing existing plant components (PC / PCU)

Existing plant components are imported with the aim of creating an overall plant configuration on the server.

An import can only be performed on the server if the cursor is located at the highest level of the Explorer and the "Import of an existing factory hierarchy.." checkbox is selected.

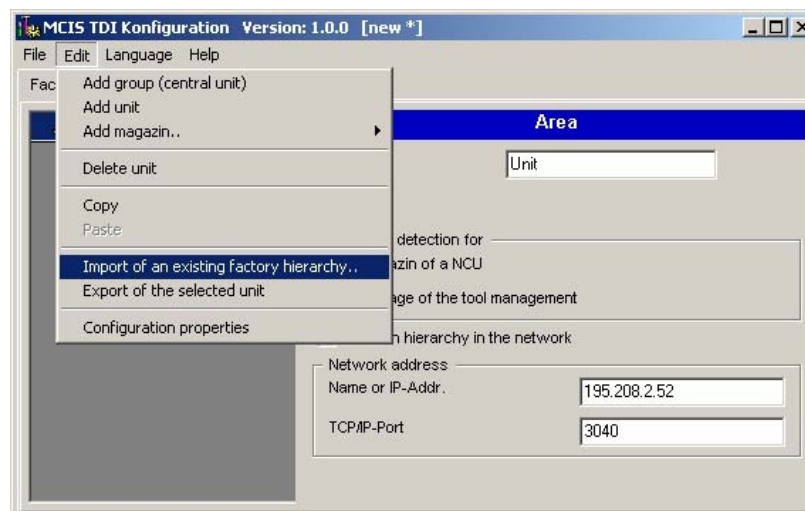


Fig. 2-36 Importing the plant hierarchy

The menu item "Import of an existing factory hierarchy.." must be selected using the pull-down menu "Edit".

The import process is divided into a number of steps.

1. Selection of plant components:

All machines that can be accessed via the network and on which TDI is running appear in the list.

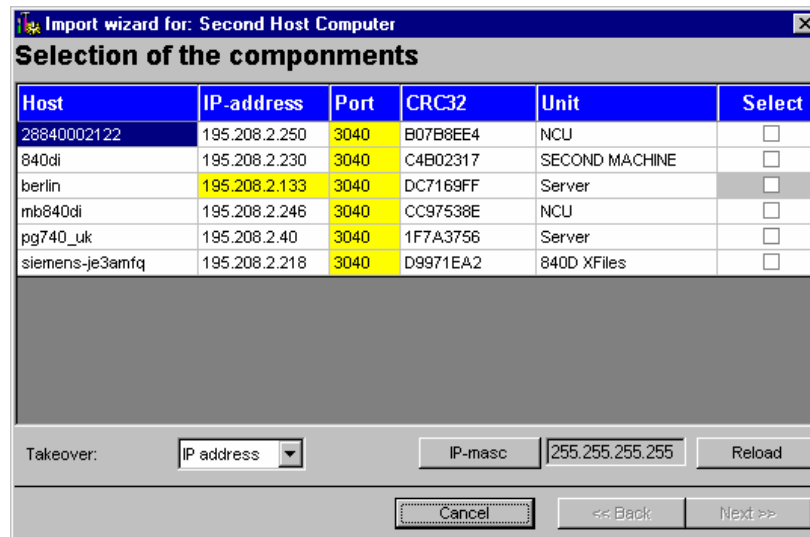


Fig. 2-37 Selection of plant components

Explanation of terms:

- "Host"
Host name of the address that was found
- "IP address"
IP address of the machine that was found.
- "Port"
Port number of the machine
- "CRC32"
An internal ID stamp for the configuration found
- "Unit"
Name of the unit in the configuration found
- "Select"
Column for selecting the units to be imported. As soon as the first unit has been selected, the "Next" button becomes activated.

Values that appear both in the configuration on the server and in the configuration on the machine found appear highlighted in yellow. This highlighting will help you to identify existing components more quickly.

The imported machines are added to the configuration, or the existing entry is updated.

A semi-concealed field in the "Select" column means that this machine cannot be added. You cannot select this particular machine. This is the case if the configuration includes a machine with the same host/IP entry which has since been moved from its original location.

The following actions can be performed in this screen:

- "Takeover:"
Specifies whether the IP addresses or the host names of the machines found are accepted in the configuration.
- "IP-masc"
Displays a dialog box in which you can specify a search mask. The current search mask appears alongside the "IP Screen" button.
- "Reload"
Starts a new search for machines on the network.

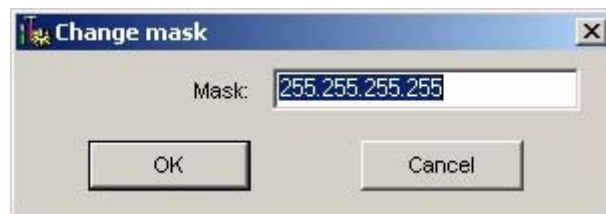


Fig. 2-38 Modifying the search mask

Click on "OK" or "Cancel" to return to the "Selection of plant components" screen.

Click on "Next>>" to proceed to the next step. Click on "Cancel" to abort the import process.

2. Validate names:

The names of the imported units can be changed in order to facilitate identification. Every name must be unique. A unique name that differs from the original ("Unit" column) appears in the "New name" column.

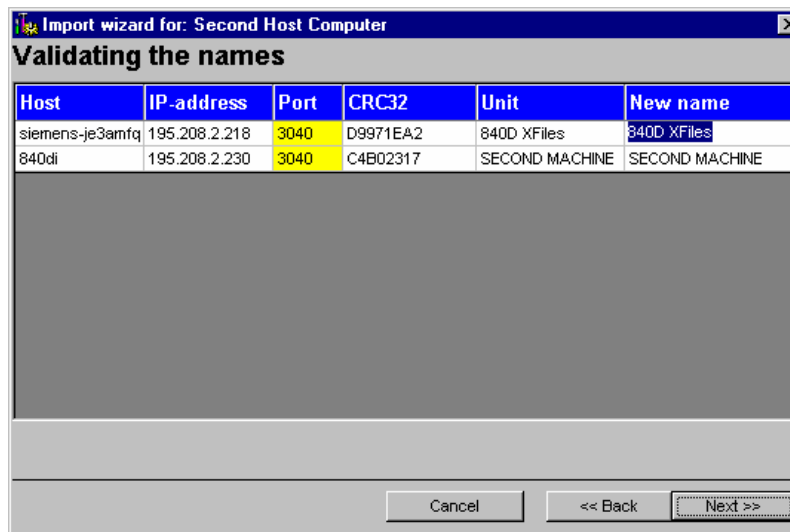


Fig. 2-39 Validating names

All other columns have the same function as in the previous screen.

Click on "Next>>" to proceed to the next step. Click on "<<Back" to return to the previous list. All entries you have made up to this point will be lost. Click on "Cancel" to abort the import process.

3. Importing the plant hierarchy:

Click on "Import" to start the import process. The current status of the process is shown in the "Status" column.

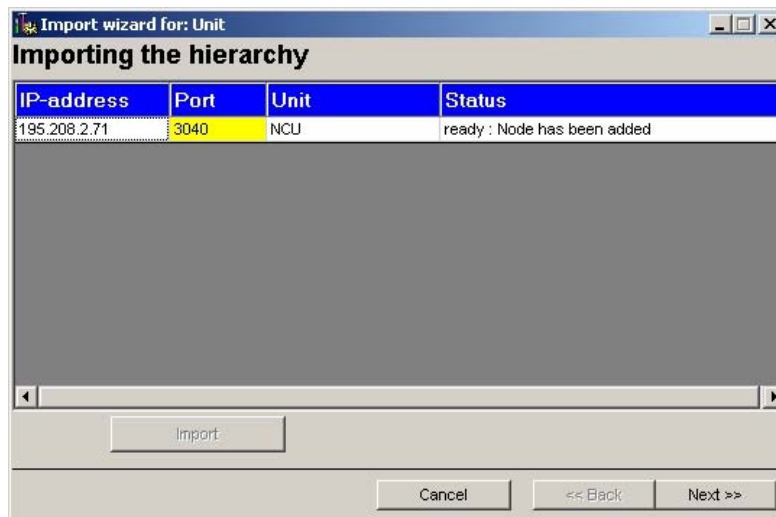


Fig. 2-40 Importing the plant hierarchy

Once the import has been completed successfully, it will no longer be possible to revert to the previous screen via the "<<Back" button.

4. Resulting plant hierarchy:

In this step, the subsequent plant hierarchy based on the import process appears in Explorer.

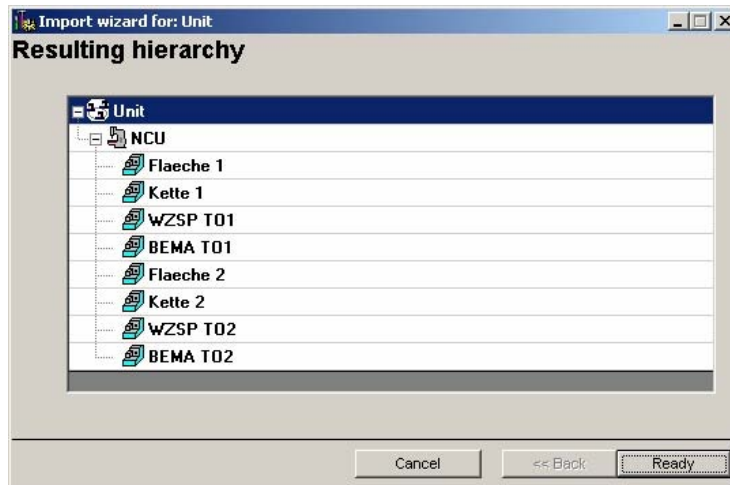


Fig. 2-41 Resulting plant hierarchy

If the resulting configuration is correct, it can be accepted by clicking on "Ready". If not, it can be rejected by clicking on "Cancel". You will then need to repeat the import process.

2.3.7 Exporting a completed configuration (PC / PCU)

Once a plant hierarchy has been completed (via an import or manual configuration), it can be distributed to all of the components involved (machines and server) using the "Export of the selected unit" function. This function makes it possible to access the same plant configuration on all connected machines.

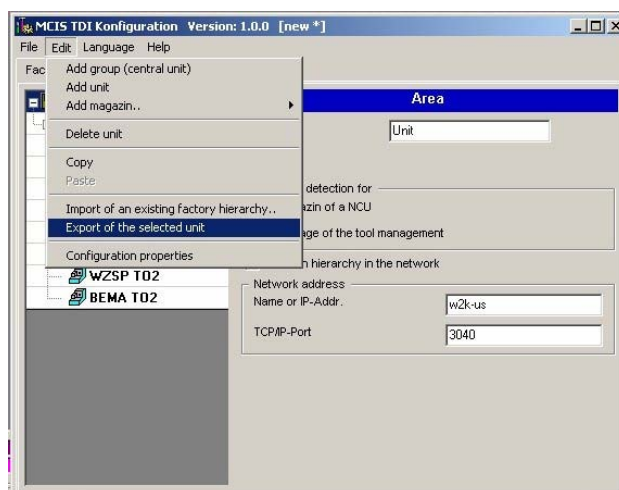


Fig. 2-42 Exporting plant components

The configuration must be saved in advance.

Note

Any changes made to a configuration and distributed using the "Export of the selected unit" function will be effective immediately on the machines and on the server. The PC user interfaces must be restarted.

Like the import process, the export process is also divided into a number of steps:

1. Selection of plant components:

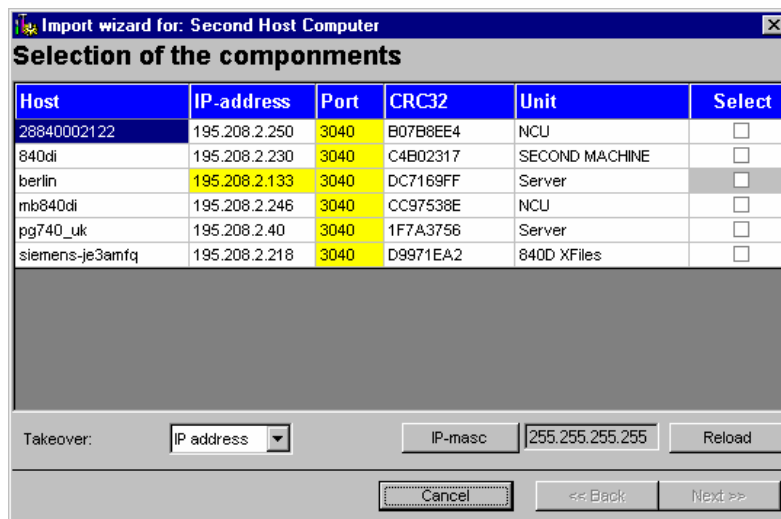


Fig. 2-43 Selection of plant components

The target components/machines to which the overall configuration is to be exported must be selected.

All machines that can be accessed via the network and whose IP addresses or host names are located in the accessible branch appear in the list.

If the machine does not respond, i.e., if it is not "online", the "Select" column will be grayed out and no selections can be made.

The meanings of the individual columns in the list are as follows:

- "Host"
Host name of the address that was found
- "IP address"
IP address of the machine that was found.
- "Port"
Port number of the machine
- "Unit"
Name of the unit in the configuration

- "Online"
Status indicating whether the machine can be accessed ("online") or not ("offline")
- "Select"
Column for selecting the machines to which the configuration is to be exported

The following actions can be performed in this screen:

- "Takeover:"
Specifies whether the IP addresses or the host names of the machines found are transferred into the list.
- "Reload"
Starts a new search for machines on the network.

Click on "Next>>" to proceed to the next step. Click on "Cancel" to abort the export process.

2. Click on "Export" to start the export process. The current status of the process is shown in the "Status" column.

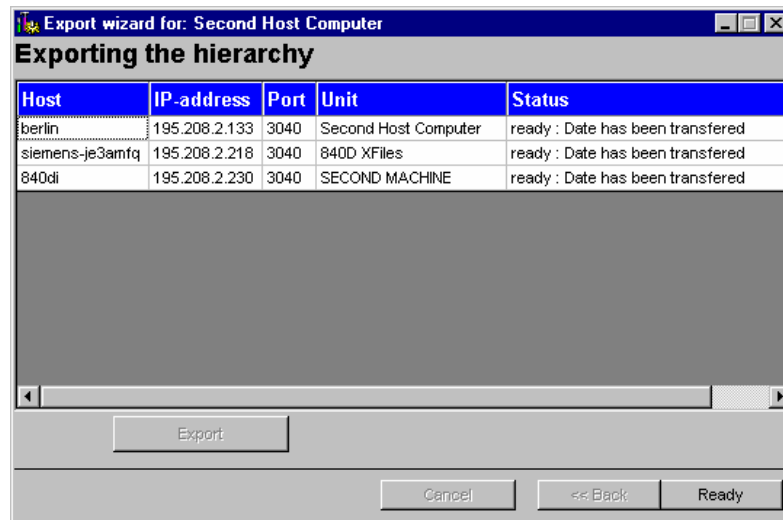


Fig. 2-44 Exporting the plant hierarchy

Once the export has been completed, you must click on "Ready" to exit the dialog box.

Note

After exporting a configuration with a changed port axis, the TDI service must be stopped on the host computer and then restarted.

2.3.8 Configuring components on a PCU (unit)

If the configuration is made directly on a unit, only the components relevant for the unit, the plant, and the configuration will be available.

Using the default unit as a starting point, other components can be added to this unit using the "Edit" function button or by selecting "Unit" and then clicking with the right mouse button. On a unit with default tool management, automatic magazine detection can be performed by activating the "Automatic magazine detection for NCU machine magazine with tool management" function.

Note

If automatic magazine detection has been selected, once the configuration is complete, the next time TDI is started up on the machine, the magazines available on the NCU will be added to the configuration. The magazines detected can then be modified as required on the machine using the TDI configuration. If, when configuring the standard tool manager, a name was not assigned for the magazine, then instead of the general magazine names, TDI applies the magazine numbers.

Adding magazines

This function can be used to add a new tool magazine. The position of the magazine within the Explorer hierarchy is determined by the position of the cursor while the magazine is being added. The position of the component within the hierarchy can be modified subsequently by dragging and dropping.

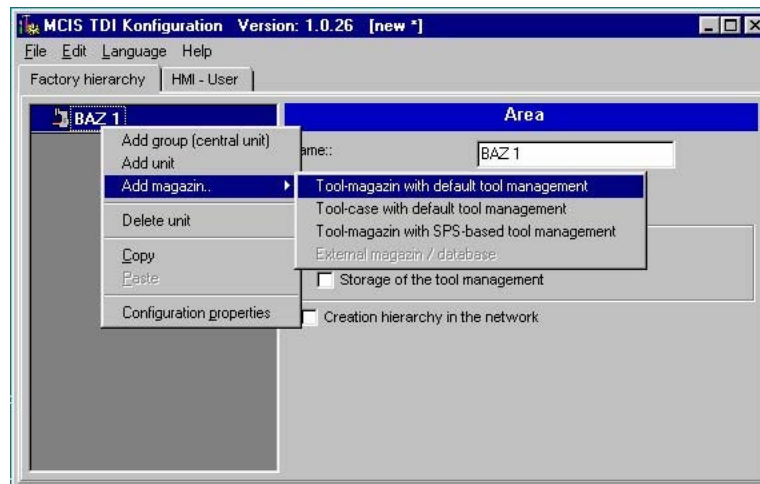


Fig. 2-45 Adding a magazine, PCU

When adding a magazine, you must specify the type of tool magazine.

The following options are available:

- "Tool-magazin with default tool management"
- "Tool-case with default tool management"
- "Tool-magazin with SPS-based tool management" (e.g., in Transline HMI Pro with DB xx or machine manufacturer-specific tool management)
- "External magazin/database"
e.g., for machine manufacturer-specific tool management

Note:

If an external tool magazine does not have dedicated management, TDI will assume the tool management function.

On a unit with default tool management, unlike automatic and complete detection of all configured tool magazines, this function can be used to display specific individual magazines.

Note

If magazines have been configured for units on a PC, once the configuration is complete it must be exported to the units concerned (see Import/Export Functions).

The following configuration options are available for creating the various tool magazines in Explorer:

Creating a tool magazine with default tool management

The following settings must be made to create a unit magazine with default tool management:

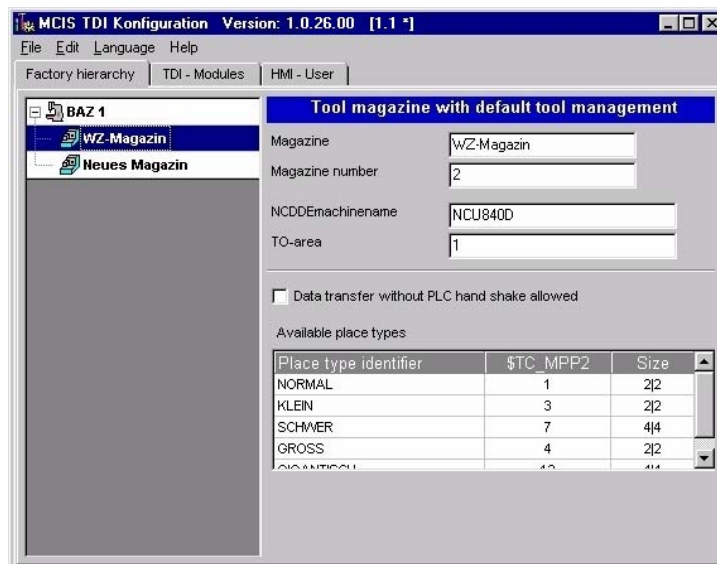


Fig. 2-46 Tool magazine with default tool management, PCU

- "Magazine"
Specification of magazine name (Note: The name can be the same as the name of the corresponding magazine in default tool management, see TO-INI.INI in NC-active data on unit \$ TC _ MAP2 [< Mag.No.>]=<Mag-Name>.)
- "Magazine number"
Specification of magazine number (Note: The number must be the same as the number of the corresponding magazine in default tool management, see TO-INI.INI in NC-active data \$ TC _ MAPX [< Mag.No.>].)
- "NCDDEmachinename"
Specification of NCDDEMachineName. (Note: The name must be identical to the entry in MMC.INI of the unit).
- "TO-area"
Definition of the TO area (Note: TO-area in which the magazine is valid).
- "Data transfer without PLC hand shake allowed"
If you add complete tool containers (e.g., tool cartridges) to the machine, or insert single tools directly in magazine places, you can use this function to deactivate scanning of PLC acknowledgements. In other words, the tool data are entered directly in the magazine list when tools are managed with the TDI Tool Handling system. For further details, please refer to section TDI Tool Handling.
- "Available place types"
When automatic magazine detection is active, the magazine location types are detected for the default tool management and entered in the table for the relevant magazine. The table cannot be modified.

Note

The "Place type identifier" and the "Size" are read from the MS-ACCESS file "WZACCESS.MDB" in the default tool management. If this information is not available, the table headings are empty.

The location type defines the kind of location in the magazine. With the allocation of location types to magazine locations, the magazine is subdivided into areas when the standard tool management system of the SINUMERIK 840D is configured.

It is only possible to load any tool to a location of the appropriate type. It is therefore possible to assign various types of special tool, e.g., "large", "heavy", to specific locations. There is no need to apply fixed location coding for this purpose. When you load a tool, you must ensure that the type of magazine location (\$TC_MPP2) matches the location type you entered in the tool-specific data (\$TC_TP7) of the tool setting station.

The machine manufacturer assigns location types when configuring / starting up the machines. In this context, ambiguities may arise between individual machines and manufacturers in relation to the following definitions:

- Name of location type
- Type of magazine location (\$TC_MPP2)
- Size and form of location in magazine.

The operator must check to ensure that all location types are clearly defined on all machines in the plant.

Table 2-3 Example illustrating ambiguities in location type definition:

Machine 1	Name of location type	Type of magazine location (\$TC_MPP2)	Size
			Total width Total height
	Normal	1	2/2
	Large	2	4/4
	Heavy	3	2/2
Machine 2	Normal	1	2/2
	Large	2	2/2
	Heavy	4	2/2

The example above illustrates the following problems:

- Different tool sizes are defined for location type "Large", i.e., if a tool is set with tool-specific data \$TC_DP7 = 2 for machine 1 and then loaded to machine 2, there is a risk of collision as the tool management in machine 2 is programmed to reserve only one magazine location for magazine location type \$TC_MPP2 = 2.
- Different magazine location types \$TC_MPP2 are defined for location type "Heavy", i.e., if a tool is set with tool-specific data \$TC_DP7 = 3 for machine 1, it will not be possible to load this tool to machine 2 because magazine location type 3 is not defined for the tool management in machine 2.

Creating a tool cabinet with default tool management

The following settings must be made to create the tool cabinet with default tool management as a magazine.

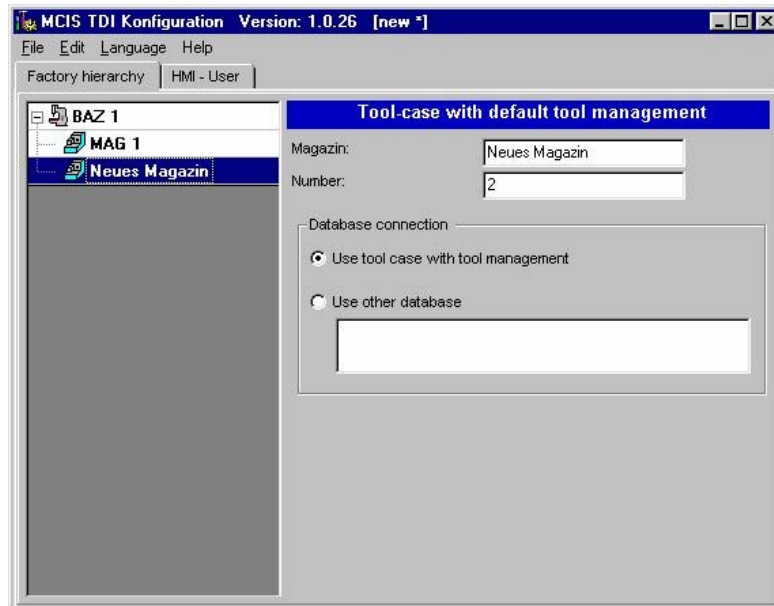


Fig. 2-47 Tool cabinet with default tool management, PCU

- "Magazin"
Specification of magazine name (Note: Freely selectable).
- "Number"
Specification of magazine number (Note: You should accept the magazine number suggested by the TDI configuration).
- "Use tool case with tool management"
If this option is selected, TDI will use the default tool management data.
- "Use other database"
If the tool data is being managed in a database area other than that used by the default tool management, you can enter the database path for the tool magazine created here.
Example: Managing a tool cabinet on a PC:
Provider=Microsoft.Jet.4.0;Data Source=c:\Personal\WZACCESS.mdb

Note

A database provider does not have to be supplied for MS ACCESS.

Creating a tool magazine with SPS-based tool management

The following settings must/can be made to create a tool magazine for SPS-based tool management:

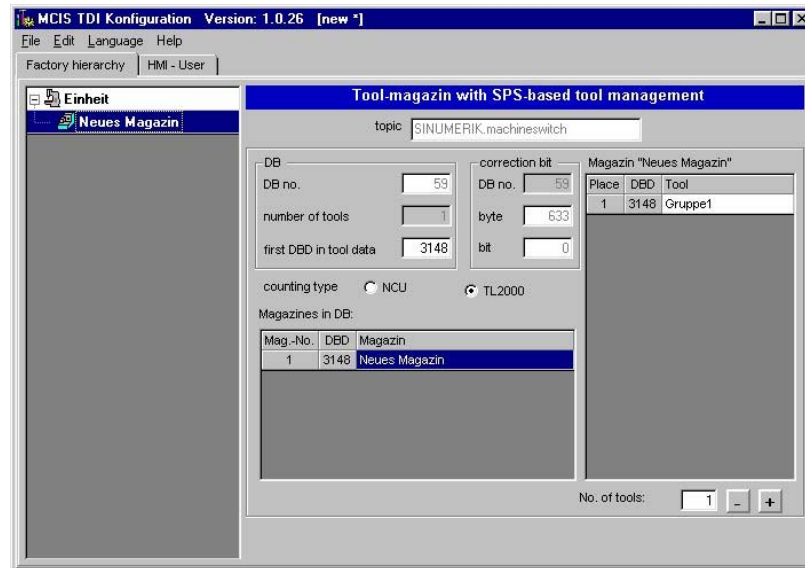


Fig. 2-48 Creating a magazine with SPS-based tool management, PCU

Setting data blocks

- "topic"

Information required for setting up OPC communication as a link to a specific NC or SIMATIC S7. A separate topic must be specified for each unit.

A protocol ID and a unique, protocol-specific connection name for the OPC server must be specified in the "topic" input field for each station. This connection name is specified during Simatic S7 configuration.

Syntax example: S7:[S7-Connection-1]

More detailed information about the protocol ID and the connection name can be found in:

References: // SIMATIC NET – CD: Industrial Communication With PG/PC, Chapter OPC Process Variables for SIMATIC NET -> S7 Communication.

Selecting data blocks

By default, DB59 is used with a maximum of 96 tools. The tool data is stored starting at data word 3148 (if there are 48 tools, tool data is saved from data value 1908).

The following fields appear for information:

- "DB no."
- "number of tools"
- "first DBD in tool data"

Note

The following DBDs are used (= managed tool data in the DB) in the DB for each tool (see tool identifier assignments):

DBD 1 = Actual value (actual value of tool life in Transline)

DBD 2 = Prewarning limit (prewarning in Transline)

DBD 3 = Extended alarm

DBD 4 = Setpoint (alarm limit in Transline)

This assignment is also valid for other DBs (see also: L_H1_ERW).

Offset bit

The offset bit is set whenever changes are made to tool offsets/monitoring data under "Details" in the "TDI Tool Actual Data Overview" screen. The default setting for the address of DB59 is:

"DB no." = 59

"Byte" = 633

"Bit" = 0

This byte address can be changed, but only in accordance with the structure of DB59.

Counting type

There are a number of options for the tool life counting type in TDI:

- **Option: NCU**
The actual value is counted down from 100% (= setpoint) to 0.
- **Option: TL2000**
The actual value is counted up from 0 to 100% (= setpoint/extended alarm).

Assigning tool identifiers to machine magazines

The tools in the magazine must be added to the "Tool" column in the "New Magazine" list box for each magazine with the tool identifier and on a location-specific basis.

Defining tools for magazine locations

The number of magazine locations required is defined in the "Number of tools" input field. The plausibility of the number of tools specified for each magazine is checked.

Creating additional magazines

If additional magazines are to be created in DB 59 within the selected unit, this is done by selecting the unit in the Explorer structure and adding the magazines.

The new magazine is added to the "Magazines in DB" list box:

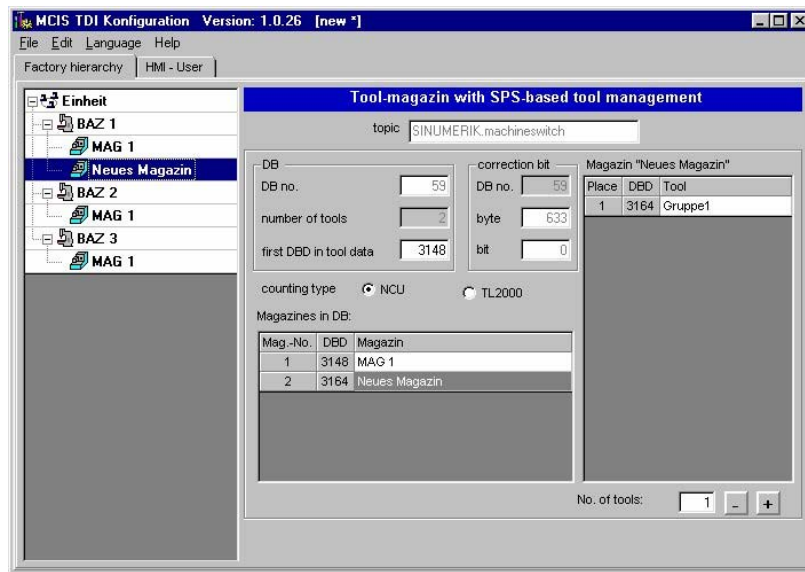


Fig. 2-49 Creating additional magazines, PCU

Creating an external tool magazine / database

You must make the following settings if you intend to use an external tool cabinet or database (e.g., MSDE, Oracle, MS Access) to store tool data.

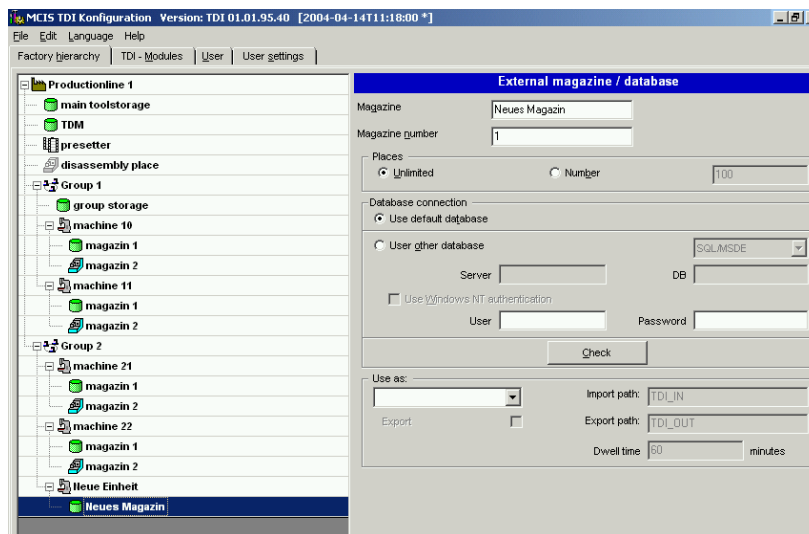


Fig. 2-50 External magazine / database, PCU

- "Magazine"
Specification of magazine name (Note: Freely selectable).
- "Magazine number"
Specification of magazine number (Note: You should accept the magazine number suggested by the TDI configuration).
- "Places"
Define the number of magazine locations

- "Unlimited" means no limit on the number of locations
- "Number" limits the number of locations to the set number
- "Database connection"
 - "Use default database": When you select this option, the existing Microsoft Access database (AreaDB.mdb) in subdirectory "Data" in the installation directory on the target computer is used.

Fig. 2-51 Use default database, PCU

- "Use other database": When you select this option, you can configure one of the following databases in the selection box.

SQL/MSDE or Oracle

Fig. 2-52 Use Oracle database, PCU

- "Server"
Server name or IP address of SQL server.
- "DB"
Name of database to be used.
- "Use Windows NT authentication"
This setting means that database login is handled according to MS Windows NT security mechanisms. The "User" and "Password" fields are deactivated accordingly.
- "User"
Database user name (Note: Required only if you are not working with integrated security).
- "Password"
Password for database user name (Note: Required only if you are not working with integrated security).

MS Access

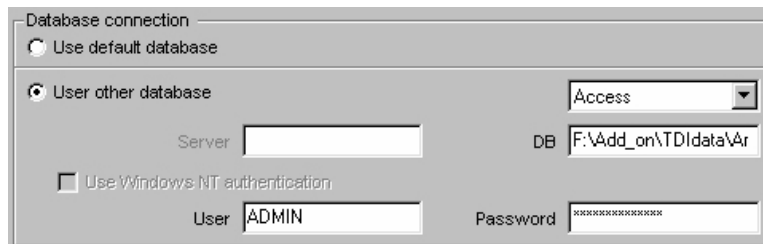


Fig. 2-53 Connect Access database, PCU

- "DB"
Full path including filename (Note: Always refers to the local path of the target computer of the configuration).
- "User"
Database user name (Note: Only if required).
- "Password"
Password for database user name (Note: Only if required).

Create setting magazine

If TDI is to accept tool data from external devices (e.g., a tool setting station, higher-level tool management system), then an external magazine/database must be defined as a setting magazine.

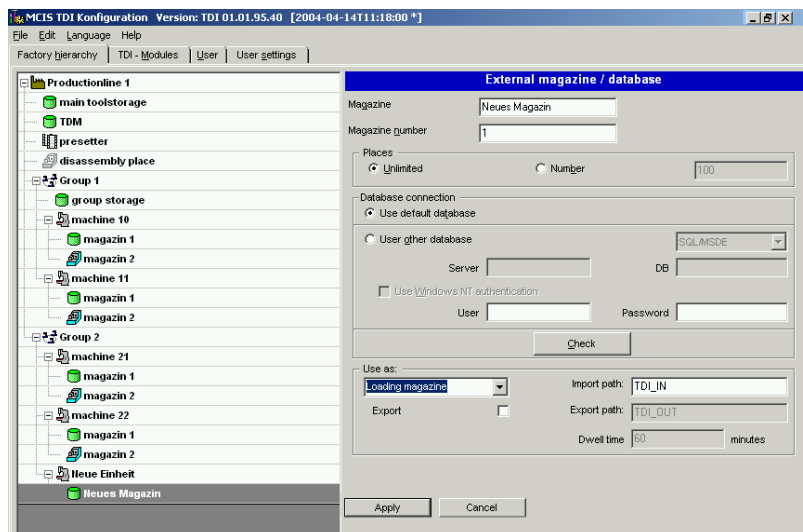


Fig. 2-54 Use setting magazine, PC

Note

If no setting magazine is configured when configuring a unit, balancing is only possible with restrictions. In that case, the calculated requirement for new tools on balance deallocation cannot be put into the setting list.

- "Import path"
Directory in which the tool data files (see also section "Connection of tool setting stations") uploaded from the tool setting station. The default entry "TDI_IN" is relative to the directory in which TDI is installed. Alternatively, you can specify a complete path.

Create a removal magazine

In conjunction with the TDI tool handling function, it is possible, for example, to unload worn tools to a removal magazine. If this is the case, an external magazine/database must be defined as a removal magazine.

In conjunction with "TDI Planning" and the requested function "transfer balance deallocation to the tool setting station" (Chapter 5: Balance deallocation), an export path must be defined for the setting magazine.

In this path, the tool requirement is transferred as a file. The default entry "TDI_OUT" is relative to the directory in which TDI is installed. Alternatively, you can specify any complete path.

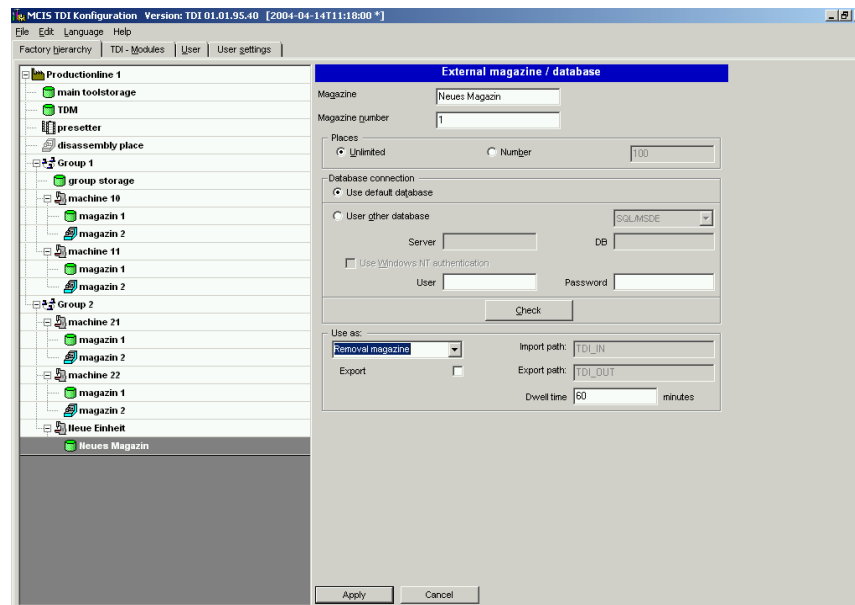


Fig. 2-55 Use removal magazine, PC

- "Export path"
Directory to which TDI saves the tool data files from the tool removal magazine. You must enter this setting if you want to store a tool data file. The default entry "TDI_OUT" is relative to the directory in which TDI is installed. Alternatively, you can specify any complete path.
- "Dwell time"
Time period (in minutes) after which a tool unloaded to the tool removal magazine is deleted automatically from this magazine (depending on setting) or stored as a tool data file in the export path.

2.3.9 Enabling TDI modules on the PCU

The individual TDI modules are enabled via keys on the unit.

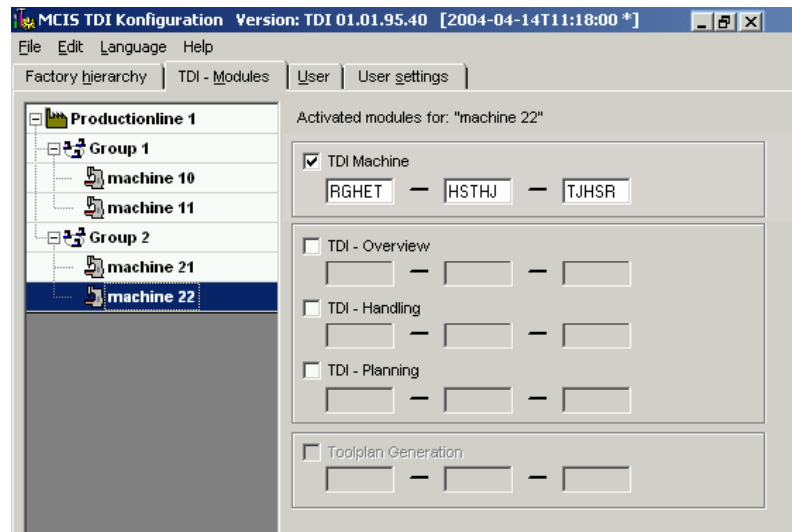


Fig. 2-56 Enabling TDI modules, PCU

You can find the key for the relevant TDI modules in the Remark field of the "Certificate of License" document.

The key is displayed in plain text as you are entering it. When you click the "Apply" button or open the screen again, the keys are displayed as asterisks (*).

Note

Modules are not installed as part of the enabling/export process.

Note

If the "TDI Machine" is enabled, this is an alternative to the modules "TDI Overview", "TDI Handling" and "TDI Planning". Only one of the two enable blocks can be activated. "TDI Toolplan Generation" can only be enabled if either "TDI Machine" or "TDI Planning" is enabled.

2.3.10 HMI user management on the PCU (unit)

Within the HMI Users area, rights and protection levels can be assigned to predefined users and default settings made for the individual components.

Assigning user rights

The right to execute the following functions can be assigned on a user-specific basis:

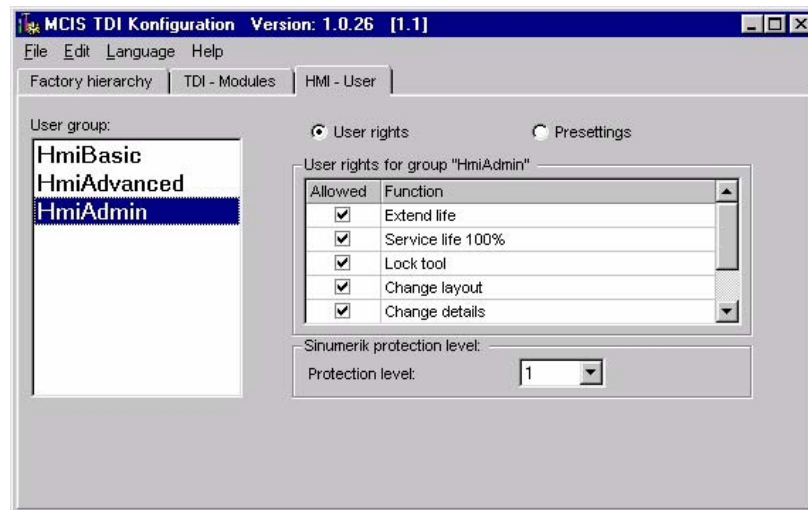


Fig. 2-57 HMI users

- Extend service life (only if you are using HMI Pro V3.1 or higher)
- Set service life to 100%
- Lock tool
- Change layout
- Change details
- Enable handling options
- Accept tool movement enabled

Functions that have not been activated are not executed in the user interface. A message is output instead.

For a precise description and effect, refer to Chapter 3: "Overview" and Chapter 4: "TDI Tool Handling".

The protection levels control access to functions on the HMI. Eight levels of protection (0 to 7) have been defined. The lowest four (4 to 7) are set using the key switches on the HMI.

The lower the number of the protection level, the more rights the user has.

The following protection levels have been defined:

- 0 : SIEMENS
- 1 : Machine manufacturer
- 2 : Startup engineer, service (machine manufacturer)
- 3 : Service (end user)
- 4 : Key switch setting 3 → Programmer
- 5 : Key switch setting 2 → Skilled operator
- 6 : Key switch setting 1 → Operator
- 7 : Key switch setting 0 → Semi-skilled operator

Default settings

In the default settings, the various views for displaying the magazines in the Explorer can be specified for each user and for the individual levels (area, group, unit).

The following default settings can be made:

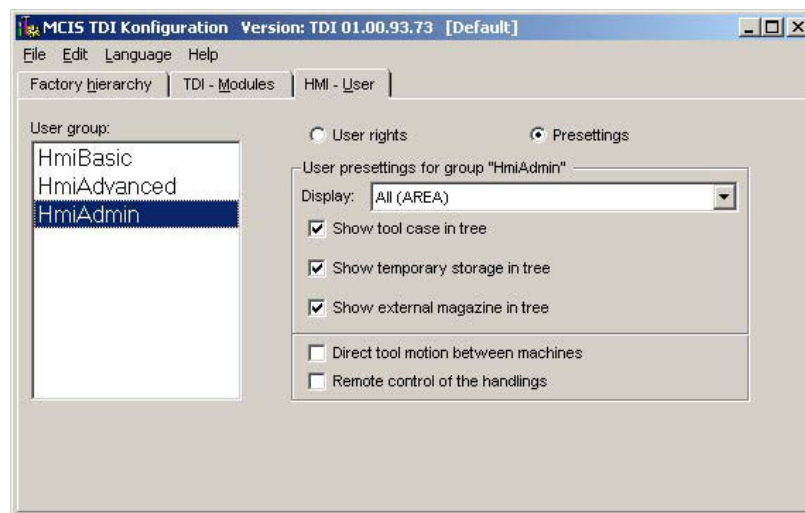


Fig. 2-58 HMI users

- "Show tool case in tree"
- "Show temporary storage in tree"
- "Show external magazine in tree"

If the appropriate selections have been made, the corresponding magazines will appear in the user interface. If not, they will not be visible and it will not be possible to select them.

Temporary storage is an exception to this rule. Even if a temporary storage is not visible in the HMI Explorer, the tools it contains will be displayed in the tool list.

- "Direct tool motion between machines"
This option allows tools to be moved directly between machine magazines that are managed by SINUMERIK 840D. If this option is not activated, tools can only be moved indirectly via an external magazine.
- "Remote control of the handlings"
This option allows tools to be moved between machine magazines from an external operator station (external PC). If this option is not activated, tools can be moved only from an operator station on one of the machines involved in the movement.



3

3 Overview

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3.1 Actual tool data overview

The "Overview" module enables you to read the current state of the actual tool data and provides you with basic functions for editing tool data.

Press the "Actual tool data" softkey to access a comprehensive overview of the actual data for the tools loaded in the machine magazine of the connected units. The plant components appear in a tree structure (Explorer view) on the left-hand side under "System overview".

The tool data for the selected plant components appears in list format on the right-hand side.

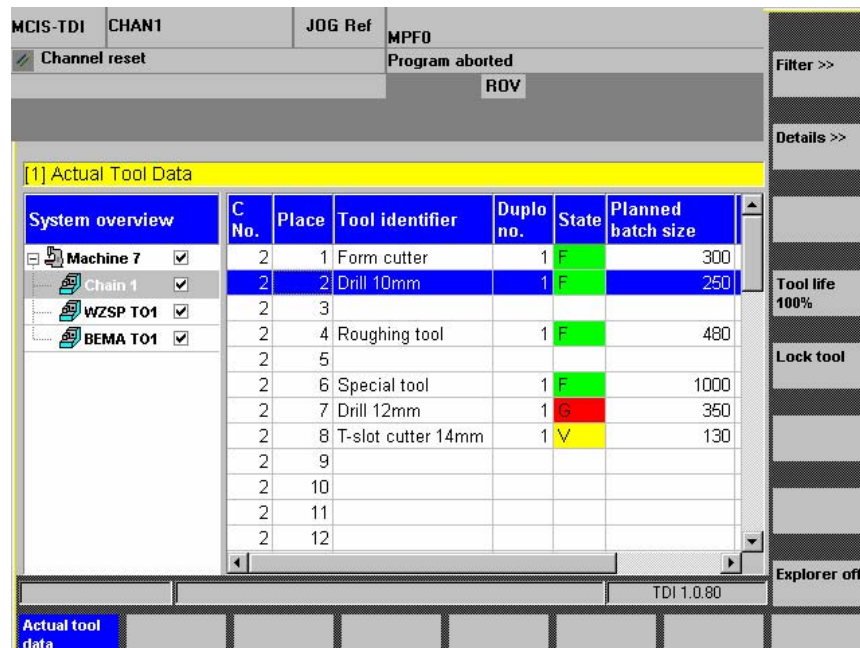























Fig. 3-1 Overview of actual tool data

Meaning of symbols in the system overview

The following component statuses are displayed as symbols in the plant overview.

Table 3-1 Description of symbols

	State: Normal	State: Error	State: Synchronization in progress
Plant			
Group			
Unit/machine			
Container/magazine			
External container/magazine			
Disposal container/magazine			
Presetter			

Description of state:

Normal: This plant component is communicating "online" and the actual tool data is up-to-date.

Error: This plant component has a communication error. Data cannot be read.

Synchronization in progress: All tool data is read once when the system boots.

Tool state: Meaning of abbreviations

The bit-coded tool state is represented by a letter in the "State" column.

Table 3-2 Tool state

Color	Meaning	Letter for display
Green	Enabled	F
Red	Blocked	G
Yellow	Prewarning limit reached	Fp

Description of softkeys

The following functions can be executed using the vertical softkeys:

"Filter>>"

This key accesses the screen for defining selection filters and for selecting the columns that appear in the list.

"Details>>"

Click this key to access details of the selected tool in order to view and change tool data. A distinction is made between NC data and PLC data.

"Tool life 100%"

If tools of the same type are exchanged, it is possible to set the tool life to 100% using a softkey.

The actual service life/actual unit quantity for the selected tool can be set as follows:

- In NCU counting mode: To the appropriate target service life / target unit quantity (of workpieces),
- In TL2000 counting mode: To zero.

"Lock tool"

A selected tool can be disabled in order to prevent its further use. This function is also protected by a Transline protection level.

"Explorer on/off"

Shows/hides the plant components tree.

The "Details", "Tool life 100%", and "Lock tool" buttons are related to the tool selected in the list and are only active if a tool is selected.

Note

In order to avoid errors, all buttons are deactivated during data transfer.

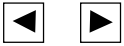
Note

The "Tool life 100%" and "Lock tool" functions can be protected using the protection level concept.

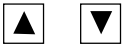
Operating



Use the TAB key to switch between the Explorer view and list format.



Use the left/right arrow keys to open and close the individual levels of the plant components shown in the display.

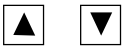


Use the up/down arrow keys to move the cursor up and down within Explorer.

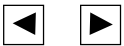


Use the selection key to select and deselect the plant components to be displayed. A checkmark appears in the checkbox when a component is selected.

An empty box indicates that a component has not been selected.



Within the actual tool data list, use the arrow keys to move the cursor up and down.



Only the columns selected in the layout are displayed.

However, the list of available columns may be larger than the list of selected columns.

In order to view the columns outside of the visible area, scroll horizontally using the right/left arrow keys.



Use this button to make the Explorer window and the list columns wider.



Use this button to make the Explorer window and the list columns narrower.

3.2 Actual tool data details

Select a tool in the tool list and press the "Details>>" softkey to access geometry and technology data, as well as a graphic of the tool. This screen can only be selected by entering a password (protection level 1). A scroll bar may appear depending on the number of items of data.

The screen is divided into a number of sections separated by yellow divider bars.

3.2.1 Tool details for NC

If a SINUMERIK 840D is being used with standard tool management, a graphic image of the selected tool will appear depending on the tool type.

Global tool data				
Place no.	7			
Tool identifier	FACE MILL120			
Duplo no.	1	T-Placetype	1	
Tool state	P			
Monitoring	Tool life			

Edge data				
Tool length compensation	Geometry	Wear	Base	Unit
Length 1 (L1)	142	0	0	
Length 2 (L2)	0	0	0	
Length 3 (L3)	0	0	0	
Tool radius offset	Geometry	Wear	Unit	
Radius 1 (R1)	60	0		

Monitoring data				
Batch size	0	0	0	Items
Life time	0	170	15	Minutes

Fig. 3-2 NC details

General tool data

The following basic data appears in the "Global tool data" section:

- "Place no."
- "Tool identifier"
- "Duplo no."
- "T-Place type"

The tool location type defines the kind of location in the magazine. The selected tool can only be loaded (changed) to a location of the appropriate type. For additional details, please refer to the description of the standard tool management of Sinumerik 840D

- "Tool state"

The values "Place no.", "Tool identifier", "Duplo no.", "T-Place type" cannot be changed!

Select the state:

The state of a tool can be changed. After selecting the "Change data" button and the state field, a window to select the state is opened when the Return key is pressed.

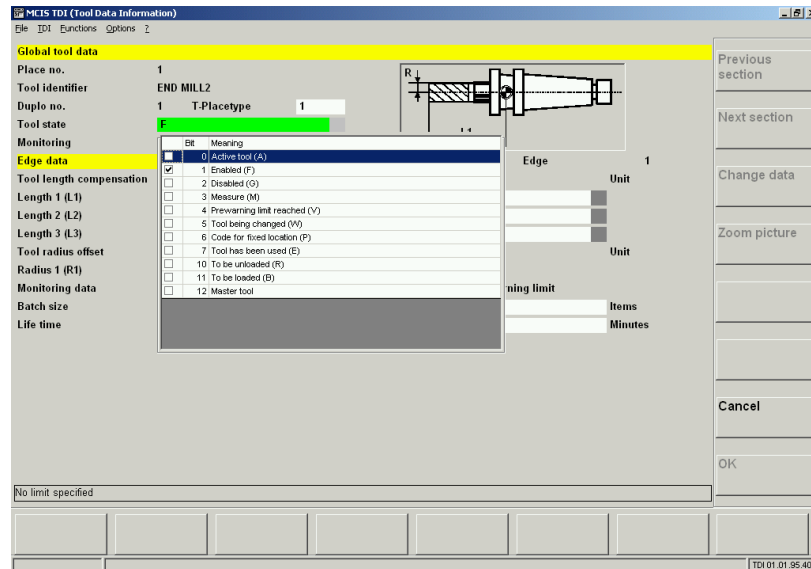


Fig. 3-3 Change tool state

You can select the following states:

- Active tool (A)
- Enabled (F) *)
- Disabled (G) *)
- Measure (M) *)
- Prewarning limit reached (V)
- Tool being changed (W)
- Code for fixed location (P)
- Tool has been used (E)
- To be unloaded (R) *)
- To be loaded (B) *)
- Master tool

For the meaning of the individual states, please refer to the description of the standard tool management for Sinumerik 840D.

References: /FBW/ Description of Functions Tool Management

Multiple states can be selected. The states marked with *) are represented by the letter (abbreviation) in the display field.

Cutting edge data

The "Edge data" section displays the following data for each tool nose, some of which can be modified:

Tool length compensation:

- "Geometry" (data cannot be modified)
- "Wear"

- "Base" (data cannot be modified)
- "Unit" (data cannot be modified)

Tool radius offset:

- "Geometry"
- "Wear"

Monitoring data (unit quantity/service life)

- "Residual value"
- "Setpoint"
- "Prewarning limit"

Depending on the number of tool noses or the tool type, additional data may be available. If this is the case, a scroll bar appears.

A wait screen appears while the tool data is being loaded. An error message is output if an error occurs during loading.

Checking limit values

The input fields may have limit values. These are indicated in the status bar. If you input a value that exceeds the limits, a message will appear in the status bar to inform you of this and you will only be able to exit the input field once you have corrected the value.

Description of softkeys

The following functions can be executed using the vertical softkeys:

"Previous section"

The screen reverts to the previous section in order to view other tool data.

"Next section"

The screen moves forward one section.

"Change data"

You must use this function to enable changes to be made to tool data in the screen.

"Zoom picture"

The tool symbol can be made larger/smaller.

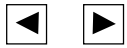
"Cancel"

Data that has already been entered is deleted and the screen returns to the actual tool data overview.

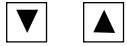
"OK"

Data is saved and the screen returns to the actual tool data overview.

Operating



Use these keys to move the cursor from input field to input field.



You must press the [ENTER] key once you have added data to the input fields.

Depending on the type of tool management, the display will differ for NC and PLC.

3.2.2 Tool details for PLC

Tool data for PLC is displayed as follows:

MCIS-TDI	CHAN1	JOG Ref	MPFD
Channel reset		Program aborted	
		ROV	
Global tool data			
Place no.	1		
Tool identifier	Form cutter		
Tool state	F		
Alarm	Not extended		
Monitoring data			
Actual batch	38	Items	
Pre alarm	280	Items	
Extended	0	Items	
Target value	300	Items	
Remaining	262	Items	
No limit specified			
			TDI 1.0.80
			OK
			Cancel
			Zoom picture
			Change data
			Next section
			Previous section

Fig. 3-4 PLC details

The following basic data appears in the "Global tool data" section:

- "Place no."
- "Tool identifier"
- "Tool state"

These values cannot be changed.

The following values appear and can be modified in the "Monitoring data" section:

- "Actual batch"
Current service life/unit quantity
- "Target batch"
Max. permissible unit quantity / service life
- "Pre alarm"
Default service life for the "Prewarning reached" message.
- "Extended"
Option for increasing the setpoint (absolute value).
Note: Only if you are using the Transline counting mode under HMI PRO.
- "Remaining"
Residual unit quantity/service life. As soon as the extended warning is set, the residual unit quantity is determined by the extended warning.
(This value cannot be edited!)

A wait screen appears while the tool data is being loaded. However, if an error occurs during loading, an error message is output.

Description of softkeys

The following functions can be executed using the vertical softkeys:

"Change data"

You must use this function to enable changes to be made to tool data in the screen.

"Cancel"

Data that has already been entered is deleted and the screen returns to the actual tool data overview.

"OK"

Data is saved and the screen returns to the actual tool data overview.

Operating



Use the TAB key to move the cursor from input field to input field.



You must press the [ENTER] key once you have added data to the input fields.



Use the "screen keys" to move the screen with the scroll bar.

Depending on the type of tool management, the display will differ for NC and PLC.

3.3 Actual tool data filter

The filter settings for the actual tool data to be displayed can be defined in this screen. With one exception (see below), all filter criteria are logically ANDed. Select a tool in the actual tool data overview and press the "Filter" softkey. The more criteria you define, the more refined searches for specific tools will be.

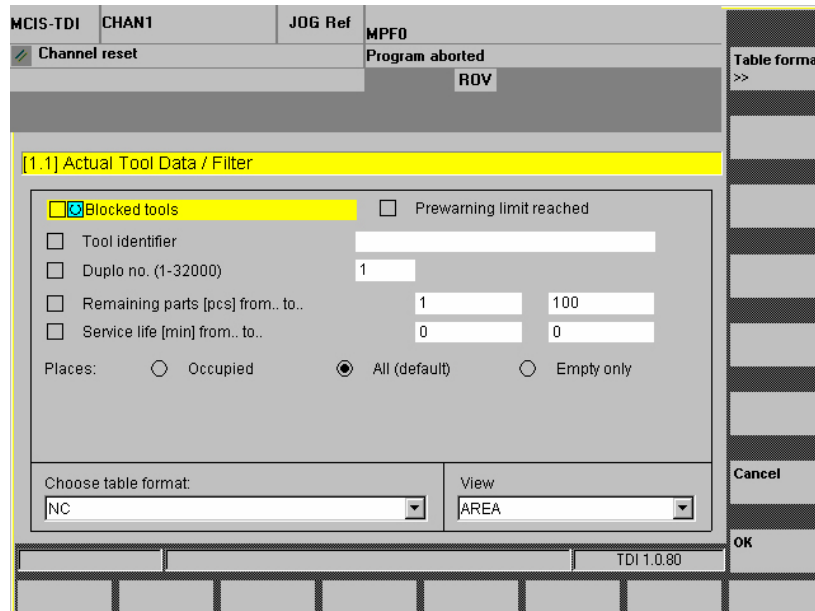


Fig. 3-5 Filter settings

Possible filter settings

- "Blocked tools"
Show broken, worn out or blocked tools.
- "Prewarning limit"
All tools are displayed that have reached the prewarning limit.
- "Tool identifier"
The identifier is entered manually. An asterisk (*) can be used as a wildcard. For example, enter "Drill*" for all tools whose identifier starts with "Drill" (Drill 10 mm, Drill 14 mm, etc.). The tool identifier filter is case-sensitive.
- "Duplo no. (1-32000)"
All tools with the preset duplo number appear.
- "Remaining parts (pcs) from ... to ..."
- "Service life (min.) from ... to ..."

- "Place" (Occupied, All (default), Empty only)
- "Choose table format"
Use this function to select a table format.
- "View"
You can customize the view in the Explorer.

The following settings apply:

AREA -> Complete view

Hierarchical -> The machines and all of the higher-level containers assigned to the machines are displayed.

UNIT -> The machine you are working on is displayed.

Note

If files "Blocked tools", "Prewarning limit", "Remaining parts (pcs) from ... to ..." and "Service life (min.) from ... to ..." are activated in parallel, the system displays the tools that have fulfilled at least one of the criteria.

Description of softkeys

The following functions can be executed using the vertical softkeys:

"Table format >>"

All settings appear in table format.

"Cancel"

Data that has already been entered is deleted and the screen returns to the actual tool data overview.

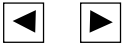
"OK"

The settings are saved and the screen returns to the actual tool data overview.

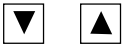
Operating



Use the TAB key to switch from one field to the next.



Use these keys to move the cursor from input field to input field.



Use the selection key to select/deselect a component.



You must press the [ENTER] key once you have added data to the input fields.
If the checkbox for a text field has not been activated, that field cannot be accessed.

3.4 Actual tool data layout

In the "Actual tool data filter" screen, select a table format that has already been saved in the "Select table" column and press the "New layout..." softkey. The screen for editing the table or creating a new format appears.

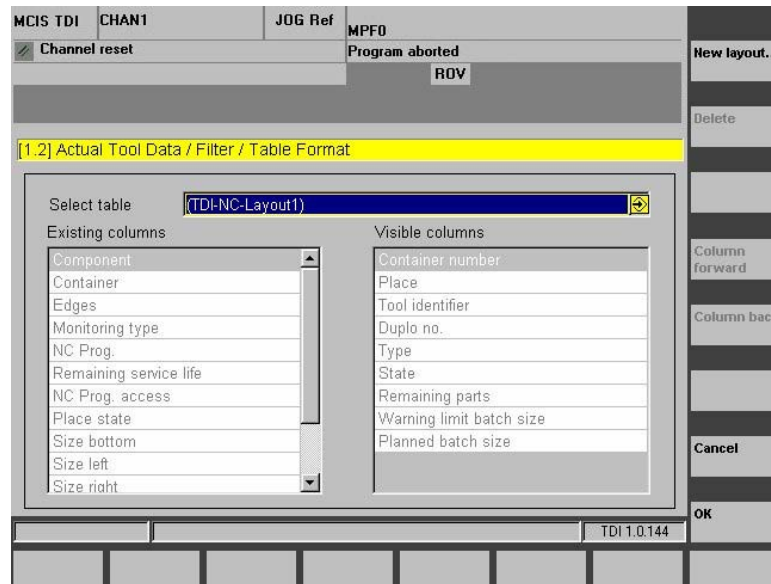


Fig. 3-6 Actual tool data layout

- "Existing columns"
The list shows all tool data that has not been selected.
- "Visible columns"
The list shows the values displayed in the actual tool data overview for each tool.

Note

You can use the protection level concept to restrict access to this screen. Table formats, whose names are displayed in brackets, designate standard formats that cannot be changed.

List display: Possible columns

Five different table displays have been created as examples to facilitate operation. You cannot change these five predefined table displays. However, you can use these examples as a template to create and store your own table displays.

The following different displays can be selected.

1. For operation with a CNC and standard tool management:
 - TDI NC layout1 (display of residual unit quantity)
 - TDI NC layout2 (display of residual service life)

2. For operation with a PLC-based tool management (if you are using HMI PRO):
 - PLC TL layout (the actual unit quantity is calculated using the Transline counting mode).
 - PLC NC layout (the actual unit quantity is calculated using the CNC counting mode).

3. For mixed operation between CNC with standard tool management and PLC-based tool management (TDI NC layout 3).

Table 3-3 Preset columns for Transline and TDI

No.	Overview programmed	Transline PLC, counting mode as TL2000 (PLC TL layout)	Transline PLC, counting mode as NC (PLC NC layout)
1	Component	Preset	Preset
19	C no.	Location (5)	Location (5)
3	Container	Tool identifier (6)	Tool identifier (6)
5	Location	State (8)	State (8)
6	Tool identifier	Actual unit quantity (28)	Residual unit quantity (16)
7	Duplo no.	Prewarning (29)	Warning limit for unit quantity (30)
14	Tool edges	Target unit quantity (27)	Target unit quantity (27)
10	Monitoring	Extended alarm (32)	
16	Residual unit quantity	Residual unit quantity (16)	
15	Residual service life		
12	NC prog.		
13	Access		
17	Destination	Residual columns:	Residual columns
18	Provision	Component (1)	Component (1)
8	State	C no. (19)	C no. (19)
25	Location state	Container (3)	Container (3)
24	U		
21	L		
22	R		
23	O		
26	Target service life		

No.	Overview programmed	Transline PLC, counting mode as TL2000 (PLC TL layout)	Transline PLC, counting mode as NC (PLC NC layout)
27	Target unit quantity		
28	Actual unit quantity		
29	Prewarning		
30	Warning limit for unit quantity		
31	Warning limit for service life		
32	Extended alarm		
9	Type		

Table 3-4 Preset columns for TDI unit quantity, tool life, and mixed operation

No.	Overview programmed	TDI unit quantity (TDI NC layout1)	TDI tool life (TDI NC layout2)	Mixed operation NC/PLC (TDI NC layout3)
1	Component	Preset:	Preset:	Preset:
19	C no.	C no. (19)	C no. (19)	Component (1)
3	Container	Location (5)	Location (5)	Container (3)
5	Location	Tool identifier (6)	Tool identifier (6)	Location (5)
6	Tool identifier	Duplo no. (7)	Duplo no. (7)	Tool identifier (6)
7	Duplo no.	Type (9)	Type (9)	Duplo no. (7)
14	Tool edges	State (8)	State (8)	State (8)
10	Monitoring	Residual unit quantity (16)	Residual tool life (15)	
16	Residual unit quantity	Warning limit for unit quantity (30)	Warning limit for tool life (31)	
15	Residual service life	Target unit qua. (27)	Target serv. life (26)	
12	NC prog.			
13	Access			
17	Destination	Residual columns:	Residual columns:	Residual columns:
18	Provision	Component (1)	Component (1)	C no. (19)
8	State			Tool edges (14)
25	Location state	Container (3)	Container (3)	Monitoring (10)
24	U	Tool edges (14)	Tool edges (14)	Residual unit quant. (16)
21	L	Monitoring (10)	Monitoring (10)	Residual service life (15)
22	R	NC prog. (12)	NC prog. (12)	NC prog. (12)
23	O	Res. serv. life (15)	Res. unit quantity (16)	Access (13)
26	Target service life	Access (13)	Access (13)	Location state (25)
27	Target unit quantity	Location state (25)	Location state (25)	U (24)

No.	Overview programmed	TDI unit quantity (TDI NC layout1)	TDI tool life (TDI NC layout2)	Mixed operation NC/ PLC (TDI NC layout3)
28	Actual unit quantity	U (24)	U (24)	L (21)
29	Prewarning	L (21)	L (21)	R (22)
30	Warning limit for unit quantity	R (22)	R (22)	O (23)
31	Warning limit for service life	O (23)	O (23)	Target service life (26)
32	Extended alarm	Target service life (26)	Target unit quantity (27)	Target unit quantity (27)
9	Type	Warning limit for service life (31)	Warning limit for unit quantity (30)	Actual unit quantity (28)
				Prewarning (29)
				Warning limit for unit quantity (30)
				Warning limit for service life (31)
				Extended alarm (32)
				Type (9)

Description of softkeys

The following functions can be executed using the vertical softkeys:

"New layout..."

Shows a selection window in which you can enter the name of a new table format.

"Delete"

Deletes the current table format (subject to the confirmation of a prompt).

"Column forward"

Moves the line selected in the "Visible columns" list one position upwards. In the table view, this moves the corresponding column one position to the left.

"Column back"

Moves the line selected in the "Visible columns" list one position downwards. In the actual tool data table view, this moves the corresponding column one position to the right.

"Cancel"

Data that has already been entered is deleted and the screen returns to the "Actual Tool Data Filter" view.

"OK"

The data is saved and the screen returns to the "Filter" view.

Note

The "New layout...", "Delete", "Column forward", and "Column back" functions are only available for user-defined table formats.

Operating

Use the TAB key to move the cursor from input field to input field within a screen.



Use the selection key to select the required layout



and confirm your selection by pressing [ENTER].



Use these keys to move the cursor in the "Existing columns" and "Visible columns" lists.



Use these keys to move tools from active to inactive tables. This function is only available for user-defined layouts.

3.4.1 Editing the layout

This screen is used to adapt the tool data available for the actual tool data overview to the list view. If a table format is selected, all tool data displayed in the actual tool data overview for each tool appears in the "Visible columns" list. The "Existing columns" list contains all other available tool data. The screen is the same as the one for the "Actual Tool Data Layout". The softkeys listed below can be used to modify the selection and assignment of columns.

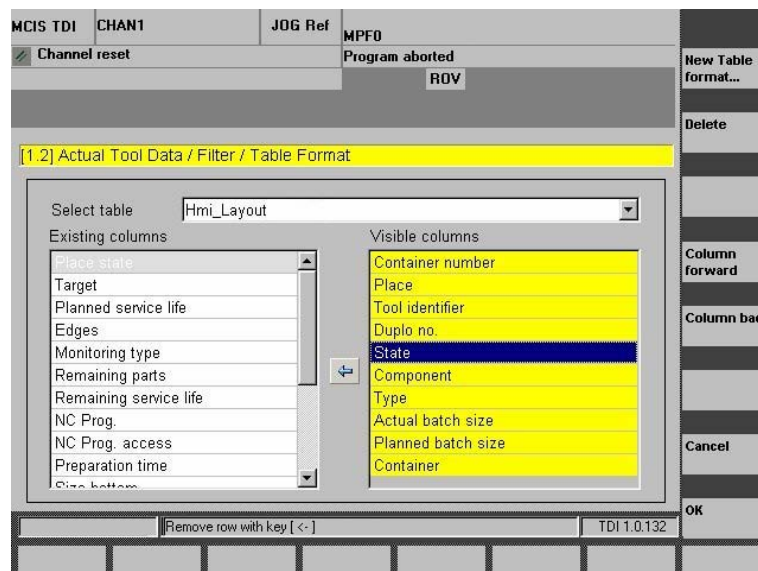


Fig. 3-7 Editing layouts

The arrow symbol in between the two lists indicates the direction in which the tool data item currently selected in the list can be moved.

Description of softkeys

The following functions can be executed using the vertical softkeys:

"New Table format..."

Shows a selection window in which you can enter the name of a new table format.

"Delete"

Deletes the current table format (subject to the confirmation of a prompt).

"Column forward"

Moves the line selected in the "Visible columns" list one position upwards. In the table view, this moves the corresponding column one position to the left.

"Column back"

Moves the line selected in the "Visible columns" list one position downwards. In the actual tool data table view, this moves the corresponding column one position to the right.

"Cancel"

Data that has already been entered is deleted and the screen returns to the "Actual Tool Data Filter" view.

"OK"

The data is saved and the screen returns to the "Filter" screen.

3.4.2 New layout

The "Table Format" input screen appears when you press the "New Table format..." softkey. Enter the name of the new layout under "Enter new name". If the maximum number of layouts has been reached, a new layout can only be created by overwriting an existing one. In this case, in addition to the input field for the name, a list of existing layouts also appears.

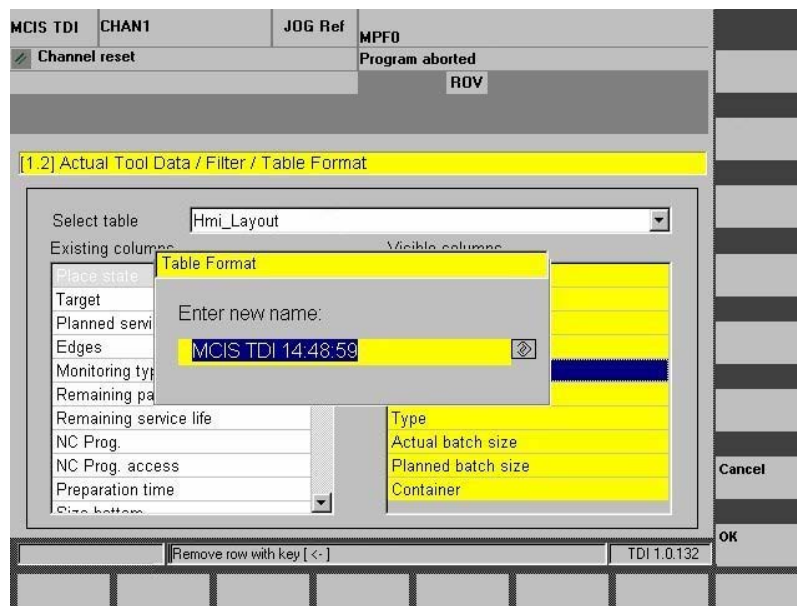


Fig. 3-8 New layout

Description of softkeys

The following functions can be executed using the vertical softkeys:

"Cancel"

A new layout is not created, all data entered is deleted and the screen returns to the "Actual Tool Data Filter" view.

"OK"

The data is accepted and a new layout is created.

If the window does not close after you have clicked on "OK", you must check the layout name.

Restrictions on layout names

- Only letters, numbers and underscores (_) may be used.
- The name must not contain more than 40 characters.
- All names must be unique.

Operating



Names that have been entered must be completed by pressing the input [ENTER] key. New names are accepted when you exit the screen by clicking "OK".

3.4.3 Deleting the layout

Once you have selected a table format and pressed the "Delete" softkey, a window will appear with a prompt to ask if you really want to delete the layout.

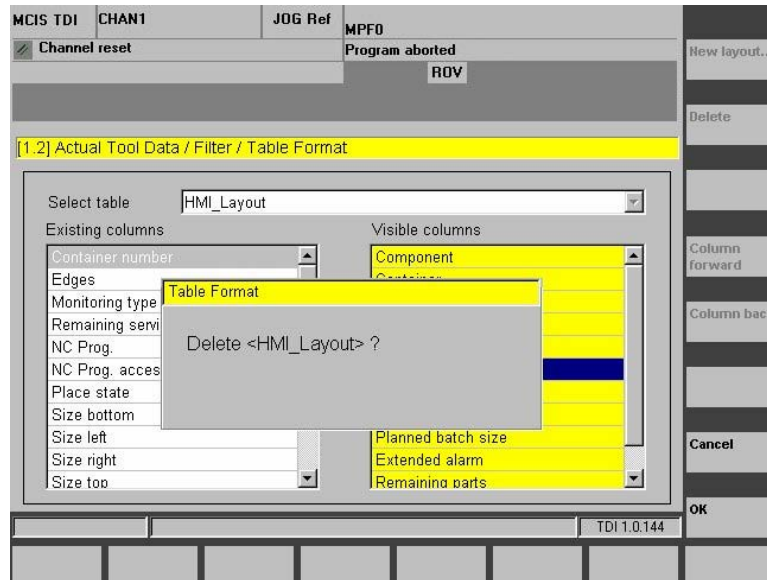


Fig. 3-9 Deleting layouts

Note

Only layouts that have been created for specific customers may be deleted.

Description of softkeys

The following functions can be executed using the vertical softkeys:

"Cancel"
Do not delete the selected layout.

"OK"
Delete the selected layout.



4

4 Tool Handling

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4.1 General

The TDI Tool Handling module can be used to map all tool handling operations within a plant, to control loading, unloading or relocation of tools on the CNC machine or a tool container, and to download tool data from a tool setting station. Any of the containers within a plant can be involved in these processes. The TDI Tool Handling module can operate within a network with TDI Cell/Plant or on a single station (e.g., for downloading tool data from a tool setting station).

4.2 Tool handling / selection

You can select the tools to be moved via the entry screen for the tool handling module.

The "Tool Handling / Selection" screen is divided into two halves:

The top half displays an Explorer view of all the tool magazines positioned above the local component (operating / installation location) within the plant hierarchy.

The local plant component is displayed in the lower half.

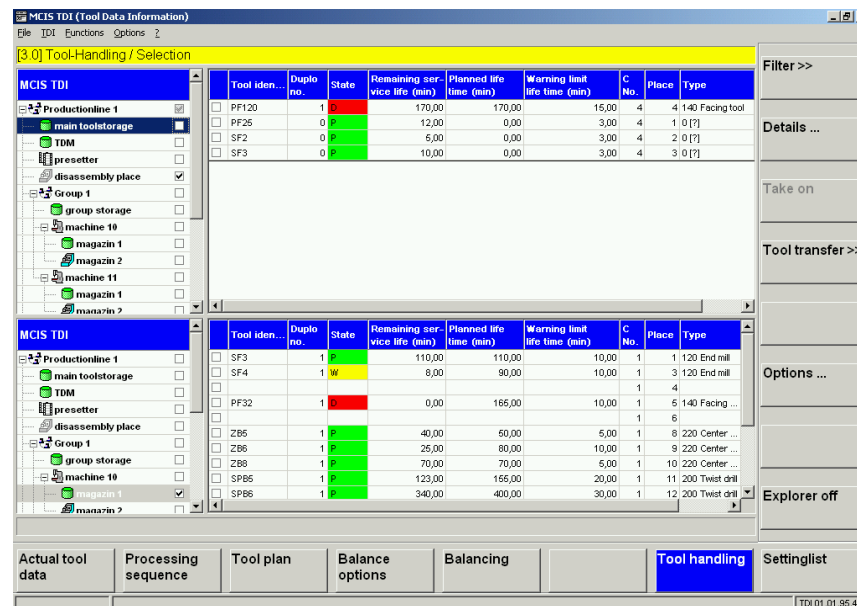


Fig. 4-1 Tool handling / selection

Note

Lower half of screen:

In the CNC version, the lower half always shows a view of the local component (unit).

A view of the whole plant as configured as shown in the PC version.

Depending on the type of movement (load or unload), the top or bottom half of the display can be either the source or target of the movement.

You select the tools to be moved in the table (by placing a tick in the selection box). The tools you select in the table are transferred to the movement list when you click the "Accept" softkey.

You can select either individual or multiple tools (e.g., cartridge, tool carriage, loading magazine with more than one location) for the movement list. If you select only one tool (source), you can specify a particular target location by ticking the appropriate box in the table. This only works if you have selected a single tool.

The screenshot displays the MCIS TDI (Tool Data Information) software interface. The main window is titled "MCIS TDI (Tool Data Information)" and contains a menu bar (File, IDI, Functions, Options) and a toolbar. The interface is divided into several sections:

- Left Panel:** A tree view showing the production line structure, including "Productionline 1", "main toolstorage", "TDM", "presetter", "disassembly place", "Group 1", "group storage", "machine 10", "magazin 1", "magazin 2", "machine 11", and "magazin 1".
- Top Table:** A table with columns: Tool identifier, Duplo no., State, Remaining service life (min), Planned life time (min), Warning limit life time (min), C No., Place, and Type. It lists tools PF120, PF25, SF2, and SF3.
- Bottom Table:** A table with the same columns as the top table, listing tools SF3, SF4, PF32, ZB5, ZB6, ZB8, SPB5, and SPB6.
- Right Panel:** A vertical stack of buttons: Filter >>, Details ..., Take on, Tool transfer >>, Options ..., and Explorer off.
- Status Bar:** Displays the current movement: "Productionline 1:Group 1:machine 10:magazin 1 => Productionline 1:disassembly place".
- Bottom Navigation:** A row of buttons: Actual tool data, Processing sequence, Tool plan, Balance options, Balancing, Tool handling (highlighted), and Settinglist.

Fig. 4-2 Tool handling with info line

The source and target of the movement you are currently programming are shown explicitly in the info line. A movement is defined by the following information in the info line:

- Location
- Container

Note

- You may only specify one machine as the target for tool movements.
- If you have transferred tools to the movement list with the "Accept" softkey, they will no longer be available for selection. The checkbox selection is grayed out. You can only make changes in the "Organize movement" screen.
- If you change the selection of containers to be displayed in the Explorer view, you invalidate the tool selection of the deselected container. A tool selection can be invalidated if you have not yet transferred the tools to the movement list.
- The ticks for selected tools which you have transferred to the movement list remain set until you complete the operation.
- You can add to the movement list at any time by selecting "Accept tool".
- One possible target for tools is the disposal container; this is displayed in the plant configuration (Explorer) with a waste bin symbol. Tools which are transferred to the disposal container remain in the container list for only a limited period. This list can be made available to a higher-level tool management system for tool disposal functions.

The actual tool data are displayed on the right-hand side of the relevant subscreen in the same format used for the actual tool data overview display. For further details, please see Chapter 3: Overview

Description of softkeys

The following functions can be executed using the vertical softkeys:

"Filter>>"

This key accesses the screen for defining selection filters and for selecting the columns that appear in the list. The filter setting you make here is applicable only to the area of the screen on which the cursor is positioned.

"Details..."

Click this key to access details of the selected tool in order to view and change tool data. A distinction is made between NC data and PLC data.

"Take on"

The selected tool movements are transferred to the tool movement list.

"Tool transfer>>"

This key opens the list of all current tool movements.

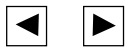
"Options..."

Opens the pop-up screen in which you can specify different sequences for tool movements.

"Explorer on/off"

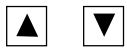
Shows/hides the plant component tree.

Operating



Use the right/left arrow keys to open and close the individual levels of the plant components featured in the display.

If the scroll bar is displayed in the diagram, use the scroll feature.



Use the up/down arrow keys to move the cursor up and down within Explorer.

If the scroll bar is displayed in the diagram, use the scroll feature.



Use the selection key to select and deselect the plant components to be displayed. A checkmark appears in the checkbox when a component is selected.

An empty box indicates that a component has not been selected.



Within the actual tool data list, use the arrow keys to move the cursor up and down.



Only the columns selected in the layout are displayed.

However, the list of available columns may be larger than the list of selected columns.

In order to view the columns outside of the visible area, scroll horizontally using the right/left arrow keys.



Use this button to make the Explorer window and the list columns wider.



Use this button to make the Explorer window and the list columns narrower.

4.3 Options settings for Tool Handling

You can make global settings for all movements in the "Options" pop-up window in the "Tool Handling" screen.

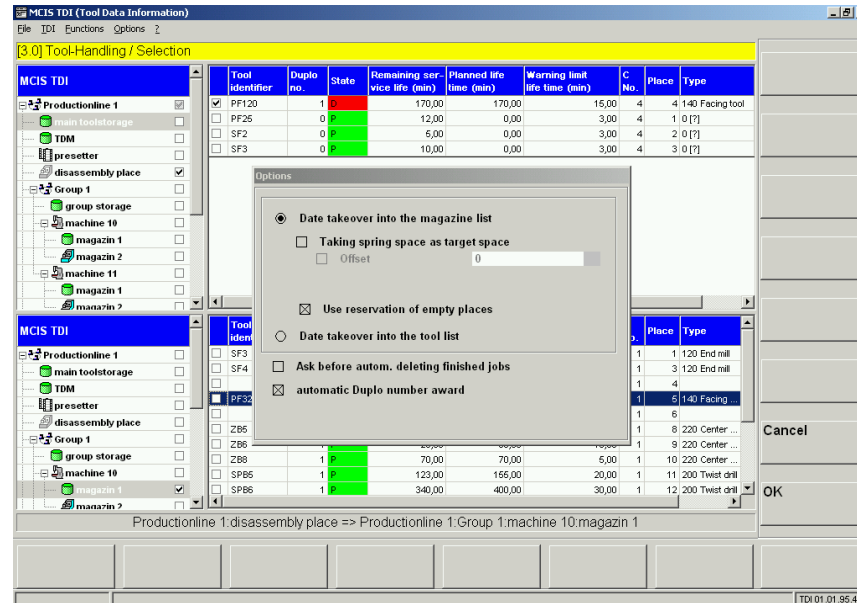


Fig. 4-3 Tool handling / Options

"Data takeover into the magazine list"

Specifies that the movement occurs in a real magazine. You can select further options for this movement.

"Data takeover into the tool list"

For tool loading via the tool list (e.g., loading/unloading via OP030) of the standard tool management system, you can use this function to write the tool data to the list without actually moving the tool. Depending on the selected movement, the load or unload identifier is set for the relevant tool in the standard tool management system.

Note

This option is visible only if the configuration contains at least one machine magazine with activated option "Permit data transfer without PLC acknowledgement" is activated.

"Taking spring space as target space"

(only with "Data takeover into the magazine list")

To facilitate the handling of transport magazines (changing magazines), the location in the transport magazine can be accepted as the target location in the machine. You can accept the location unchanged or apply an offset (transport magazine locations 1-20 => with offset 100: Target magazine locations 101- 120).

"Data transfer without PLC acknowledgement"

(only with "Data takeover into the magazine list")

If you add complete tool containers (e.g., tool cartridges) to the machine, or insert single tools directly in magazine locations, you can use this function to deactivate scanning of PLC acknowledgements. In other words, the tool data are entered directly in the magazine list.

This option is visible only if the configuration contains at least one machine magazine with activated option "Permit data transfer without PLC acknowledgement".

"Use reservation of empty places"

(only with "Data takeover into the magazine list")

This option is activated by default, i.e., TDI automatically reserves empty locations using a virtual TDI tool TDI_Reservation in the magazine. This option prevents problems caused by several stations attempting to load a tool to the same location simultaneously. This option is stored for each tool movement.

If the reservation option is deactivated, the softkeys for empty location searches and the setting options for empty locations are not displayed (safety reasons).

"Ask before autom. deleting finished jobs"

In the default setting, all completed jobs are automatically deleted, i.e., no longer displayed, every time you open and close the "Movement list" screen (and only then!).

If the option "Prompt before automatically deleting completed jobs" is activated, completed orders are not automatically deleted when the screen is displayed, i.e., all completed jobs are displayed. When you close the screen, a prompt window will open asking whether you wish all completed jobs to be deleted.

"automatic Duplo number award"

In the case of duplo number conflicts in the target magazine, you can activate automatic assignment of duplo numbers in this screen. The next higher duplo number is assigned according to the existing duplo number assignments in the SIN 840D tool management system.

4.4 Tool movement

The tool movement screen displays a list of all current tool movements and keys for starting or canceling the list of tool movements and for organizing individual movements.

Tool name Duplo no.	Source	Source place	Destination	Destination place	State	Load/Unload position
PF120 1	Productionline 1, disassembly place	4	machine 10, magazin 1	AUTO		
ZB6 1	machine 10, magazin 1	9	Productionline 1, disassembly place	AUTO		
PLANFRAESER2 1	machine 11, magazin 1	4	Productionline 1, disassembly place	AUTO		
SCHAFTFRAESEI 1	machine 11, magazin 1	3	Productionline 1, disassembly place	8		
SF3 1	machine 10, magazin 1	1	Productionline 1, presetter	AUTO		
GB5 1	machine 10, magazin 1	14	Productionline 1, presetter	9		
GB10 1	machine 10, magazin 1	16	Productionline 1, presetter	AUTO		

Fig. 4-4 Tool movement

The screen shows the following detailed information:

- Icons which represent the various motion processes:



Load



Unload



Relocate

- Which tool is being moved
- Current source location of tool
- Target magazine of tool
- Target location of tool
 - Target location: An individual location has been specified explicitly
 - Auto: An empty location search is performed automatically

- Status of movement
 - <Empty> The movement has not yet started
 - "Initialization" The movement is being initialized
 - "Set options" The options for the movement are being set
 - "In progress" The movement has been started
 - "Unloading active" The tool is being unloaded
 - "Loading active" The tool is being loaded
 - "Finished" The movement is complete
 - "Cancel (<code>)" The movement has been aborted.
The reason for the abort is displayed in the status line
- Loading/unloading location

Description of softkeys

"Organise transfer>>"

Function for organizing the movement, e.g.: change sequence, delete movement, specify target location.

"Details>>"

Click this key to access details of the selected tool in order to view and change tool data. A distinction is made between NC data and PLC data.

"Start transfer"

This key initiates execution of the movement list.

"Cancel transfer"

Execution of the movement list is aborted as soon as the current movement is completed.

"Options..."

Opens the pop-up screen in which you can specify different sequences for the selected tool movement.

"<<"

Return to the tool handling screen.

Note

If the movement is aborted with "error" due to a duplo number conflict, you must either assign a new duplo number in the "Tool identifier/Duplo" column 2nd line, or activate the "Automatic Duplo number assignment" option in the options screen to assign a number automatically. In all cases, the altered duplo number changes color for easier identification.

If the TSS does not specify a duplo number (0), TDI automatically assigns a free number as the tool is being moved.

Completed jobs are no longer displayed when you open the screen again (unless a processing error has occurred).

If the source or target is a machine magazine, then you must specify the loading/unloading location in the Options screen if there is more than one point.

If the target is a magazine without location management (e.g., an external tool magazine), it will not be possible to perform an empty location search. An attempt to perform an empty location search generates an error message.

Tools cannot be moved directly from machine to machine, but only via a temporary storage location in a tool cabinet. This restriction can be disabled when user rights are configured.

You can define the tool movement only on the operator interface of a machine which is involved in the movement. This restriction can be disabled when user rights are configured.

The following applies if the source and target of a movement are machine magazines in the same tool area (TO area):

- If "with PLC acknowledgement" is activated on at least one of the machines involved, the tool movements are not performed via the load points but directly between the magazines.
- You cannot assign a new duplo number. Any attempt to change the duplo number will be rejected with a corresponding error message.

Tool movements must be checked after a power failure. You can resume processing of the tool movement list by clicking "Start movement".

Operating



Use these keys to move the cursor from input field to input field.



Organize movement

You can edit the tools entered in the movement list by clicking the "Organize movement" button.

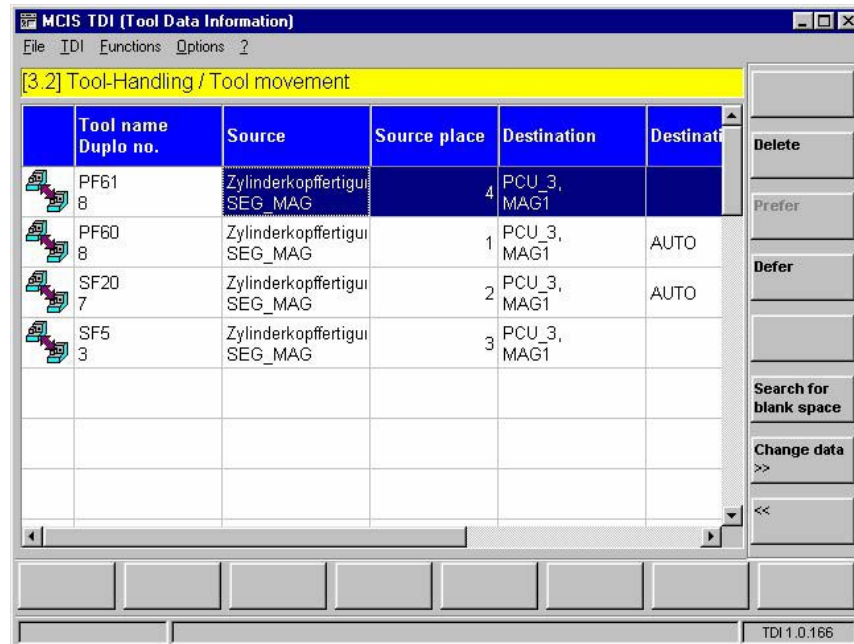


Fig. 4-5 Organize tool movement

The following organizational functions are available:

- Change the machining sequence (move entries up and down in the list).
- Delete entries from the movement list (only applies to movements which have not already commenced).
- Empty location search in target magazine for the selected tool (first free, location is entered as the target location as a function of the magazine and associated load point).
- Option to edit the duplo number and target location using "Change data", e.g., in error situations.

Note

If several magazines are assigned to one load point and the automatic empty location search is activated, the system searches for an empty location in the other magazines if no free location can be found in the specified target magazine.

Description of softkeys

"Delete"

The movement selected in the movement list is deleted.

"Prefer"

The selected movement is moved up by one place in the movement list.

"Defer"

The selected movement is moved down by one place in the movement list.

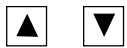
"Search for blank space"

An empty location is sought in the target magazine for the selected movement.

"Change data >>"

You can edit the duplo number and the target location for the selected movement.

Operating



Use these keys to move the cursor from input field to input field.



Changing data

Pop-up window for changing the duplo number and the target location.

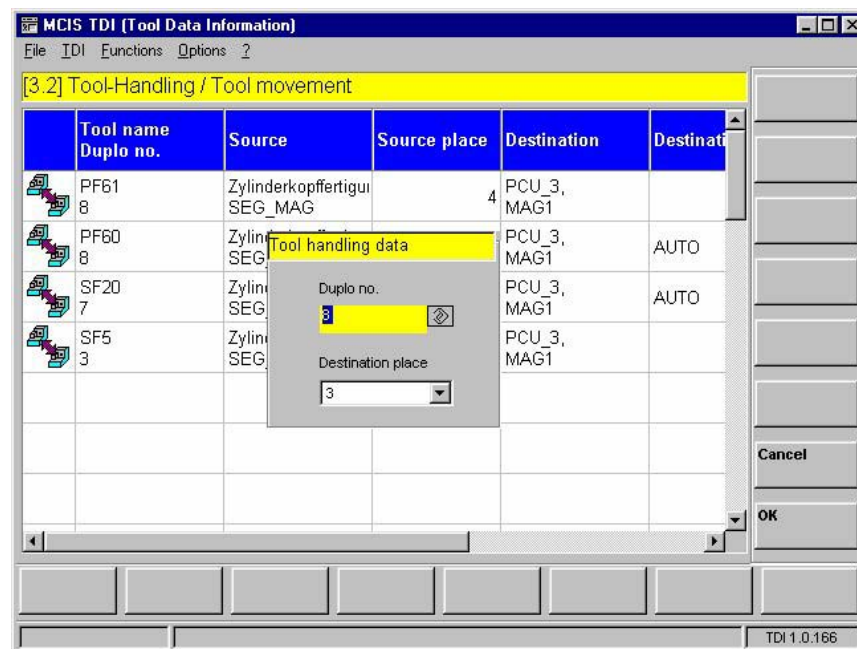


Fig. 4-6 Change duplo number and target location

In this dialog you can enter a duplo number and select the number of the target location from a combobox.

Description of softkeys

"Cancel"
Your changes are discarded.

"OK"
Transfers the changed data to the movement list.

Operating



Use these keys to move the cursor from input field to input field.



You must press the [ENTER] key once you have added data to the input fields.



Use the selection key to select/deselect a component.

4.5 Options settings for tool movement

You can make settings for the selected movement in the "Options" pop-up window in the "Tool handling" screen.

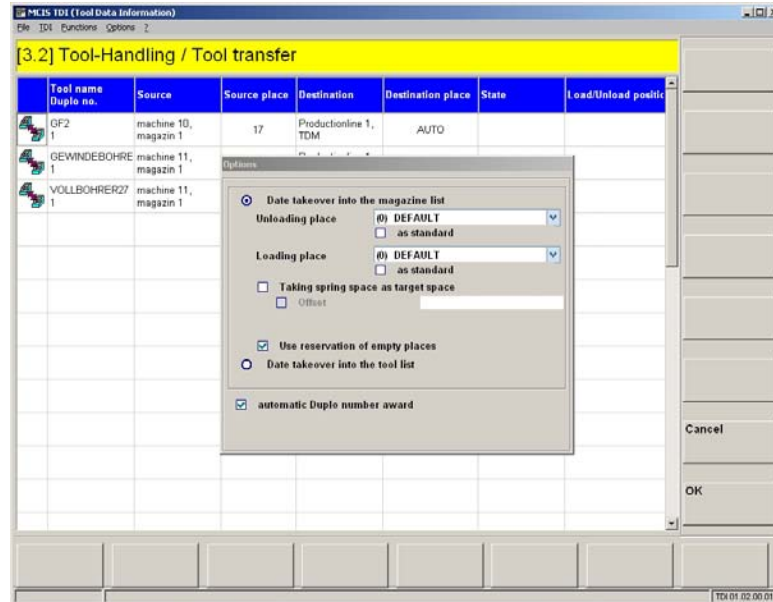


Fig. 4-7 Options for tool movement

You can select the following functions:

"Data takeover into the magazine list"

Specifies that the movement occurs in a real magazine. You can select further options for this movement.

Input of "Unloading place" / "Loading place" (only with "Data takeover into the magazine list")

If a machine has more than one loading/unloading location, you must specify which point is to be used for a tool movement. You can do this by selecting the loading/unloading location in the pull-down list. You can also set one loading/unloading location as the default for all further movements by activating the "as standard" checkbox.

"Take spring space as target space"

To facilitate the handling of transport magazines (changing magazines), the location in the transport magazine can be accepted as the target location in the machine. You can either accept the location unchanged or apply an offset.

(Transport magazine, locations 1-20 => with offset 100: Target magazine locations 101- 120).

"Data transfer without PLC acknowledgement" (only with "Data takeover into the magazine list")

If you add complete tool containers (e.g., tool cartridges) to the machine, or insert single tools directly in magazine locations, you can use this function to deactivate scanning of PLC acknowledgements. In other words, the tool data are entered directly in the magazine list.

This option is visible only if the source and/or target magazine is a machine magazine with activated option "Permit data transfer without PLC acknowledgement".

Note

This option is only visible if the configuration for source and/or target magazine contains a machine magazine with activated option "Permit data transfer without PLC acknowledgement".

"Use reservation of empty places" (only with "Data takeover into the magazine list")

This option is activated by default, i.e., TDI automatically reserves empty locations using a virtual TDI tool TDI_Reservation in the magazine. This option prevents problems caused by several stations attempting to load a tool to the same location simultaneously. This option is stored for each tool movement.

If the reservation option is deactivated, the softkeys for empty location searches and the setting options for empty locations are not displayed (safety reasons).

"Data takeover into the tool list"

For tool loading via the tool list (e.g., loading/unloading via OP030) of the standard tool management system, you can use this function to write the tool data to the list without actually moving the tool. Depending on the selected movement, the load or unload identifier is set for the relevant tool in the standard tool management system.

"automatic Duplo number award"

In the case of duplo number conflicts in the target magazine, you can activate automatic assignment of duplo numbers in this screen. The next higher duplo number is assigned according to the existing duplo number assignments in the SINUMERIK 840D tool management system.

4.5.1 Examples of handling operations

Sample sequence for: "Loading selected tools to a machine magazine"

1. In the "Tool handling" screen on the machine, you select the source = a central, external magazine with set tools (TSS) in the top half of the Explorer view and the target = machine (automatically preset) with corresponding magazine in the bottom half of the Explorer view.
2. By clicking the "Filter>>" softkey (focus decides whether the filter at the top or bottom is operative), you can
 - display tools according to specific criteria in the table at the top: e.g., search for particular tool identifiers
 - set the magazine view in the table at the bottom: e.g., display empty locations.
3. By ticking the appropriate checkbox, you can select the tool to be loaded in the table at the top.
4. By clicking the "Accept" softkey, you can transfer the selected tools to the "Tool movement" screen.
5. The screen opens when you click the "Tool movement>>" softkey.
6. By clicking the softkey: "Start movement" you can start the loading operation.
7. When the load operation commences, a corresponding PI service for empty location search/location check and for loading is started automatically for each tool in the TDI movement list. You physically position the tool(s) at the load point. You must then acknowledge the PI service for loading each tool (PLC: Using button or automatically). During this process the tool data are transferred from the external magazine (database) to the machine magazine (CNC).

Note

If the source or target is a tool directory magazine, you must also select the loading/unloading location.
You can repeat steps 2-4 several times.

Sample sequence for: "Unloading worn tools"

1. In the "Tool handling" screen on the machine, you select the source = machine in the bottom half of the Explorer view and the target = disposal container in the top half of the Explorer view.
2. By clicking the "Filter>>" softkey, you can display the worn tools in the table at the bottom.
3. By ticking the appropriate checkbox, you can select the tool to be unloaded in the table at the bottom.
4. By clicking the "Accept" softkey, you can transfer the selected tools to the "Tool movement" screen.
5. The screen opens when you click the "Tool movements>>" softkey.
6. By clicking the softkey: "Start movement" you start the unloading operation.
7. When the unload operation commences, a corresponding PI service for unloading is started automatically for each tool in the TDI movement list. After each tool is unloaded, you must acknowledge the relevant PI service (PLC: Using button or automatically). You physically remove the tool(s) at the unload point. During this process the tool data are transferred from the machine magazine to the disposal container.

Note

If the source or target is a tool directory magazine, you must also select the loading/unloading location.
You can repeat steps 2-5 several times.

4.6 Connecting tool setting stations (TSS)

The TDI tool handling module includes the interface for downloading tool data from a TSS. If a TSS is integrated into a network with machine tools, the TO data acquired at the TSS can be transferred to TDI.

Tool data are transferred in files. You can freely select the file names; however, all file names must be unique and end with the extension ".ini".

You must set up target directory ...\\TDI\\TDI_IN (installation directory) for importing tool data from the TSS on the machine or the server.

TDI automatically downloads the tool data files from the specified directory. The tool data are downloaded to the TSS magazine (which needs to be configured).

The files in the TDI_IN directory are then deleted.

You can view the tool data by selecting the TSS magazine in the Explorer window of the TDI Overview or TDI Tool Handling.

Note

If no folder for data exchange is set in the configuration for MCIS TDI, the following defaults apply:

On one machine, the TSS must use folder "...\\dh\\tdi_in.clp" in the Sinumerik data management.

On one PC, the folder "TDI_IN" must be used below the installation directory.

If another folder is specified in the configuration for MCIS TDI, the TSS must be configured accordingly.

The tool data stored in the file must be set up as shown below by the TSS:

%_N_SEG_001_COM	Program header (optional)
\$TDI_MACHINE="Machine1"	Machine name for assignment of tools (optional)
\$TDI_SETNAME[1] ="1234"	Name of tool set
\$TDI_SETDATE[1] = "2001/01/14 15:49"	Time of request (optional, only relevant with TDI Planning in conjunction with setting list)
\$TDI_HOLDER="8446"	Holder number for unambiguous identification of tool within a plant (inventory number) (optional)
\$TC_TP1[1] =000	Duplo number; 3-digit; Duplo_Default: 000
\$TC_TP2[1] ="12345"	Tool identifier (32 characters).

\$TC_TP3[1] =1	Size on left Normal: 1 Large: 2 (as for \$TC_TP7 magazine location type)
\$TC_TP4[1] =1	Size on right Normal: 1 Large: 2 (as for \$TC_TP7 magazine location type)
\$TC_TP5[1] =1	Size above Normal: 1 Large: 2 (as for \$TC_TP7 magazine location type)
\$TC_TP6[1] =1	Size below Normal: 1 Large: 2 (as for \$TC_TP7 magazine location type)
\$TC_TP7[1] =1	Magazine location type Note: The magazine location type must match the location type set up on the target machine. If tools from several machines are used, then the magazine location types must be the same across all machines, e.g. 1=small; 2=average; 3=large
\$TC_TP8[1] =10	Status Default: 10 The tool status is calculated e.g., as follows: 2 = tool released + 8 = measure (gauge tool) =10
\$TC_TP9[1] =0	Tool monitoring method Possible values, e.g.: 0 = No tool monitoring 1 = Service life 2 = Unit quantity ... For further methods, see Description of Functions for Tool Management
\$TC_TP10[1] =2	Tool replacement strategy Possible values, e.g.: 0 = No strategy 1 = Next duplo no. 2 = Shortest path ... Others: See Description of Functions for Tool Management
\$TC_TP11[1] =0	Tool info not used Default: 0
\$TC_TPC1[1] =1	Load/unload identifier for TDI default: 0 Note: If the standard data "Load/unload identifier" is not used, OEM data can be used instead. TDI automatically uses the first free OEM data

4.6 Connecting tool setting stations (TSS)

\$TC_TPC2-10[1] =0	Possible OEM data
\$TC_DP1[1.1] = 0	Tool type
\$TC_DP2[1.1] = 0	Cutting edge position
\$TC_DP3[1.1] =0	Geometry - length 1
\$TC_DP4[1.1] =0	Geometry - length 2
\$TC_DP5[1.1] =0	Geometry - length 3
\$TC_DP6[1.1] =0	Geometry - radius
\$TC_DP7[1.1] =0	Geometry - corner radius
\$TC_DP8[1.1] =0	Geometry - length 4
\$TC_DP9[1.1] =0	Geometry - length 5
\$TC_DP10[1.1] =0	Geometry - angle 1
\$TC_DP11[1.1] =0	Geometry - angle 2
\$TC_DP12[1.1] =0	Wear - length 1
\$TC_DP13[1.1] =0	Wear - length 2
\$TC_DP14[1.1] =0	Wear - length 3
\$TC_DP15[1.1] =0	Wear - radius
\$TC_DP16[1.1] =0	Wear - groove width b / rounding radius
\$TC_DP17[1.1] =0	Wear - projection k
\$TC_DP18[1.1] =0	Wear - length 5
\$TC_DP19[1.1] =0	Wear - angle 1
\$TC_DP20[1.1] =0	Wear - angle 2
\$TC_DP21[1.1] =0	Adapter - length 1
\$TC_DP22[1.1] =0	Adapter - length 2
\$TC_DP23[1.1] =0	Adapter - length 3
\$TC_DP24[1.1] =0	Tool clearance angle
\$TC_DP25[1.1] =0	Reserved Default: 0
\$TC_MOP1[1.1]=0	Prewarning limit in minutes Default: 0
\$TC_MOP2[1.1]=0	Residual service life in minutes Default: 0
\$TC_MOP3[1.1]=0	Prewarning limit unit quantity Default: 0
\$TC_MOP4[1.1]=0	Residual unit quantity Default: 0
\$TC_MOP5[1.1]=0	Wear prewarning limit - or prewarning limit for local offset fine
\$TC_MOP6[1.1]=0	Actual wear or actual value for local offset fine
\$TC_MOP11[1.1]=0	Setpoint tool life
\$TC_MOP13[1.1]=0	Target unit quantity
\$TC_MOP15[1.1]=0	Wear setpoint or setpoint for local offset fine
Other cutting edge data if configured	
\$TC_DP1[1.2] =	Cutting edge (2)
\$TC_DP2[1.2] =	Cutting edge (2)
\$TC_DP3[1.2] =	Cutting edge (2)
...	
...	
M17	File end (optional)

Note

The parameters described for the individual sections are illustrated by examples. For a detailed list of other possible system parameters, please refer to the Description of Functions, SIN 840D Tool Management.

Only the relevant cutting edge and monitoring data need to be passed to the interface, TDI adds a zero to any files that are not needed.

4.7 Constraints on location types

The location type defines the kind of location in the magazine. With the allocation of location types to magazine locations, the magazine is subdivided into areas when the standard tool management system of the SINUMERIK 840D is configured.

It is only possible to load a tool to a location of the appropriate type. It is therefore possible to assign various types of special tool, e.g., "large", "heavy", to specific locations. There is no need to apply fixed location coding for this purpose.

When you load a tool, you must ensure that the type of magazine location (\$TC_MPP2) matches the location type you entered in the tool-specific data (\$TC_TP7) of the tool setting station.

The machine manufacturer assigns location types when configuring / starting up the machines. In this context, ambiguities may arise between individual machines and manufacturers in relation to the following definitions:

- Name of location type
- Type of magazine location (\$TC_MPP2)
- Size and form of location in magazine.

The operator must check to ensure that all location types are clearly defined on all machines in the plant.

Example illustrating ambiguities in location type definition:

Machine1	Name of location type	Type of magazine location \$TC_MPP2	Size Total width Total height
	Normal	1	2/2
	Large	2	4/4
	Heavy	3	2/2
Machine 2	Normal	1	2/2
	Large	2	2/2
	Heavy	4	2/2

The example above illustrates the following problems:

- Different tool sizes are defined for location type "Large", i.e., if a tool is set with tool-specific data \$TC_DP7 = 2 for machine 1 and then loaded to machine 2, there is a risk of collision as the tool management in machine 2 is programmed to reserve only one magazine location for magazine location type \$TC_MPP2 = 2.
- Different magazine location types \$TC_MPP2 are defined for location type "Heavy", i.e., if a tool is set with tool-specific data \$TC_DP7 = 3 for machine 1, it will not be possible to load this tool to machine 2 because magazine location type 3 is not defined for the tool management in machine 2.

Note

When automatic magazine detection is configured in the TDI, the magazine location types are detected for the standard tool management system and entered in the table for the relevant magazine (see Chapter 2: Creating a tool magazine with standard tool management). This information can be used to detect conflicts within the plant.



5

5 Planning

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5.1 General

Machine capacity can only be used to the full if tools are made available for the next production period. TDI Planning ensures that the required tools are provided at the right time. TDI Planning puts together the tool requirement for the next production period based on the current tool inventory on the machine and machine environment.

Any containers within a plant can be involved in the planning (e.g., machine magazine, machine-related tool store, tool default).

The TDI Planning module can operate within a network with TDI Cell/Plant or on a single station.

TDI Planning is divided into

- Processing sequence (job sequence)
- Tool plan
- Balancing with
 - Balance options
 - Settings list

5.2 Processing sequence

5.2.1 Overview

Processing sequences, also known as job sequences, must be set so that TDI Planning knows which tools are required for the upcoming jobs. The processing sequence and the tool plan together form the basis for balancing. It defines the sequence of workpieces to be machined (orders) including the quantity of parts to be produced (unit quantity).

An easy-to-use operator interface, the Processing Sequence screen form, is provided so the operator can enter the orders to be planned.

There, the operator can create the production orders / NC programs for each machine and assign the unit quantities to be planned.

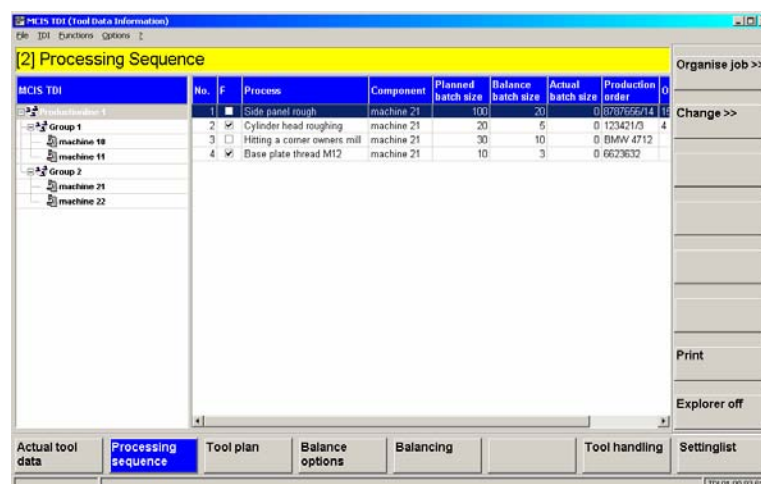


Fig. 5-1 Processing sequence overview

The "Processing Sequence" screen form shows a general view of the jobs to be planned on the selected machine or group.
The following information is shown for each order:

- "No."
Serial number of the order.
- "F"
Checkmark set = enable for balancing.
- "Process"
Name of the processing sequence / order.
- "Component"
Name of the associated unit.
- "Planned batch size"
Maximum number of workpieces per order.
- "Balance batch size"
Workpieces to be planned per order.
- "Actual batch size"
Completed workpieces in the order.
- "Production order"
Additional identification option for the machining/process sequence.¹⁾
- "Operation"
A further identifier for the processing sequence.¹⁾
- "Appointment"
Completion deadline for the order.¹⁾

Note

The actual unit quantity is automatically incremented by NC end of program and the display is updated. (For settings, see "Creating / displaying / changing a job").

Description of softkeys:

The following functions can be executed using the vertical softkeys:

"Organize job >>"

This opens the following menu for organizing the processing sequence.

"Change/display >>"

This opens the screen form for changing the selected processing sequence.

¹⁾ no mandatory field

"Print"

This prints the list of processing sequences. (equivalent screen form display).

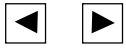
"Explorer on/off"

Activates/deactivates the hierarchical Explorer view.

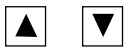
Operating



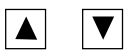
Use the TAB key to switch between the Explorer view and list format.



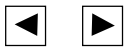
Use the left/right arrow keys to open and close the individual levels of the plant components shown in the display.



Use the up/down arrow keys to move the cursor up and down within Explorer.



Within the processing sequence list, use the arrow keys to move the cursor up and down.



Displays the defined columns.
In order to view the columns outside of the visible area, scroll horizontally using the right/left arrow keys.



With the selection key you can select or deselect the processing sequences that are active for balancing. A checkmark appears in the checkbox when a component is selected.
An empty box indicates that a component has not been selected.



Use this button to make the Explorer window and the list columns wider.



Use this button to make the Explorer window and the list columns narrower.

5.2.2 Organizing a job

With the "Organize job >>" softkey, you can switch the vertical softkey menu to the following menu for organizing the processing sequences.

No.	F	Process	Component	Planned batch size	Balance batch size	Actual batch size	Production order
1	<input type="checkbox"/>	Side panel rough	machine 21	100	20	0	0787656/14
2	<input checked="" type="checkbox"/>	Cylinder head roughing	machine 21	20	5	0	123421/3
3	<input type="checkbox"/>	Hitting a corner owners mill	machine 21	30	10	0	BMW 4712
4	<input checked="" type="checkbox"/>	Base plate thread M12	machine 21	10	3	0	6623632

Fig. 5-2 Processing sequence with softkey menu for organizing

The following functions are available:

"New>>"

You can create a new processing sequence via the "Add job" screen form. (Softkey only active if a machine is selected in the Explorer tree).

"Change>>"

You can change the data of a selected processing sequence via the "Change job" screen form.

"Delete"

This deletes the selected job. Deletion of a processing sequence must be acknowledged via a query in the pull-down menu.

"Prefer"

This moves the selected job one position up in the overview.

"Defer"

This moves the selected job one position down in the overview.

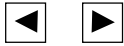
"<<:"

The vertical softkey menu is reactivated.

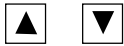
Operating



Use the TAB key to switch between the Explorer view and list format.



Use the left/right arrow keys to open and close the individual levels of the plant components shown in the display.



Use the up/down arrow keys to move the cursor up and down within Explorer.



Within the processing sequence list, use the arrow keys to move the cursor up and down.



Displays the defined columns.
In order to view the columns outside of the visible area, scroll horizontally using the right/left arrow keys.



With the selection key you can select or deselect the processing sequences that are active for balancing. A checkmark appears in the checkbox when a component is selected.
An empty box indicates that a component has not been selected.



Use this button to make the Explorer window and the list columns wider.



Use this button to make the Explorer window and the list columns narrower.

Creating/displaying/changing a job

The "New>>" or "Display/change" softkey display the "Job sequence / Show / edit job sequence" screen form. This screen form is used to enter all necessary data for new balancing or to display/change a previously selected existing job.

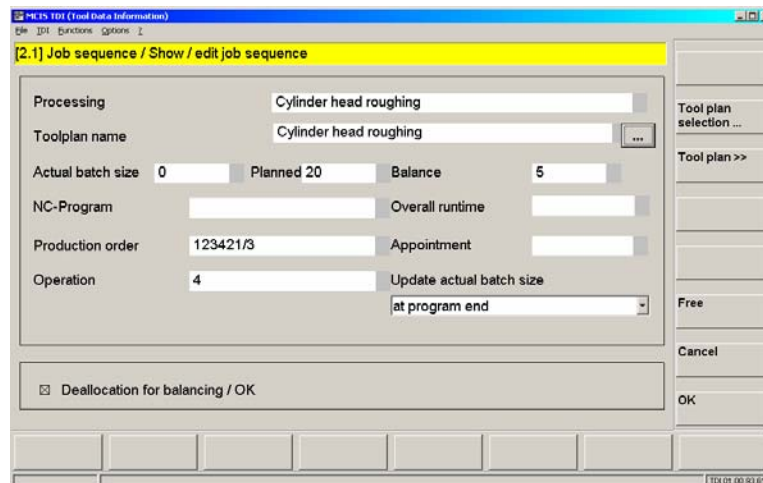


Fig. 5-3 Display/change job sequence

The following input fields are available:

- "Processing"
Freely definable name for defining the production process. The name of the job can be assigned manually.
- "Tool plan name"
Input field for direct entry of the tool plan for the job. It is also possible to jump directly to the tool plan overview via the button next to the input field and to apply a tool plan by selecting and pressing the "OK" softkey.
- "Actual batch size"
If machining has already begun, the number of workpieces completed is shown here. (The counter is incremented by 1 on every NC end of program, if the update actual unit quantity counter option is set).
- "Planned"
The planned total quantity of workpieces to be completed.
- "Balance"
Settable subset of the planned quantity of workpieces for the next planning run.
- "NC-Program"
Name of the NC program associated with the processing sequence. (only required in conjunction with updating the "Actual unit quantity" field).
- Only display field in the processing sequence. On importing the tool plan, this field is automatically filled with the NC program stored there.
- "Overall runtime"
Time required to produce a part (1 NC program run).¹⁾
Only display field in the processing sequence. On importing the tool plan, this field is automatically filled with the total runtime stored there.
- "Production order"
Additional identification option for the machining/process sequence.¹⁾
- "Operation"
A further identifier for the processing sequence.¹⁾
- "Appointment"
Completion deadline for the order (DD.MM.YY HH:MM).¹⁾

¹⁾ no mandatory field

- Update actual unit quantity:
The following options are available for selection from the pull-down menu:
 - Do not update
 - At program end (M02 or M30 in main program)
- "Deallocation for balancing / OK"
When the release for balancing is set, the selected processing sequence is considered in the next balancing run. Deallocation / resetting is performed via the "Enable" softkey or by setting / resetting the checkbox.

Note

The tool plan defined in the processing sequence must be available before balancing in the TDI system starts.

Description of softkeys

The following functions are available:

"Tool plan selection..."

This allows you to jump directly to the tool plan overview and import a tool plan into the "tool plan name" input field by selecting it and pressing "OK".

"Tool plan>>"

This displays the tool plan entered under the tool plan name. There the same functionality is available as under "Display/change tool plans".

"Free"

Sets/resets the release code for balancing.

"Cancel"

This allows you to exit the screen form without storing the inputs and to jump back to the "Processing Sequence" main screen form.

"OK"

This stores the inputs and jumps back to the "Processing Sequence" main screen form.

Operating



Use the TAB key to switch from one field to the next.



Use these keys to move the cursor from input field to input field.





Use the selection key to select/deselect a component.



You must press the [ENTER] key once you have added data to the input fields. If the checkbox for a text field has not been activated, that field cannot be accessed.

Deleting a job

The "Delete" softkey deletes the selected job.

Moving a job forward/back

The "Move forward" and "Move backwards" softkeys move the selected job forward or back in the processing sequence.

5.2.3 Changing/displaying a job

The "Change/display" softkey in the initial processing sequence screen form displays the "Change/display job" screen form directly. This screen form is used to display/change all necessary data for balancing an existing and previously selected job. For a description of the fields and the available functions, please refer to chapter:
Creating/displaying/changing a job.

5.3 Tool plans

5.3.1 General

A tool plan must be stored for balancing for each job. The tool plan and the processing sequence together form the basis for balancing. These tool plans are managed via the "Tool plan" softkey on the horizontal menu of TDI. The tool plan contains all necessary tool data, e.g., the appropriate service period of the tools that are required during an NC program run. These are the basis for calculating the service life/unit quantity required by each tool type during the balancing run. The tool plans can be created in different ways:

- by manual entry via the TDI Planning user interface.
- by importing the tool plans from a higher-level system (e.g., NC programming) via the integrated import/export interface of TDI Planning.
- By simulation of the existing NC programs on Sinumerik 840D with the TDI Toolplan Generation module (for details, see Chapter 6 Toolplan Generation).

5.3.2 Managing tool plans

In TDI, management/storage of created/imported tool plans is performed either on the single machine in standalone operation or on the server database in a network operation with the TDI Cell or TDI Plant module. An easy-to-use user interface, the tool plans screen form, is provided for the operator to perform this management function. The tool plans can be arranged hierarchically, i.e., depending on the level (area/group/unit) they are assigned to. Then the tool plans for all machines assigned to a level can be called and used for balancing. This list of tool plans is called by selecting a machine in Explorer.

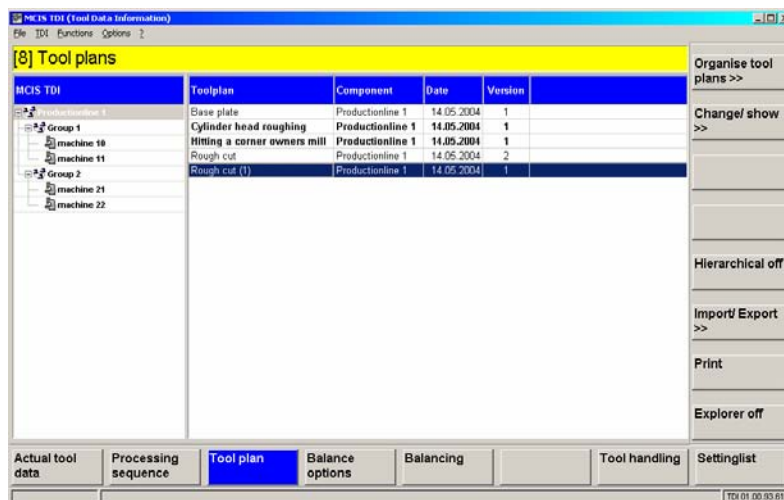


Fig. 5-4 Tool plans

The following information is shown for each tool plan:

- "Toolplan"
Name of the tool plan.
- "Component"
Name of the machine/machine group that is assigned to this tool plan.
- "Date"
Creation date of the tool plan.
- "Version"
Version of the tool plan (index for the frequency of change, no management criterion).

Note

Tool plans that are assigned to a released processing sequence are shown in boldface type.

Description of softkeys

The following functions are available:

"Organize tool plans >>"

This opens the following menu for organizing the tool plans.

"Change/show>>"

This opens the screen form for displaying/changing the selected tool plan.

"Hierarchical on/off"

This softkey activates/deactivates the hierarchy function. If the hierarchy function is on, all tool plans are displayed that are on the same level or above the selected component in the Explorer tree.

If the hierarchy function is deactivated, the tool plans assigned to the selected component are displayed.

"Import/Export >>"

This opens the following menu for importing or exporting tool plans.

"Print"

This prints the list of processing sequences. (equivalent screen form display).

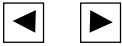
"Explorer on/off"

Activates/deactivates the Explorer view.

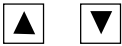
Operating



Use the TAB key to switch between the Explorer view and list format.



Use the left/right arrow keys to open and close the individual levels of the plant components shown in the display.



Use the up/down arrow keys to move the cursor up and down within Explorer.



Within the tool plan list, use the arrow keys to move the cursor up and down.



Use this button to make the Explorer window and the list columns wider.



Use this button to make the Explorer window and the list columns narrower.

Organizing tool plans

The "Organize tool plans>>" softkey switches the vertical softkey menu to the following menu for editing/creating tool plans.

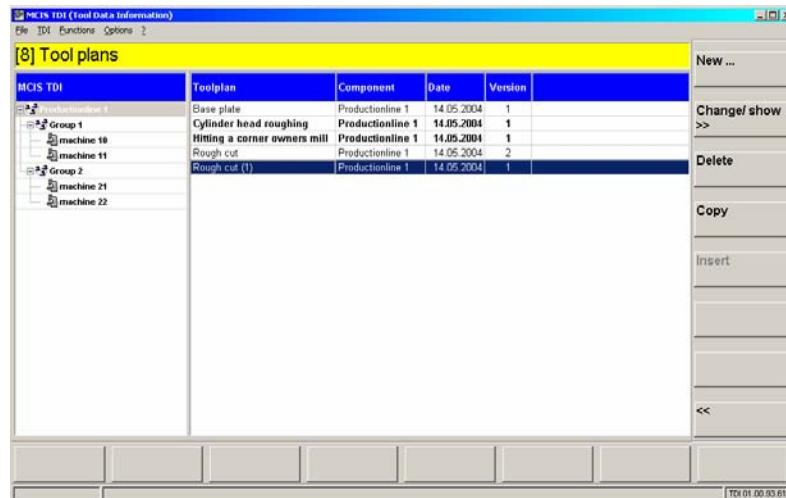


Fig. 5-5 Tool plans with softkey menu for organizing

The following functions are available:

"New ..."

This allows you to create the header data of a new tool plan via the "New" screen form. (Softkey only active if a machine is selected in the Explorer tree).

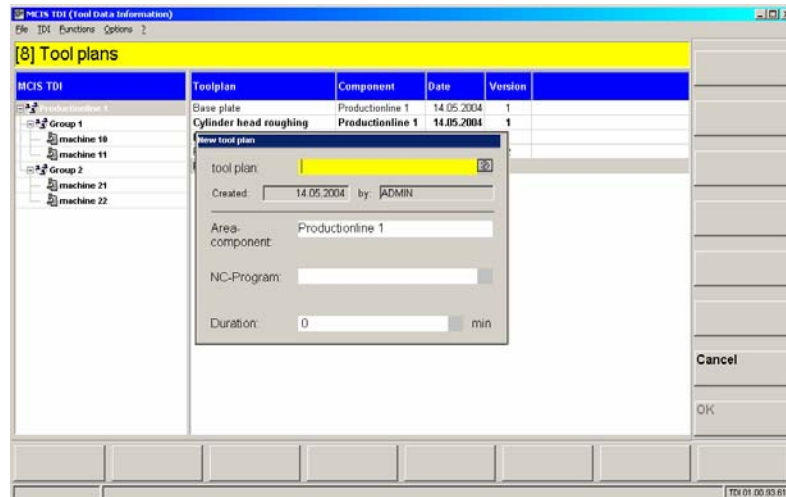


Fig. 5-6 New tool plan

The following input fields or information fields are available:

- "tool plan"
Input field for the tool plan name.
- "Created"
Creation date of the tool plan.
- "by"
Person who created the tool plan (= selected user).
- "Area component"
Storage location of the tool plan (selected plant component in Explorer).
- "NC-Program"
Input field for entering the NC program associated with the tool plan.
Alternatively, on the unit with Sinumerik 840D incl. HMI Advanced it is possible to display a list of all NC programs assigned to the machine via the "Program selection" softkey (all main programs both from the workpiece directory that is to be stored in the NC data management of the Sinumerik). You can then transfer one of the NC programs into the input field by selecting it and pressing the "OK" softkey.

- "Duration":
Input field for the total runtime of the NC program.
This value is adapted automatically as soon as the sum of the tool service times (without downtimes) is greater than the value entered.

The entries are applied with "OK" and rejected with "Cancel".

"Change/display >>"

This allows you to change the data of a selected processing sequence via the "Display/change" screen form. (For a description, see Section: "Displaying/changing tool plans").

"Delete"

This deletes the selected tool plan. Deletion of a tool plan must be acknowledged via a query in the pull-down menu.

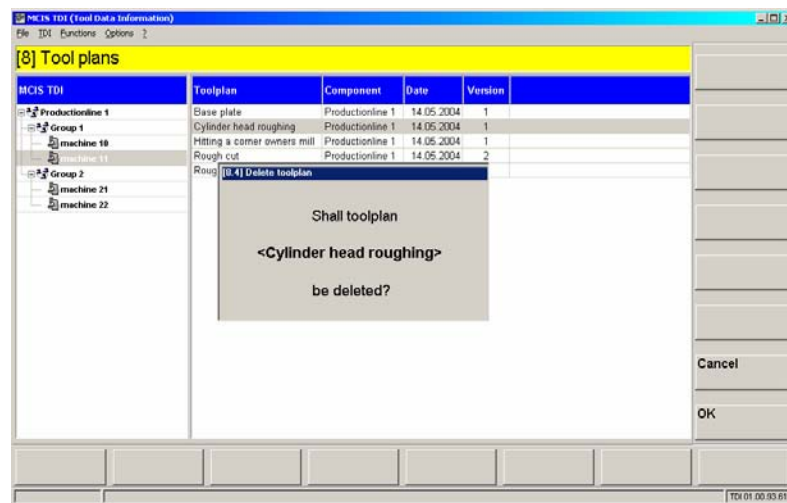


Fig. 5-7 Deleting a tool plan

"Copy"

This copies the selected tool plan and stores it in the buffer.

"Insert"

This reinserts the tool plan stored in the buffer under a different name (index appended).

"<<"

This switches back to the vertical softkey menu.

The entries are applied with "OK" and rejected with "Cancel".

Displaying/changing tool plans

You can display the selected tool plan again via the "Display/change>>" softkey.

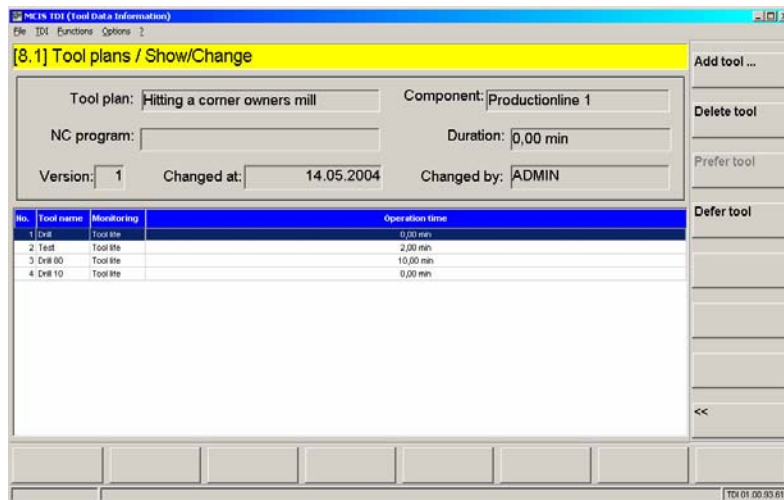


Fig. 5-8 Tool plans / Display/change

Further softkeys are available in the following menu:

"Change tool plan...":

This shows a pop-up window with the header data of the previously selected tool plan.

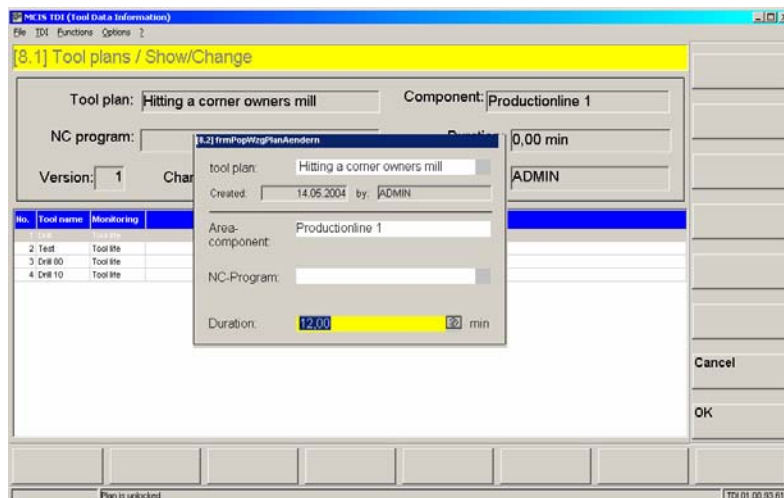


Fig. 5-9 Changing a tool plan

In this window, you can change the following tool plan header data:

- "tool plan"
Tool name in the tool plan field.

- "Area component"
- "NC-program"
The NC program name can be entered manually. Alternatively, on the unit with Sinumerik 840D incl. HMI Advanced it is possible to display a list of all NC programs assigned to the machine via the "Program selection" softkey (all main programs both from the workpiece directory that is to be stored in the NC data management of the Sinumerik). You can then transfer one of the NC programs into the input field by selecting it and pressing the "OK" softkey.
- "Duration"
Total runtime of the NC program. This value is adapted automatically as soon as the sum of the tool service times (without downtimes) is greater than the value entered.

The changes are applied with "OK" and rejected with "Cancel".

"Organize tools >>"

This switches over the menu. The following functions are then available:

"Add tool ..."

A pop-up window for entering tool data for a new tool is displayed.

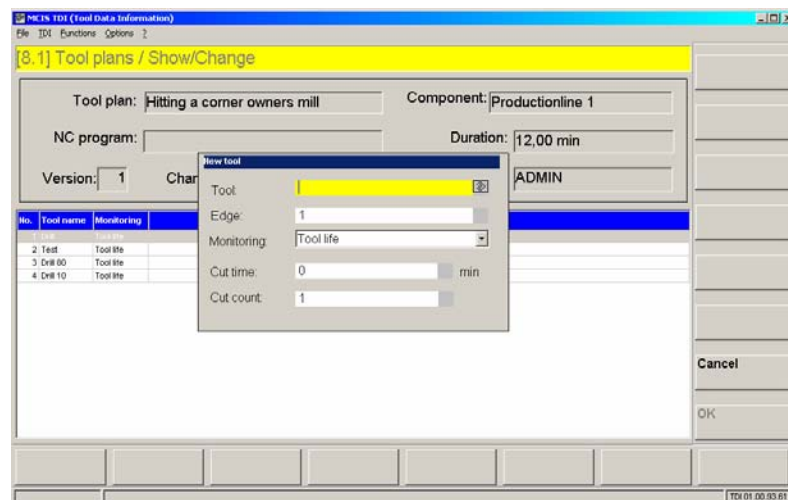


Fig. 5-10 Creating a new tool

The following input fields are available:

- "Tool"
Identifier of the tool.
- "Edge"
The cutting edge used for the machining step in the NC program.
- "Monitoring"
Selection of the monitoring method via pull-down menu.
You can choose one of the following two databases:
 - No monitoring
 - Service life
 - Unit quantity

Balancing is performed with the monitoring method selected here.
Depending on the monitoring method selected, the fields "Cut time" (for service life monitoring) and/or cut count (for unit quantity monitoring) will be displayed.

- "Cut time"
Time in minutes for which the tool is cutting.
- "Cut count"
Number of pieces machined between sharpening to be subtracted from the planned cut count per operation.

Note

Must match the actual unit quantity (setpiece) in the NC program.

The changes are applied with "OK" and rejected with "Cancel".

Description of softkeys

"Delete tool"

This deletes a selected tool. Deletion of a tool must be acknowledged via a query in the pop-up window.

"Move tool forward"

This moves the selected tool one position up in the sequence.

"Move tool backwards"

This moves the selected tool one position down in the sequence.

"Print"

The current tool plan is printed.

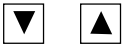
Operating



Use the TAB key to move the cursor from input field to input field.



Use these keys to move the cursor from input field to input field.



You must press the [ENTER] key once you have added data to the input fields.

Importing/exporting tool plans

The "Import/Export" softkey switches the vertical softkey menu to the following menu for importing and exporting tool plans.

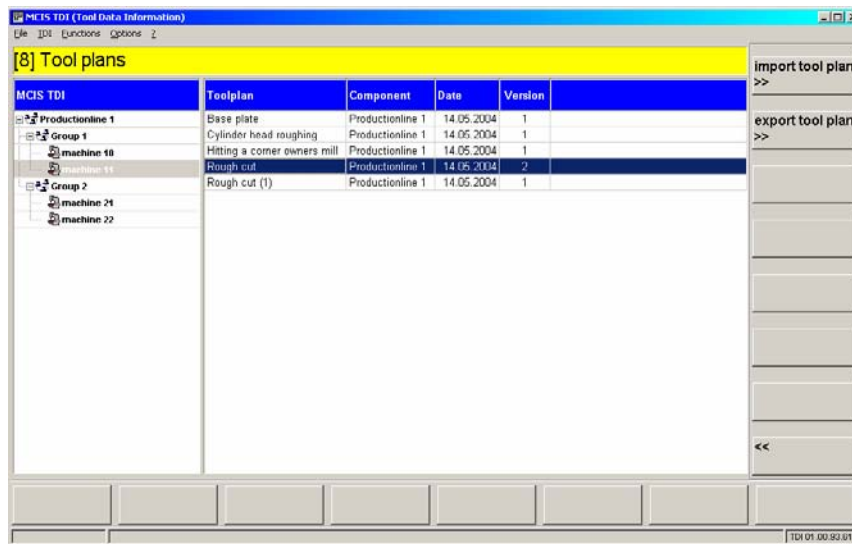


Fig. 5-11 Importing/exporting tool plans

The following functions are available:

Importing a tool plan

"Import tool plan >>"

This allows you to import tool plans from a drive directory into the central database of TDI via the "Tool plan/Import" screen form. The assignment is made via the selected component in the Explorer tree.

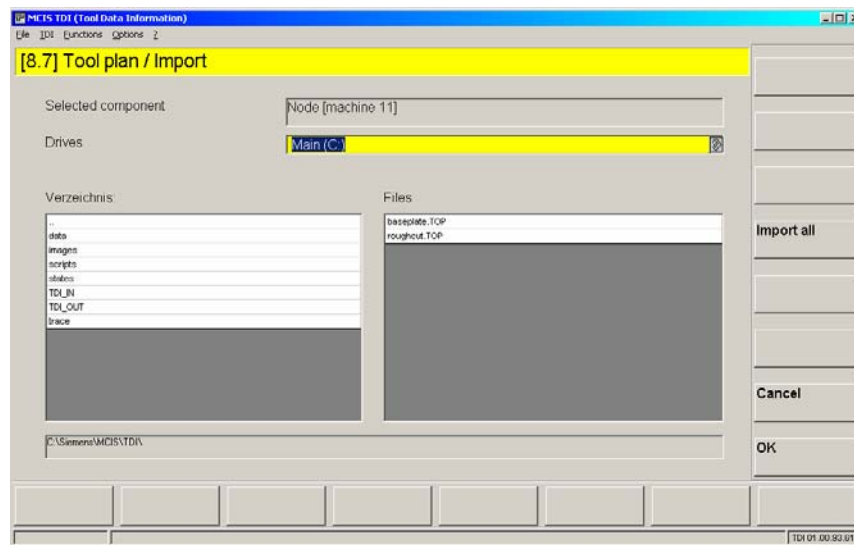


Fig. 5-12 Tool plan / Import

- "Drives"
You can navigate to the accessible drives via the "Drives" pull-down menu.
- "Directory"
The "Directory" selection list on the bottom left shows the selected directories on the selected drive.
- "Files"
If you select a directory, the TOP files (tool plans) stored in that directory will be shown in the right-hand selection list "Files". In this selection list, you can select a tool plan for importing.

Pressing the "OK" softkey transfers the selected tool plan into the central database and assigns it to the component previously selected in the Explorer tree. This component is shown under Selected component.

"Import all"

The "Import all" softkey transfers all tool plans in the directory into the central database and assigns them to the component previously selected in the Explorer tree.

Note

Imported tool plans are stored in the tool plan overview with the name they had in the header data of the tool plan.

Note

Tool plans in SinTDI format can be converted to TDI format via the import function and stored in the database. They are transferred with the file names of the files. Tool plans imported in this way still have to have the missing parameters (NC program name, total runtime, changed on, changed by) added via "Change/display tool plan".

Note

Importing does not delete the tool plans in the source.

Operating



Use the TAB key to move the cursor from input field to input field.



These keys move the cursor up and down within the directory list and within the file list.



The selection key is used to select a drive in the "Drives" pull-down menu.



The input key switches to a selected directory.

Exporting a tool plan

"Export tool plan >>"

This exports tool plans from the central database of TDI into a drive directory via the "Tool plan / Export" screen form. The assignment is made via the selected component in the Explorer tree and the selected tool plan. The selected source component and the selected tool plan are shown under "Selected component".

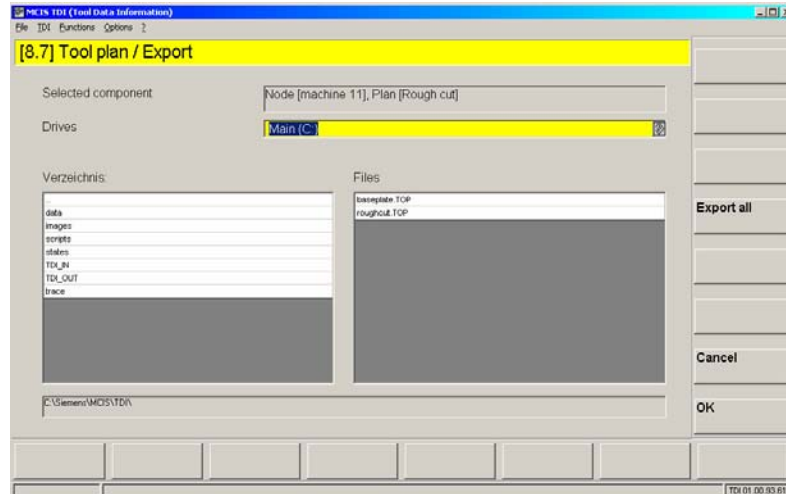


Fig. 5-13 Tool plan / Export

"Drives"

You can navigate to the accessible drives via the "Drives" pull-down menu.

- "Verzeichnis"

The "Verzeichnis" selection list on the bottom left shows the selected directories on the selected drive.
- "Files"

If you select a directory, the TOP files (tool plans) stored in that directory will be shown in the right-hand selection list "Files". The tool plan previously selected in the tool plan overview is exported into this directory when you press the "OK" softkey.

"Export all"

The "Export all" softkey exports all tool plans in the previously selected component.

Note

Exporting does not delete the tool plans in the source. In the target directory, already existing tool plans that were already exported are overwritten by another export operation.

Operating



Use the TAB key to move the cursor from input field to input field.



These keys move the cursor up and down within the directory list and within the file list.



The selection key is used to select a drive in the "Drives" pull-down menu.



The input key switches to a selected directory.

Tool plan format

The tool plans are managed in the following format:

```
<ToolPlan id="Rough cut" nodeId="BAZ1" version="4"
prog="ROUGHING" duration="30." lastChangeDate="2004-05-05T12:08:49"
lastChangeName="ADMIN">
  <Tool toolId="Cutter 100" cutTime="5." mon="1"/>
  <Tool toolId="test" cutTime="15." cutCount="1" mon="2"/>
  <Tool toolId="Cutter 80" cutTime="10." mon="1"/>
</ToolPlan>
```

The parameters signify:

TDI identification	Description	Example
<ToolPlan	Begin tool plan	
id=	Name of tool plan	"Rough cut"
nodeId=	Component to which tool plan is assigned	"BAZ1"
version=	Version of tool plan	"1"
prog=	Name of NC program associated with tool plan (main program of type MPF only). Paths of the Sinumerik 840D data management can be defined as well. In the example: \\MPF.DIR\roughing.MPF Alternatively: \\WKS.DIR\roughing.WPD\roughing.MPF	"ROUGHING" Alternatively: "ROUGHING\ ROUGHING.MPF"

duration=	Total runtime of the NC program	"30."
lastChangeDate=	Date of last change	"2004-05-05T12:08:49"
lastChangeName=	Name of last change	"ADMIN"
<Tool toolId=	Name of first tool	"Cutter 100"
cutTime=	Cut time in min of the tool for the operation with monitoring method tool life	"5."
cutCount=	Cut count in workpieces for the operation with monitoring method batch size	"1"
mon=	Monitoring method: 0= none 1= service life 2= unit quantity	"2"
</ToolPlan>	End of tool plan	

5.4 Balance options

There are constraints on balancing such as time limits or type of balancing that you must set first. This is done in the "Balance options" screen form.

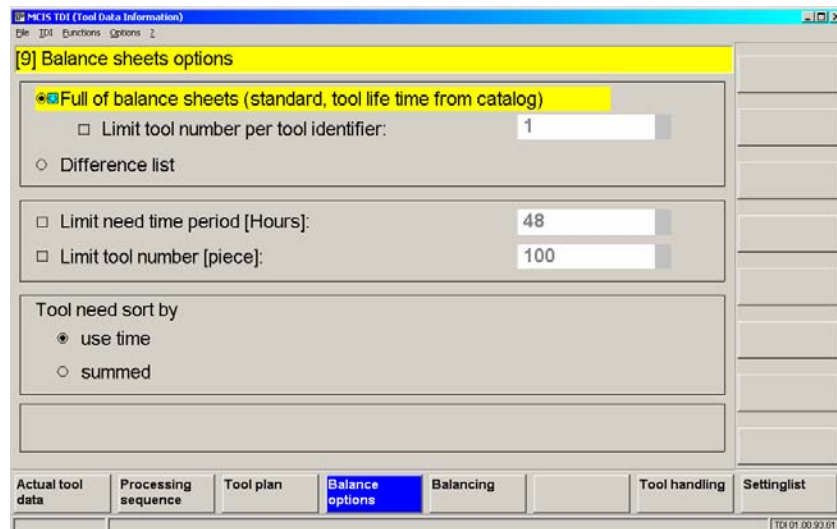


Fig. 5-14 Balance options

The "Balance sheets options" screen form is divided into 4 areas:

- Type of balancing
- Balance limits
- Display of balance results
- Selection of plant view (only in conjunction with HMI Advanced)

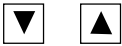
Operating



Use the TAB key to move the cursor from input field to input field.



Use these keys to move the cursor from input field to input field.



You must press the [ENTER] key once you have added data to the input fields.

5.4.1 Balancing type

You can chose between two types of balancing:

Full balance

If activated, the balance calculation compares the planned service life/unit quantity of the tools and the current residual service life/unit quantity compared with the averaged required service life/unit quantity (service time per tool in the tool plan x number of part to be produced). The result of the balancing is the required number of tools per tool type.

With the setting "Limit tool number per tool identifier:" the calculation of the balancing is terminated after the specified number of a tool identifier has been reached.

Up to MMC 103 software version 5.3.xx, the result of balancing with full balancing is only meaningful if the planned service life was stored in the case area of the standard tool management. Otherwise, only the resulting quality of the difference is achieved.

Difference list

If activated, the tool types used according to the tool plan are compared with the tool types in the tool magazine. The result of the balancing is a list of the tool types not available in the selected magazines.

Note

In addition to the tool magazine, other magazines can be considered as available capacity in the balancing. The selection is made in the "Balancing" screen form with the "Container selection ..." softkey.

5.4.2 Balance limits

You can set the following limits:

- "Limit need time period [Hours]:"
This applies time limits for calculation of the balance (e.g., one shift = 8 hours).
- "Limit tool number [piece]:"
This limits the number of tools required to a maximum number across all tool types.

5.4.3 Display of balance results

The result of balancing can be displayed in one of two ways:

- "use time"
This makes an entry for each tool required in the result list stating the latest time that the tool must be available to the machine without causing downtimes due to a missing tool.
- "summed"
This makes an entry in the result list for each tool type stating what quantity is required for the tool type in question.

5.4.4 Selecting the plant view

Via this pull-down menu, you can influence the view in the Explorer in the HMI Advanced environment.

The following settings apply:

AREA: Display without restriction.

GROUP: The entire group of the machine you are working on is displayed.

UNIT: The machine you are working on is displayed.

5.5 Balancing

In the Balancing screen form, it is possible to trigger a balancing operation, display the calculation, and make further settings.

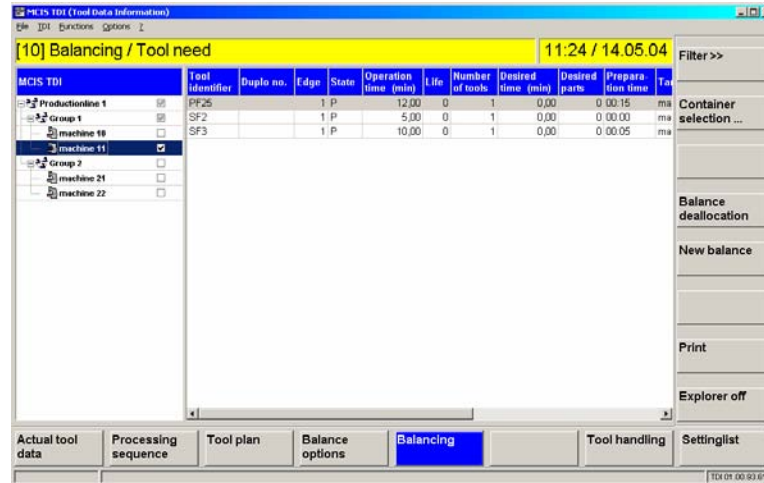


Fig. 5-15 Balancing

Description of softkeys

The following functions can be executed using the vertical softkeys:

"Filter >>"

The balance result is displayed according to certain criteria.

"Container selection ..."

This opens the screen form for selecting the tool magazine to be included in balancing.

"Balance deallocation"

This releases the balancing last created and storage of the requirement list.

"New balance"

This triggers a new balancing run.

"Print"

This prints the currently visible balance result.

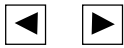
"Explorer on/off"

Shows/hides the plant components tree.

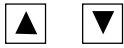
Operating



Use the TAB key to switch between the Explorer view and list format.



Use the left/right arrow keys to open and close the individual levels of the plant components shown in the display.

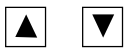


Use the up/down arrow keys to move the cursor up and down within Explorer.

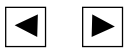


Use the selection key to select and deselect the plant components to be balanced. A checkmark appears in the checkbox when a component is selected.

An empty box indicates that a component has not been selected.



Within the tool list, use the arrow keys to move the cursor up and down.



Only the columns selected in the layout are displayed.

However, the list of available columns may be larger than the list of selected columns.

In order to view the columns outside of the visible area, scroll horizontally using the right/left arrow keys.



Use this button to make the Explorer window and the list columns wider.



Use this button to make the Explorer window and the list columns narrower.

5.5.1 Filters for balance result

The balance result display can be altered using filters.

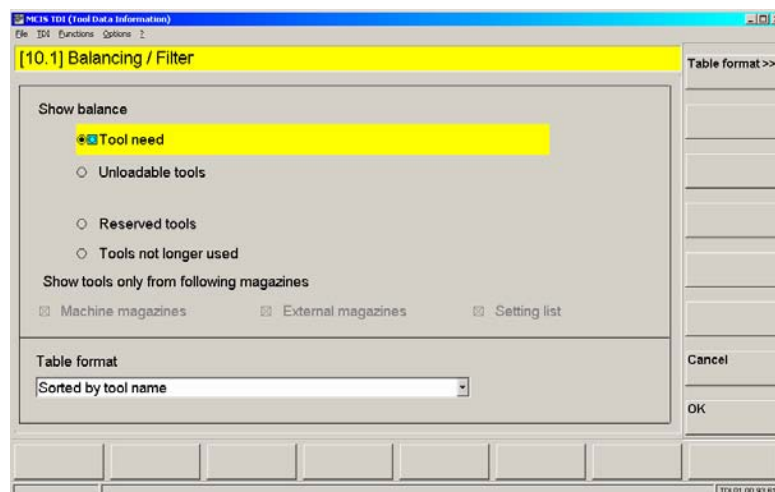


Fig. 5-16 Balance result / Filters

The following settings are available:

- "Tool need"
The new tools that need to be set are displayed.
- "Unloadable tools"
The tools that can be unloaded from the machine magazine of the machine selected in the Explorer are displayed.
- "Reserved tools"
The tools that were considered as available in the balancing for a certain machine are displayed. The tool containers to be considered are selected in the "Container selection" screen form.
- "Tools not longer used"
The tools are displayed that have a reservation code from a previous balance session but that are no longer required in the current balancing.
- "Show tools only from following magazines"
The hit set of the "Reserved tools" and "Tools not longer used" filters can be further restricted. There are 3 settings:
 - Machine magazines
 - External magazines
 - Setting list

"Table format"

Display of the table format can be set via the "Table format>>" softkey in various views or via previously defined or standard stored tables selected from the "Table format" pull-down menu. (For operating mechanisms, see TDI Overview "Actual tool data layout".)

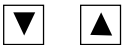
Operating



Use the TAB key to move the cursor from input field to input field.



Use these keys to move the cursor from input field to input field.



Use the selection key to select/deselect a component.



You must press the [ENTER] key once you have added data to the input fields.

5.5.2 Container selection for balancing

Via the "Container selection ..." softkey, it is possible to assign the available magazines to each machine as available tool capacity. The tools in the activated magazines are then considered in balancing.

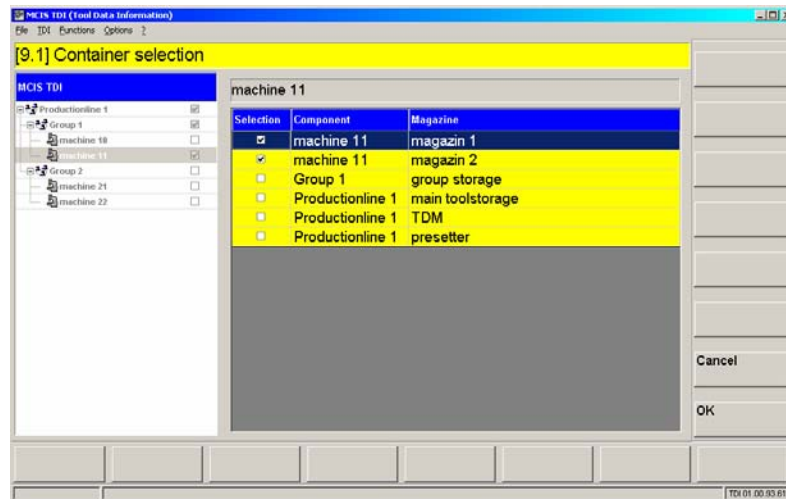


Fig. 5-17 Container selection

If tools are required in the activated magazines for the balancing period, they are identified with a reservation code by the balancing. You can display just these tools using the "Reserved tools" filter function.

Operating



These keys move the cursor up and down in the list.



Use the selection key to select/deselect a component.

5.5.3 Balance deallocation

Balance deallocation sets or deletes the reservation codes for existing tools. If tools are missing, the relevant entry will be made in the settings list. Tools that are no longer needed but have been set on the settings list in a previous balancing and have not yet been set by the tool setting station in the current balancing will be removed again.

In addition, if the "Setting magazine and export" function in the TDI configuration is active, the tool requirement is transferred to the tool setting station (TSS) in a file. The file name starts with "ToSEG", followed by a 3-digit consecutive number and ends with the extension ".ini" (e.g., ToSEG002.ini).

To export the tool requirement to the TSS, TDI setup creates a default directory. On the machine (HMI / MMC103), directory "TDI_OUT.CLP" is set-up in the data management and directory "TDI_OUT" is set-up on the server (TDI Cell / TDI Plan) in the installation directory of TDI.

The tool data file is automatically transferred to the defined directory by TDI on deallocation of the balancing by pressing the "OK" softkey. This writes all tools to be set for the current balancing into a file.

Note

For access via a network, network sharing must be set up for this folder.

Export into the TDI_OUT directory can be activated separately in the TDI configuration for the relevant setting magazine. In addition, the export path can be adapted here.

The tool data stored in the file are structured as follows:

%_N_ToSEG_001_INI	Program header (optional), stating the file name. In the example, the file is named ToSEG001.ini
\$TDI_SETDATE ="2004-03-15 16:49"	Time of query Format: YYYY-MM-DD HH:MM
\$TC_TP2[1] ="Drill1"	Tool identifier (32 characters).
\$TDI_MACHINE[1] ="Machine1"	Machine name for which the requirement was ascertained.
\$TDI_WORK[1] ="Engine block"	Name of the processing sequence.
\$TDI_PART[1] =2	Workpiece count above which the tool will be required in the processing sequence.

\$TDI_ACCESS[1] ="2004-03-16 09:01"	The parameter states the planned start time for use of the tool. Format: YYYY-MM-DD HH:MM.
\$TDI_TOOL_COUNT[1]=2	Number of tools required (only summated requirement)
\$TC_TP2[2] ="Cutter1"	Tool identifier (32 characters).
\$TDI_MACHINE[2] ="Machine2"	Machine name for which the requirement was ascertained.
\$TDI_WORK[2]="Gearbox"	Name of the processing sequence
\$TDI_PART[2] =4	Workpiece count above which the tool will be required in the processing sequence.
\$TDI_ACCESS[2] ="2004-03-16 09:50"	The parameter states the planned start time for use of the tool. Format: YYYY-MM-DD HH:MM

5.5.4 New balancing

The "New balance" softkey starts a new balancing run. The processing sequences of all selected machines having a release code are balanced.

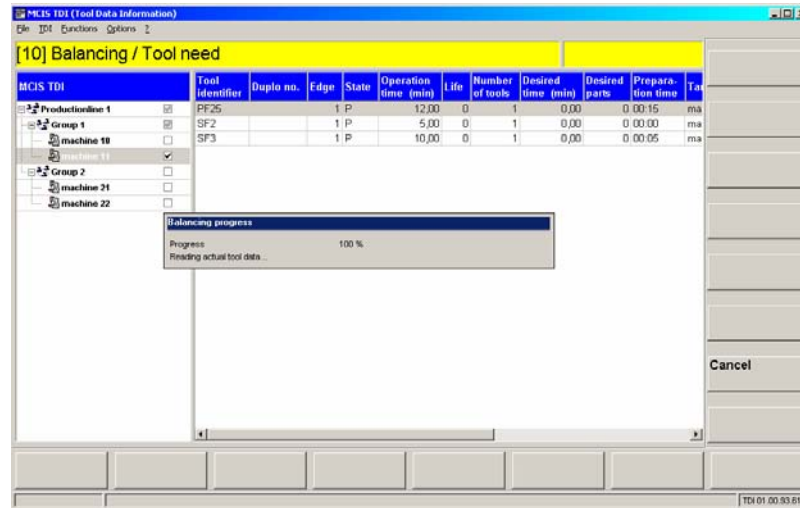


Fig. 5-18 Balancing with status bar

After pressing the "New balance" softkey, a status bar appears on the screen, showing the operation that balancing is active or has been canceled with error (e.g., tool plan does not exist or component has an error).

Note

If, after a balancing operation, the balance result is released and then balancing is carried-out again, then another balancing result is obtained as the released balance result is taken into account as the requested capacity.

5.6 Settings list

All tools that have been defined as a new requirement by the current balancing, are transferred to the settings list with the balance deallocation.

Tool identifier	Remaining on vice life (min)	Planned life time (min)	Preparation time	Duplo (no)	Target	Job sequence
PF25	12,00	0,00	2004-05-14 11:41	0	machine 11	Planning
SF2	5,00	0,00	2004-05-14 11:26	0	machine 11	Planning
SF3	10,00	0,00	2004-05-14 11:31	0	machine 11	Planning

Fig. 5-19 Settings list

Description of softkeys

The following functions can be executed using the vertical softkeys:

"Table format>>"

Table format display can be set to different views.

"Print"

The settings list can be printed.

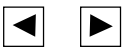
"Explorer on/off"

Shows/hides the plant components tree.

Operating









Use the TAB key to switch between the Explorer view and list format.



Use the left/right arrow keys to open and close the individual levels of the plant components shown in the display.



Use the up/down arrow keys to move the cursor up and down within Explorer.

-   Within the tool list, use the arrow keys to move the cursor up and down.
-   Only the columns selected in the layout are displayed.
However, the list of available columns may be larger than the list of selected columns.
In order to view the columns outside of the visible area, scroll horizontally using the right/left arrow keys.
-  Use this button to make the Explorer window and the list columns wider.
-  Use this button to make the Explorer window and the list columns narrower.

5.6.1 Available columns in the settings list

You can set which columns are visible via the "Table format" softkey.

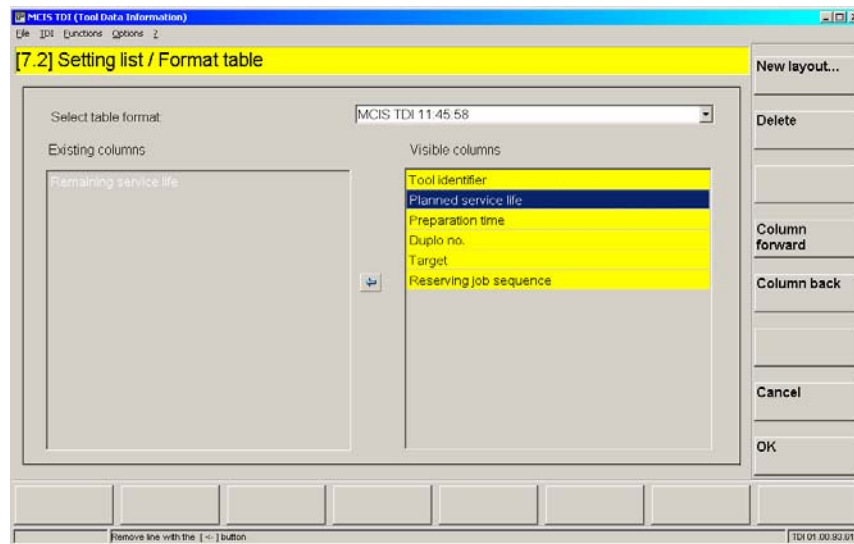


Fig. 5-20 Settings list table format

For operation of the screen form, see TDI Overview "Actual tool data layout"

The following columns are available:

- Preparation time:
Time at which the tool must be available on the machine.
- Reserving job sequence:
Processing sequence for which the tool was balanced.
- Target:
Component for which the tool is to be set.
- Tool identifier:
Identifier of the balanced tool type.
- Planned service life:
Planned service life of the balanced tool type.



6

6 Cell

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6.1 General

You can use TDI Cell to make TDI functions installed on individual machines available on a network-wide basis.
Up to 16 CNC machines can be interconnected to form an information network using TDI Cell.
TDI Cell can be installed on a host computer or a master control under MS Windows NT or XP.

6.2 Configurable plant structure

The plant can be structured as follows:

Plant structure

The individual components to be managed are defined in the module. The plant configuration can consist of up to 5 levels.

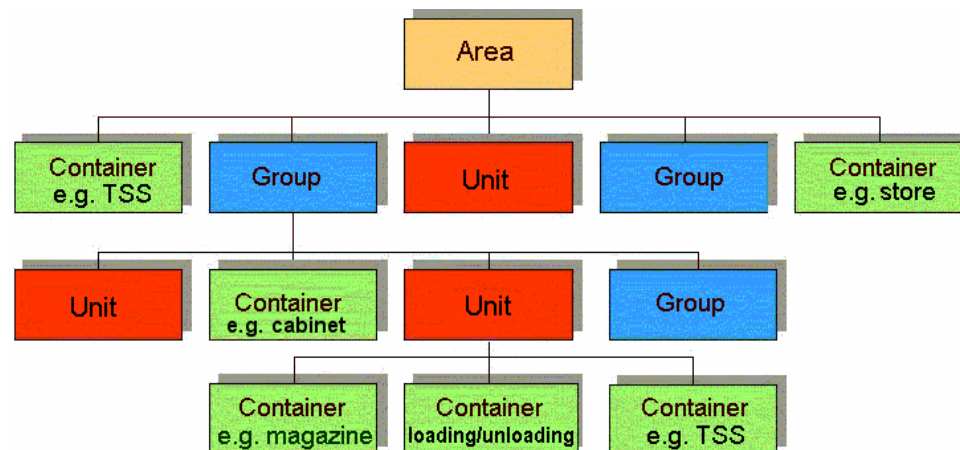


Fig. 6-1 Plant configuration

1st Level:
Entire plant (max. 1 area per plant)
Overview of all connected units

2nd Level:
Group level (max. 20 groups per plant)
Grouping of individual machines and tool store/tool setting stations for whole groups as well as individual machines

3rd Level:
Unit level (max. 200 units per plant)
Individual machines, subgroups, and tool stores/tool setting stations for whole machines

4th Level:
Machine magazine (max. 600 containers per plant)
Image of the machine magazines on a machine and its directly assigned external magazines

Note

The scalability of the server and its ability to be distributed over several PCs makes for improvements in performance and fail-safety within the plant.

Plant components

The following plant components can be managed in TDI:

- Sinumerik 840D/840DI/810D with standard tool management (integration is project-specific for systems without tool management or with customized tool management).
- SIMATIC S7 with DB 59 via OPC server.
- Non-Siemens controls via OPC server (must be adapted to specific project).
- PC-based control systems (e.g., MCIS PDA or TDM manufactured by TDM Systems)
- External tool stock (e.g., preset tools or second-hand tools without machine assignment).

6.3 Installation

Installing the TDI Cell software enables the following functions in the TDI configuration:

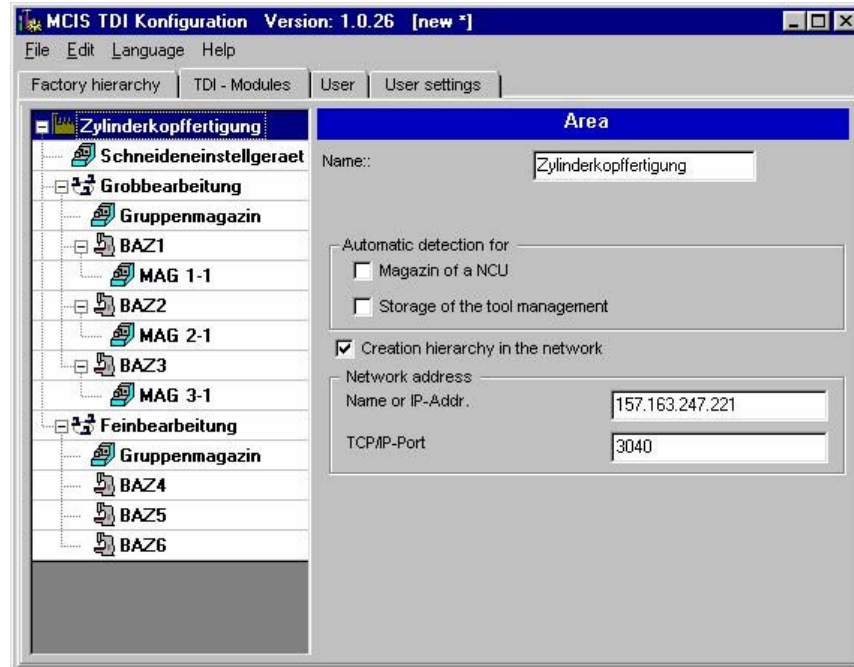


Fig. 6-2 Configuring user management

- Creation of an area in the configuration
- Assignment of network addresses
- Import and export of plant configurations

Please see Chapter 2, Installation and Configuration, for more detailed information.

6.4 Function

Setting up a TDI Cell configuration makes it possible to manage the following data centrally on the host computer or master control for all connected controls:

- Tool master data, tool plans, and tool requests can be managed centrally for all connected controls.
- All actual tool data on the connected units can be accessed (see Chapter 3: Overview).
- Planning sessions can be held for all connected units.
- Data can be transferred from and to higher-level tool management systems or production planning systems (MCIS PDA).

Note

The functions described above can be executed for the unit on the host computer on which the corresponding function has been installed.

If more than 16 units are to be interconnected to create a network, either a second cell system can be set up or the cell can be expanded using TDI Plant so that the plant can support maximum capacity (200 units).

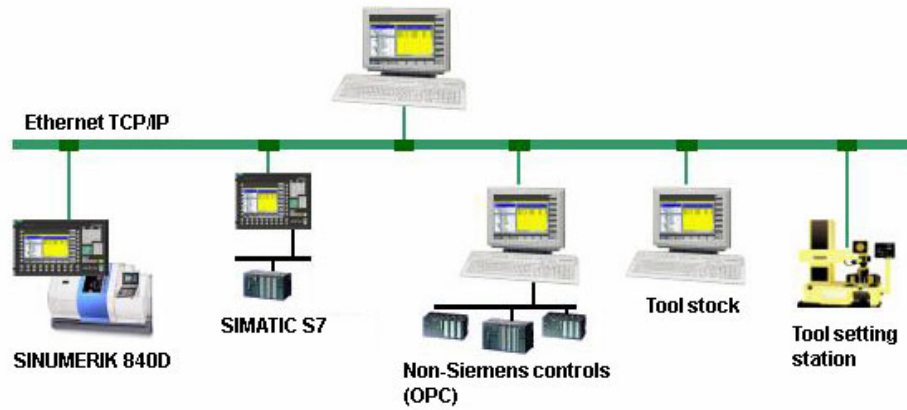


Fig. 6-3 TDI Cell example configuration

■

7

7 Machine

7.1 General

In the case of machines that are not networked, users have the option to install the following functions on the individual machine as a compact package using the "TDI machine" function.

- TDI Overview
- TDI Planning
- TDI Tool Handling

For TDI Machine, the functional scope of the module, described in Chapters 3, 4 and 5 applies.



8

8 Toolplan Generation

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8.1 General

The "Tool plan generation" module is used to determine the tool operating times from an NC part program and to generate a tool plan.
"Tool plan generation" is embedded in the "Planning" application.

"Tool plan generation" is used if the tool operating times are not known or if the NC programming cannot provide a tool plan.
The tool operating times are determined based on the standard simulation of Sinumerik 840D.

8.2 Tool plan generation

8.2.1 Setting up standard simulation

The "Tool plan generation" function is based on the settings of the standard simulation. This means that the standard simulation must be commissioned before "Tool plan generation" is started for the first time.
For the commissioning of the standard simulation, please refer to the following documentation:

References: /IAM/ Start-up Guide, HMI, IM2 or IM4

The following settings must be made when simulating an NC program:

User cycles

If user cycles are called in the NC program with parameter transfer, then these must be entered in the file DPCUSCYS.COM .
The file is located in the "Utilities" operator area, in the "Dialog programming" directory and in the "Simulation data" sub-directory.
(Path: F:\DH\DP.DIR\SIM.DIR)

Example

The sub-routine call "YINC" (1,2,3) is programmed in the part program.
In order that the simulation detects the program, make the following entry in DPCUSCYS.COM: PROC YINC(REAL POSY, REAL INCY, INT FY).

User-specific definition files

All user-specific definition files (Global User Data) must be copied from the Definitions directory (Path: F:\DH\DEF.DIR) into the simulation directory (Path: F:\DH\DP.DIR\SIM.DIR).
The Definitions directory is located in the "Utilities" operator area and in the "Definitions" directory.

Note

The new settings only become effective when the standard simulation is started (entry in F:\user\dpsimnck.ini).

To simulate an NC program, users must ensure that the PLC cannot be accessed in the simulation when generating the program.

Tip: Skip the required PLC access operations in the program with the prompt for \$P_SIM.

In order to reduce the computational time required, when simulation is active, skip to the change command in the tool change cycle.

The standard simulation and "Tool plan generation" mutually exclude each other. This means that before calling "Tool plan generation", standard simulation must be exited. Consequently, if the standard simulation is running, then it is not possible to start "Tool plan generation".

Presently, the "Tool plan generation" function is only available for the first NC channel.

8.2.2 TDI-specific settings for the simulation

SMAC.DEF

Tool plan generation operates with a special SMAC.DEF in the installation directory of TDI (e.g., F:\add_on\tdi), based on the standard F:\DH\DEF.DIR\SMAC.DEF. "Tool plan generation" requires an additional manufacturer's entry via which the tool can be loaded (changed) in the spindle (e.g.M06). This corresponds to the setting in the machine data TOOL_CHANGE_M_MODE.

Tool plan generation creates a new SMAC.DEF using the "Adjust machine data" function ("generate tool" softkey in the screen form). The M function from the machine data TOOL_CHANGE_M_MODE is transferred into this new SMAC.DEF.

Original file SMAC.DEF

```
;V04.04.04 17.07.98 Sca macro definition file
N10 DEFINE M13 AS M3 M7
N20 DEFINE M14 AS M4 M7
N30 DEFINE M15 AS M5 M9
N40 DEFINE RL AS REAL
N99 M30
```

Entry in the file C:\add_on\SMAC.DEF

```
DEFINE M06 AS M00 H6=4711.06
;V04.04.04 17.07.98 Sca macro definition file
N10 DEFINE M13 AS M3 M7
N20 DEFINE M14 AS M4 M7
N30 DEFINE M15 AS M5 M9
N40 DEFINE RL AS REAL
N99 M30
```

Note

The file SMAC.DEF is copied from the Definitions directory (F:\DH\DEF.DIR) to F:\add_on\tdi\data. This means that the relevant SMAC.DEF for the machine must remain in the Definitions directory.

File initial.ini

In order that "Tool plan generation" can operate as close as possible to the control system, the file "initial.ini" must be available in the directory F:\add_on\tdi\data. After "Tool plan generation" is called for the first time, the "initial.ini" file is re-generated from the active NC data in the "Generate tool" screen form by activating the function "Adjust machine data".

When required, it can be re-generated at any time (e.g., changing the machine data).

Note

Terminate the simulation by pressing the "Adjust machine data" softkey. Re-start the simulation using the "Start simulation" softkey.

File to_ini.ini

When determining the tool operating times, "Tool plan generation" only works together with the special tool and magazine data from the file to_ini.ini.



Warning

This file may not be changed. To simulate NC programs in Tool plan generation, the limitations listed in Chapter "Setting-up the standard simulation" must, under all circumstances, be carefully observed.

8.3 Creating a tool plan

If the "TDI Tool plan generation" is enabled via the TDI Configuration, then the screen forms of "TDI Planning" are extended with the softkeys for "TDI Tool plan generation". Before an NC program can determine the tool operating times, the header data of the tool plan, in which the determined tools are to be saved with their operating times, must be set-up. (refer to Chapter 5: Tool plans).

In order that "TDI Tool plan generation" functions correctly, the NC program from which the tool operating times are to be determined, must be saved in the header data. This NC program must be located in the Sinumerik NC data directory.

Fig. 8-1 Creating a tool plan

Call-up the appropriate tool plan using the softkeys "Display/Change>>" and "Tools organiz."; now, the "Generate tools" softkey is located on the vertical softkey bar. You can access the starting screen of the tool plan simulation using this softkey.

The tool plan generation is initialized by pressing the "Start simulation" softkey. The standard simulation with the settings for TDI Tool plan generation is loaded – the appropriate part program is also loaded and started. The tools, called-up in the part program together with the determined operating times and the programmed cutting edge, are continually entered into the tool plan while the simulation is running.

Information about the simulation run is provided in the dialog line. In addition, during the simulation, the following status information is displayed below the tool plan:

- Machining time
- Idle time
- Current tool

- Current program
- D number
- Block number

The screenshot shows the TDI simulation interface. At the top, it displays 'TDI', 'CHAN1', 'Auto', and 'MPF.DIR PLAN.MPF'. Below this, there are buttons for 'Channel reset' and 'Program aborted'. A 'ROV' button is also visible. The main area contains a form for tool plan details: 'Tool plan: Corner machining', 'Component: production line 1', 'NC program: cylindercylinder_head.mpf', 'Duration: 51,42 min', 'Version: 1', 'Changed at: 18.12.2004', and 'Changed by: HmiAdmin'. Below the form is a table with the following data:

No.	Tool name	Monitoring	Operation time	Edge
1	face cutter	Tool life	15.83 min	1
2	centre drill	Tool life	14.95 min	1
3	face cutter	Tool life	1.27 min	1
4	spot facer	Tool life	1.45 min	1
5	milling cutter	Tool life	7.27 min	2
6	face cutter	Tool life	7.33 min	1
7	taper reamer	Tool life	1.45 min	1

Below the table, there are fields for 'Machining time' (49,55 min) and 'Idle time' (1.87 min). There are also fields for 'Current tool' (taper reamer), 'Current program' (L6.SPF), and 'D' (1). A yellow warning bar at the bottom states 'Standard simulation cannot be started at present.' and 'TDI 01.01.95.40'. On the right side, there are several softkeys: 'Start simulation', 'End simulation', 'Store tool plan', 'Activate skip', and 'Adjust machine data'.

Fig. 8-2 Simulation

The result of the NC simulation is now available in the form of a tool plan with the operating times that have been determined:

The tool plan that has been determined and the resulting total runtime are transferred into the tool plan database using the "Store tool plan" softkey. If the screen is exited without saving, then the data that has been determined is discarded.

The "Start simulation" softkey operates in the form of a toggle key and is used during the simulation run to interrupt the current program simulation.

The TDI specific settings are de-selected and the standard simulation terminated using the "End simulation" softkey.

The "Activate skip" softkey can be used to select whether skip blocks are taken into account in the simulation.

Simulation settings

In the simulation, initiated by Tool plan generation, the following settings are permanently set:

- F-Override = 100%
- M01 is disabled
- Single block is not active

8.4 Function restrictions

Spindles

Simulation using "Tool plan generation" is presently only available for one spindle.

Tool change

"Tool plan generation" requires that the tool change is initiated using an M function. Tool plan generation cannot be used for machines where the tool change is initiated using a T function.

Cutting edge change

If only one cutting (cutting edge 1) is being used, the NC program can be simulated unchanged. However, if several cutting edges are being used for machining, the NC program to be simulated must be adapted in order that the simulation identifies a cutting edge change. In this case, an additional "DSIM" sub-program, as described below, must be generated and must be called in the NC program after every cutting edge selection.

Note

All of the traversing movements for the actual tool are only taken into account after "DSIM" has been called.

A programming D2 X... (before DSIM) would mean that the operating times would be added to the previous tool.

Further, correction/offset data $\neq 0$ must exist for all of the valid tool cutting edges.

Main program:

```
N1000 T="T1"
N1200 M6
N1300 D2
N1400 DSIM
N1500 X ... Y ...
```

Sub-routine DSIM:

```
N1000 if $P_SIM ==1
N1100 M0 H6=4711.07
N1200 endif
N1300 M17
```

Expanded M functions

Expanded M functions are presently not supported.



9

9 Statistics

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9.1 Overview

Recorded machine results can be displayed via the "Statistics" module in diagram or table format.

Prerequisite

System requirements for the "Statistics" module include:

- SQL database (MSDE)
- NCK software version 5.2 and above
- Machine data 27860 "SMC_PROCESSTIMER_MODE"
Bit0, Bit1 and Bit2 must be set
- Network connection to the host computer in the case of installation in multiple locations

Note

If the network connection fails, the machine cannot display any statistics data. When the network connection is available again, the statistics screen must be reloaded.

Diagram overview

The following diagrams are available:

- Tool frequency
Records the number of tool operations. This type of evaluation can be used, for example, to define master tools for individual machines.
- Tool usage time (min)
Sum of operation times. This evaluation type can be used, for example, to define master tools for individual machines.
- Tool failure in the spindle
Monitoring of the tools loaded into the spindle via the part program. If the tool status changes to "Locked" this is recorded as a tool failure.
- Program standstill due to missing tool
Based on the recording of program interruptions, at which no operable tool was available in the magazine.
- Results list for all tools
Displays the recorded results in a table.

The recorded results can be displayed directly in table format. This offers the option to change the display using filters (see Chapter: "Filters for table display").

The last displayed statistic appears when selecting the “Statistics” horizontal softkey.

The plant components appear in a tree structure (Explorer view) on the left-hand side. The statistics for the required machines are selected here. The statistics can then be adapted to the new machine selection using the “Update” softkey.

The corresponding statistics are displayed on the right-hand side in diagram or table format. To make the statistics display larger, simply hide the Explorer.

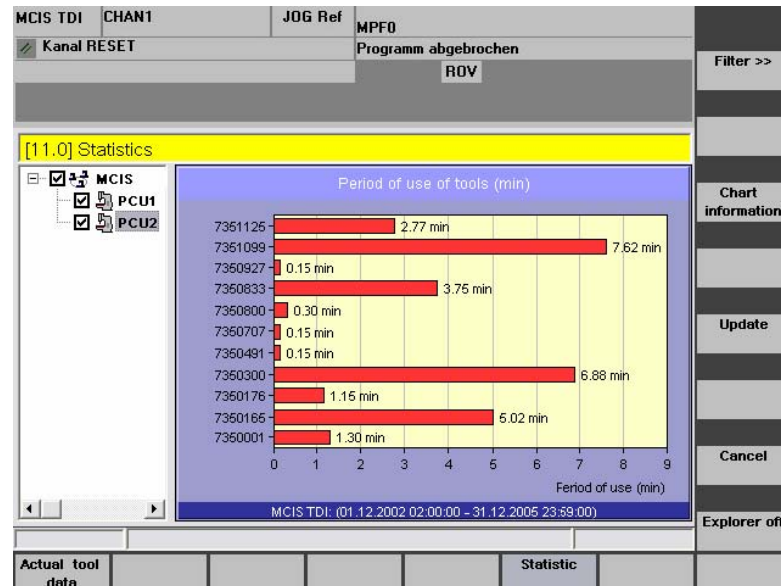


Fig. 9-1: Statistics: Overview with diagram of usage time

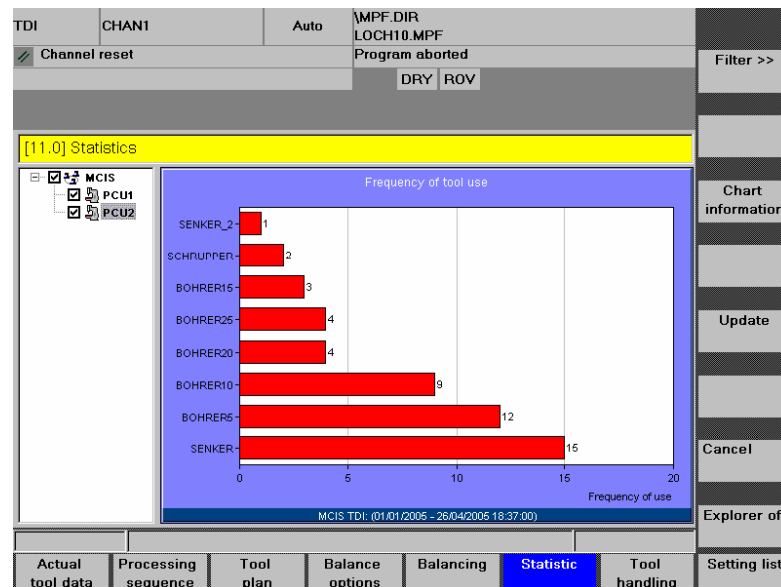


Fig. 9-2: Statistics: Overview with diagram of frequency of use

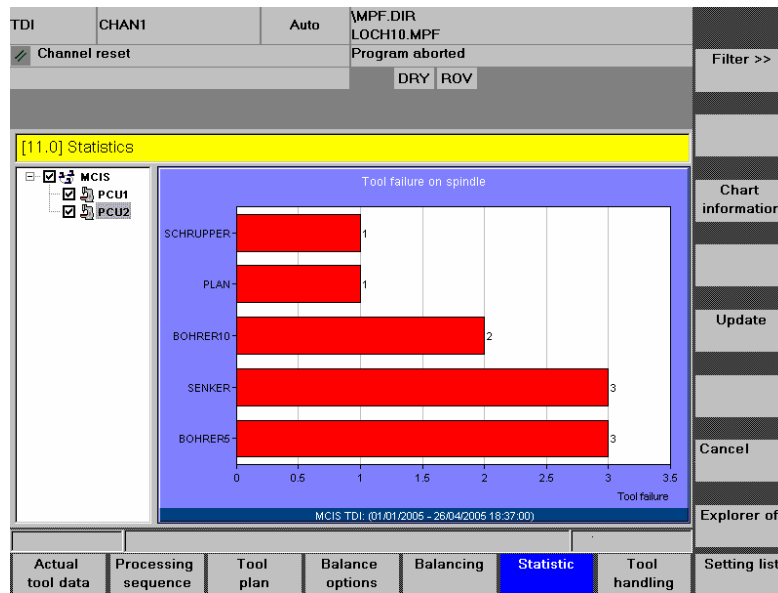


Fig. 9-3: Statistics: Overview with diagram of tool failure in the spindle

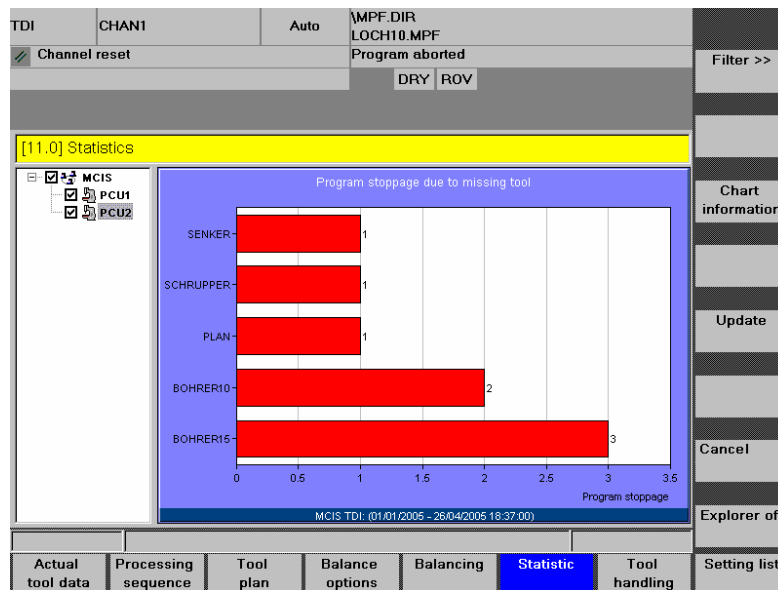


Fig. 9-4: Statistics: Overview with diagram of program standstill

EventTime	EventId	NodeId	ContainerId	PlaceNo	ToolId	Dupl
29.04.2005 16:28:58	NC_Start	NCU-WJ			0	
29.04.2005 16:29:53	NC_End	NCU-WJ			0	
29.04.2005 16:32:09	NC_Start	NCU-WJ			0	
29.04.2005 16:32:41	Tool access	NCU-WJ			0	HPLAN
29.04.2005 16:33:12	Tool access	NCU-WJ			0	HPLANF
29.04.2005 16:33:28	Tool access	NCU-WJ			0	HSENKER
29.04.2005 16:33:43	Tool access	NCU-WJ			0	HBOHRERS
29.04.2005 16:33:57	NC_End	NCU-WJ			0	
29.04.2005 16:53:05	NC_Start	NCU-WJ			0	
29.04.2005 16:53:17	NC_End	NCU-WJ			0	
29.04.2005 16:53:20	NC_Start	NCU-WJ			0	
29.04.2005 16:53:34	NC_End	NCU-WJ			0	
29.04.2005 16:53:43	NC_Start	NCU-WJ			0	
29.04.2005 16:59:05	NC_End	NCU-WJ			0	
29.04.2005 16:59:08	NC_Start	NCU-WJ			0	
29.04.2005 16:59:31	NC_End	NCU-WJ			0	

Fig. 9-5: Statistics: Overview with table

The following table explains the significance of the individual columns in the statistics table:

Field name	Meaning
Event date	Date/time of event record (Unix time)
Event time in ms	Millisecond time of event record
Event	Event identifier
Component	Unique identifier of a plant component
Container	Magazine identifier
Location	Location number
Tool identifier	Tool identifier
Duplo no.	Duplo number
Cutting edge	Cutting edge number
Internal ID	Internal T number
External ID	Holder number
Tool status	Tool status
Monitoring	Tool monitoring method
Spindle no.	Spindle number
Mode	Active mode
Channel no.	Channel number
Prog. name	Workpiece name and program name for the current program
Prog. position	Position in the current NC program
Prog. runtime	Runtime of the selected NC program (in seconds)
Operating time	Machining time of the selected tool/cutting edge
Idle time	Idle time of the selected tool/cutting edge

Description of softkeys

The following functions can be executed using the vertical softkeys:

"Filter>>"

This key accesses the screen for defining selection filters and for selecting the desired statistics.

"Chart info"

Detailed information from the database request for the current display.

"Update"

Refreshes the statistics displays and takes into account changes to the machine selection in Explorer.

"Cancel"

Permits termination of the data query using this softkey.

"Explorer on/off":

Shows/hides the plant components tree.

Operating



In Explorer: Use the right/left arrow keys to open and close the individual levels of the plant components featured in the display.

In the diagram: Scrolling, if scroll bars are displayed.



Use the up/down arrow keys to move the cursor up and down within the Explorer.

In the diagram: Scrolling, if scroll bars are displayed.



Use the selection key to select and deselect the plant components to be displayed.

A checkmark appears in the checkbox when a component is selected.

An empty box indicates that a component has not been selected.



This key increases the width of the Explorer window.



This key decreases the width of the Explorer window.

9.2 Statistics filter

The filter screen allows users to select the display format and settings for the desired time period.

Additional filters are available for the table view.

The upper area is reserved for diagram and table display.

The lower area is only reserved for table display.

9.2.1 Filters for diagram display

Diagram.

You can select from the following displays in the “Diagram” combobox:

- Tool frequency
- Tool usage time (min)
- Tool failure in the spindle
- Program standstill due to missing tool
- Event list for all tools

When selecting “Event list for all tools” the display is given in the form of a table and the lower filter area is activated (see Subsection: Filters for table display).

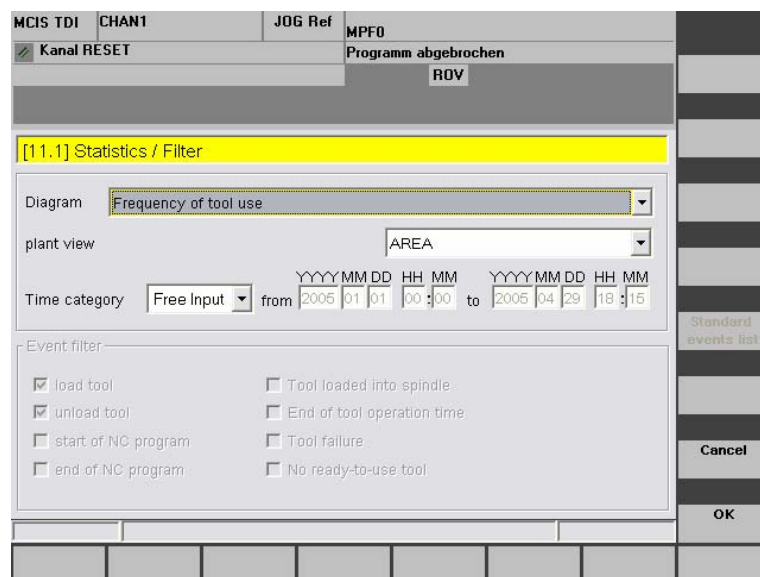


Fig. 9-6: Statistics: Filter for diagram

Plant view.

You can customize the view in Explorer in the “Plant view” combobox. This behaves in the same manner as the “Overview” operator area.

The following settings apply:

- AREA
Displays the entire plant without restriction.
- H-UNIT
The entire group of the machine you are working on is displayed, along with the higher-level general container (magazine).
- UNIT
The machine you are working on is displayed.

Time type

This combobox is loaded together with the input fields for date selection. If you select the "Free input" entry, you can enter start and end times for the data to be displayed in the individual input fields. All other entries will hide the input fields and propose a fixed time period.

The following table summarizes the possible entries and the corresponding assignment of the input fields:

Table 9-1: Assignment of input fields

Time type	Assignment of input fields
Free input	Editable
Today	"Today 00:00" until "End of the day"
This week	"Start of current week 00:00" until "End of the week"
This month	"Start of current month 00:00" until "End of the month"
This year	"Start of current year 00:00" until "End of the year"

Description of softkeys

The following functions can be executed using the vertical softkeys:

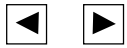
"Cancel"

Data that has already been entered is deleted and the screen returns to the statistics display.

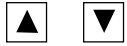
"OK"

Data is transferred and saved and the screen returns to the statistics display

Operating



Use these keys to move the cursor within input fields.



Use these keys to move the cursor within an expanded combobox.



Use the selection key to browse through the entries in a closed combobox.



You must press the [ENTER] key once you have added and selected data.



Use the TAB key to move the cursor between input and selection screens.

9.2.2 Filters for table display

If you select “Event list for all tools” as the diagram type, the data is displayed in the main screen as a table. The lower area is then activated in the filter where the display can be restricted to certain events.

If you choose events by selecting the checkboxes, the system only displays data which meet this criterion. For example, when activating a filter the number of displayed columns is changed and only relevant columns are displayed, or the system only outputs data blocks which meet the filter criterion. There are no default restrictions, i.e., no checkboxes are selected and all data are displayed.

The display is limited to 1000 data blocks. You can change the selection of data blocks by entering starting and end times in the upper filter area.

MCIS TDI	CHAN1	JOG Ref	MPFD
<input checked="" type="checkbox"/>	Kanal RESET		Programm abgebrochen
			ROV
[11.1] Statistics / Filter			
Diagram <input type="text" value="Event list of all tools"/>			
plant view <input type="text" value="AREA"/>			
Time category <input type="text" value="Free Input"/> from <input type="text" value="2005 01 01 00 :00"/> to <input type="text" value="2005 04 29 18 :15"/>			
Event filter			
<input checked="" type="checkbox"/> load tool		<input type="checkbox"/> Tool loaded into spindle	
<input checked="" type="checkbox"/> unload tool		<input type="checkbox"/> End of tool operation time	
<input type="checkbox"/> start of NC program		<input type="checkbox"/> Tool failure	
<input type="checkbox"/> end of NC program		<input type="checkbox"/> No ready-to-use tool	
Standard events list			
Cancel			
OK			

Fig. 9-7: Statistics: Filter for table view

Description of softkeys

The following functions can be executed using the vertical softkeys:

"Default event list"

The selection of events to be displayed in the lower area is reset to the default setting. In this case no checkboxes are selected and all of the data are displayed (maximum quantity specified in the "Max. data blocks" field).

"Cancel"

Data that has already been entered is deleted and the screen returns to the statistics display.

"OK"

Data is transferred and saved and the screen returns to the statistics display

Operating



Use these keys to move the cursor within input fields.



Use these keys to move the cursor within an expanded combobox.



Use the selection key to select or deselect an event for display in the lower filter area.



You must press the [ENTER] key once you have added and selected data.



Use the TAB key to move the cursor between input and selection screens.



A

A Appendix

A.1 Abbreviations

Code	Full version
.CSV	MS Excel-compatible document
.PDF	Portable Document Format
.TXT	Text format
DB	Database
Dbxy	Data block (e.g. 59)
DNC	Direct Numeric Control
h	Hour
HMI	Human Machine Interface
IH	Maintenance
MDA	Machine Data Acquisition
MS	Microsoft
MSDE	Microsoft Data Engine
ODBC	Open Database Connectivity
OEM	Original Equipment Manufacturer
OLE	Object Linking & Embedding
OP	Operator Panel
OPC	OLE for Process Control
PC	Personal Computer
PCU	PC Unit
PDA	Production Data Acquisition
PLC	Programmable Logic Controller
PMT	Parts Monitoring & Tracking
ProTool Pro	Configuration tool
PWS	Personal Web Server
RCS	Remote Control System
TSS	Tool Setting Station
TDI	Tool Data Information
XML	Extensible Markup Language



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E-mail: <mailto:motioncontrol.docu@siemens.com>

Recommendations

Corrections

for document:

Motion Control Information System

Tool Data Information (TDI)

User documentation

From

Name:

Company/Department

Street: _____

Zip code: _____ City: _____

Phone: _____ / _____

Fax: _____ / _____

Operator's Guide

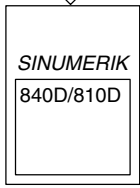
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06/2005 Edition

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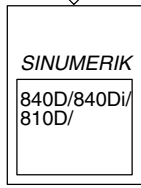
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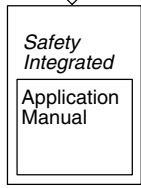
General Documentation



Brochure

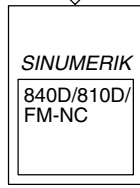


Catalog
Ordering Info.
NC 60 *)

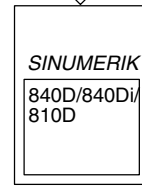


Safety Integrated
Application Manual

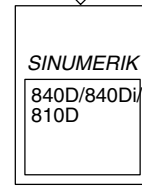
User Documentation



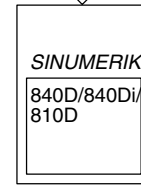
AutoTurn
– Short Guide
– Programming/Setup



Operator's Guide
– HT 6

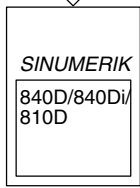


Diagnostics Guide *)

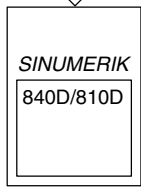


Operator's Guide *)
– Short Guide
– HMI Embedded
– HMI Advanced

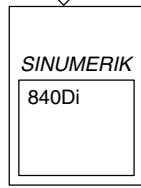
User Documentation



Programming Guide
– Short Guide
– Fundamentals *)
– Advanced *)
– Cycles
– Measuring Cycles
– ISO Turning/Milling
– Lists **System Variables**

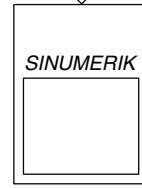


Operator's Guide
– **ManualTurn**
– Short Guide ManualTurn
– **ShopMill**
– Short Guide ShopMill
– **ShopTurn**
– Short Guide ShopTurn

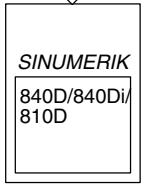


System Overview

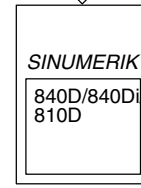
Manufacturer/Service Documentation



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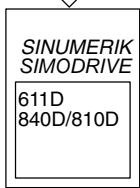


Operator Components (HW) *)

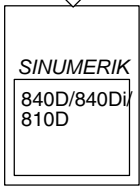


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– **ManualTurn**
– **ShopMill**
– **ShopTurn**

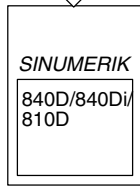
Manufacturer/Service Documentation



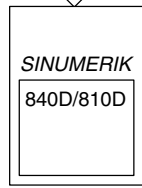
Description of Functions
Synchronized Actions



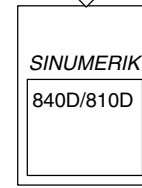
Description of Functions
Drive Functions *)



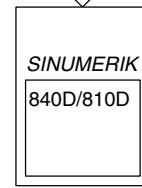
Description of Functions
– Basic Machine *)
– Extended Functions
– Special Functions



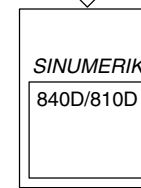
Description of Functions
Tool Management



Configuring Kit
HMI Embedded



Description of Functions
Operator Interface
OP 030

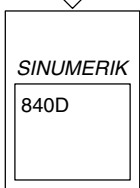


MCIS
– Computer Link
– Tool Data Inform. Syst.
– NC Data Management
– NC Data Transfer
– Tool Data Communication

Manufacturer/Service Documentation



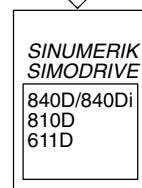
Description of Functions
SINUMERIK
Safety Integrated



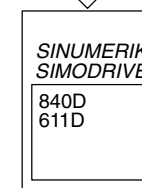
Description of Functions
Digitizing



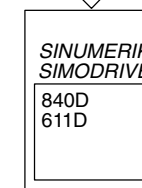
Installation & Start-Up Guide *)
– 810D
– 840D/611D
– HMI



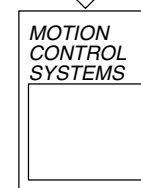
– Lists *)



Description of Functions
Linear Motor

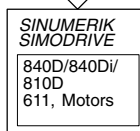


Description of Functions
– **Hydraulics Module**
– **Analog Module**



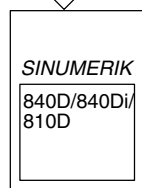
EMC
Guidelines

Electronic Documentation



DOC ON CD *)
The SINUMERIK System

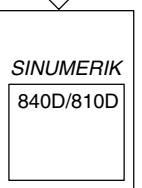
Manufacturer/Service Documentation



Description of Functions
ISO Dialects for SINUMERIK



Manual
(HW + Installation and Start-Up)



Description of Functions
Remote Diagnosis



Manual @ Event

*) These documents are a minimum requirement