

SINUMERIK

SINUMERIK 840D sl SINUMERIK Operate

Commissioning Manual

Valid for
Control:
SINUMERIK 840D sl/840DE sl
Software:
CNC software V4.95
SINUMERIK Operate V4.95

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SINUMERIK 840D sl SINUMERIK Operate

Commissioning Manual

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Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

DANGER

indicates that death or severe personal injury will result if proper precautions are not taken.
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WARNING
--

indicates that death or severe personal injury may result if proper precautions are not taken.

CAUTION
--

indicates that minor personal injury can result if proper precautions are not taken.
--

NOTICE

indicates that property damage can result if proper precautions are not taken.
--

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

Proper use of Siemens products

Note the following:

WARNING
--

Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.
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Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

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Introduction

1.1 About SINUMERIK

From simple, standardized CNC machines to premium modular machine designs – the SINUMERIK CNCs offer the right solution for all machine concepts. Whether for individual parts or mass production, simple or complex workpieces – SINUMERIK is the highly dynamic automation solution, integrated for all areas of production. From prototype construction and tool design to mold making, all the way to large-scale series production.

Visit our website for more information SINUMERIK (<https://www.siemens.com/sinumerik>).

1.2 About this documentation

Target group

This document is intended for commissioning personnel.

The plant or system is installed, connected and ready to start. For the following steps, e.g. configuring the individual components, the Commissioning Manual contains all the necessary information or at least references.

Benefits

The Commissioning Manual allows the target group to test and commission the plant or the system in a professional and safe way.

Usage phase: Setup and commissioning phase

Standard scope

This documentation only describes the functionality of the standard version. This may differ from the scope of the functionality of the system that is actually supplied. Please refer to the ordering documentation only for the functionality of the supplied drive system.

It may be possible to execute other functions in the system which are not described in this documentation. This does not, however, represent an obligation to supply such functions with a new control or when servicing.

For reasons of clarity, this documentation cannot include all of the detailed information on all product types. Further, this documentation cannot take into consideration every conceivable type of installation, operation and service/maintenance.

The machine manufacturer must document any additions or modifications they make to the product themselves.

Websites of third-party companies

This document may contain hyperlinks to third-party websites. Siemens is not responsible for and shall not be liable for these websites and their content. Siemens has no control over the information which appears on these websites and is not responsible for the content and information provided there. The user bears the risk for their use.

1.3 Documentation on the internet

You will find extensive documentation on the functions of SINUMERIK 840D sl from version 4.8 SP4 at 840D sl documentation overview (<https://support.industry.siemens.com/cs/ww/en/view/109766213>).



You can display documents or download them in PDF and HTML5 format.

The documentation is divided into the following categories:

- User: Operating
- User: Programming
- Manufacturer/Service: Functions
- Manufacturer/Service: Hardware
- Manufacturer/Service: Configuration/Setup
- Manufacturer/Service: Safety Integrated
- Manufacturer/Service: SINUMERIK Integrate/MindApp
- Information and training
- Manufacturer/Service: SINAMICS

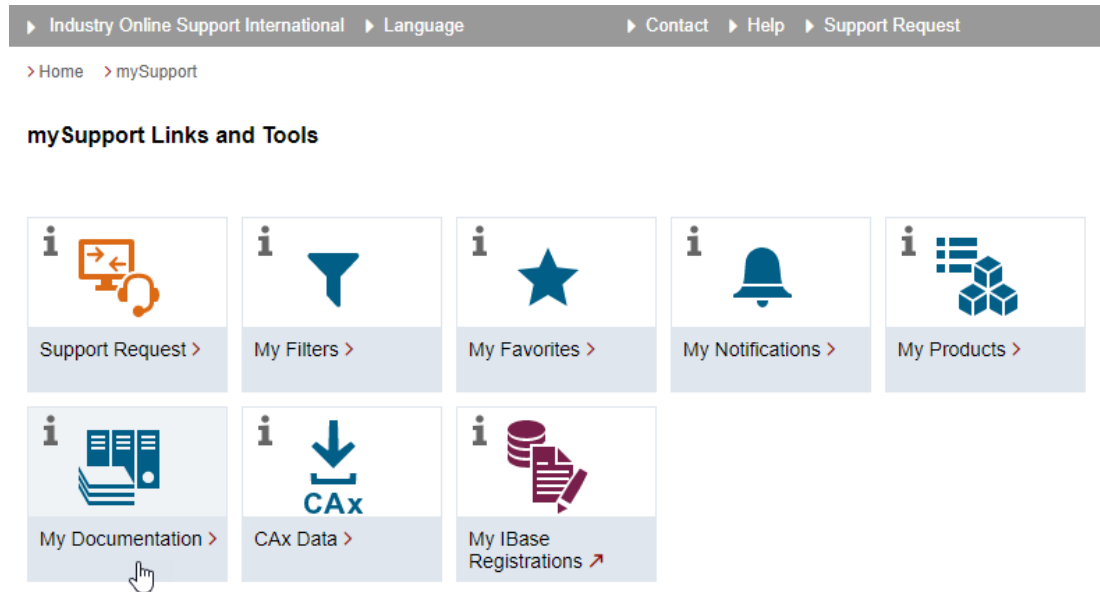
1.4 Feedback on the technical documentation

If you have any questions, suggestions or corrections regarding the technical documentation which is published in the Siemens Industry Online Support, use the link "Send feedback" link which appears at the end of the entry.

1.5 mySupport documentation

With the "mySupport documentation" web-based system you can compile your own individual documentation based on Siemens content, and adapt it for your own machine documentation.

To start the application, click on the "My Documentation" tile on the mySupport homepage (<https://support.industry.siemens.com/cs/ww/en/my>):



The configured manual can be exported in RTF, PDF or XML format.

Note

Siemens content that supports the mySupport documentation application can be identified by the presence of the "Configure" link.

1.6 Service and Support

Product support

You can find more information about products on the internet:

Product support (<https://support.industry.siemens.com/cs/ww/en/>)

The following is provided at this address:

- Up-to-date product information (product announcements)
- FAQs (frequently asked questions)
- Manuals
- Downloads
- Newsletters with the latest information about your products
- Global forum for information and best practice sharing between users and specialists
- Local contact persons via our Contacts at Siemens database (→ "Contact")
- Information about field services, repairs, spare parts, and much more (→ "Field Service")

Technical support

Country-specific telephone numbers for technical support are provided on the internet at address (<https://support.industry.siemens.com/cs/ww/en/sc/4868>) in the "Contact" area.

If you have any technical questions, please use the online form in the "Support Request" area.

Training

You can find information on SITRAIN at the following address (<https://www.siemens.com/sitrain>).

SITRAIN offers training courses for automation and drives products, systems and solutions from Siemens.

Siemens support on the go





With the award-winning "Siemens Industry Online Support" app, you can access more than 300,000 documents for Siemens Industry products – any time and from anywhere. The app can support you in areas including:

- Resolving problems when implementing a project
- Troubleshooting when faults develop
- Expanding a system or planning a new system

Furthermore, you have access to the Technical Forum and other articles from our experts:

- FAQs
- Application examples
- Manuals
- Certificates
- Product announcements and much more

The "Siemens Industry Online Support" app is available for Apple iOS and Android.

Data matrix code on the nameplate

The data matrix code on the nameplate contains the specific device data. This code can be read with a smartphone and technical information about the device displayed via the "Industry Online Support" mobile app.

1.7 Important product information

Using OpenSSL

This product can contain the following software:

- Software developed by the OpenSSL project for use in the OpenSSL toolkit
- Cryptographic software created by Eric Young.
- Software developed by Eric Young

You can find more information on the internet:

- OpenSSL (<https://www.openssl.org>)
- Cryptsoft (<https://www.cryptsoft.com>)

Compliance with the General Data Protection Regulation

Siemens observes standard data protection principles, in particular the data minimization rules (privacy by design).

For this product, this means:

The product does not process or store any personal data, only technical function data (e.g. time stamps). If the user links this data with other data (e.g. shift plans) or if he/she stores person-related data on the same data medium (e.g. hard disk), thus personalizing this data, he/she must ensure compliance with the applicable data protection stipulations.

CompactFlash Cards

- Do not remove the memory card while it is being accessed. This can lead to damage of the memory card and the SINUMERIK as well as the data on the memory card.
- Insert the memory card carefully and the right way round into the memory card slot (observe indicators such as arrow or similar). This way you avoid mechanical damage to the memory card or the device.
- Only use memory cards that have been approved by Siemens for use with SINUMERIK. Even though SINUMERIK follows general industry standards for memory cards, it is possible that memory cards from some manufacturers will not function perfectly in this device or are not completely compatible with it (you can obtain information on compatibility from the memory card manufacturer or supplier).
- For further information on handling CompactFlash cards, please refer to the NCU manuals.

Fundamental safety instructions

2.1 General safety instructions



WARNING

Electric shock and danger to life due to other energy sources

Touching live components can result in death or severe injury.

- Only work on electrical devices when you are qualified for this job.
- Always observe the country-specific safety rules.

Generally, the following steps apply when establishing safety:

1. Prepare for disconnection. Notify all those who will be affected by the procedure.
2. Isolate the drive system from the power supply and take measures to prevent it being switched back on again.
3. Wait until the discharge time specified on the warning labels has elapsed.
4. Check that there is no voltage between any of the power connections, and between any of the power connections and the protective conductor connection.
5. Check whether the existing auxiliary supply circuits are de-energized.
6. Ensure that the motors cannot move.
7. Identify all other dangerous energy sources, e.g. compressed air, hydraulic systems, or water. Switch the energy sources to a safe state.
8. Check that the correct drive system is completely locked.

After you have completed the work, restore the operational readiness in the inverse sequence.



WARNING

Electric shock due to connection to an unsuitable power supply

When equipment is connected to an unsuitable power supply, exposed components may carry a hazardous voltage. Contact with hazardous voltage can result in severe injury or death.

- Only use power supplies that provide SELV (Safety Extra Low Voltage) or PELV- (Protective Extra Low Voltage) output voltages for all connections and terminals of the electronics modules.



WARNING

Electric shock due to equipment damage

Improper handling may cause damage to equipment. For damaged devices, hazardous voltages can be present at the enclosure or at exposed components; if touched, this can result in death or severe injury.

- Ensure compliance with the limit values specified in the technical data during transport, storage and operation.
- Do not use any damaged devices.



WARNING

Electric shock due to unconnected cable shields

Hazardous touch voltages can occur through capacitive cross-coupling due to unconnected cable shields.

- As a minimum, connect cable shields and the cores of cables that are not used at one end at the grounded housing potential.



WARNING

Electric shock if there is no ground connection

For missing or incorrectly implemented protective conductor connection for devices with protection class I, high voltages can be present at open, exposed parts, which when touched, can result in death or severe injury.

- Ground the device in compliance with the applicable regulations.

NOTICE

Damage to equipment due to unsuitable tightening tools.

Unsuitable tightening tools or fastening methods can damage the screws of the equipment.

- Be sure to only use screwdrivers which exactly match the heads of the screws.
- Tighten the screws with the torque specified in the technical documentation.
- Use a torque wrench or a mechanical precision nut runner with a dynamic torque sensor and speed limitation system.

**WARNING****Spread of fire from built-in devices**

In the event of fire outbreak, the enclosures of built-in devices cannot prevent the escape of fire and smoke. This can result in serious personal injury or property damage.

- Install built-in units in a suitable metal cabinet in such a way that personnel are protected against fire and smoke, or take other appropriate measures to protect personnel.
- Ensure that smoke can only escape via controlled and monitored paths.

**WARNING****Unexpected movement of machines caused by radio devices or mobile phones**

Using radio devices or mobile telephones in the immediate vicinity of the components can result in equipment malfunction. Malfunctions may impair the functional safety of machines and can therefore put people in danger or lead to property damage.

- Therefore, if you move closer than 20 cm to the components, be sure to switch off radio devices or mobile telephones.
- Use the "SIEMENS Industry Online Support app" only on equipment that has already been switched off.

**WARNING****Fire due to inadequate ventilation clearances**

Inadequate ventilation clearances can cause overheating of components with subsequent fire and smoke. This can cause severe injury or even death. This can also result in increased downtime and reduced service lives for devices/systems.

- Ensure compliance with the specified minimum clearance as ventilation clearance for the respective component.

NOTICE**Overheating due to inadmissible mounting position**

The device may overheat and therefore be damaged if mounted in an inadmissible position.

- Only operate the device in admissible mounting positions.



WARNING

Unexpected movement of machines caused by inactive safety functions

Inactive or non-adapted safety functions can trigger unexpected machine movements that may result in serious injury or death.

- Observe the information in the appropriate product documentation before commissioning.
- Carry out a safety inspection for functions relevant to safety on the entire system, including all safety-related components.
- Ensure that the safety functions used in your drives and automation tasks are adjusted and activated through appropriate parameterizing.
- Perform a function test.
- Only put your plant into live operation once you have guaranteed that the functions relevant to safety are running correctly.

Note

Important safety notices for Safety Integrated functions

If you want to use Safety Integrated functions, you must observe the safety notices in the Safety Integrated manuals.



WARNING

Malfunctions of the machine as a result of incorrect or changed parameter settings

As a result of incorrect or changed parameterization, machines can malfunction, which in turn can lead to injuries or death.

- Protect the parameterization against unauthorized access.
- Handle possible malfunctions by taking suitable measures, e.g. emergency stop or emergency off.

2.2 Equipment damage due to electric fields or electrostatic discharge

Electrostatic sensitive devices (ESD) are individual components, integrated circuits, modules or devices that may be damaged by either electric fields or electrostatic discharge.



NOTICE

Equipment damage due to electric fields or electrostatic discharge

Electric fields or electrostatic discharge can cause malfunctions through damaged individual components, integrated circuits, modules or devices.

- Only pack, store, transport and send electronic components, modules or devices in their original packaging or in other suitable materials, e.g. conductive foam rubber or aluminum foil.
- Only touch components, modules and devices when you are grounded by one of the following methods:
 - Wearing an ESD wrist strap
 - Wearing ESD shoes or ESD grounding straps in ESD areas with conductive flooring
- Only place electronic components, modules or devices on conductive surfaces (table with ESD surface, conductive ESD foam, ESD packaging, ESD transport container).

2.3 Warranty and liability for application examples

Application examples are not binding and do not claim to be complete regarding configuration, equipment or any eventuality which may arise. Application examples do not represent specific customer solutions, but are only intended to provide support for typical tasks.

As the user you yourself are responsible for ensuring that the products described are operated correctly. Application examples do not relieve you of your responsibility for safe handling when using, installing, operating and maintaining the equipment.

2.4 Security information

Siemens provides products and solutions with industrial security functions that support the secure operation of plants, systems, machines and networks.

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art industrial security concept. Siemens' products and solutions constitute one element of such a concept.

Customers are responsible for preventing unauthorized access to their plants, systems, machines and networks. Such systems, machines and components should only be connected to an enterprise network or the internet if and to the extent such a connection is necessary and only when appropriate security measures (e.g. firewalls and/or network segmentation) are in place.

For additional information on industrial security measures that may be implemented, please visit

<https://www.siemens.com/industrialsecurity> (<https://www.siemens.com/industrialsecurity>).

Siemens' products and solutions undergo continuous development to make them more secure. Siemens strongly recommends that product updates are applied as soon as they are available and that the latest product versions are used. Use of product versions that are no longer supported, and failure to apply the latest updates may increase customer's exposure to cyber threats.

To stay informed about product updates, subscribe to the Siemens Industrial Security RSS Feed under

<https://www.siemens.com/industrialsecurity> (<https://new.siemens.com/global/en/products/services/cert.html#Subscriptions>).

Further information is provided on the Internet:

Industrial Security Configuration Manual (<https://support.industry.siemens.com/cs/ww/en/view/108862708>)



WARNING

Unsafe operating states resulting from software manipulation

Software manipulations, e.g. viruses, Trojans, or worms, can cause unsafe operating states in your system that may lead to death, serious injury, and property damage.

- Keep the software up to date.
- Incorporate the automation and drive components into a holistic, state-of-the-art industrial security concept for the installation or machine.
- Make sure that you include all installed products into the holistic industrial security concept.
- Protect files stored on exchangeable storage media from malicious software by with suitable protection measures, e.g. virus scanners.
- On completion of commissioning, check all security-related settings.

2.5 Residual risks of power drive systems

When assessing the machine- or system-related risk in accordance with the respective local regulations (e.g., EC Machinery Directive), the machine manufacturer or system installer must take into account the following residual risks emanating from the control and drive components of a drive system:

1. Unintentional movements of driven machine or system components during commissioning, operation, maintenance, and repairs caused by, for example,
 - Hardware and/or software errors in the sensors, control system, actuators, and cables and connections
 - Response times of the control system and of the drive
 - Operation and/or environmental conditions outside the specification
 - Condensation/conductive contamination
 - Parameterization, programming, cabling, and installation errors
 - Use of wireless devices/mobile phones in the immediate vicinity of electronic components
 - External influences/damage
 - X-ray, ionizing radiation and cosmic radiation
2. Unusually high temperatures, including open flames, as well as emissions of light, noise, particles, gases, etc., can occur inside and outside the components under fault conditions caused by, for example:
 - Component failure
 - Software errors
 - Operation and/or environmental conditions outside the specification
 - External influences/damage
3. Hazardous shock voltages caused by, for example:
 - Component failure
 - Influence during electrostatic charging
 - Induction of voltages in moving motors
 - Operation and/or environmental conditions outside the specification
 - Condensation/conductive contamination
 - External influences/damage
4. Electrical, magnetic and electromagnetic fields generated in operation that can pose a risk to people with a pacemaker, implants or metal replacement joints, etc., if they are too close
5. Release of environmental pollutants or emissions as a result of improper operation of the system and/or failure to dispose of components safely and correctly
6. Influence of network-connected communication systems, e.g. ripple-control transmitters or data communication via the network

For more information about the residual risks of the drive system components, see the relevant sections in the technical user documentation.

System overview

3.1 System overview

Note**PCU / IPC**

In this document, any textual use of PCU also applies to IPC.

NCU

The SINUMERIK Operate V4.x operating software is an integral component of the CNC software V4.x and can therefore run on an NCU 7x0.3. The NCU's CompactFlash card is the standard data storage medium of the CNC software.

The SINUMERIK Operate operating software is started automatically when the NCU software runs up and in the delivery state offers its standard functional scope, which depends on the actual NC and PLC configuration.

PCU/IPC

The SINUMERIK Operate operating software is supplied on DVD and must then be installed on the hard disk of the PCU/IPC. The operating software is automatically started when the controller runs up.

PC

The SINUMERIK Operate operating software is supplied on DVD and can be installed in a freely selectable directory.

The following sections describe the expansions and adaptations that the machine manufacturer can make using the SINUMERIK Operate operating software.

More information

For a description of the commissioning procedure for the SINUMERIK 840D sl controller, please refer to the following documentation:

Commissioning Manual CNC: NCK, PLC, Drive

The integration of SINUMERIK Operate in WinCC / TIAP is described in the following documentation:

Configuration Manual SINUMERIK Integrate Create MyHMI /WinCC

3.2 System requirements

Overview

It is a requirement that all system components be fully mounted, installed and configured. Commissioning of the NC and PLC must have been completed. The PLC is in the "Run" condition.

- Storage medium, e.g. USB FlashDrive and/or network connection: Handles data exchange with an external PC/PG.

Note

USB keyboard

You can use a USB keyboard to enter uppercase and lowercase text.

Note

When you load user data with a USB FlashDrive, the data size must not be larger than 4 GB!

SINUMERIK Operate under Windows

You require the following software if you use SINUMERIK Operate under Windows:

- PCU 50.5: WinXP PCU basic software as of V1.2
- PCU 50.5: Win7 PCU basic software as of V11.4
- IPC: Win7 PCU basic software as of V11.4
- IPC: PCU Base for IPC Win 10 as of V13
- PC: Windows XP SP3 / Windows 7 / Windows 10 operating system

Additional programs

- TextPad text editor: Used for the external creation and editing of XML and INI files in Windows. You can get the program on the Internet at:
<http://www.textpad.com>
- WinSCP: Enables protected data transfer between different computers (NCU - PC). You can get the program on the Internet at:
<http://winscp.net/eng/index.php>
- SINUMERIK Integrate Access MyMachine /P2P (previously RCS Commander): Permits the remote maintenance for machines with the SINUMERIK Operate operating software from a standard Windows PC.
- SINUMERIK Integrate Create MyConfig: Due to the modular concept, it enables automatic series production and the upgrade of different machines of a series with one package.
- Access MyMachine provides a special conversion function to transfer alarm texts of HMI Advanced or HMI Embedded to SINUMERIK Operate.

Principles of start-up

4.1 Data structure of SINUMERIK Operate

For SINUMERIK Operate, all files are saved on the CompactFlash card (NCU) or to the hard disk (PCU/IPC) or DVD (PC).

The file system is at the uppermost level:

- On the NCU in the "/System CF-Card/" directory
- On the PCU/IPC in the directory "C:\Program Files (x86)\Siemens\MotionControl"
- On the PC, the drive can be freely selected, e.g. "C:\Programs\siemens\sinumerik"

The directory structure comprises the following directories:

- addon
- compat (PC/PCU/IPC only)
- oem
- siemens
- user

These directories have essentially an identical structure.

Note

The files in the "siemens" directory represent the original status and cannot be modified!

Files, whose contents can be supplemented or modified, are available as templates (specimen files) in the following directories:

Files	Directory
Configuration files	/siemens/sinumerik/hmi/template/cfg
Text files	/siemens/sinumerik/hmi/template/lng

Before making any changes/supplements, these files should be copied into the /cfg or /lng in **/oem/sinumerik/hmi/**, **/addon/sinumerik/hmi/** or **/user/sinumerik/hmi/** directories.

Structure

The section of the directory structure relevant for SINUMERIK Operate is shown below:

siemens directory		
/siemens/sinumerik		
	/hmi	
	/appl	// applications (operating areas)
	/base	// basis system components

4.1 Data structure of SINUMERIK Operate

siemens directory		
	/cfg	// all configuration files
	/data	// version data
	/hlp	// online help files
	/hlps	// online help files, zipped and version files
	/ico	// symbol files
	/lco640	// icons in resolution 640x480
	/lco800	// icons in resolution 800x600
	/lco1024	// icons in resolution 1024x768
	/lco1280	// icons in resolution 1280x1024
	/lco1600	// icons in resolution 1600x1240
	/lng	// text files
	/lngs	// text files zipped and versions files
	/osal	
	/ace	// ACE/TAO
	/qt	// Qt
	/proj	// EasyScreen configuring
	/template	// various templates
	/cfg	// templates for configuration files
	/lng	// templates for text files
	/tmpp	// storage, temporary data
	/sys_cache/hmi	// various log files

compat directory		
/compat		// files for integrating the OEMFrame applications
	/add_on	
	/hmi_adv	
	/mmc2	
	/oem	
	/user	

addon directory		
/addon/sinumerik		
	/hmi	
	/appl	// applications (operating areas)
	/cfg	// configuration files
	/data	// version data
	/hlp	// online help files, zipped and version files
	/ico	// symbol files
	/lco640	// icons in resolution 640x480
	/lco800	// icons in resolution 800x600
	/lco1024	// icons in resolution 1024x768

addon directory		
	/ico1280	// icons in resolution 1280x1024
	/ico1600	// icons in resolution 1600x1240
	/lng	// text files
	/lngs	// text files zipped and versions files
	/proj	// EasyScreen configuring
	/template	// various templates

oem directory		
/oem/sinumerik		
	/data	// version data
	/archive	// manufacturer archive
	/hmi	
	/appl	// applications (operating areas)
	/cfg	// configuration files
	/data	// version data
	/hlp	// online help files
	/hlps	// online help files, zipped and version files
	/ico	// symbol files
	/ico640	// icons in resolution 640x480
	/ico800	// icons in resolution 800x600
	/ico1024	// icons in resolution 1024x768
	/ico1280	// icons in resolution 1280x1024
	/ico1600	// icons in resolution 1600x1240
	/lng	// text files
	/lngs	// text files zipped and versions files
	/proj	// EasyScreen configuring
	/template	// various templates

user directory		
/user/sinumerik		
	/data	// version data
	/archive	// user-specific archive
	/prog	// user-specific programs
	/hmi	
	/cfg	// configuration files
	/data	// version data
	/hlp	// online help files
	/ico	// symbol files
	/ico640	// icons in resolution 640x480
	/ico800	// icons in resolution 800x600
	/ico1024	// icons in resolution 1024x768

4.1 Data structure of SINUMERIK Operate

user directory		
	/ico1280	// icons in resolution 1280x1024
	/ico1600	// icons in resolution 1600x1240
	/lng	// text files
	/proj	// EasyScreen configuring
	/log	// log files
	/md	// machine data views
	/proj	// EasyScreen configuring

4.2 Editing files

4.2.1 Editing the file at the controller

You can use a copy of the sample file in order to make specific adjustments. Template files are available in the following directories:

`/siemens/sinumerik/hmi/template/cfg` and `/siemens/sinumerik/hmi/template/lng`

Save the sample file in the "user" or "oem" directory - in the appropriate folder.

Note

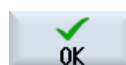
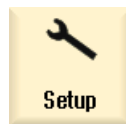
As soon as the file is in the user-specific directory, the entries of this file have priority over the Siemens file. If an entry is missing in a user-specific file, the corresponding entry from the Siemens file is used instead.

You need to restart the operating software for the settings made in the file to take effect.

Precondition

- If you copy files, you require access level 1 (manufacturer).
- When assigning a new file name, ensure that only files with a maximum name length of 49 characters can be managed.

Copying / pasting / opening a file



1. Select the "Start-up" operating area.
2. Press the "System data" softkey.
The data tree is displayed.
3. For instance, on the NCU directory, "System CF card", under "siemens" open the required directory (e.g. `/sinumerik/hmi/template/cfg`).
4. Position the cursor on the desired file.
5. Press the "Copy" softkey.
6. For instance, on the NCU in the "System CF card" directory, under "oem" or "user" open the required directory (e.g. `/sinumerik/hmi/cfg`), in which the copied file should be saved.
7. Press the "Paste" softkey.
If a file of the same name already exists, you receive a message. You can overwrite or rename the file.
8. Press the "OK" softkey.



9. You can open the selected file in the editor by pressing the "Open" softkey.

- OR -

Press the <INPUT> key.



- OR -

Double-click the highlighted file.

Rename file



1. Select the required file.
2. Press the ">>" and "Properties" softkeys.

The "Properties of..." window opens.

The following data is displayed:

- Path:
- Name:
- Creation date and time:
- Date of change and time:



3. To change the file name, place the cursor in the "Name" entry field and overwrite the name. Date of change and time are simultaneously updated.
4. Press the "OK" softkey to save the new name.



Cut-out/delete file



1. Select the required file.
2. Press the "Cut" softkey.

The file is copied into the buffer and at the same time deleted from the previous directory.

As the file is located in the buffer, you can also insert the file into another directory.

- OR -



2. Press the ">>" and "Delete" softkeys.

You receive an alarm and you can delete the file by pressing the "OK" softkey.

Press the "Cancel" softkey to cancel the delete operation.

Displaying the file in the preview window



1. Select the required file.
2. Press the ">>" and "Preview window" softkeys.

The preview window is displayed in the lower area of the window together with the file contents.

Press the "Preview window" softkey again to close the window.

4.2.2 Editing a file externally

To create or edit an XML file on an external PC with Windows, use a text editor that supports the required "UTF-8" coding, e.g. "TextPad".

This means that you can enter or directly insert all characters of the unicode system without rewriting them using the keyboard.

If files with a different coding are saved, the special characters are not correctly displayed in the editor. In SINUMERIK Operate, there is no automatic conversion into the UTF-8 coding!

Saving the XML file in UTF-8 coding

1. Select the "Save As" dialog box.
2. Set the character set to "UTF-8".

Entering comments in an XML file

If you are entering comments to explain a program, you must keep the following in mind:

- A comment always begins with the character string: <!--
- A comment ends with the character string: -->

Example

```
<!-- Work offset: -->
```

Note

In the comment itself, you can never use two minus signs one right after the other!

Special characters

If you use characters in the text where the syntax of XML is of significance, then these must specifically formatted:

Special characters	Notation
&	&
'	'
<	<
>	>
"	"

Comments in an ini file

If you enter a comment in an ini file, start the comment line with a semicolon.

Copy file

Using the "WinSCP" or "Access MyMachine" program, copy the file from an external computer to the NCU via a network connection – or in the opposite direction from the NCU to an external PC.

More information

A detailed description of the function Save/Restore Data and the service tools WinSCP and PuTTY is provided in

Commissioning Manual NCU Operating System.

See also

Configuring alarm and message texts via alarm text files (Page 220)

General settings

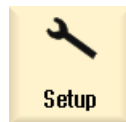
5.1 Changing the language

The operating software is available as standard in several languages.

Selecting a language

You can define the language selection mode using the following machine data.

MD9100 \$MM_CHANGE_LANGUAGE_MODE	Language selection mode
= 1	The user-interface language is specified via the "Language Selection" window (default value).



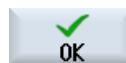
1. Select the "Start-up" operating area.



2. Press the "Change language" softkey.
The "Language Selection" window opens. The language most recently set is highlighted.
3. Switch the cursor to the required language.
4. Press the <INPUT> key.



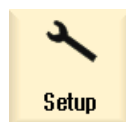
- OR -



Press the "OK" softkey.
The operating software switches to the language selected.

Defining two languages

MD9100 \$MM_CHANGE_LANGUAGE_MODE	Language selection mode
= 2	Selection of two languages. During operation, the "Change language" softkey can be used to toggle between these languages.



1. Select the "Start-up" operating area.



2. Press the "HMI" softkey.



3. Press the ">>" softkey.

5.1 Changing the language



4. Press the "Language selection" softkey.
The "Language Selection" window opens.

All the installed languages are displayed in the fields "First language" and "Second language".



5. Select a language in each of these.
6. Press the <INPUT> key.

- OR -



Press the "OK" softkey.



During operation, you can switch between the two languages by pressing the "Change language" softkey.

5.2 Set date/time

You have the possibility of manually setting the date and time for the NCU (PLC and Linux) or PCU/PC (Windows). In so doing, you can select from various display formats.

Formats of the date display

Format	Example
d.M.yy	3.1.09
dd.MM.yy	03.01.09
dd.MM.yyyy	03.01.2009
d/M/yy	3/01/09
dd/MM/yy	03/01/09
dd/MM/yyyy	03/01/2009
M/d/yy	1/3/09
MM/dd/yy	01/03/09
MM/dd/yyyy	01/03/2009
yyyy/MM/dd	2009/01/03

The following applies:

Date	Description of the entry
d	Single or double digit day of the month (1 - 31).
dd	Double digit day of the month, with leading zero (01 - 31).
M	Single or double digit month of the year (1 - 12).
MM	Double digit month of the year, with leading zero (01 - 12).
yy	Double digit year (00 - 99).
yyyy	Four-digit year (e.g. 2009).

Time display formats

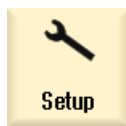
Format	Example	Hour system
H:m:s AP	1:2:4 PM	24 hour system, with display of "AM" / "PM"
h:m:s ap	1:2:8 pm	12 hour system, with display of "am" / "pm"
HH:mm:ss AP	13:02:08 PM	24 hour system, with display of "AM" / "PM"
hh:mm:ss ap	01:02:09 pm	12 hour system, with display of "am" / "pm"
H:mm:ss AP	1:02:09 PM	24 hour system, with display of "AM" / "PM"
h:mm:ss ap	1:02:09 pm	12 hour system, with display of "am" / "pm"
h:mm:ss	13:02:09	24 hour system
hh:mm:ss	13:12:04	24 hour system

The following applies:

Time symbol:	Description of the entry
h	Single or double digit hour (0 - 23 or 1 - 12 for am/pm).
hh	Double digit hour, with leading zero (00 - 23 or 01 - 12 for am/pm).

Time symbol:	Description of the entry	
H	Single or double digit hour (0 - 23 for AM/PM).	
HH	Double digit hour, with leading zero (00 - 23 for AM/PM).	
m	Single or double digit minute (0 - 59).	
mm	Double digit minute, with leading zero (00 - 59).	
s	Single or double digit second (0 - 59).	
ss	Double digit second, with leading zero (00 - 59).	
AP	Display of the time of day:	AM or am = before midday or PM or pm = after midday

Procedure



1. Select the "Start-up" operating area.



2. Press the "HMI" softkey.



3. Press the "Date/Time" softkey.
The "Set Date and Time" window opens.



4. Select the required formats for the date and time with the <SELECT> key in the "Format" field.
5. For SINUMERIK Operate in the NCU: In the entry fields after "new" enter the actual date and time.
For SINUMERIK Operate on PCU/PC: In the entry fields after "new NCU + PCU" enter the actual date and time.



6. Confirm the entry with the "OK" softkey.
The new date and time details are accepted and output in the fields "actual NCU" and "actual PCU".

Note

You require administrator rights to set the date and time on the PCU/PC.

5.3 Using the time server

To ensure that the correct time information is always automatically available to the control, you can connect up to three time servers to the operating software. Make your settings in the "Set Date and Time" window.

Note

The "Use time server" setting is not available for SINUMERIK Operate on PCU/PC/IPC.

NOTICE
Time synchronization errors Do not set the time synchronization on two different systems; this means: Select the NTP server either in the PLC project via PROFINET IO (X150) or in the file "basesys.ini" on the NCU in section [LinuxBase], but not in both simultaneously, as an additional time zone can be specified on the NCU and not in the PLC project.

More information

More information on the configuration file "basesys.ini" and the use of external time servers is provided in the

Commissioning Manual NCU Operating System.

Precondition

You require as a minimum access level 3 (User) to use time servers.

Checking the connection status

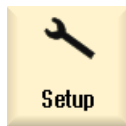
The icon on the right in field "Name / IP" shows the status of the server connection.

Symbol	Meaning
	The connection status is unknown. The settings have not yet been processed or set.
	You are connected to the time server. The system is successfully synchronizing times.
	The system is still attempting to synchronize with a time server.

Note

The system checks the time server connection cyclically. If a change is made, it may take a few seconds for the setting to take effect.

Procedure



1. Select the "Start-up" operating area.



2. Press the "HMI" softkey.



3. Press the "Date/Time" softkey.
The "Set Date and Time" window opens.

4. Select the "Use time server" check box.
The "Name / IP" entry field is displayed.

5. In field "Name / IP," enter the DNS name or IP address of the time server.
You can enter up to three time servers separated by blanks.



6. Press the "Set time server" softkey.
If a connection to a time server exists, the settings will be synchronized with the system immediately. After that, a cyclic check is made as to whether the settings are effective. The "Set Date and Time" window remains open.



7. Confirm the entry with the "OK" softkey.
The time server settings and the current times are taken over from the control.

Note

If the checkmark is removed from field "Use time server", then the standard "UTC" time zone will apply again.

5.4 Use time zone

To ensure that the controller has the correct time information even in countries with different time zones, you can select the appropriate time zone.

The time zone set here is used by the entire system to translate Universal Time Coordinated (UTC) time into local time.

Note

UTC is the default.

Procedure



1. Select the "Start-up" operating area.



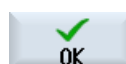
2. Press the "HMI" softkey.



3. Press the "Date/Time" softkey.
The "Set Date and Time" window opens.

4. Set the check mark in the "Use time zone" field.
The "Time zone" input field becomes active.

5. Enter your time zone in the "Time zone" field.



6. Confirm the entry with the "OK" softkey.
The current time zone is applied by the controller.

Note

Changing the time zone can take a few seconds.

Note

Zones without daylight saving time/standard time

When changing the time zone, take into account the local daylight saving time/standard time. For example, regions like China or Japan have no daylight saving time/standard time, but Europe and the USA do.

Examples

Hours are added or subtracted from the UTC time. You can set the following time zones, for example:

Europe	Etc/Universal (UTC)
	Europe/Amsterdam (UTC-1:00)
	Europe/Berlin (UTC-1:00)
USA	US/Central (UTC+6:00)
	US/Michigan (UTC+5:00)
	US/Pacific (UTC+8:00)
China	Asia/Hong Kong (UTC-8:00)
Japan	Tokyo (UTC-9)

5.5 Device registration

You must register your machine so it can be supported by Siemens Support. The registration is relevant for the warranty.

Message 150412 is displayed if the machine is not registered:

No information about SIEMENS warranty available.

Note

Message 150412 cannot be acknowledged.

Register the machine in the Diagnostics operating area:

"Diagnostics" → "Version" → "Register machine"

Additional information

Additional information on how to register the machine is provided in the online documentation Commissioning Functions and Service.

5.6 Activation of the display for the remaining time of spindle utilization

In order to protect the spindle from overload, you can display the maximum remaining time of the spindle utilization in seconds in the T,F,S window in addition to the control display of the spindle utilization. The time and spindle utilization symbol are displayed when the remaining time is less than 120 seconds at the current spindle load.

Axis machine data

Set the following machine data:

MD53035 \$MAS_SHOW_SPINDLE_UTIL_TIME	Show spindle utilization time
= 0	Do not show spindle utilization time
= 1	Show spindle utilization time

5.7 Configuring Caps Lock

The "CAPSLOCK on" function ensures that text entered via an external keyboard is always entered in upper case and not in lower case.

The key behavior is set using the following display machine data.

Setting

MD9009 \$MM_KEYBOARD_STATE	
= 0	CAPSLOCK off (default value)
= 2	CAPSLOCK on

If the machine data is changed, the system must be rebooted.

5.8 Activating/deactivating the virtual keyboard

The virtual keyboard is configured in the file "slguiconfig.ini".

Procedure

1. Copy the "slguiconfig.ini" file from the folder
/siemens/sinumerik/hmi/template/cfg.
2. Paste the copy of the file into the following directory:
/oem/sinumerik/hmi/cfg or /user/sinumerik/hmi/cfg.
3. Open the file in the editor.
4. To activate or deactivate the keyboard, make the following settings:
 - Activating the virtual keyboard:
In the section [TouchPanel], EnableTouch = true
In the section [Keyboard], EnableVirtualKeyBoard = true
 - Deactivating the virtual keyboard:
In the section [TouchPanel], EnableTouch = true
In the section [Keyboard], EnableVirtualKeyBoard = false
5. Double click in the input field to display the keyboard.

5.9 Defining the access rights for the "HMI restart" softkey

Display machine data

Using the following display machine data, set the access rights from which access level the "HMI restart" softkey is displayed.

For SINUMERIK Operate on PC or PCU, the "EXIT" softkey is displayed.

MD9110_\$MM_ACCESS_HMI_EXIT	Access level of the "EXIT" softkey
= 1	Access level 1 (manufacturer), default value

Restart the HMI

Use the following procedure to restart SINUMERIK Operate:

Open the operating area, e.g. with the <MENU SELECT> key → "Menu step enable key" → "HMI restart"

5.10 Setting OEM functions for the softkeys "HMI restart" and "EXIT"

You can influence the default functional behavior of the "HMI restart" or "EXIT" softkey. You can set the configuration in the "slamconfig.ini" file.

Creating the "slamconfig.ini" configuration file

Insert a copy of the "slamconfig.ini" file into one of the following directories:

<Installation path>/**user**/sinumerik/hmi/cfg

<Installation path>/**oem**/sinumerik/hmi/cfg

Configuring the "slamconfig.ini" file

Configure the values via the following sections in the "slamconfig.ini" file:

Section	Description
[ExitSoftkey]	Section for Exit softkey With SINUMERIK Operate on NCU, the "HMI restart" softkey is displayed with this configuration.
[RebootSoftkey]	Section for HMI restart softkey This section only works with SINUMERIK Operate on PCU/IPC.

Value	Description
Visible	true or false Switches the softkey to visible or invisible in the operating area
SoftkeyPosition	Fixed softkey position of the area softkey In this case, softkey positions 1 to 8 are located on the 1st horizontal bar and softkey positions 9 to 16 on the 2nd horizontal bar, etc.
AccessLevel	0 to 7 Access level as of which the softkey will be displayed This value is a compatibility value for operating software without MD9110 support.
QueryUser	true or false Activates or deactivates a confirmation dialog

Note

Compatibility value for access level

Please note that the configuration for the access right with the value `AccessLevel` has no effect in this version of SINUMERIK Operate. You set the access right via MD9110.

You can find **more information** in Chapter "Defining the access rights for the "HMI restart" softkey (Page 53)".

Example

The following example describes the default configuration for "slamconfig.ini":

```
[ExitSoftkey]
Visible=true
SoftkeyPosition=16
AccessLevel=1
QueryUser=false

[RebootSoftkey]
Visible=false
SoftkeyPosition=15
AccessLevel=1
QueryUser=false
```

More information

More information on the "slamconfig.ini" configuration file can be found in Chapter "Link OEMFrame application (Page 599)".

5.11 Changing the skin design

Display machine data

You can change the skin design via the following item of machine data.

MD9112 \$MM_HMI_SKIN		Skin design The number of the skin is indicated
= 0	Skin 0	
= 1	Skin 1 (standard)	
= 2	Skin 2	

After changing the machine data, the operating software must be restarted.

5.12 Setting the screensaver

Defining the time until the screen is darkened (screensaver)

The duration (in minutes), after which the screen is automatically darkened if no keyboard key is pressed, can be specified using the display machine data MD9006 \$MM_DISPLAY_SWITCH_OFF_INTERVAL.

NOTICE

Influence of screen darkening on the service life

To extend its service life, the recommended duration for darkening a screen is 60 minutes. If you significantly reduce the duration, i.e. the screen is switched dark too often, this tends to shorten the screen service life.

Interface signal

The screen is darkened by setting an interface signal.

DB 19 byte	Signals to the operator panel front (PLC → HMI)	
DBB0	Bit 1	Bit 0
	Darken screen	Brighten screen

The following applies when actively darkening the screen using the interface signal:

- It is no longer possible to light up the screen again from the keyboard.
- The first keystroke on the operator panel already triggers an operator action.

Note

In order to prevent accidental operator actions via the interface signal when the screen is darkened, we recommend disabling the keyboard at the same time.

5.13 Setting cleaning mode for the operator panel

The cleaning mode helps you to clean the operator panel without changing the data displayed on the screen. If you activate the "Cleaning mode for panel" function, the multitouch and key functions of the operator panel will be disabled for a few seconds. The progress bar shows you the remaining time.

Activate the cleaning mode for the operator panel using a special softkey in the "Commissioning" operating area:

"Commissioning" → "Cleaning mode for panel"

Note

The cleaning mode can only be used on operator panels with a Touch Panel.

Display machine data

You can set the inhibit time via the following display machine data.

MD9116 \$MM_PANEL_CLEAN_MODE_TIME	Duration of cleaning mode
= 30	Define the duration in seconds for which the cleaning mode must be activated Setting range 10 to 60 seconds, 30 seconds is standard

5.14 Inserting a user-specific run up screen

OEM-specific run up screen

You can replace the Siemens run up screen by your own run up screen.

Procedure:

1. Call your own run up screen "splash.png".

Note

The file name must not contain any lower case letters.

2. Save your own run up screen in one of the following directories:
/user/sinumerik/hmi/ico/ico640 or
/oem/sinumerik/hmi/ico/ico640 or
/addon/sinumerik/hmi/ico/ico640

Note

The size of the screen is of no significance. A resolution of 640x480 pixels is always set.

5.15 Using user interfaces in parallel

It is possible to use SINUMERIK Operate in parallel on several user interfaces connected with one NCU. When doing so, only one user interface may be used as the main interface, while all other user interfaces behave passively and can only be used to a limited extent. To avoid function conflicts between the individual user interfaces and the controlled system, adapt the following configuration file:

"systemconfiguration.ini" file

Create the new "systemconfiguration.ini" configuration file in one of the two directories:

<Installation path>/user/sinumerik/hmi/cfg

<Installation path>/oem/sinumerik/hmi/cfg

In the configuration file, enter the section **[miscellaneous]** with the parameter `HMIFunctionMode` and the appropriate value. The following value specifications are possible:

Value	Description
PanelMode or <empty>	The operating software and the system behave by default. It can lead to errors in the system if SINUMERIK Operate is operated in parallel on another user interface.
InterfaceMode	SINUMERIK Operate is switched to passive in the system and does not log on as a regular user interface. The operating software: • does not write to the PLC interface • does not monitor PLC hardkeys • does not monitor MMC commands • does not monitor language selection via PLC • does not monitor PLC commands • does not monitor Ctrl-Energy • does not monitor dark-ON via PLC • does not set HMI-Ready in the PLC
TerminalMode	SINUMERIK Operate is used in the system as a tool loading station. The user interface behaves passively.

Example

For a CNC machine, two user interfaces are to be used in the same system with one NCU.

Setting of the main user interface:

```
[miscellaneous]
HMIFunctionMode=PanelMode
```

Setting of the secondary user interface:

```
[miscellaneous]
HMIFunctionMode=InterfaceMode
```

More information

More information on functions and settings on the user interface for interface signals (DB19) and commands is provided in:

- Function Manual PLC
- Programming Manual NC Programming
- Programming Manual Easy XML

5.16 Setting how login data (credentials) are handled when archiving

If you generate a commissioning archive, then SINUMERIK Operate issues a dialog query as to whether all of the login data for the set up drives and OPC UA should also be saved to the archive. You parameterize the login data handling using the following display machine data:

Display machine data

MD9112 \$MM_SAVE_CREDENTIALS		Backing up access authorization for network drives when archiving
= 0	Dialog is displayed (default setting)	
= 1	No dialog, access authorizations are not saved	
= 2	No dialog, access authorizations are always saved	

Note

Using shortcut key CTRL+ALT+S, no login data is saved to the archive.

5.17 VNC remote connections

From SINUMERIK Operate, you have the possibility of operating external systems via VNC:

- Define a remote access, and link the selection via a softkey configured in the operating area.
- Define key forwarding to use key combinations in the VNC control area as an alternative.

The remote connection is started using a softkey configured in the operating area menu. If the sidescreen is activated, the VNC operating area can be additionally called using the navigation bar of the sidescreen.

Note

The VNC operating area only supports hextile encoding with color depths of 16 or 32 bits.

Requirement

In the plant or company network, there is at least one system where a VNC server has been set up.

Examples

The following use cases are possible, for example:

- Connection to additional controls
- Connection to the CAD system
- Connection to tool measuring station
- Connection to other PCs

Procedure

You make the remote connection settings via the "Setting up the operating area" window:

Operating area "Commissioning" → "HMI" → "Operating area menu"

Press the "Details" softkey if you want to parameterize additional key forwarding or the "Display VNC source" drop-down list.

You can define an alternative shortcut key for the "Select menu" key.

Note

Reserved softkeys

Softkeys reserved for the system are marked, and are not available for free configuration.

General information

Entry		Description
Operating area 1 - 24		
Type	VNC	Remote access to an external control or PC
	Empty	A VNC that has already been set up is deleted
Computer name		Name or IP address of the external system
Password		Password for logging on to the VNC server The password is displayed encrypted as "**".
Status bar	Off Top Bottom	Display position of the VNC access information: - Name of the system or IP address - Port - Connection status (e.g. for an incorrect connection)
Port		Interface to the VNC server The default port is 5900.
Display VNC source (only visible if "Details" softkey selected)	Cutout Left Width Top Height Full screen	Definition of the displayed range The VNC viewer display shows the entire source screen. To enable the source screen to be completely visible in the VNC viewer, it must often be stretched or compressed (possibly by changing the aspect ratio). Configuring the size and position of the picture details defines the area of the VNC source screen which you would like to see in the VNC viewer. This picture detail is also stretched or compressed (possibly by changing the aspect ratio) to enable it to be completely visible in the VNC viewer.
Operate header	On Off	Display bar for operating area and message line active/inactive

Specifications for the configured softkey

Entry		Description
Access level	Key-operated switch, position 0 ... manufacturer	Assign access rights to the actual connection: from access level 7 (key operated switch position 0) to access level 1 (manufacturer).
Softkey text		Two-line label on the softkey %n is accepted as a line separator. If the first line is too long, then a line break is automatically inserted. If a space is present, it is taken as a line separator. For language-dependent softkey texts, the text ID is entered, which is used to search in the text file. If nothing is specified in the entry field, then the symbolic name of the operating area, which is automatically assigned, is used as softkey text (e.g. AreaVNC_500).
Softkey icon	No icon	No icon is displayed on the softkey.
	hd_vnc.png 	File names of the icon displayed on the softkey.
Text file		File and context for the language-dependent softkey text. If nothing is specified in the input fields, the text appears on the softkey as was specified in the "Softkey text" input field.
Text context		

Key transfer to the external system

Press the "Details" softkey to display the area "Key forwarding", and activate the appropriate checkbox.

When you press "Menu Select" an additional window opens in which you can select the key combination that you want to use.

Note

Be aware that, depending on the operator panel that you are using, not all keys will be available to you.

Designation	Key combination	Description
M	Shift+F10	Calls the "Machine" operating area (M key)
Cancel alarm	Esc	Deletes alarms and messages
Machine	Shift+F11	Calls the "Machine" operating area (hard key)
Program manager	Home (numpad)	Calls the "Program Manager" operating area
Channel	F11	Switches further for multiple channels

Designation	Key combination	Description
Program	End (Numpad)	Calls the "Program" operating area
Alarm	Page Up (Numpad)	Calls the "Diagnosis" operating area
Menu Select	F10	Opens the operating area menu You can change the shortcut key in the input field. When attempting to edit, the "Alternative key combination for Menu Select" dialog opens, allowing the following parameterization be made: A - Z, F1 - F12, Home, End, Page Up, Page Down AND combinable with SHIFT, CTRL, ALT
Help	F12	Calls the context-sensitive online help for the selected window
Offset	Page Down (Numpad)	Calls the "Parameter" operating area
Custom	Shift+F12	Calls the "Custom" operating area
Next Window	Home	Toggles between the windows

Automatic key transfer

If the VNC operating area is selected, then the following keys and/or key combinations are directly transferred to the VNC server:

Keys of the operator panel	Key combination
Horizontal softkeys (upper bar, HU)	F1 – F8
Vertical softkeys (right bar, VR)	Shift+F1 - Shift+F8
Horizontal softkeys (lower bar, HL)	Ctrl+F1 - Ctrl+F8
Vertical softkeys (left bar, VL)	Shift+Ctrl+F1 - Shift+Ctrl+F8
Recall	F9
ETC switchover	Shift+F9
Extended horizontal softkeys (upper bar, HU)	F13 - F20
Extended, vertical softkeys (right bar, VR) and right direct keys HT8	Shift+F13 - Shift+F20
Extended horizontal softkeys (lower bar, HL)	Ctrl+F13 - Ctrl+F20
Extended, vertical softkeys (left bar, VL) and left direct keys HT8	Shift+Ctrl+F13 - Shift+Ctrl+F20
Lower and left-hand softkey bar (HL, VL)	(Shift)+Ctrl+F1 - (Shift)+Ctrl+F8

5.18 Setting the WEB browser

In SINUMERIK Operate you have the possibility to set up the additional operating area "WEB Browser".

With the WEB Browser you can display web pages directly on the control.

You adapt the WEB Browser operating area to your requirements by configuring it accordingly.

The WEB Browser is started by means of a configured softkey configured in the operating area menu. If the sidescreen is activated, the VNC operating area can be additionally called via the navigation bar of the sidescreen.

Requirement

The control system is connected in the network with the Internet, intranet or a web server.

Example

To obtain additional information for your activity, you use web pages on the Internet or intranet.

Procedure

You make the WEB Browser settings via the "Setting up the operating area" window:

Operating area "Commissioning" → "HMI" → "Operating area menu"

General information

Entry		Description
Operating area 1 - 24		
Type	WEB Browser	Displays web pages on the control
Start URL		URL which is displayed when the WEB browser is started.
Address specification	On Off	Field for entering the URL/Internet address in the WEB browser
Status display	On Off	Status display in the WEB browser, e.g. loading the progress indicator for URL
Search	On Off	Search field in WEB Browser
Home URL		If a Home URL is specified, the corresponding icon appears in the WEB Browser. If you press the Home URL icon, the Home URL is accessed.
Operate header	On Off	Display bar for operating area and message line
Navigation	On Off	Navigation arrow in WEB Browser

Specifications for the configured softkey

Entry		Description
Access level	Keyswitch position 0	Operability of the configured softkey
	...	Access level 7 - job-trained operator
	Manufacturer	...
Softkey text		Access level 1 - manufacturer
		A text-ID for language-specific text or a two-line label for the softkey %n is accepted as a line separator. If the first line is too long, a line break is automatically inserted. Any spaces are used as line breaks. For language-specific softkey texts, the text ID is entered which is used to search in the text file.
Softkey icon	No icon	No icon is displayed on the softkey.
	sk_web.png	File names of the icon displayed on the softkey.
		
Text file		File and context for language-dependent softkey text. If nothing is specified in the entry fields, the text in input field "Softkey text" is used for all languages.
Text context		

5.19 Access levels

5.19.1 Definition of access levels

Access to programs, data and functions is protected in a user-oriented hierarchical system of seven access levels. These are divided into

- Three password levels for manufacturer, service and users
- Four keyswitch positions for users

There are access levels 1 to 7 (see table below); where

- 1 is the highest and
- 7 is the lowest level.

Table 5-1 Access level concept

Access level	Protected by	Area
1	Password: SUNRISE (default value)	Manufacturer
2	Password: EVENING (default value)	Service
3	Password: CUSTOMER (default value)	User
4	Keyswitch 3	Programmer, machine setter
5	Keyswitch 2	Qualified operator
6	Keyswitch 1	Trained operator
7	Keyswitch 0	Semi-skilled operator

Password security

Note

Assigning secure passwords

Observe the following rules when assigning new passwords:

- When assigning new passwords, never choose passwords that can be easily guessed, e.g. simple words, sequences of consecutive keys on the keyboard, etc.
- Passwords must always contain a combination of upper-case and lower-case letters as well as numbers and special characters. Passwords must comprise at least 8 characters. PINS must comprise an arbitrary sequence of digits.
- Wherever possible and where it is supported by the IT systems and the software, a password must always have a character sequence as complex as possible.

You can use a password management program to assist you when dealing with passwords. With its help, you can save passwords and PINs in encrypted form, manage them and generate secure passwords.

Note**Changing passwords between SINUMERIK Operate and NC**

The access levels for SINUMERIK Operate and NC have been merged. Changing a password for SINUMERIK Operate simultaneously changes the relevant NC password and vice versa. It is important to note the following behavior:

- When a general NC reset is performed, no passwords are reset to the default passwords.
- Following a software upgrade, the SINUMERIK Operate passwords apply to the NC.
- Once changed, a password can no longer be reset - not even by SIEMENS service. The possibility of resetting passwords violates requirements relating to IT security. Therefore, make sure that you store the changed password in a safe place. Losing a password means that the SINUMERIK system has to be completely reinstalled using a backup file (restore).

More information on how to install a backup is provided in the Commissioning Manual NCU Operating System.

5.19.2 Modifying the access levels password

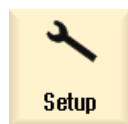
Overview

You can activate the access levels protected with passwords from the user interface.

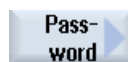
The following options are available for editing the passwords:

- Set new password
- Change password
- Delete password

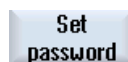
Setting the password



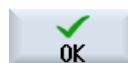
1. Select the "Setup" operating area.



2. Press the "Password" softkey.



3. Press the "Set password" softkey. The "Set Password" window opens.



4. Enter one of the possible default passwords and press the "OK" softkey to confirm the entry.

A permissible password is set and the valid access level is displayed. Invalid passwords will be rejected.

Change password

You must change the standard passwords to obtain a secure access protection.



1. Press the "Change password" softkey. The "Change Password" window opens.
2. Select the area (e.g. user) for which you want to assign a new password.
3. Enter the new password in the input fields "New password" and "Repeat password".

Always assign a secure password.



4. Press the "OK" softkey to confirm your entry. A new, valid password is only accepted if the two terms entered are identical.

Note

Invalid passwords are rejected by the operating software. Note the rules for strong passwords:

- A password must contain at least 8 and can contain up to 32 characters.
- Permissible characters are:
 - Uppercase characters
 - Lowercase characters
 - Numbers
 - Special characters (ASCII 0x20 - 0x7E)
- The character combination of a password must contain:
 - At least one number
 - At least one uppercase letter
 - At least one lowercase letter
- A password must not be too similar to the following names:
 - User names (manufacturer, service, user)
 - Computer name
 - The additional values that can be stored for a user in the Linux password file (so-called GECOS data)

We recommend that you confine yourself to the characters available on the operator panel front when selecting a password.

Delete password



Press the "Delete password" softkey. The access authorization is reset.

Note

Access authorization is not automatically deleted at POWER ON.

5.19.3 Work station safety

In order to secure machines against manipulation and protect people from accidents, proceed as follows when leaving the work station:



1. Set the keyswitch to 0 and then remove it.
2. Press the "Delete password" softkey.
Access authorization is then reset.

5.19.4 Access levels for programs

Objective

Access levels can be allocated to protect information; they can also be used to prevent unauthorized operation or deliberate damage to the control system or machine.

Access levels for files and directories specify which users are authorized to execute which operations on a directory or a file in a file system. Operations in this sense include:

- Reading the contents of a file (READ), copying the file or placing the file in an archive.
- Changing the content of a file (WRITE) or deleting the file.
- Executing a file (EXECUTE).
- Listing and displaying a file in a directory (SHOW).
- Creating a file in a directory.
- Displaying or reading the contents of a directory.
- Creating or deleting a directory.

Function description

The **individual allocation of access rights** acts, in the passive NC file system, on the following directories:

- Part programs
- Subprograms
- Manufacturer cycle directory
- User cycle directory
- Workpiece directory
- Workpiece directories

Furthermore, the function acts on the files of the main program type (*.mpf) and subprograms or cycle (*.spf).

In addition, the technique can be expanded to include the following directories on the local drive:

- Part programs
- Subprograms
- Workpiece directory
- Workpiece directories

Note**Working via remote access**

When working via remote access (e.g. WinSCP or Access MyMachine), the same access rights apply for editing or saving files and directories as when working directly at the control system.

Additional information

Information about access rights with WinSCP or Access MyMachine is provided in the:

- NCU Operating System
- SINUMERIK Integrate Access MyMachine /OPC UA

Access rights via machine data

The following machine data is still available to **globally allocate access rights**:
MD51050 \$MNS_ACCESS_WRITE_PROGRAM

Default setting = 4 (access level: User)

Note**Effect of access rights**

The more restrictive setting is always effective both when individual access rights have been allocated and when settings have been made via MD51050 \$MNS_ACCESS_WRITE_PROGRAM.

Settings in the "slfsfileattributes.ini" file

The "slfsfileattributes.ini" file is available as a template in the following directory:

../siemens/sinumerik/hmi/template/cfg

The values from 1 ... 7 correspond to the access levels that, for example, also apply to the password. The 4-digit numbers designate the sequence according to the following rights:

Meaning (left to right): R W X S		
R	READ	Reading files and directories
W	WRITE	Changing, deleting or creating files and directories
X	EXECUTE	Executing a program: for files, for directories, always 7
S	SHOW	Outputting a list of files and directories

Copy the "slfsfileattributes.ini" file into one of the following directories:

`../oem/sinumerik/hmi/cfg` or `../user/sinumerik/hmi/cfg`

The operating software must be restarted for the changes to become effective.

Example

The paths are composed of the data type identifiers. In the following example, "`\wks.dir\*.wpd \*.mpf`" stands for the data type for workpiece directories "`wks.dir`" the workpieces "`*.wpd`" and the part programs "`*.mpf`".

For all workpieces, 7777 is defined as the default setting for new part programs.

All entries are in the section [ACCESSMASKS] and have the following form:

```
[ACCESSMASKS]
```

```
\wks.dir\*.wpd\*.mpf = 7777
```

```
\mpf.dir\*.mpf = 6577
```

```
\cus.dir\*.spf = 6577
```

See also

Definition of access levels (Page 69)

5.19.5 Access rights for files

Changing access rights

Access rights for execution, writing, listing and reading are displayed in the "Properties" window.

- Execute: is used for the selection for execution.
- Write: controls the changing and deletion of a file or a directory.

For NC files, you have the option to set the access rights from keyswitch 0 to the current access level, to be set separately for each file.

If an access level is higher than the current access level, it cannot be changed.

For external files (e.g. on a local drive), the access rights are displayed to you only if settings have been executed for these files by the machine manufacturer. They cannot be changed via the "Properties" window.

Note

Settings for the access rights to directories and files

Via the configuration file and MD51050, access rights of the directories and file types of the NC memory and user memory (local drive) can be changed and pre-assigned.

Configuration file "slfsfileattributes.ini"

The access rights defined in the configuration file "slfsfileattributes.ini" and in MD51050 become valid in the NC when creating new files and can then be changed individually in the Program Manager using the "Properties" function. The access rights are an individual attribute of each file in the NC.

The access rights defined in the configuration file "slfsfileattributes.ini" and MD51050 become valid for external data on the CompactFlash Card of the NCU, or on the hard disk of the PCU/PC immediately for all the specified directories and file types, and cannot be changed through operation. The access rights can only be set globally for external data.

5.19.6 Access levels for softkeys

Use

The display and operation of softkeys can be suppressed by both the manufacturer as well as the user. This allows the operating software to be specifically adapted to the required functional scope and therefore be configured as transparently as possible.

This means that the functional scope of the system is restricted, to prevent access to functions in the operating software, or to restrict the possibility of operator errors.

Access hierarchy

A new access level can only be allocated for those softkeys that are also visible and can be used in the actual access level.

Example: If a softkey is only accessible with the "Manufacturer" access level, then the access level cannot be changed by an operator with access level "Key-operated switch setting 3".

Restrictions

In order to guarantee that the system remains stable and operable, certain softkeys are excluded from the access level change, e.g. the "Customize softkeys" softkey itself, in order that the undo path is not cut-off or the softkey "<< Back" to the vertical softkey bar.

The following softkeys cannot be hidden or the access level changed:

- All "OK" softkeys
- All "Cancel" softkeys
- All "Accept" softkeys
- All "<<" Back and ">>" Continue softkeys

The access level for softkeys in the cycle dialog boxes can also be changed; this does not apply to softkeys in Easy Screen dialog boxes.

Note

Software upgrade

As all changes of the access levels for softkeys are described using the softkey ID, they still remain valid after a software upgrade, which may have resulted in softkeys being shifted.

Softkeys, where access is already protected by machine data - for example MD51045 \$MNS_ACCESS_TEACH_IN - are only protected by the allocated access level after a new one has been allocated. The machine data is no longer evaluated.

All of the softkeys hidden using this mechanism can be temporarily displayed again using the access rights specified by the system. This is done using the "Show all softkeys" softkey. The softkey is deactivated as long as no softkeys have been allocated new access levels: This setting remains effective until the system is rebooted.

Note

Applicability of modified access levels for softkeys

The setting of specific access levels for softkeys on a PCU has an exclusive effect on the respective PCU softkeys themselves. To implement access rights on the NCU, both the manufacturer and the user must use the appropriate mechanisms and set the rights accordingly, see Chapter "Access levels for programs (Page 72)".

5.19.7 This is how you define new access levels for softkeys

General sequence

In order to allocate a new access level to a softkey, proceed as follows:

- Activate the adaptation mode.
- Change the access level of a softkey.
- Accept the changes and confirm.

Preconditions

Access to the "Customize softkeys" is protected using a general MD51073 \$MNS_ACCESS_SET_SOFTKEY_ACCESS. This machine data is pre-assigned access level 3, i.e. the function is available from "Service" password and higher. In order that an operator with "User" access level can use this function, set this machine data to a value > 3.

An external mouse is required in order to make changes.

Changing the access level of a softkey

Procedure

1. In the "Start-up" operating area, select the "HMI" menu.
2. On the expansion bar ">>" select the "Customize softkeys" softkey.
You can obtain precise information about the procedure in the following dialog.
3. Confirm with "OK", in order to activate the "Customize the softkey access levels active" mode.
A table is displayed.
4. Select an operating area.
5. Place the mouse cursor on a softkey and using the right-hand mouse key call the context menu "Define access level", in order to define a new access level for this softkey.
 - The displayed access level is the default setting.
 - A softkey is practically made invisible with "Always hide".
 - You can reset the additionally allocated access level using "Original setting". This selection is only listed after an individual access level was set.
6. In order to accept changes, return to the "Start-up" operating area and there, press the "Close customizing" softkey. This means that you exit the "Customize the softkey access levels active" mode.
If you acknowledge the following query with "OK", then the changes are accepted and become effective once the system has rebooted.
7. If the changes to a softkey are not to be applied, select the line in the "Adapt softkey access levels" window and press the "Original setting" softkey. The identifier "Original setting" is entered in the "New access level" column. After the end of the softkey adaptation and system restart, the original setting of the softkey is restored and the line entry in the "Adapt softkey access levels" window is deleted.

Example

The following access levels were changed:

Softkey	New access level
SISuMainScreenMenuHu::0::3	Manufacturer
SIMaJogMillMenuHU::jogHuMore::6	User
SISuPaUserDataMenu::::4	Service

Once selected, the identifier and position of the softkey are transferred to the "Softkey" column.

Result

When the changes have been accepted, a configuration file with the name "slsoftkeyaccess.xml" is created and saved in the file system under the following path: `../user/sinumerik/hmi/cfg`. Files can also be saved on the `/oem` path; these files are evaluated when the system boots. The following priority applies: `oem < user`.

Note

Editing the file "slsoftkeyaccess.xml"

In order to avoid errors in the xml syntax and for the softkey identifier the "slsoftkeyaccess.xml" file may only be edited via the operating software as described above, and not directly in the file system under "System data". It is possible that the complete file or individual entries for softkeys can no longer be interpreted.

5.19.8 Setting the MDA program access via protection level

Use the following general machine data to set the protection level from which programs can be edited in MDA operating mode. The setting also applies to program overwriting in Automatic mode. The access levels 0 to 7 are possible.

Setting the protection level

MD51075 \$MNS_ACCESS_WRITE_MDI	Write protection level MDA program
= 7	No interlock, editing is permitted (standard)

Note

A change of the protection level is activated after POWER ON.

If the current access level is not sufficient, a program under MDA mode can neither be edited nor changed using the "Load MDA" and "Delete blocks" softkeys.

5.20 Program selection

5.20.1 Displaying the softkey

The softkeys on the user interface for calling the program lists are activated via general configuration machine data.

Configuring a softkey

MD51041 \$MNS_ENABLE_PROGLIST_USER	
0	No softkey
1	The "Prog. list" softkey is displayed

MD51043 \$MNS_ENABLE_PROGLIST_MANUFACT	
0	No softkey
1	The "MANUFACTURER" softkey is displayed

Precondition

To create program lists, you require the following authorization:

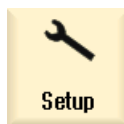
- "Program manager" operating area: Access level 3 (password: User) or
- "Start-up" operating area: Access level 1 (password: Manufacturer).

Program lists

You can create a program list by combining desired programs from the NC data, e.g. workpieces, part programs and subprograms. These programs can then be selected by the PLC for execution.

Program lists	Directory
plc_proglst_user.ppl	/user/sinumerik/hmi/plc/programlist
plc_proglst_manufacturer.ppl	/oem/sinumerik/hmi/plc/programlist

Procedure



1. Select the "Start-up" operating area if you have the authorization for access level 1 (password: Manufacturer).

- OR -



Select the "Program manager" operating area if you have the authorization for access level 3 (password: User).



2. Press the menu forward key and the "Prog. list" softkey.
The "Program List" window opens.



3. Press the "Manufacturer" softkey if you want to create a program list that can be used for all machines of a certain series.



4. Place the cursor in the desired line (program number).

5. Press the "Select program" softkey.

The "Programs" window opens. The data tree of the NC memory with the directories "Workpieces", "Part programs" and "Subprograms" is displayed.



6. Place the cursor on the desired program and press the "OK" softkey.
The selected program is inserted in the first line of the list together with its path.

- OR -

Enter the program name directly in the list.

If you are making entries manually, check that the path is correct (e.g. //NC/WKS.DIR/MEINPROGRAMM.WPD/MEINPROGRAMM.MPF).

If required, the extension (.MPF) is added.

Note:

A syntax check is not performed.

With workpieces, make sure that there is a main program or a job list with the same name in the workpiece itself.



7. To remove a program from the list, place the cursor on the appropriate line and press the "Delete" softkey.

- OR -



To delete all programs from the program list, press the "Delete all" softkey.

5.21 Activate and configure the Sidescreen window

5.21.1 Activate Sidescreen

In addition to SINUMERIK Operate, multi-touch panels with widescreen displays offer the option of displaying more elements on the additional area at the side of the screen. As default, widgets that quickly and continually display important information are shown. Further, pages that include a virtual keyboard and virtual MCP are prepared. In addition, you can also configure your own pages.

More information

More information and examples on the sidescreen function is provided in:

- Programming Manual Easy XML
- Programming Manual Run MyScreens
- Operating Manual Universal/Turning/Milling/Grinding

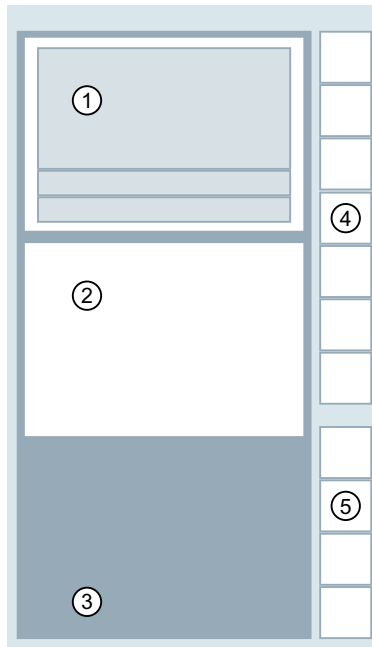
Precondition

To use the function, you need a multi-touch panel in the widescreen format (resolution, 1366x768, 1920x1080).

Sidescreen structure

Several pages can be displayed on the sidescreen. Only one page is active at a time. You can toggle between the pages using the page selection keys.

The standard page contains a standard element to display widgets. You can configure additional elements on this page.



- ① Widgets in the Siemens standard element
- ② Element (OEM) on a standard page
- ③ Page
- ④ Navigation bar for SINUMERIK Operate
- ⑤ Keys to select pages

Activation



WARNING

Unexpected machine movements caused by incorrect operation

Incorrect operation of devices with touch screen can result in unexpected machine movements. This can result in personal injury or damage to property.

- Prevent unintentional incorrect operation by configuring the user interface appropriately, e.g. by placing the buttons for starting and stopping machine components far enough apart.
- Configure the machine in such a way that safety-related functions are not operated with the touch screen.

You activate the Sidescreen function via the following display machine data:

MD9114 \$MM_SIDESCREEN	SINUMERIK Operate Sidescreen
= 1	Enables the additional Sidescreen display area of the multi-touch panel (HD Ready or Full HD).
= 2	Enables the sidescreen display area in HD Ready. Enables the Display Manager in full HD.

Note

Automatically hiding the Windows taskbar

In some situations SINUMERIK Operate is covered by the Windows taskbar on PCU/IPC. You can hide the taskbar automatically to ensure proper user interface operation:

Right-click the taskbar and open the "Properties" (Windows 7) or "Taskbar settings" (Windows 10) item in the menu. In the "Task bar" tab, select the option "Automatically hide the taskbar" (Windows 7) or "Automatically hide the taskbar in desktop mode" (Windows 10).

The bar and value displays for widgets are defined via machine data:

Axis load display



Software option

To use this function, you need the software option:
"Evaluation of internal drive variables"

You can activate the acquisition of additional drive actual values for the axis load display in the sidescreen using the following axis machine data:

MD36730 \$MA_DRIVE_SIGNAL_TRACKING	Acquisition of additional drive actual values
= 1	\$AA_LOAD: Drive load \$AA_POWER: Drive efficiency \$AA_TORQUE: Drive torque setpoint \$AA_CURR: Smoothed current actual value (quadrature-axis current) of the drive

Note

Acquisition for the axis load display is only possible if actual values are available from the drive.

Bar display for axis and spindle power

You can assign parameters for the bar display for the axis power using the following axis-machine data:

MD53030 \$MAS_AXIS_MAX_POWER	Maximum value of the axis power display
= 100	Default Maximum permitted axis power in percent The bar display is green in the range between 0 and the value of AXIS_MAX_POWER.

5.21 Activate and configure the Sidescreen window

MD53031 \$MAS_AXIS_POWER_RANGE	Display range of the axis power display
= 100	Default Full-scale value for axis power display in percent This value must be greater than or equal to AXIS_MAX_POWER. The bar display is red in the range between the values of AXIS_MAX_POWER and AXIS_POWER_RANGE.

You can assign parameters for the bar display for the spindle power using the following general machine data:

MD51030 \$MNS_SPIND_MAX_POWER	Maximum value of the spindle power display
= 100	Default Maximum permitted spindle power in percent The bar display is green in the range between 0 and the value of SPIND_MAX_POWER.

MD51031 \$MNS_SPIND_POWER_RANGE	Display range of the spindle power display
= 100	Default Full-scale value for spindle power display in percent The value must be equal to or greater than SPIND_MAX_POWER. The bar display is red in the range between the values of SPIND_MAX_POWER and SPIND_POWER_RANGE.

Note

If you do not need a standard widget, set the comment character ";" before the corresponding keyword in the sample file "slsidescreen.ini".

5.21.2 Display Sidescreen ABC keyboard

Not only the standard windows but also the window for an ABC keyboard can be displayed in the Sidescreen display of the Multitouch panel.

Procedure

1. Copy the sample file "slsidescreen.ini" from the directory
/siemens/sinumerik/hmi/template/sidescreen
2. Place the copy of the file in one of the following directories:
/oem/sinumerik/hmi/cfg or
/user/sinumerik/hmi/cfg
3. Open the copy and delete the comment sign ";" in front of the keyword PAGE002.

Note

The values of the attributes `name` and `implementation` must not be changed.

4. Save the setting.
The ABC keyboard can be selected after a run-up.

5.21.3 Display Sidescreen machine control panel

Not only the standard windows but also the window for machine control panel functions can be displayed in the Sidescreen display of the Multitouch panel.

Multiple machine control panel windows can be optionally displayed.

The example of a machine control panel is displayed by the following procedure:

Procedure

1. Copy the sample files "slsidescreenmcppageconfig.xml", "slsidescreenmcppage_eng.ts" and the subdirectories of the icon files from the directory
/siemens/sinumerik/hmi/template/sidescreen/mcp/
The icon files are stored in the following subdirectories:
/ico1024 for HD Ready
/ico1920 for Full HD
2. Place the copy of "slsidescreenmcppageconfig.xml" in one of the following directories:
/oem/sinumerik/hmi/proj or
/user/sinumerik/hmi/proj
3. Place the copy of "slsidescreenmcppage_eng.ts" in one of the following directories:
/oem/sinumerik/hmi/lng or
/user/sinumerik/hmi/lng

Note

The TS file is automatically integrated by the system during startup.

4. Save the icon files under the following path in one of the intended subdirectories:
/oem/sinumerik/hmi/ico or
/user/sinumerik/hmi/ico
Depending on the screen resolution, there are the following subdirectories:
/ico1024 for HD Ready
/ico1920 for Full HD
5. Copy the sample file "slsidescreen.ini" from the directory
/siemens/sinumerik/hmi/template/sidescreen
6. Place the copy of "slsidescreen.ini" in one of the following directories:
/oem/sinumerik/hmi/cfg or
/user/sinumerik/hmi/cfg
7. Open the copy of the file "slsidescreen.ini", and delete the comment sign ";" in front of the keyword PAGE003.
Multiple machine control panels are optionally available:
PAGE004, PAGE005 and PAGE006

Note

The values of the attributes `name` and `implementation` must not be changed.

8. Save the setting.
The machine control panel can be selected after a run-up.

5.21.3.1 Configuring your own keys on the machine control panel

Your own keys can also be displayed in the sidescreen for the machine control panel. To do this, the keys must be configured in the file "slsidescreenmcpconfig.xml". The properties, position of the keys and the headers are specified here.

Example of the file "slsidescreenmcpconfig.xml"

```
<sideScreenControlPanel>
  <mainBlock id="sideScreenMcpBlock1">
    <block position="1" title="SPINDLE">
      <row position="1">
        <buttonGroup spacing="false" title="COOLANT">
          <button position="1" text="ON" icon="slsidescreenmcp_cooling.png"
style="redStyle" title="Spindle">
            <onPressed address="HmiUserKey1"/>
            <active address="HmiUserLed1"/>
            <disabled address="DisableHmiUserKey1"/>
          </button>
          <button position="2" text="OFF" icon="slsidescreenmcp_cooling_off.png">
            <onPressed address="HmiUserKey2"/>
            <active address="HmiUserLed2"/>
          </button>
        </buttonGroup>
      </row>
    </block>
  </mainBlock>
  *****
  *** optional ***
  *****
  <mainBlock id="sideScreenMcpBlock2">
    <.../>
  </mainBlock>
  <mainBlock id="sideScreenMcpBlock3">
    <.../>
  </mainBlock>
  <mainBlock id="sideScreenMcpBlock4">
    <.../>
  </mainBlock>
  <mainBlock id="sideScreenMcpBlockBelow1">
    <.../>
  </mainBlock>
  <mainBlock id="sideScreenMcpBlockBelow2">
    <.../>
  </mainBlock>
  <mainBlock id="sideScreenMcpBlockBelow3">
    <.../>
  </mainBlock>
  <mainBlock id="sideScreenMcpBlockBelow4">
    <.../>
  </mainBlock>
</sideScreenControlPanel>
```

Adaptation options of the file "slsidescreenmcppageconfig.xml"

You can make the settings for your own keys in the `<sideScreenControlPanel>` tag:

Tag	Description	
<code><mainBlock id="sideScreenMcpBlock1"></code>	Is the internal name of the machine control panel window	
<code><block position="1" title="SPINDLE"></code>	<code>position</code>	Order of the blocks
	<code>title</code>	Block header
<code><row position="1"></code>	Each block has any number of lines.	
	<code>position</code>	Positioning of the lines
<code><buttonGroup spacing="false" title="COOLANT"></code>	A key group combines two keys under one header.	
	<code>spacing</code>	The property enables the display type of the keys to be determined: together "false" or separate "true". The default is separate.
	<code>title</code>	All the keys in a key group have the same header.
<code><button position="1" text="ON" icon="slsidescreenmcp_cooli ng.png" style="redStyle" title="Spindle"></code>	Defines the key properties	
	<code>position</code>	Position of the key
	<code>text</code>	Labeling shown on the key
	<code>icon</code>	Icon of the key The icon is displayed above the <code>text</code> label. If there is no labeling, then the icon also takes up the labeling space.
	<code>style</code>	Changes the background color assigned to the key Possible values are: "redStyle" for a red key "greenStyle" for a green key The default is "defaultStyle"
<code><onPressed address="HmiUserKeyX"/></code>	<code>title</code>	A key that does not belong to any group can have its own header.
	<code>address</code>	If the key is pressed, the PLC bit is then set to 1. The value remains at 1 as long as the key remains actuated. With a brief press, the value remains at 1 for at least 300 ms. Alias name "HmiUserKeyX" for the addressed PLC bit Values of 1 to 64 are permitted for X. HmiUserKey1 to HmiUserKey64 stand for DB19.DBB404.0 to DB19.DBB411.7.

5.21 Activate and configure the Sidescreen window

Tag	Description	
<code><active address="HmiUserLedX"/></code>	The key is shown as active (LED animation at the top edge of the key).	
	address	Alias name of the PLC bit from which the active identifier is derived Values of 1 to 64 are permitted for X. HmiUserLed1 to HmiUserLed64 stand for DB19.DBB412.0 to DB19.DBB419.7.
<code><disabled address="DisableHmiUserKeyX"/></code>	The key is shown as inactive (icon and text grayed out).	
	address	Alias name of the PLC bit from which the inactive identifier is derived. Values of 1 to 64 are permitted for X. DisableHmiUserKey1 to DisableHmiUserKey64 stand for DB19.DB420.0 to DB19.DB427.7.

Note

Distribute the keys over several pages if you wish to configure a larger number of keys via the alias names `HmiUserKeyX`. This will help to prevent key display errors for machine control panels with a lower screen resolution.

Store own icons

You can create your own icon files under one of the following paths:

`/oem/sinumerik/hmi/ico` or

`/user/sinumerik/hmi/ico`

Depending on the screen resolution, under the following subdirectories:

`/ico1024` for HD Ready

`/ico1920` for Full HD

Note

The icon file names must be the same as the names used in the XML file, e.g. `icon="slsidescreenmcp_cooling.png"`.

5.21.3.2 Create own translations of texts for the machine control panel

You can display all machine control panel texts in different languages. Translations are created in the file `"slsidescreenmcp_page_XXX.ts"`.

"XXX" stands for a language code, e.g. "deu" for German, "eng" for English, and so on. You will find the supported languages at "Supported languages (Page 597)"

Procedure

1. Create the file "slsidescreenmcppage_xxx.ts" with the desired language code in one of the following directories:
 / **oem**/sinumerik/hmi/lng or
 / **user**/sinumerik/hmi/lng
2. Open the language file and insert the designations accordingly.
 The following texts may be displayed in translation:
 - All headers, e.g. title="COOLANT"
 - All key labels e.g. text="ON"
3. Save the language file.
 The translations are displayed after a run-up and the language has been changed.

Adaptation options of the file "slsidescreenmcppage_xxx.ts"

You can insert the translations in the <message> tag:

Tag	Description
<source>ON</source>	This is the language code of the original language.
<translation>ON</translation>	This is the translation.
<chars>8</chars>	This is the maximum length of the translation. The tag serves merely a note for the translator.

Example extract of the file "slsidescreenmcppage_eng.ts"

```
...
<message>
  <source>ON</source>
  <translation>EIN</translation>
  <chars>8</chars>
</message>
...
```

5.21.4 Display sidescreen camera

In addition to the standard windows, up to two camera images can be displayed in the sidescreen display of the multi-touch panel.

Note**Compatibility**

This function is not supported for an NCU 710.

5.21 Activate and configure the Sidescreen window

Procedure

1. Copy the sample file "slsidescreen.ini" from the directory
/siemens/sinumerik/hmi/template/sidescreen
2. Place the copy of the file in one of the following directories:
/oem/sinumerik/hmi/cfg or
/user/sinumerik/hmi/cfg
3. Open the copy and delete the comment sign ";" in front of the keyword `ELEMENT009` for Camera 1 and in front of `ELEMENT010` for Camera 2.

Note

The values of the attributes `name` and `implementation` must not be changed.

4. Save the setting.
The cameras can be selected following run-up.

More information

For more information regarding setup of the cameras, please refer to the online help Commissioning functions and service.

5.22 SINUMERIK Operate Display Manager

5.22.1 Display configurations

Using the Display Manager and display configurations, it is possible to reduce the size of SINUMERIK Operate, in other words, run in less than full-screen mode, and to allocate the space that is freed up to other applications. These applications are either standard Windows applications (.EXE) or applications that belong to the Display Manager. Both types of applications can also be developed by third parties using the OA Toolkit from SINUMERIK Operate and integrated into a display configuration. To display the applications, the screen is divided into "frames". Each frame may contain an application or a menu for controlling an application displayed in another frame. Several screen segments or "Displays" are possible and you can navigate between them during the program runtime. These displays are combined into a display configuration. There may be multiple display configurations, for example, for different screen resolutions.

A display configuration is defined either for a specific screen resolution or for a specific operating unit. The available display configurations must be made known to the system in the [displayConfigurations] section of the `systemconfiguration.ini` file. The display configuration itself is described in a separate configuration file.

System requirement

The display manager is supported by the following systems:

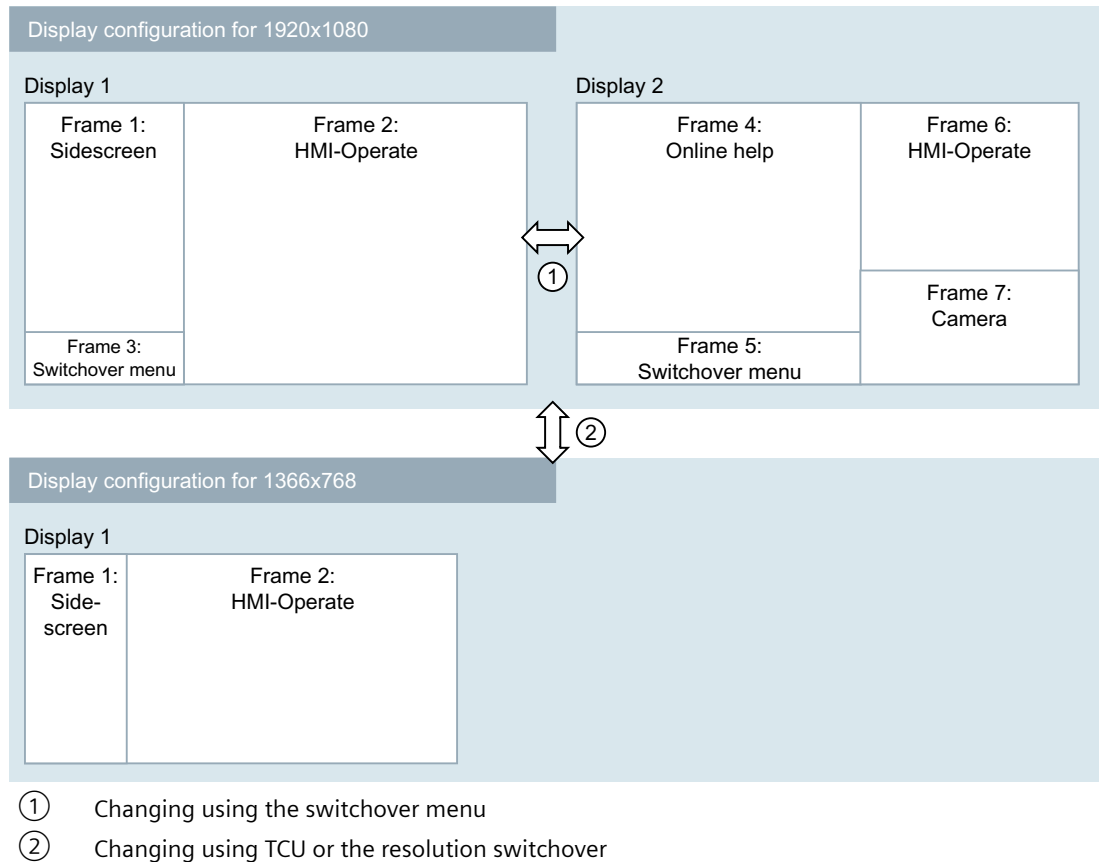
- PC, PCU/IPC
- NCU 720 and NCU 730

More information

More information and examples relating to the Display Manager is provided in:

- Programming Manual Run MyScreens
- Operating Manual Universal/Turning/Milling/Grinding

Display configurations (examples)



Example of the "systemconfiguration.ini" file

```
[displayConfigurations]
DC001 = res:=1366x768, file:=sldm_1366x768
DC002 = res:=1920x1080, file:=sldm_1920x1080
DC003 = tcu:=TCU1, file:=tcu1_layout
```

The example includes three display configurations. The names of the entries always begin with the string "DC" followed by a sequential number. Each entry has a "file" property that points to the file with the display configuration. The file can have any name. Like other configuration files, it is also searched for in the cfg directories under siemens, addon, oem, and user. The ".ini" file name extension does not have to be specified. The "res" property indicates the resolution to

which the respective display configuration applies. Different Display Manager configurations can be displayed on various panels using property "tcu".

Note

Special aspects

- The size of the manufacturer layout must match the parameterized resolution, otherwise display errors may occur on the user interface.
- If multiple display configurations are parameterized for a user interface, the display priority "tcu" → "res" applies
- If no display configuration is applicable, the user interface is displayed in the full-screen mode.

Activation

 WARNING
Unexpected machine movements caused by incorrect operation Incorrect operation of devices with touch screen can result in unexpected machine movements. This can result in personal injury or damage to property. • Prevent unintentional incorrect operation by configuring the user interface appropriately, e.g. by placing the buttons for starting and stopping machine components far enough apart. • Configure the machine in such a way that safety-related functions are not operated with the touch screen.

To activate the SINUMERIK Operate Display Manager, the following display machine data must be set.

MD9114 \$MM_SIDESCREEN	SINUMERIK Operate Sidescreen
= 2	Enables the sidescreen display area in HD Ready. Enables the Display Manager in full HD.

The default configurations used by the Display Manager for the two screen resolutions, 1920x1080 and 1366x768, are in the two files:

- sldm_1920x1080.ini
- sldm_1366x768.ini

These files can be used as a template for custom display configurations. This section describes how to create custom display configurations.

Note
Automatically hiding the Windows taskbar

In some situations SINUMERIK Operate is covered by the Windows taskbar on PCU/IPC. You can hide the taskbar automatically to ensure proper user interface operation:

Right-click the taskbar and open the "Properties" (Windows 7) or "Taskbar settings" (Windows 10) item in the menu. In the "Task bar" tab, select the option "Automatically hide the taskbar" (Windows 7) or "Automatically hide the taskbar in desktop mode" (Windows 10).

5.22.2 Creating your own display configurations

5.22.2.1 Displays

One or more displays can be defined in the respective configuration file for each display configuration. A name and a list of frames are specified for each of these displays. The frames describe the division of the display into rectangular areas in which applications or menus can be displayed.

Note

The order of configured displays is arbitrary.

Example

```
[displays]
DISPLAY001= name:=display_1, frames:="frame1, frame2, frame3"
DISPLAY002= name:=display_2, frames:="frame4, frame5, frame6, frame7"
...
```

Property	Meaning
name	Name of the display. Required, for example, for switching displays
frames	Contains a comma-separated list of frames that should be present on this display to describe the layout of the display
enableMirrorMode (true false)	Activates (true) or deactivates (false) mirror mode for the display When the mirror mode is activated, all frames of the display are displayed mirrored horizontally when the setMirrorMode (true) function is called. Otherwise, the appearance of the frames remains unchanged after calling the setMirrorMode (true) function. "true" is default.

Property	Meaning
onStartup	Contains a semicolon-separated list of actions to be performed when the display first appears The possible actions are described below.
onShow	Contains a semicolon-separated list of actions to be performed each time the display fades The possible actions are described below.

5.22.2.2 Frames

A frame is a container for applications or menus and primarily describes the desired position and size of the application and menus in pixels. In addition, this is also where the application or menu that should be displayed in the frame after the Display Manager starts is specified. The applications that can be assigned to the frames are specified in the `systemconfiguration.ini` file.

Example

```
[frames]
FRAME001= name:=frame1, x:=0, y:=0, width:=460, height:=970,
app:=mydialog
FRAME002= name:=frame2, x:=460, y:=0, width:=1460, height:=1080,
app:=OPERATE
FRAME003= name:=frame3, x:=0, y:=970, width:=460, height:=110,
menu:=mymenu
FRAME004= name:=frame4, x:=0, y:=0, width:=1280, height:=970,
app:=mydialog2, runnableApps:="mydialog, mydialog2"
FRAME005= name:=frame5, x:=0, y:=970, width:=1280, height:=110,
menu:=menu2
FRAME006= name:=frame6, x:=1280, y:=0, width:=640, height:=480,
app:=OPERATE
FRAME007= name:=frame7, x:=1280, y:=480, width:=640, height:=600,
app:=mydialog3
...
```

If SINUMERIK Operate is to be displayed in a frame, the application name is specified as "OPERATE". It should be noted that SINUMERIK Operate can only be used in certain sizes. The currently supported sizes (in pixels) are:

- 640x480
- 760x505
- 800x480
- 800x600
- 1024x768
- 1024x1014
- 1080x810
- 1280x768
- 1280x800

- 1280x1024
- 1300x768
- 1366x768
- 1440x1080
- 1454x1080
- 1854x1014
- 1854x1080
- 1920x1080

Property	Meaning
name	Name of the frame. Used in the frame list of the displays, for example
x, y, width, height	Absolute position (x, y), width and height of the frame in pixels
app	Application displayed in the frame the first time the frame is displayed.
runableApps	List of applications that may be displayed in this frame in case an application is swapped.
menu	Menu that is displayed in the frame. Ignored if "app" is used at the same time

5.22.2.3 Menus

In addition to applications, menus can also be displayed in the frames of a display. These menus are typically used to display certain applications in another frame or to switch displays.

A menu configuration consists of four parts:

- Description of the individual menu items (section [menuitems])
- Description of the look and feel of the menu items (section [menuitemstyle])
- Description of the menu structure (section [menus])
- Description of the look and feel of the menu (section [menustyle])

The [menuitems] section defines the menu items (keys/buttons). Each entry corresponds to a key/button. The properties of the menu items can be configured.

The following properties are available:

Property	Meaning
name	Unique name of the menu item.
onClicked	Action to be triggered by clicking on this menu item. The actions that are possible are described in the "Menu actions" section.
text	Text displayed on the menu item. Line breaks can be generated with \n or %n.
textID	A text ID that references a language-dependent text. If the text can be read, it replaces the text specified in the "text" property.
textContext	The context associated with the text ID. The context can also be specified when configuring a menu or globally on the file level. Specifying a context in the menu item overwrites any existing context information in the menu or on the file level. Specifying a context in the menu overwrites any existing context information on the file level.
image	File name of the icon that is displayed on the menu item. Special case for display button: For buttons that are used to switch displays, the icon to be displayed on the button can be generated automatically by the Display Manager. To do this, you specify the name of the display to be switched with the file extension ".auto" as the file name. A schematic drawing of the display is then displayed as an icon. The stroke width and stroke color used for this representation can be specified with the properties strokeWidth and strokeColor. Display buttons have no text and no "imagePressed" icon.
strokeWidth ¹⁾	Stroke width of the schematic drawing for display buttons (see Property image). Default: 1.
strokeColor ¹⁾	Color of the strokes of the schematic drawing for display buttons (see Property image). Default: Qt::lightGray
imagePressed	File name of the icon displayed on the menu item in the pressed state. As an alternative to specifying this property, a file named "<image>_activated" is automatically used, if available; <image> is the name specified in the "image" property.

Property	Meaning
accessLevel	Access level from which the menu item is displayed: System, Manufacturer, Service, Customer, Key_3, Key_2, Key_1, Key_0 or numerical equivalent (0-7) Default: Key_0 (7)
menuItemStyle	Style of the menu item that defines all visual properties of the menu item.
	Note All of the properties described below can be specified for configuring the respective menu items as well as for defining the MenuItemStyles. An entry in the menu item overwrites the corresponding entry in the MenuItemStyle.
textSize ²⁾	Font size
textAlignment ²⁾	Alignment of the text of the menu item: Left, Right, Top, Bottom, TopLeft, TopRight, BottomLeft, BottomRight (analog Qt::Alignment) You can also specify the values of the Qt flag field in hex (0x00) or decimal. Default: Qt::AlignCenter
imageAlignment ²⁾	Alignment of the icon of the menu item: Left, Right, Top, Bottom, TopLeft, TopRight, BottomLeft, BottomRight (analog Qt::Alignment) You can also specify the values of the Qt flag field in hex (0x00) or decimal. Default: Qt::AlignCenter
width ²⁾	Width of the menu item in pixels. Default behavior: The menu items equally share the available space in the menu (horizontal menu) less spacing, or are as wide as the menu minus the margin (column menu). For grid menus, the menu items equally share height and width.
height ²⁾	Height of the menu item in pixels. Default behavior: The menu items equally share the available space in the menu (vertical menu) less spacing, or are as tall as the menu minus the margin (row menu). For grid menus, the menu items equally share height and width.
color ²⁾	Color of the menu item. See paragraph "Color definitions". Default: Qt::lightGray
pressedColor ²⁾	Color of the menu item in the pressed state. See paragraph "Color definitions". Default: Qt::blue
textColor ²⁾	Color of the menu item text See paragraph "Color definitions". Default: Qt::black
pressedTextColor ²⁾	Color of the menu item text in the pressed state of the menu item See paragraph "Color definitions". Default: Qt::white

Property	Meaning
<code>borderWidth²⁾</code>	Width of the border of the menu item in pixels Default: 1.
<code>borderColor²⁾</code>	Color of the border of the menu item See paragraph "Color definitions". Default: Qt::darkGray
<code>textRect²⁾</code>	Rectangle relative to the menu item (widget coordinate system, i.e. Top-Left of the menu item is coordinate 0,0) in which the text is aligned. The following should be specified: x, y, width, height. For example, <code>textRect:="0,10,40,30"</code> or <code>textRect:=0/10/40/30</code> or <code>textRect:=0 10 40 30</code> Note the required quotes when commas are used as delimiters, because commas are also the separator between the properties. Default: The rectangle within the border; for <code>borderWidth = 0</code> this is the rectangle of the complete menu item.
<code>imageRect²⁾</code>	Rectangle relative to the menu item (widget coordinate system, i.e. Top-Left of the menu item is coordinate 0,0) in which the icon is aligned. The following should be specified: x, y, width, height. For example, <code>imageRect:="0,10,40,30"</code> or <code>imageRect:=0/10/40/30</code> or <code>imageRect:=0 10 40 30</code> Note the required quotes when commas are used as delimiters, because commas are also the separator between the properties. Default: The rectangle within the border; for <code>borderWidth = 0</code> this is the rectangle of the complete menu item.

¹⁾ Only relevant for display buttons

²⁾ Applies to `menuItem` and `menuItemStyle`

Example 1

```
[menuitems]
MENUITEM001= name:=menuItem1, onClicked:=showDisplay(display1),
text:="Display1"
MENUITEM002= name:=menuItem2, onClicked:=showDisplay(display2),
text:="Display2", accessLevel:=Customer, width:=100
MENUITEM003= name:=miPdf, menuItemStyle:=misMenu,
onClicked:="showApp(defaultFrame, appPdf)", image:=dm_pdf.png,
text:="PDF"
MENUITEM004= name:=miBrowser, menuItemStyle:=misMenu,
onClicked:="showApp(defaultFrame, appBrowser)",
image:=dm_browser.png, textID:=TEXT_ID_BROWSER
```

In the `[menuItemstyles]` section, styles can be defined for menu items in which all visual properties of a menu item are defined. The individual properties can in turn be overwritten in the menu item. The summary of all visual attributes saves typing work, because you usually have many menu items that generally should all look the same. If a property should then be different for a menu item, it can be overwritten individually.

Description of `MenuItemStyle` properties: See above.

Example 2

```
[menuitemstyles]
MENUITEMSTYLE001= name:=misMenu, textSize:=10,
textAlignment:=bottom, imageAlignment:=top, color:=37/53/63,
textColor:=153/173/185, pressedColor:=52/87/140,
pressedTextColor:=White, borderColor:=37/53/63,
pressedBorderColor:=52/87/140, borderWidth:=5, height:=66, width:=66
```

For unspecified properties, the corresponding default values (see above) take effect.

In the [menus] section, one or more `menuItems` are combined into a menu. This is done using the `menuItems` property, which contains a list of the menu items (buttons/buttons) to be displayed in a certain menu. The available properties are listed in the following table:

Property	Meaning
<code>menuItems</code>	List of menu items. Comma-separated list of menu item names With the "grid" menu layout, the menu items are specified as follows to determine their position within the menu: <pre>menuItem(row, col, rowSpan=1, colSpan=1)</pre> The indexes "row" and "col" start with the value 0. Specifying "rowSpan" and "colSpan" is optional, default value is 1 (analogous to <code>QGridLayout::addWidget ()</code>) With the "row" or "col" menu layout, you can also use the specification of spacing (pixel) and stretch (factor = 0): - Spacing inserts "int" pixels of additional spacing between the menu items (analogous to <code>QBoxLayout::addSpacing ()</code>) - Stretch inserts a stretchable additional distance between the menu items, an expansion factor can be optionally specified (analogous to <code>QBoxLayout::addStretch ()</code>)
<code>defaultFrame</code>	Name of the frame on which the menu items of the menu are to act and that use the "defaultFrame" string as target specification in the <code>showApp</code> statement. This allows menu items to be reused in multiple menus.
<code>textContext</code>	The context for the text ID of the menu items (see above).
<code>itemAccessLevel / accessLevel</code>	Access level from which the menu items are displayed: System, Manufacturer, Service, Customer, Key_3, Key_2, Key_1, Key_0 or numerical equivalent (0-7) Default: Key_0 (7)
<code>menuStyle</code>	Style of the menu. Sets all visual properties
	Note All of the properties described below can be specified for configuring the respective menus as well as for defining the <code>MenuStyles</code>. An entry in the menu overwrites the corresponding entry in the <code>MenuStyle</code>.
<code>layout¹⁾</code>	Alignment of menu items: "row", "col" or "grid". With a "row" or "col" layout, the menu items are aligned horizontally in a row or vertically in a column. With a "grid" layout, the menu items are arranged in a grid. Default: "row"

Property	Meaning
margin ¹⁾	Margin between the menu items and the outer edge of the menu. Value in pixels, (analogous to <code>QBoxLayout::setMargin()</code> or <code>QGridLayout::setContentsMargin()</code> (all 4 directions)) Default: 1.
spacing ¹⁾	Spacing between the menu items. Value in pixels, (analogous to <code>QBoxLayout::setSpacing()</code> or <code>QGridLayout::setSpacing()</code>) Default: 1.
color/ backgroundColor ¹⁾	Color (background color) of the menu. See paragraph "Color definitions". Default: Qt::gray

¹⁾ Applies to menu and menuStyle

Example 3

```
[menus]
MENU001= name:=menu1, menuItems:="menuitem1, menuitem2, menuitem3"
MENU002= name:=menu2, orientation:=vertical, margin:=2, spacing:=2,
items:="menuitem4, menuitem5, spacing(50), menuitem6, menuitem7,
stretch()", itemHeight:=100
MENU003= name:=mMenuOben, menuStyle:=msMenu, defaultFrame:=fTop,
items:="miPdf, miBrowser, spacing(10), miOperate, stretch(),
miMaximize"
MENU004= name:=mGridMenu, menuStyle:=msGrid, defaultFrame:=fBottom,
items:="miMachine(0,0), miProgram(0,1), miProgramManager(0,2),
miDiagnosis(0,3), miPdf(1,0), miBrowser(1,1), mOperate(1,2,1,2),
miMirror(0,3,2,1)"
```

In the [menustyles] section, styles can be defined for menus in which all visual properties of a menu are defined. The individual properties can in turn be overwritten during the configuration of the respective menu.

Description of the menu style properties: See above.

Example 4

```
[menustyles]
MENUSTYLE001= name:=msVerticalMenu, color:=59/76/88, layout:=column,
margin:=0, spacing:=1
MENUSTYLE023= name:=msGrid, color:=59/76/88, layout:=grid,
margin:=10, spacing:=1
```

Finally, the menu still needs to be assigned to a frame. The "menu" frame property is used for this:

```
[frames]
FRAME003= name:=frame3, x:=0, y:=970, width:=460, height:=110,
menu:=menu2
```

5.22.2.4 Menu actions

The actions to be performed when a menu item is pressed are defined in the `onClicked` property of the menu items. This property can include one or more command statements (separated by semicolons), which are executed one after the other.

The following commands are available:

Command	Meaning
<code>showDisplay(displayname)</code>	Switches to the display named <code>displayname</code> The target display must be configured in the same display configuration file.
<code>showApp(frameName, appName)</code>	Displays application <code>appName</code> in the <code>frameName</code> frame If the application is already visible in another frame of the display, it is moved from there to the frame specified here. If possible, the freed frame is filled with the application displaced from <code>frameName</code> . If this happens, it is referred to as application swapping. Which applications can be displayed in the released frame is specified in the "runableApps" property of this frame. You can prefix the frame name with a display name (<code>displayname.frameName</code>) and change the frame assignment in hidden displays. Instead of <code>appName</code> , you can also specify <code>frameName.currentApp</code> or <code>displayname.frameName.currentApp</code> . <code>showApp()</code> then moves the displayed application in the <code>frameName</code> or <code>displayname.frameName</code> frame into the specified frame.
<code>showPopup(frameName, appName)</code>	Displays application <code>appName</code> in the <code>frameName</code> frame as popup window. It is not permissible that frame <code>frameName</code> belongs to a display, i.e. it is not specified in the <code>Frames</code> attribute for an existing display. It is automatically displayed with the <code>showPopup()</code> call and placed over the currently active display. The only applications allowed are the applications created on the basis of the <code>SlGfwSideScreenDialog</code> class. SINUMERIK Operate and OEM frame applications cannot be displayed as popups. If you use an application that was developed based on the <code>SlGfwSideScreenDialog</code> class as a popup, you need to declare its window as a <code>TopLevel</code> window, which means the <code>Qt::WindowStaysOnTopHint</code> bit must be set in the <code>windowFlags()</code> . Only one popup can be open at a time.
<code>hidePopup(appName)</code>	Hides an application displayed with <code>showPopup()</code> or <code>togglePopup()</code>
<code>togglePopup(frameName, appName)</code>	Displays application <code>appName</code> in the <code>frameName</code> frame as popup window. If the <code>appName</code> application is already displayed as popup window, then it is hidden again.
<code>showMenu(frameName, menuName)</code>	Shows the <code>menuName</code> menu in the <code>frameName</code> frame.

Command	Meaning
<code>showPopupMenu (framename, menuname)</code>	Shows the menu <code>menuname</code> in the <code>framename</code> frame as popup menu.
<code>hidePopupMenu (menu name)</code>	Hides a pop-up menu displayed with <code>showPopupMenu ()</code> or <code>togglePopupMenu ()</code> .
<code>togglePopupMenu (framename, menuname)</code>	Shows the menu <code>menuname</code> in the <code>framename</code> frame as popup menu. If menu <code>menuname</code> is already displayed as popup menu in the <code>framename</code> frame, then it is hidden again.
<code>setMirrorMode (true false)</code>	Enables (true) or disables (false) mirror mode When mirror mode is enabled, the frames of all displays in which mirror mode has not been disabled with <code>enableMirrorMode (false)</code> are mirrored horizontally. In other words, frames that were previously displayed on the left are now displayed on the right and vice versa. The size of the frames does not change.
<code>toggleMirrorMode ()</code>	Toggles the mirror mode If it was previously enabled, it is now disabled and vice versa.
<code>sendCmd (appname, cmd1, ...)</code>	Sends a command to the <code>appname</code> application. If the target application is <code>appname</code> SINUMERIK Operate (<code>appname="OPERATE"</code>), the operating area of SINUMERIK Operate can be selected in this way, e.g. <code>sendCmd (OPERATE, AreaMachine)</code> The identifier for the operating area (<code>AreaMachine</code>) can be taken from the <code>systemconfiguration.ini</code> file (see [areas] section). If the target application is an application created on the basis of the <code>SlGfwSideScreenDialog</code> class, this application is given a command of the type <code>SL_GFW_MSG_DISPCONFIG_CMD</code> in its <code>onMessage ()</code> implementation. The commands <code>cmd1, ..., cmd10</code> are given as message data in the form of a string in which the individual parameters (<code>cmd1 ... cmd10</code>) are separated by the " " symbol. Commands to Windows applications (.EXE) are not possible with <code>sendCmd ()</code> !

Examples

```
[menuitems]
MENUITEM001= name:=item1, onClicked:=
"showApp (frame1, OPERATE); showApp (frame2, myDialog)", text:="HMI"
```

Displays SINUMERIK Operate in "frame1" and the "myDialog" application in "frame2" on the current display.

```
MENUITEM003= name:=item3,
onClicked:="showApp (full.frame1, frame2.currentApp); showDisplay (full)
", text:="Full frame"
```

Sets the currently displayed application (`currentApp`) from "frame2" to "frame1" in the "full" display. Thereafter, the display is switched to "full".

```
MENUIITEM004= name:=item4, onClicked:=  
"sendCmd(OPERATE,'AreaMachine')", text:="Machine"
```

Selects the machine operating area in SINUMERIK Operate.

```
MENUIITEM005= name:=item5,  
onClicked:="sendCmd(myDialog,'doFun','42')", text:="Machine"
```

Sends message `SL_GFW_MSG_DISPCONFIG_CMD` with the data "doFun|42" to the "myDialog" application (requires the use of `CreateMyHMI/3GL`).

5.22.2.5 Applications

The applications used in a display configuration must be specified in the `systemconfiguration.ini` file.

There are two types of applications:

- Type A: Applications created on the basis of the `SlGfwSideScreenDialog` class
- Type B: Standard Windows applications (.EXE)

All applications are automatically started by the Display Manager at system start and closed again when the system is shut down.

Type A applications are declared in the `[dialogs]` section of the `systemconfiguration.ini` file in the number range 500 - 999 (OEM area).

Type B applications are handled like OEM frame applications and are therefore declared in the `[processes]` section. In addition, the `nPlacementMode` parameter must be set to 3 for the applications in the `C:\Program Files (x86)\Siemens\MotionControl\compat\user\OEMFRAME.INI` file.

The following applications are included in the standard version:

- PDF viewer
- VNC viewer
- Virtual keyboard
- Virtual MCP
- Application for displaying widgets
- Camera display
- WEB Browser
- SINUMERIK Operate

PDF viewer

For the configuration in the standard version, the following is declared in file `systemconfiguration.ini`:

```
[dialogs]
```

```
DLG107= name:=SlPdfApp,
implementation:=sldmpdfviewerapp.SlDmPdfViewerApp,
process:=SlHmiHost1, preload:=false cmdline:"-pdfFile
gestenbedienung.pdf -matteColor #3b4c58"
```

The application name to be used for configuration within a display configuration:
SlPdfApp

The document to be displayed is specified in the "cmdline" parameter. The two parameters have the following meaning:

- pdfFile: File to be displayed in the PDF Viewer. The file can be in the appl or hlp directories.
- matteColor: Background color of the PDF Viewer (color must be hex coded).

Additional instances of the PDF Viewer can be declared within a display configuration. The "name" parameter obtains the name of the additional instance and the "cmdline" parameter specifies the document to be displayed by this instance, for example:

```
DLGxxx= name:=anotherPdf,
implementation:=sldmpdfviewerapp.SlDmPdfViewerApp,
process:=SlHmiHost1, preload:=false cmdline:"-pdfFile
mydocument.pdf -matteColor #3b4c58"
```

The PDF viewer allows languages to be toggled.

More information on how you integrate the PDF files for language identification is provided in Chapter "Language support for PDF files (Page 410)".

More information on which functions are available is provided in the PDF Viewer in the Operating Manual Universal/Turning/Milling/Grinding.

VNC viewer

For the configuration in the standard version, the following is declared in

```
file systemconfiguration.ini:
[dialogs]
DLG108= name:=SlVncApp,
implementation:=sldmvncviewerapp.SlDmVncViewerApp,
process:=SlHmiHost1, preload:=false, cmdline:"-configuration MyPC"
```

The application name to be used for configuration within a display configuration:
SlVncApp

The VNC Viewer is configured in the slvnconfig.ini file. The name of the section containing the configuration for a specific VNC Viewer instance is specified in the "cmdline" parameter as the value of the "-configuration" argument - "MyPC" in the example above.

The following parameters must be specified for each VNC Viewer instance:

- host: IP address or DNS name of the host on which the associated VNC server is running.
- port: TCP port that the server uses.
- Password (optional): Password for protected access to the VNC server.

Example

For configuration in the `slvncconfig.ini` file:

```
[MyPC]
host=172.218.152.43
port=5900
password=secret
```

Virtual keyboard

For the configuration in the standard version, the following is declared in

file `systemconfiguration.ini`:

```
[dialogs]
DLG111= name:=SlKeyboardApp,
implementation:=sldmvirtualkeyboardapp.SlDmVirtualKeyboardApp,
process:=SlHmiHost1, preload:=false, cmdline:="-settingsFile
sldm_keyboard.ini"
```

The application name to be used for configuration within a display configuration:

`SlKeyboardApp`

The application may only be used in one instance in a display configuration.

In the standard version, three sizes are pre-configured for the virtual keyboard (see file

```
sldm_keyboard.ini):
[760x505]
Num= KeyboardLayout:="numpadlayout", x:=430, y:=270
Alpha= KeyboardLayout:="nclayout", x:=92, y:=50
KeyHeight=47
```

```
[1024x242]
Num= KeyboardLayout:="numpadlayout", x:=784, y:=25
Alpha= KeyboardLayout:="nclayout", x:=206, y:=25
KeyHeight=47
```

```
[824x210]
Num= KeyboardLayout:="numpadlayout", x:=584, y:=22
Alpha= KeyboardLayout:="nclayout", x:=5, y:=22
KeyHeight=47
```

The section name corresponds to the respective frame size (specification in pixels). The attributes have the following meanings:

Property	Meaning
KeyboardLayout	Layout of the virtual keyboard. Two layouts are available: - numpadlayout: Only has keys for inputting numbers - nclayout: Complete NC keyboard
x, y	Position of the upper left corner of the virtual keyboard in relation to the upper left corner of the frame in which the keyboard is displayed.
KeyHeight	Height (and width) of the keys on the virtual keyboard.

If further frames with other sizes are configured in a display configuration in which the virtual keyboard is to be shown, the file `sldm_keyboard.ini` must be supplemented with the corresponding sections and stored in the `oem` directory.

Virtual MCP

The MCP can be used in two different sizes in the Display Manager:

- 760x505
- 1024x242 - Hereinafter simply marked with the identifier "below"

If the Display Manager has four windows and the user interface is displayed at the top right, the MCP is displayed once with the size [760x505] bottom left, and again with the size [1024x242] below the user interface.

More information is also provided in Chapter "Display Sidescreen machine control panel (Page 85)".

Procedure

- Copy the sample files `sldm_1920x1080.ini`, `sldmmcpage1.ini`, `sldmmcpagebelow1.ini`, `systemconfiguration.ini`, `slsidescreenmcpageconfig.xml`, `slsidescreenmcpage_deu.ts` and the subdirectories `ico640` and `ico1920` from the directory:
`/siemens/sinumerik/hmi/template/displaymanager/mcp/`
- Place the copies of `sldm_1920x1080.ini`, `sldmmcpage1.ini`, `sldmmcpagebelow1.ini` and `systemconfiguration.ini` into the directory:
`/oem/sinumerik/hmi/cfg` or
`/user/sinumerik/hmi/cfg`
- Place the copy of `slsidescreenmcpageconfig.xml` into the directory:
`/oem/sinumerik/hmi/proj` or
`/user/sinumerik/hmi/proj`
- Place the copy of `slsidescreenmcpage_eng.ts` in the directory:
`/oem/sinumerik/hmi/lng` or
`/user/sinumerik/hmi/lng`

Note

The TS file is automatically integrated by the system during run-up.

5. Save the directories ico640 and ico1920 using the following path:

`/oem/sinumerik/hmi/ico` or
`/user/sinumerik/hmi/ico`

6. The machine control panels can be selected following run-up.

Additional machine control panel windows can be optionally activated (four more in this example):

1. Perform the following adaptations in the file `systemconfiguration.ini`:
Remove the ";" in front of the keywords `DLG501`, `DLG502`, `DLG503` and `DLG504`.
2. Perform the following adaptations in the file `sldm_1920x1080.ini`:
Remove the ";" in front of the keywords `MENUITEM500`, `MENUITEM501`, `MENUITEM502`, `MENUITEM503`, `MENUITEM550`, `MENU550` and `FRAME500`.
With the following keywords, insert a ";" in front of the first occurrence and remove the ";" in the line directly below:
`MENUITEM124`, `MENUITEM125`, `MENU022`, `MENU032`, `MENU033`, `FRAME022`
and `FRAME028`.
3. Copy the sample files `sldmmcpage2.ini`, `sldmmcpagebelow2.ini`, `sldmmcpagebelow3.ini` and `sldmmcpagebelow4.ini` into the directory:
`/oem/sinumerik/hmi/cfg` or
`/user/sinumerik/hmi/cfg`

Application for displaying widgets

For the configuration in the standard version, the following is declared in file `systemconfiguration.ini`:

```
[dialogs]
DLG109= name:=SlWidgetsApp,
implementation:=sldmsidescreenapp.SlSideScreenDialog,
process:=SlHmiHost1, preload:=false, cmdline:="-sidescreen1
sldmwidgets1.ini -sidescreen2 sldmwidgets2.ini -spacing 3"
```

The application name to be used for configuration within a display configuration:
`SlWidgetsApp`

The application may only be used in one instance in a display configuration.

Camera display

The following keyword is used in files `sldmwidgets1.ini` and `sldmwidgets2.ini` for configuring the application:
`ELEMENT005`

If cameras are set up with SINUMERIK Operate, up to two camera images can be displayed in the Display Manager.

WEB Browser

The following keyword is applied for the application configuration in the file `sldm_1920x1080.ini`:

```
MENUITEM129
```

More information on how to set up the WEB Browser is provided in Chapter: "Setting the WEB browser (Page 67)".

SINUMERIK Operate

The application name to be used for configuration within a display configuration:

```
OPERATE
```

Standard file `sldm_1920x1080.ini`:

```
FRAME040= name:=fMax, x:=66, y:=66, width:=1854, height:=1014,  
app:=OPERATE
```

SINUMERIK Operate may only be used in one instance in a display configuration.

It should also be noted that SINUMERIK Operate can only be displayed/executed in certain sizes. The currently supported sizes (in pixels) are:

- 640x480
- 760x505
- 800x480
- 800x600
- 1024x768
- 1024x1014
- 1080x810
- 1280x768
- 1280x800
- 1280x1024
- 1300x768
- 1366x768
- 1440x1080
- 1454x1080
- 1854x1014
- 1854x1080
- 1920x1080

Example of Type B applications

Configuration in the `systemconfiguration.ini` file with the `notepad.exe` application as an example:

```
[processes]
PROC500=process:=Notepad, image:=notepad, cmdline="C:\Windows
\system32\notepad.exe", oemframe:=true, windowname="Unknown -
Editor", classname="Notepad", processaffinitymask:=0xFFFFFFFF,
deferred:=true
```

The application name to be used for configuration within a display configuration:

Notepad

The application may only be used in one instance in a display configuration.

Configuration in the `oemframe.ini` file with the `notepad.exe` application as an example:

```
[notepad]
nPlacementMode=3
WindowStyle_Off = 15597568
```

Type B applications may only be executed in one instance.

Note**Possible malfunction**

Integrated OEM applications may be incompatible and cause malfunctions. Check the configuration in the event of malfunctions. Insert the OEM application, e.g. using the configuration option from Section "Link OEMFrame application (Page 599)".

5.22.2.6 Global settings

In addition to the configuration of the displays and their layouts, there is also a `[miscellaneous]` section. Settings can be made there that apply to all displays of a display configuration (configuration file).

Entry	Meaning
<code>startupdisplay</code>	Name of the display that is to be selected after starting the Display Manager. If this information is omitted, the display configured first is used as the <code>startupdisplay</code> .
<code>hmihostofmenus</code>	Specifies the host process in which the menus associated with a display configuration are executed. Default is <code>SlHmiHost1</code> .
<code>backgroundcolor</code>	Background color of the desktop, which can be visible in the gaps between the frames depending on the configuration of the frames.

Entry	Meaning
textfile	Language-dependent texts can be used in the same way as with SINUMERIK Operate. One or several text files can be specified. <code>slam</code> must be specified as the 1st file. You can add your own text files after a comma.
textcontext	In addition to specifying the text context for configuration of the menus or the menu items, a global text context can be specified here, which then applies to the language-dependent texts of all menu items.

Example

```
[miscellaneous]
backgroundcolor=100/120/135
startupdisplay=d3
hmihostofmenus=SlHmiHost1
textfile=slam
textcontext=SlAmAreaMenu
```

Note

The designation `slam` must always remain. You can add your own language files after a comma, e.g.:

```
textfile=slam, <anothertextfile>
```

Color information

Colors can be specified via decimal RGB values, for example in the form:

```
color:=255/255/255 or color:="255, 255, 255" or color:=255 255 255
```

Note

Note the required quotes when commas are used as delimiters, because commas are also the separator between the property information.

Alternatively, the usual hexadecimal notation can be used with HTML, for example:

```
color:=#FFFFFF
```


Licensing

Licenses are required for the activated options. When you purchase licenses you receive a "license key" that contains all options requiring a license and which is only valid for your CompactFlash card.

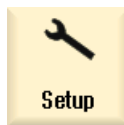
Requirement

If you wish to set or reset the options for a machine, you need at least access level 3 (user).
You can only license options for a machine from this access level and higher.

General information

Serial number of the CompactFlash card	Permanently defined serial number of the CompactFlash card
Hardware type	Data of the control
Machine name/No.	Displays the data saved in machine data MD17400 \$MN_OEM_GLOBAL_INFO.
License key	Only with access level 1 (manufacturer) can a display field be edited. Information about options that require a license

Procedure



1. Select the "Setup" operating area.
2. Press the menu forward key.
3. Press the "Licenses" softkey.
The "Licensing" window opens.
The general data for control and licenses is displayed.

License database

You purchase licenses via the Web License Manager in the Internet, administered by Siemens Industry.

More information

A detailed description of the license management is provided in the CNC Commissioning Manual: NCK, PLC, drive.

Deactivate options

When importing old archives from other HMI systems, it can occur that options are set which are no longer required in the actual system – however, these are subject to the license check:

Order number	Option
6FC5800-0AP04-0YB0	Workstep programming
6FC5800-0AP11-0YB0	Manual machine
6FC5800-0AP15-0YB0	ShopTurn HMI/ShopMill HMI for SINUMERIK 840Di sl incl. HMI-Advanced
6FC5800-0AP20-0YB0	3D simulation of the finished part
6FC5800-0AP21-0YB0	Simulation milling (2D dynamic; 3D static)
6FC5800-0AP23-0YB0	Simultaneous recording ShopMill (real-time simu.)
6FC5800-0AP24-0YB0	Simultaneous recording ShopTurn (real-time simu.)

Further information: A summary of all options can be found in the SIEMENS Industry Service & Support Portal (<https://support.industry.siemens.com/cs/document/104466659/sinumerik-840d-sl-glossary-functions-and-terms?dti=0&dl=en&lc=de-WW>), for example.

6.1 Determining the license requirement

Procedure



1. Press the "All options" softkey to list all the options that can be selected for this controller.

- OR -



Press the "Missing lic./opt." softkey.

You receive an overview of all options that

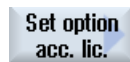
- are not adequately licensed
- are licensed, but which have not been set

2. Activate or deactivate the required options in the "Set" column:

- Activate the checkbox or
- Enter the number of options.

Options shown in red are activated, however, not yet licensed or not adequately licensed.

- OR -



Press the "Set option acc. to license" softkey to activate all of the options contained in the license key.

You obtain a confirmation prompt that you must confirm with "OK".



3. To activate new selected options, press the "Reset (po)" softkey. A safety prompt appears.

For several options, you will have to also restart SINUMERIK Operate. Corresponding prompts will appear in the user response line.



4. Press the "OK" softkey to trigger a warm restart.

- OR -



Press the "Cancel" softkey to cancel the process.

Note

If you activate the "Set option acc. to license" function, the sum of the axes that can be activated may be exceeded. Therefore, reduce the number of actually used axes in the corresponding options.

Searching for options

You have the possibility of finding options using the search function.



1. The window "Licensing: All Options" or "Licensing: Non-licensed Options" is open.
2. Press the "Search" softkey and enter the required option in the search form. The cursor is positioned on the first entry that corresponds to the search term.
3. Press the "Continue search" softkey if the term that was found is not the option that you were looking for.

Additional search option



Press the "Go to beginning" softkey to start the search at the first option.

Press the "Go to end" softkey to start the search at the last option.

Note

Use of non-licensed options

Before licensing options, you can also activate them temporarily without the license keys and use them for test purposes. In this case, the control displays alarm 8080/8081 periodically, indicating that the option used has not yet been assigned the required license. Further, in this state, the NC cannot be started.

6.2 Activating the test license

If you wish to use options without any restrictions – and without purchasing a license – you can activate these for a limited time using the test license. Six test license periods are available. The first test license period has a longer operating time. The operating time depends on the NCU being used. Generally, the additional test license periods are 150 operating hours of the control system.

Note

A test license supports "short-term use" of the software in a non-productive context, e.g. use for testing and evaluation purposes; it can be transitioned into another license.

Duration of the first test license period

NCU	Operating time duration
710.3	1000 h
720.3	2000 h
730.3	3000 h

Requirement

If you wish to activate the test license, you require access level 2 (service).

Procedure



1. Press the "Activate test license" softkey.
A message informs you of the remaining number of test license periods.
2. Press the "OK" softkey.
The test license period is now active.
The active test license periods and the remaining operating time are now displayed.

Note

In the message line, the control displays the operating time still available for the current test license period every hour.

Note

Interruption of the test license

A test license period is interrupted in the following cases:

- If no axis is operated actively, e.g. during simulation mode.
- If a new valid license key is entered.
- If all non-licensed options are reset.

The test license continues when a non-licensed option is set again.

Note

End of the test license

A test license period ends when the time has expired.

No further test license can be activated on the NCU if all test license periods have expired.

6.3 Exporting license requirements

After you have determined the license requirement, you can export the data via the set-up external storage locations.

Procedure



1. Press the "Export license requirement" softkey.

A window opens listing the storage locations that have been set up.

2. Select "USB" for example, if you export the licenses on a USB flash drive.



3. Press the "OK" softkey.

The set options, the options which are not set but are licensed options, the license requirement and the license key are stored in an Alm file.

In addition, an Internet connection is established for the Web License Manager.

More information

A detailed description of the license management is provided in the CNC Commissioning Manual: NCK, PLC, drive.

6.4 Reading in the license key

You have the following options of communicating the license key to the control:

- Enter manually
- Read in electronically

Procedure

Overview

The "Licensing" window is open.

Enter license key manually



1. If you obtained the license key via the Web License Manager, enter the license key manually in the field "You can enter a new license key here".
2. Press the <INPUT> key.
If the license key is valid, the message "License key set" is displayed.

Read in license key electronically



...



If you have an .alm file with an appropriate license key, then press the "Read-in license key" softkey.

Open the appropriate storage location (e.g. USB) with "OK".

The matching .alm file is detected automatically and the license key is read in.

Note:

If several matching .alm files are in the directory, they will be offered to you in a subsequent selection dialog box.

Select the desired file.

6.5 Backing up the license of a new CompactFlash card.

If, for example, you want to replace a defective card on the control and transfer an existing archive to a new empty CompactFlash card, you must back up the license of the new CF card before restoring. If you restore without backing up, the license key of the CompactFlash card will be overwritten.

Requirement

To back up the license key, you require a multi-card reader with USB on a PG/PC.

Procedure

1. The CompactFlash card has been inserted into the multi-card reader, which is connected to the PG/PC.
2. Open directory cards/keys/sinumerik/.
Here you will find the license key in the form of a txt file.
3. Copy the license key to your back-up directory.
4. Insert the CompactFlash Card into the control and perform the restore action.
5. Insert the CompactFlash card into the multi-card reader again.
6. Copy the license key, renamed keys.txt, back to directory cards/keys/sinumerik.
7. Insert the CompactFlash card into the control again.
After the control has been powered up again, the license key will be installed from the file keys.txt onto the system and be activated. The system renames the txt file to the installation date.

What to do if you lose the license key

To obtain a valid license key for the new, empty CompactFlash Card, please contact the SINUMERIK hotline. They will then send you a new license key without delay.

Creating drive connections

Up to 21 connections to so-called logical drives (data carriers) can be configured. These drives can be accessed in the "Program Manager" and "Commissioning" operating areas.

The following logical drives can be set up:

- USB interface
- CompactFlash card of the NCU, only for SINUMERIK Operate in the NCU
- Network drives
- Local hard disk of the PCU, only for SINUMERIK Operate on the PCU



Software option

In order to use the CompactFlash Card as data carrier, you require the option "Additional HMI user memory on CF card of NCU".

Note

The USB interfaces of the NCU are not available for SINUMERIK Operate and therefore cannot be configured.

7.1 Setting up drives

The "Set Up Drives" window is available in the "Start-up" operating area for configuring the softkeys in the Program Manager.

More information

More information on the procedure and configuration is provided in the Operating Manual Universal/Turning/Milling/Grinding.

file

The created configuration data is stored in the "logdrive.ini" file. This file is located in the /user/sinumerik/hmi/cfg directory.

General information

Note

We do not recommend that a USB front interface is permitted for part program execution using EES if a system has several local USB front interfaces (several TCUs, an HT 8 is being used, etc.). The connection to the USB flash drive can be interrupted as a result of the TCU switchover. This setting should be made using the checkbox "Use this drive for program execution with EES".

Note

If a global USB front interface should be used via PCU, then the PCU must be configured as server via the VNC connection, see Chapter "Configuring VNC connections (Page 283)".

7.2 Setting EXTCALL

Using the EXTCALL command, a program on an external program memory can be called from a part program.

EXTCALL must be switched off, when in certain configurations two SINUMERIK Operate are connected to one NCU.

Activating the function

Processing EXTCALL calls is switched-on or switched-off using the following display machine data.

MD9106 \$MM_SERVE_EXTCALL_PROGRAMS	
= 0	HMI ignores EXTCALL instructions and selection via PLC
= 1	HMI processes EXTCALL instructions and selection via PLC (default value)
= 2	HMI processes EXTCALL instructions and ignores selection via PLC
= 3	HMI ignores EXTCALL instructions and processes selection via PLC

Note

A main program selected from an external program memory is selected again automatically after a power-on if the same program memory is still available and execution of EXTCALL calls has been activated in MD9106.

7.3 Creating a global part program memory

With the global part program memory (GDIR), a structure is provided analog to the passive file system of the NC. It is integrated in the search path of the NC for subprogram calls. If you create a GDIR, all participants in the system have access to the same logical drive. The participants can directly execute part programs from the common program memory. The GDIR so replaces or extends the part program memory of the NC.

Note

The global part program memory plays a role only for the EES function. The creation of a GDIR is, however, not essential for the EES operation.

Possible procedure

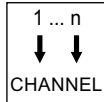
1. Declare the global part program memory in the "Creating drives" window
2. Shift the content of the local program memory with SPF, MPF and WCS directory to an external drive, e.g. to a USB flash drive.
3. Copy the directories, which have been backed up, to the global part program memory.

More information

More information about the program memory is provided in the Programming Manual NC Programming.

Channel menu

8.1 Configuring a channel menu



The channel menu is activated for display via the channel switchover key.

The channel menu is used to switchover the NC channel displayed in the SINUMERIK Operate or more precisely at the operator station. If a channel menu has been configured, when the channel switchover key is pressed, the channel menu for the channel switchover is displayed to make the appropriate operator action. If there is no channel menu, then the channel switchover key results in the HMI display advancing to the next NC channel.

Configuring

The configuration is made in the "netnames.ini" file for the operating software, as well as in the particular "config.ini" files for the individual operator stations.

The "netnames.ini" file must be generated using an editor.

Storage

The "netnames.ini" file is stored for SINUMERIK Operate in the following directory:
/oem/sinumerik/hmi/cfg or /user/sinumerik/hmi/cfg

The "config.ini" file is located in the relevant directory:

- On the NCU:
/user/common/tcu/<TCU name>/common/tcu/config.ini
- On the PCU:
F:\user_base\common\tcu\<TCU name>\common\tcu\config.ini

For <TCU name>, the TCU name of the operator station should be used that was assigned at the system when a TCU powered-up for the first time.

Using the channel menu

- For a system comprising several operator stations and several NCUs within the framework of operator unit management, if the NC channels of several NCKs are operated from one operator station.
- For a simple system with many NC channels, as an alternative to the standard mechanism, the channel switchover can be made using the channel switchover key.

The basic philosophy of the channel menu is to provide - in a selection menu - the operator with a view of the NC channels of all NCUs that are to be operated with the channel menu. In conjunction with this, a logical grouping/structuring is introduced using the so-called channel groups. The desired NC channel can be directly selected using the selection menu. Without a

8.1 Configuring a channel menu

channel menu, when pressing the channel switchover key, the NC channels must be scrolled through consecutively until the desired NC channel has been selected. An operator station can only be switched over across NCUs using the channel menu.

8.2 Constraints

- Only one SINUMERIK Operate on a PCU/ PC may be permanently connected to one NCK. It is not possible to switch over to another NCK.
- SINUMERIK Operate of an NCU can only operate with its own NCK and cannot be switched over to another NCU.

8.3 General structure of the channel menu

Overview

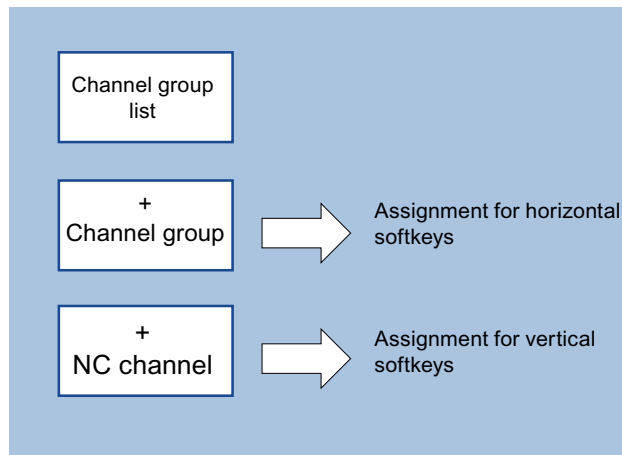
For the channel menu, a logical view is defined across all of the channels of all NCKs involved; this logical view is structured in channel groups and this in turn in specific NC channels.

A channel group list is defined for the channel menu in order to be able to switch over operation. A channel group list comprises one or several channel groups. In turn, a channel group comprises one or several NC channels.

In the channel menu, the channel groups can be selected using the horizontal softkeys.

The channels of a selected channel group can be selected with the vertical softkeys.

A certain NC channel of a specific NCU is always a switchover target that can be selected. A switchover to another channel triggered via the channel menu can implicitly mean switchover to another NCU.



Note

In a system, for example, a channel group can correspond to a machining station, the channels contained in it, machining units.

Up to 32 channel groups each with up to 8 channels can be configured in a channel menu.

Configuring the total structure

For a system, the total structure of the channel menu is configured in the "netnames.ini" file. The configuring in the "netnames.ini" file includes all switchover targets that are used at the system. This configuration must be saved or distributed in a standard form across all SINUMERIK Operate systems that provide the channel menu.

An individual channel menu for the operating station is configured for each operating station in the particular "config.ini" file.

Two-stage procedure

1. In the first stage, all channel groups that are used in the system are defined in the "netnames.ini" file, irrespective of the actual operating stations.
2. In the second stage, the version of the channel menu for the specific operating station is defined in the "config.ini" files belonging to the station.

8.4 Defining channel groups in the "netnames.ini" file

Defining channel groups

All channel groups that are used at the system are defined in the "netnames.ini" file. Independent of the specific operator stations.

A separate section [CH_GRP_x] ($1 \leq x \leq 32$) should be created for every channel group.

The entries required for a channel group are as follows:

- The text to be displayed in the channel for the channel group at the corresponding horizontal softkey.
- The list of jump destinations summarized in this channel group, i.e. NC channels. The jump destinations are defined in a consecutively numbered list with the following entries:
 - Membery.Target: Jump destination
 - Membery.Text: Softkey text to be displayed in the channel menu ($1 \leq y \leq 8$).

"netnames.ini" file

A channel group, e.g. channel group 1 is therefore specified as follows:

```
[CH_GRP_1]                                ; Name of the channel group; the notation
                                           ; must follow this scheme. The groups are
                                           ; consecutively numbered at the last
                                           ; position.

Text = Process1                            ; Softkey text for the channel group for
                                           ; display in the channel menu (horizontal
                                           ; softkey) switchover designation 1 of the
                                           ; channel group.

Member1.Target =                          ; Computer name (host name) or the IP
[<HMI>.]<NC>.#<channel                    ; address of the computer on which the HMI
number>                                   ; to be selected runs (NCU or PCU):
                                           ; <HMI> = <IP address or name of the HMI
                                           ; host (PC/PCU)>
                                           ; <HMI> can be omitted if the HMI runs
                                           ; locally on the NCU
                                           ; <NC> = <IP address or name of the NC>
                                           ; Alternatively, the machine name can also
                                           ; be specified from the mmc.ini.
                                           ; Using ".#Channel number", optionally the
                                           ; NC channel can be specified that should
                                           ; be taken when switching over.
                                           ;

Member<No>.Text = NCU730_K1              ; Softkey text for the display in the
                                           ; channel menu (vertical softkey). If, for
                                           ; "Target" a channel number is specified,
                                           ; then instead of a text, using the fixed
                                           ; value "$MC_CHAN_NAME", it can also be
                                           ; defined that the text to be displayed
                                           ; should be the channel name defined in the
                                           ; NCK machine data.
                                           ;
```

8.4 Defining channel groups in the "netnames.ini" file

```
Member2.Target =  
Member2.Text           ; Same as for the vertical softkey 2
```

8.5 Configuring operating stations in the "config.ini" file

The version of the channel menu is individually defined for the operator stations in the "config.ini" files belonging to the station. The data defined in the "netnames.ini" file is used. Here, the channel groups are assigned a softkey in the channel menu.

"config.ini" file

- The data is defined in section [T2M2N].
- The references CH_GRP_xx of the softkeys refer to the channel groups which are defined in the "netnames.ini" file. This notation is binding.
- SKx in this case, designates the xth horizontal softkey in the channel menu.

Example

```
...  
[T2M2N]  
SK1=CH_GRP_1  
SK2=CH_GRP_3  
SK8=CH_GRP_15
```

8.6 Example: Settings for 1:N

1:N configuration

For a 1:N configuration the following requirements apply:

- A PCU with SINUMERIK Operate can be connected to a maximum of four NCUs.
- SINUMERIK Operate must be switched off on all NCUs.
- The following configuration files must be adapted:
 siemens/sinumerik/hmi/template/cfg/**netnames.ini**
 siemens/sinumerik/hmi/template/cfg/**mmc.ini**

This is illustrated in the following sections using an example with 1 PCU and 2 NCUs.

Example mmc.ini

```
[Global]
NcddeMachineNames=net, NCU840D_1, NCU840D_2
NcddeDefaultMachineName=NCU840D_1

[NCU840D_1]
ADDRESS0=192.168.214.1,LINE=14,NAME=/NC,SAP=040d,PROFILE=CLT1__CP_L4_INT
ADDRESS1=192.168.214.1,LINE=14,NAME=/PLC,SAP=0202,PROFILE=CLT1__CP_L4_INT
ADDRESS2=192.168.214.1,LINE=14,NAME=/CP,SAP=0502,PROFILE=CLT1__CP_L4_INT
ADDRESS10=192.168.214.1,LINE=14,NAME=/DRIVE_00_000,SAP=0201,
SUBNET=0046-00000000:000,PROFILE=CLT1__CP_L4_INT
ADDRESS11=192.168.214.1,LINE=14,NAME=/DRIVE_03_003,SAP=0900,
PROFILE=CLT1__CP_L4_INT

[NCU840D_2]
ADDRESS0=192.168.214.2,LINE=14,NAME=/NC,SAP=040d,
PROFILE=CLT1__CP_L4_INT
ADDRESS1=192.168.214.2,LINE=14,NAME=/PLC,SAP=0202,
PROFILE=CLT1__CP_L4_INT
ADDRESS2=192.168.214.2,LINE=14,NAME=/CP,SAP=0502,
PROFILE=CLT1__CP_L4_INT
ADDRESS10=192.168.214.2,LINE=14,NAME=/DRIVE_00_000,SAP=0201,
SUBNET=0000-00000000:000,PROFILE=CLT1__CP_L4_INT
ADDRESS11=192.168.214.2,LINE=14,NAME=/DRIVE_03_003,SAP=0900,
PROFILE=CLT1__CP_L4_INT
```

Example netnames.ini

```
;*****
;      netnames.ini      - EXAMPLE -
;
; This is an example of a netnames.ini for 1:N NCU-switching in
; a configuration of 3 NCU and a PCU50.
```

8.6 Example: Settings for 1:N

```

;*****
[own]
owner = HMI

;*****
; ChanMenu
;*****
[chan HMI]
ShowChanMenu = true

;*****
;Channel-groups
;Correlation from channel-group to horizontal softkeys
; -> see config.ini of the TCU
;The section [T2M2N] can also be created in the netnames.ini file
;instead of config.ini file. This configuration applies to all TCU,
;which are not configured by their config.ini.
;*****
[T2M2N]
SK1 = CH_GRP_1
SK2 = CH_GRP_2

[CH_GRP_1]

Text = 1. NCU
Member1.Target = 192.168.214.241.192.168.214.1.#1
Member1.Text = NCU1%nKanal 1

Member2.Target = 192.168.214.241.192.168.214.1.#2
Member2.Text = NCU1%nKanal 2

[CH_GRP_2]
Text = 2. NCU
Member1.Target = 192.168.214.241.192.168.214.2.#1
Member1.Text = NCU2%nKanal 1

Member2.Target = 192.168.214.241.192.168.214.2.#2
Member2.Text = NCU2%nKanal 2

```

Note

For switching over an MCP with the operating software, the PLC block FB9 must not be used (FB9 must not be active). If necessary, the MCP must be switched over in the PLC user program.

Solution

In the OB100 (call for FB1), set MCP1BusAdr to 255 and MCP1Stop to "true".

In the OB1, scan the "MMCBTSSready" (DB10.DBX108.3) signal. If this is set, write the MCP address from DB19.DBB123 (MCP index) to the DB7.DBB27 before removing the MCP stop bit DB7.DBX62.1. The MCP is now active.

If the "MMCBTSSready" (DB10.DBX108.3) is removed again (operating software switches to another NCU), the MCP stop bit DB7.DBX62.1 will have to be reset.

8.7 Distribution via job lists in the case of 1:N

Simplified selection of programs

The function is only available in a group of several NCUs and must be enabled in the "systemconfiguration.ini" configuration file:

```
[miscellaneous]
distributeJoblist=true
```

The sources are located on the local drive of the PCU or the PC.

The distribution of the programs is done by selecting a job list which is located in a workpiece. The job list may contain COPY and SELECT instructions:

```
; Copy A.MPF to NCU1:
COPY A.MPF NC=NCU1

; Copy B.MPF to NCU2:
COPY B.MPF NC=NCU2

; Copy all subprograms to all NCUs:
COPY *.SPF *

; Select A.MPF on NCU1 in channel 1.
SELECT A.MPF ch=NCU1,1

; Select B.MPF on NCU2 in channel 2.
SELECT B.MPF ch=NCU2,2
```

Sequence:

1. If a distributed job list is active during the selection, all distributed programs on the NCU are deleted without confirmation. If the workpiece on the NCUs is empty, it will be deleted there.
2. The programs are copied to the corresponding workpieces of the relevant NCU.
3. Existing programs are overwritten without any message.
4. Following a change in a distributed program on the local drive, the modified programs using the Editor are copied to the corresponding NCU.

Sample structure

/user/sinumerik/data/ prog/JOBA.WPD	NCU1	NCU2
JOBA.JOB	WKS.DIR	WKS.DIR
A.MPF	WKS.DIR/JOBA.WPD	WKS.DIR/JOBA.WPD
B.MPF	WKS.DIR/JOBA.WPD/B.MPF	WKS.DIR/JOBA.WPD/B.MPF
UP1.SPF	JOBA.WPD/UP1.SPF	JOBA.WPD/UP1.SPF
UP2.SPF	WKS.DIR/JOBA.WPD/UP2.SPF	WKS.DIR/JOBA.WPD/UP2.SPF

/user/sinumerik/data/ prog/wks.dir/JOBA.WPD	NCU1	NCU2
JOBA.JOB	WKS.DIR	WKS.DIR
A.MPF	WKS.DIR/JOBA.WPD	WKS.DIR/JOBA.WPD
B.MPF	WKS.DIR/JOBA.WPD/B.MPF	WKS.DIR/JOBA.WPD/B.MPF
UP1.SPF	JOBA.WPD/UP1.SPF	JOBA.WPD/UP1.SPF
UP2.SPF	WKS.DIR/JOBA.WPD/UP2.SPF	WKS.DIR/JOBA.WPD/UP2.SPF

Supplementary conditions

Special behavior:

- Distributed programs are retained during a restart of the operating software.
- On the local drive, distributed programs can neither be deleted nor renamed nor overwritten using copy/move.
- Changes of distributed programs on the NCU are lost, if they are not manually saved.
- The program correction in the machine is not offered.
- When creating a commissioning archive, all data of the local drive is also automatically saved.

Restrictions:

- In the event of changes of distributed programs on the local drive using the Editor, it should be noted that only the channel states are monitored on the NCU currently connected. If the program is still interrupted or active on another NCU, it cannot be correctly distributed after the change.
- The display of the active block, the marking of the block search as well as the read-only handling of the program opened in the Editor are executed only for the active programs of the currently connected NCU.
- In the Editor, programs are always opened in the context of the currently connected NCU. This can lead to a faulty step recognition with distributed programs.
- In the current block display in the "Machine" operating area, you can display only the active/distributed programs of the currently connected NCU.
- The simulation of job lists via several machines is not possible.
- If `distributeJoblist=true` is configured in the `systemconfiguration.ini` file, then part or subprograms can no longer be selected via the "Program Manager" operating area.

8.7 Distribution via job lists in the case of 1:N

Machine and setting data

9.1 Machine and setting data

Overview

Prefix	Number ranges	Machine/setting data	Storage in range (softkey)
\$MM	9000 - 9999	Display machine data	Display MD
\$MNS	51000 - 51299	General configuration machine data	General MD
	51300 - 51999	General cycle machine data	
\$MCS	52000 - 52299	Channel-specific configuration machine data	Channel MD
	52300 - 52999	Channel-specific cycle machine data	
\$MAS	53000 - 53299	Axis-specific configuration machine data	Axis MD
	53300 - 53999	Axis-specific cycle machine data	
\$SNS	54000 - 54299	General configuration setting data	General SD
	54300 - 54999	General cycle setting data	
\$SCS	55000 - 55299	Channel-specific configuration setting data	Channel SD
	55300 - 55999	Channel-specific cycle setting data	
\$SAS	56000 - 56299	Axis-specific configuration setting data	Axis SD
	56300 - 56999	Axis-specific cycle setting data	

More information

A detailed description of the machine and setting data can be found in the List Manual "Machine Data and Parameters".

9.2 Displaying/editing machine data

You can access the following machine data in the "Start-up" operating area.

- General machine data (\$MN) and general configuration machine data (\$MNS)
- Channel-specific machine data (\$MC) and channel-specific configuration machine data (\$MCS)
- Axis-specific machine data (\$MA) and axis-specific configuration machine data (\$MAS)
- Drive-specific machine data (\$M_)
- Machine data control unit: Drive parameters
- Machine data feed-in: Drive parameters
- I/O component parameters: Drive parameters
- Communication parameters (CULINK, DMC): Drive parameters

Note

The display of the machine data / drive parameters depends on the configuration of your control.

Access authorization to the machine data operating area can be controlled by keyswitch position or password.

Read-access to machine data is possible as of access level 4 (keyswitch 3).

Machine data can be changed with access level 1 (manufacturer).

**WARNING****Incorrect parameterization**

Changes in the machine data have a considerable influence on the machine. Incorrect configuration of the parameters can endanger human life and cause damage to the machine.

Information about machine data

The following information is displayed from left to right:

- Machine data number, with array index if applicable
- Machine data name
- Machine data value
- Machine data unit
- Effective

Note

If the machine data does not use units, the corresponding column is empty. If the data is not available, the hash symbol "#" is displayed instead of the value. If the value ends in an "H", it is a hexadecimal value.

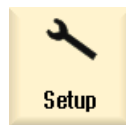
The physical units of machine data are displayed on the right-hand side of the input field.
For each machine data item, an activation type can be read in the column on the right.

so Immediately active: No action required
cf Configuration: "Set MD to active (cf)" softkey
re Reset: <Reset> key on the machine control panel
po POWER ON: "Reset(po)" softkey

Additional Information

In the footer you are given a brief explanation of the selected machine or setting data item.

Procedure



1. Select the "Start-up" operating area.



2. Press the "Mach. data" softkey. Additional softkeys for the individual machine data areas are displayed.



3. Press the "General MD", "Channel MD", or "Axis MD" softkey.
The window opens and the selected machine data is displayed.



4. Place the cursor on a machine data item.
5. Position the cursor on the entry to be modified and enter the required value.
6. Depending on the activation type, there are two ways of activating the settings:



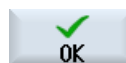
Press the "Activate MD (cf)" softkey. The value is applied.

- OR -



Press the "Reset (po)" softkey.

A safety prompt appears.



7. Press the "OK" softkey to trigger a warm restart.

- OR -



Press the "Cancel" softkey if you do not want to apply the settings.

Axis selection

If several components are available for the area selected (e.g. "Axis MD"), you can choose from the following options:



1. Press the "Axis +" or "Axis -" softkey.
The values of the next (+) and the previous (-) axes are displayed.



- OR -



Press the "Direct selection..." softkey.
The "Axis Direct Selection" window opens.

2. Select the required axis directly from those available in the drop-down list box.



3. Press the "OK" softkey to save the setting.

- OR -



Press the "Cancel" softkey to reject the settings.

9.3 Displaying/editing display machine data

You can access the display machine data via the user interface in the "Start-up" operating area.

Procedure



1. Select the "Start-up" operating area.



2. Press the "Mach. data" softkey.



3. Press the menu forward key.
Further softkeys are displayed.



4. Press the "Display MD" softkey.
The display machine data appears.

5. Position the cursor on the entry to be modified and enter the required value.



6. Press the "Reset (po)" softkey.
A safety prompt appears.



7. Press the "OK" softkey to trigger a warm restart.

- OR -



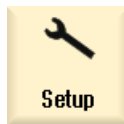
Press the "Cancel" softkey if you do not want to apply the settings.

9.4 Displaying/editing setting data

You can access the following setting data via the user interface in the "Startup" operating area.

- General setting data
- Channel-specific setting data
- Axis-specific setting data

Procedure



1. Select the "Start-up" operating area.



2. Press the "Mach. data" softkey.



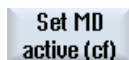
3. Press the menu forward key.
The softkeys "General SD", "Channel SD", and "Axis SD" are displayed.



4. Press the relevant softkey to display a particular setting data area.
The window opens and the selected setting data is displayed.



5. Place the cursor on the desired setting data and position the cursor on the entry to be changed. Enter the desired value.
6. Depending on the activation type, there are two ways of activating the settings:



Press the "Activate MD (cf)" softkey.

- OR -



Press the "Reset (po)" softkey.

A safety prompt appears.



7. Press the "OK" softkey to trigger a warm restart.

- OR -



Press the "Cancel" softkey if you do not want to apply the settings.

Axis/channel selection

If several components are available for the area selected (e.g. "Axis SD" or "Channel SD"), you can choose from the following options:



1. Press the "Axis +" or "Axis -" or "Channel +" or "Channel -" softkey.
The values of the next (+) and the previous axis/channel (-) are displayed.



- OR -
- Press the "Direct selection..." softkey.
The "Direct Selection" window opens.
2. Select the required axis directly from those available in the drop-down list box.
 3. Press the "OK" softkey to save the setting.



- OR -



Press the "Cancel" softkey to reject the setting.

9.5 Displaying/editing drive parameters

The "Control Unit MD", "Infeed MD" and "Drive MD" softkeys as well as the "I/O comp. MD" and "Comm. MD" softkeys on the menu forward key are available to display and edit drive parameters.

A separate list display is provided for each of these areas in which you can view and edit drive data.

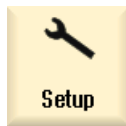
Requirement

Settings for drive parameters are protected with access level 2 (service).
The lists of the drive parameters are visible with access level 4 (keyswitch 3).

More information

More information on drive commissioning is provided in
CNC Commissioning Manual: NCK, PLC, drives.

Procedure



1. Select the "Setup" operating area.



2. Press the "Mach. data" softkey.
The "Control unit parameters", "Supply MD" and "Drive MD" softkeys are displayed.
3. Press the softkey of an area to show its parameters.
4. Place the cursor on the desired parameter.
5. Position the cursor on the entry to be modified and enter the required value.



6. In order to activate the settings, you have the option of saving or carrying out a reset.

Press the "Save/reset" softkey.



7. Press the "Save" softkey.
You are prompted "What do you wish to save?"
You can make the following selection per softkey:

- Actual drive object
- Drive unit
- Drive system

- OR -



Press the "Reset (po)" softkey.

You are prompted as to whether you wish to initiate a warm restart for the NCK and the complete drive system.



Confirm the prompt with the "Yes" softkey.



Reject the warm restart with the "No" softkey.

Extended reset

If you wish to carry out a warm restart only for specific objects or specific areas, then additional softkeys are available for this purpose.



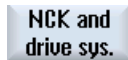
Press the "Extended reset" softkey.

You are prompted to enter for which objects you wish to initiate a warm restart.

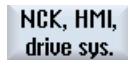
You can make a selection with the following softkeys:



Only the NCK is restarted.



All of the control units and the NCK in the system are restarted. This softkey corresponds to the "Reset (po)" softkey if you confirm the prompt with "Yes".



All of the control units and the NCK in the system as well as the operator software are restarted.

Hiding the expanded softkey bar

The "Extended reset" softkey is defined in the "slsuconfig.ini" file. If the softkey is not to be displayed, proceed as follows:

1. Copy the "slsuconfig.ini" file from the `/siemens/sinumerik/hmi/template/cfg/` directory.
2. Insert the file into the following directory:
`/user/sinumerik/hmi/cfg/`.
3. Open the file and in the section
[Softkeys] and enter
AdvancedReset = 0.

9.6 Machine data display options

Through the use of the machine data display filter, it is possible to reduce the number of displayed machine data relating to a certain area, e.g. general machine data, for special purposes.

Machine data areas

Display filters are available for the following machine data areas:

- General machine data
- Channel-specific machine data
- Axis-specific machine data
- Drive machine data
- Display machine data

Filter options

It is possible to limit the machine data display using the following filtering methods:

- Only display axes that are used
- According to indices
- According to display groups
- Display expert parameters

Only display axes that are used

If this checkbox is activated, axes that are not used are hidden when scrolling.

Indices from ... to

The index filter refers to the machine data arrays. On the display, this machine data can be identified by the field index attached to the machine data string.

Example: 10000[index]AXCONF_MACHAX_NAME_TAB

If the index filter is activated, machine data arrays are only displayed in the specified index area.

Display groups

A display group contains machine data within a machine data area that belongs to the same topic.

Note

To find out which display group a machine data item belongs to, refer to the "Display filter" parameter associated with the description of the machine data element in question.

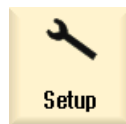
More information: List Manual Machine Data and Parameters

Select/deselect display groups to increase or decrease the number of machine data items displayed for the current machine data area.

Display expert parameters

If the "Display expert parameters" filter is disabled, only the machine data in a machine data area that is required for the basic functionality of the NC is displayed.

Procedure



1. Select the "Setup" operating area.



2. Press the "Mach. data" softkey.



3. Press the softkey of a particular data area, e.g. "General MD".
The list of general machine data is displayed.



4. Press the ">>" and "Display options" softkeys.
The "Display options: ..." window for the selected machine data opens.



5. Select the required filter options (according to display groups, indices or expert parameters) by activating the checkboxes.



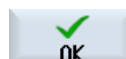
6. Press the "Select all" softkey to activate all display groups.

- OR -



Press the "Deselect all" softkey.

All checkmarks are removed and you can select individual display groups.



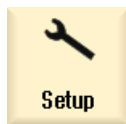
Press the "OK" softkey to save the settings.

9.7 Editing machine data and drive parameters

9.7.1 Editing hexadecimal values

You can use a bit editor to enter the required values for machine data in hexadecimal format.

Procedure



1. Select the "Start-up" operating area.



2. Press the "Mach. data" softkey and select the required machine data area (e.g. general machine data).



3. Position the cursor on the entry to be edited.



4. Press the <SELECT> or <INSERT> key.

The "Bit Editor" window opens.



All bits of the machine data item that have a description text are displayed.

5. If you activate the "Display all bits" checkbox, all bits regardless of their data type (8, 16 or 32 bits) are displayed. Activate the relevant bit.



6. Press the "OK" softkey. The setting is checked and an error message may be output.

The window closes and you return to the machine data overview.

The new value is displayed in hexadecimal format.

9.7.2 Editing BICO values

You can use the BICO editor to enter BICO values for drive parameters.

Note

BICO values can also be entered by copying and inserting or also directly entered the field.

Procedure

1. Select the "Start-up" operating area.



2. Press the "Mach. data" softkey.



3. Press the "Control unit MD" softkey and select a BICO parameter, e.g. "p738".

4. Position the cursor on the entry to be changed, e.g. BICO 63.2091.0



5. Press the <SELECT> or <INSERT> key.

The "BICO Editor" window opens.



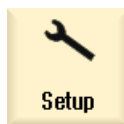
6. Complete the "Drive object number", "Parameter number", "Bit/Index" and "Parameter value (hex)" fields.

Note

The BICO editor also opens if you enter a value other than 0 or 1 for the value to be changed.

9.7.3 Editing enum values

For drive parameters, you have the option of editing enum elements (e.g. r2, p3, p4, p97 etc.) using a selection list.

Procedure

1. Select the "Start-up" operating area.



2. Press the "Mach. data" softkey.



3. Select the desired drive parameter area, e.g. "Control unit MD".

4. Select the desired parameter, e.g. "p3" and position the cursor at the entry to be changed, e.g. "[1] Display, Si...".



5. Press the <SELECT> or <INSERT> key.

A window containing a list of all defined enum values and their descriptions opens.



6. You can select a value from the list.

- OR

You can also directly enter the value as decimal number into the brackets [].

9.8 Searching for data

You can search for specific machine, setting and display machine data.

Search strategies

- When a digit or a digit with an index is entered, an exact search for this parameter is performed.
Example: If "9" is entered > p9 will be found (but not p99)
- When text is entered, a full-text search is performed: i.e. the term is sought in the relevant table and in the explanations in the footers.

Note

Search with place holders

When searching for machine data, you have the option of using place holders:

- "*": Replaces any character string
 - "?": Replaces any character
-

Searched fields

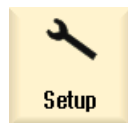
A search is made in the following fields of the machine data for the character string that has been entered if the "Additionally search in the explanation texts" option is not set:

- Machine data number
- Symbolic name
- Unit

The following fields are additionally searched if the "Additionally search in the explanation texts" option is set:

- Descriptive text
- Bit texts
- Enum texts (only for drives)

Procedure



1. Select the "Start-up" operating area.



2. Press the "Mach. data" softkey.



3. Select the required area by pressing the relevant softkey.

4. Press the "Search..." softkey and enter the required text or digit in the search screen.



5. If you wish to restrict the search only to the texts in the tables that are displayed, deactivate the "Search explanation texts too" checkbox.
6. Select the search direction required (forwards, backwards) in the "Direction" field.

The cursor is positioned on the first entry that corresponds to the search term.



7. Press the "Continue search" softkey if this machine, setting or display machine data item is not the one you are looking for.

Additional search option



Press the "Go to start" softkey to start the search at the first data.



Press the "Go to end" softkey to start the search at the last data.

9.9 Data admin

Overview

The "Data admin" function is used to simplify the setup and permits the transfer, backup, loading and comparing of machine, setting, compensation and drive data at the file level. The files are saved in the .tea ASCII format.

The "Data admin" softkey is visible as of access level "Service" (= 2).

The following option fields are available in the "Load machine data" window:

- Load data within the controller
Only those controller objects are listed that are currently available in the controller.
- Save data to a file
Additional files with the extensions .acx and .log are created for the SINAMICS parameters:
 - Files with the extension .acx contain the parameter descriptions for the selected drive object.
 - The log file may also contain the warnings and errors that occurred during the conversion from .acx to .tea.
- Load data from a file

Note

An NCK and drive reset is only triggered automatically for drive objects after loading. A reset must be triggered manually for all other controller objects.

- Compare data
Several files (.tea) and/or controller objects (axis, channel, servo, infeed, etc.) can be compared at the same time. An online comparison of constantly changing data is not possible because the values are saved temporarily at the time of the comparison. Up to eight elements can be taken into the list of the data to be compared.
- Export/import SINAMICS lists
If hydraulic components are used in the system, for example, you can export or import a valve list (Hydraulic Drive).

More information

More information on the application of valve lists is provided in
SINAMICS S120 System Manual Hydraulic Drive.

Procedure



1. Select the "Setup" operating area.



2. Press the "Mach. data" softkey.
The "Data admin" softkey is available in each machine data area, except in "User views".

- OR -



Press the "System data" softkey and select the HMI data/Data backups/IB data directory.



3. Press the "Data admin" softkey.
The "Load machine data" window opens.



4. Activate the required option filed and press "OK".

Load data within the controller



5. Position the cursor on a controller object and confirm with "OK".



6. In the window that opens, select the target controller object and confirm with "OK".

Save data to a file

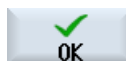


5. Position the cursor on a controller object and confirm with "OK".

6. The "Save Under: Select Archive" window opens and the appropriate storage location is preselected.



If required, press the "New directory" softkey to generate a new subdirectory. Enter the required name in the "New Directory" window and confirm with "OK".



7. In the "New File" window, enter the required name for the file to be saved and confirm with "OK".

The stored files can be found in the data tree of the "System data" in the HMI data/Data backups/IB data directory.

Load data from a file



5. The "Load Trace: Select file:" window opens.

Position the cursor on a .tea file that is located either in the IB data directory or on a USB flash drive and confirm with "OK".

Please note: If the source and target drive object numbers differ when loading drive data, you must adapt individual parameters. To do this, press the "Adapt" softkey and edit the parameter values in the window that appears.

Compare data



5. In the "Compare Data - Controller" window, select an element to be compared from the tree structure of the control objects.

- OR -



Press the "File" softkey to select a .tea file to be compared from the tree structure of the files.



6. Press the "Add to list" softkey.

The list of the data to be compared is displayed in the lower part of the window and the selected element is added.



7. Press the "Delete from list" softkey to remove individual elements from the comparison list.

- OR -

Deactivate the checkbox of the selected element in the list of the data to be compared.



8. When at least two elements are listed, the "Compare" softkey is enabled. Press this softkey to perform the comparison.

9.10 User views

Use

In the "User Views" window you can create and adapt all machine data relevant to a particular functionality. Machine data is individually collated to simplify the user's task.

You can include additional comments when creating and/or editing user views.

Note

Importing user views (compatibility)

If you have already created user views in HMI-Advanced, copy the *.klb files to `/user/sinumerik/hmi/template/user_views` to use them in SINUMERIK Operate.

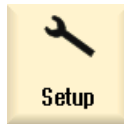
Display in the the "Parameter" operating area

Proceed as follows to show user views also in the "Parameters" operating area:

1. Select the "Start-up" operating area.
2. Press the "Machine data" softkey.
3. Press the "User views" softkey.
4. Press the "Manage view" softkey.
5. Press the "New view" softkey.
6. Activate the checkbox "Display parameter / use setting data", if you also wish to display the new user view in the "Parameter" → "Setting data" → "Data lists".
7. Enter a name for the user view.
8. Confirm with "OK".

9.10.1 Creating a user view

Procedure



1. Select the "Start-up" operating area and press the "Mach. data" softkey.



2. Press the softkeys "User views", "Manage view" and



"New view".

The "New View" window opens.

3. Enter the desired view name.



Press the "OK" softkey.

If a user view already exists with the same name, you receive a safety prompt as to whether the existing view should be overwritten.



4. Press the "Enter data" softkey.

The "Insert data" selection box opens.



5. Open the selection list with the <INSERT> key, select a machine data area and press the <INPUT> key.



Select a machine data item with the cursor keys or using the "Find" softkey.



6. Press the "Insert before line" or "Insert after line" softkey to insert the selected machine data at the required position in the user view.



Note:

You can navigate in the open user view with the mouse and select a line without closing the list box.

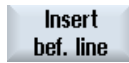


7. Press the "Back" softkey to close the list box and return to the user view you want to edit.

Your entries are automatically stored.



8. Press the "Insert text" softkey to insert any text in the open user view. The "Insert Text" input window opens.



9. Enter a text and explanatory description for the text and press the "Insert before line" or "Insert after line" softkey to accept the text.



10. Press the "Back" softkey to save your entries and return to the user view you are editing.

Selecting a particular machine data item



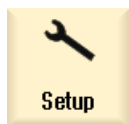
You can use the Search dialog box to look for a particular data item.

9.10.2 Editing the user view

Depending on the row you have selected, you can use the "Properties" softkey to change comments and, in the case of machine data, the data source (channel, axis, drive unit) and view the description and, if required, change.

- Machine data
Depending on the data type you can select either a fixed or a variable data source for machine data.
The entry "variable(*)" means that when you can select another data source (channel, axis, drive unit) with vertical softkeys 1- 3 (+, - and direct selection) the value displayed changes to refer to the data source currently selected.
Alternately, you can select a fixed data source so that the displayed value does not change when you select a different data source.
- Comment texts
Text and description

Procedure



1. Select the "Start-up" operating area and press the "Mach. data" softkey.



2. Press the "User views" softkey.
The "User Views" window opens.



3. Press the "Edit view" softkey. Additional softkeys to edit the user view are listed.



4. Press the "Insert data" softkey if you wish to enter another data item.



5. Select a machine data item with the cursor keys.



6. Press the "Up" or "Down" softkeys to move the selected row.



- OR -



Press the "Delete line" softkey to remove the selected line from the view. The data item is removed without a prompt.

- OR -



Press the "Properties" softkey to view the texts for comments and, if required, change.

The "Properties" window is opened. For machine data, depending on the setting, the description or the machine data is displayed in the lower left-hand window.



7. Press the "Back" softkey to save your changes.

Selecting a particular machine data item



You can use the Search dialog box to look for a particular data item.



Press the "Go to start" softkey to start the search at the first entry.

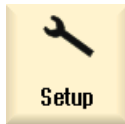


Press the "Go to end" softkey to start the search at the last entry.

Press the "Continue search" softkey if the data found during the search does not match up with what you are looking for.

9.10.3 Deleting a user view

Procedure



1. Select the "Start-up" operating area.



2. press the "Machine data" softkey.



3. Press the "User views" softkey.



4. Press the "Manage view" softkey.



5. Select the desired view from the selection list.
6. Press the "Delete view" softkey.



With the final confirmation prompt you will be requested to confirm with either "Yes" or cancel with "No".

or



The "User views" dialog is then redisplayed.

Just like before, as an alternative, it is possible to delete a user view under "System data" under the following path: `../user/sinumerik/hmi/template/user_views`

Note

User views that are part of the system cannot be deleted.

9.11 Plain texts for machine and setting data

Application-specific and language-dependent plain texts can be configured for machine and setting data depending on the version [Index].

Displaying the plain texts

You set the display of the plain texts using the following display machine data:

MD9900 \$MM_MD_TEXT_SWITCH	Plain texts instead of MD identifier
= 1	Plain text is displayed in the table
= 0	Plain text is displayed in the dialog line

Files

File	Machine/setting data
nctea_xxx.txt	General machine/setting data
chtea_xxx.txt	Channel-specific machine/setting data
axtea_xxx.txt	Axis-specific machine/setting data
hmitea_xxx.txt	Display machine data

For "xxx", the prescribed language code must be used, e.g. "deu" for German, "eng" for English, etc..

Supported languages can be viewed in "Supported languages (Page 597)".

Ensure that the file names are written in lower case letters.

Procedure

1. Depending on the machine or setting data for which you wish to change the plain text, create the corresponding file, e.g. "nctea_xxx.txt".
2. Save the file with the UTF-8 coding in order that umlauts and special characters are correctly displayed in SINUMERIK Operate.
3. Place the file in SINUMERIK Operate in the following directory:
System CF card/**user**/sinumerik/hmi/Ing or
System CF card/**oem**/sinumerik/hmi/Ing or
System CF card/**addon**/sinumerik/hmi/Ing

Note

The files are searched through in the sequence of the directories "user", "oem" and "addon". The first file that is found is evaluated. If, e.g. text files are available in the "user" and "oem" directories, the files are evaluated in the "user" directory.

Note

If a machine data item has different indices and you do not specify an index for the plain text, the same plain text appears for all the indices of the machine data item.

The parameters and indices must be sorted in an ascending order.

Example of a file with German texts

```
14510 My integer text for PLC_MD 14510
14510[1] My integer text for MD 14510[1]
14512[1] My text for HEX data 14512[1]
```

Result in the display

The plain text is displayed in the table or in the diagnostics line in the operating area "Startup", "General MD".

Machine data	Text
14510	My integer text for PLC_MD 14510
14510[1]	My integer text for MD 14510[1]
14512[1]	My text in HEX data 14512[1]

Customizing the "Machine" operating area

Automatic changeover

The circumstances under which an automatic changeover is made into the "Machine" operating area are set in MD51040 \$MNS_SWITCH_TO_MACHINE_MASK.

MD51040 \$MNS_SWITCH_TO_MACHINE_MASK		0 (default setting)
Bit 0 = 1	For program selection in the Program Manager, an automatic change is not made into the Machine operating area.	
Bit 1 = 1	For program selection in the Program Manager, an automatic change is not made into the Machine operating area. When changing over the operating mode via the machine control panel, an automatic change is not made into the Machine operating area.	
Bit 2 = 1	For program selection in the Program operating area, an automatic change is not made into the Machine operating area.	
Bit 3 = 1	When selecting a program/executing a program in the Program operating area, the block search is not automatically started.	

10.1 Setting the font size of the actual value display

Setting font size

The actual values for the machine coordinate system or workpiece coordinate system can be displayed in two different font sizes in the "Machine" operating area.

Using a channel machine data item, you can set how many axes should be displayed in a larger font.

MD52010 \$MCS_DISP_NUM_AXIS_BIG_FONT	Number of actual values with a large font
= 3	Number of actual values with a larger font (default setting)

If the number of axes changes, e.g. as a result of transformations, then the following channel-specific machine data is relevant for the representation pattern of the font sizes:

MD52011 \$MCS_ADJUST_NUM_AXIS_BIG_FONT	The number of actual values with large font is dynamically adapted to the number of geometry axes
= 0	Only MD52010 is valid. The number is therefore fixed.
= 1	Only the geometry axes are displayed using a large font. MD52010 is ignored.
= 2	The number of geometry axes and content MD52010 are displayed using a large font.

10.2 Inserting a user-specific logo

For the traditional SINUMERIK Operate display, the Siemens logo is visible in the "Machine" operating area in the header.

For the SINUMERIK Operate displays of the latest generation, the Siemens logo is permanently displayed in the header.

You can replace the Siemens logo with your own logo.

OEM-specific logo in traditional display

Procedure:

1. Name your own logo "logo.png".

Note

The file name must not contain any lower case letters.

2. Save your own logo depending on the bitmap size in one of the directories: **/oem/sinumerik/hmi/ico** or **/user/sinumerik/hmi/ico**

Directory	Bitmap size
/lco640	122 x 19
/lco800	160 x 24
/lco1024	199 x 30

OEM-specific logo of displays Skin 1 and 2

Procedure:

1. Depending on the screen resolution, name your own logo
"company_label_XXXXxYYYY.png".
Placeholder XXXXxYYYY corresponds to the screen resolution, for example
"company_label_1024x768.png".
2. Save your own logo in one of the directories:
/oem/sinumerik/hmi/skins/skin1/ico/ico640
/user/sinumerik/hmi/skins/skin1/ico/ico640
or
/oem/sinumerik/hmi/skins/skin2/ico/ico640
/user/sinumerik/hmi/skins/skin2/ico/ico640

Note

Display error

Remove your own logo "logo.png" from the directories /oem or /user when the displays of the latest generation are used.

Your own logo must not exceed the header height in relation to the screen resolution used.

The following is allowed:

Screen resolution	Maximum bitmap height
640 x 480	32
760 x 505	32
800 x 480	32
800 x 600	40
1080 x 810	53
1024 x 768	51
1024 x 1014	51
1280 x 768	51
1280 x 800	51
1280 x 1024	53
1300 x 768	51
1366 x 768	51
1440 x 1080	72
1454 x 1080	70
1854 x 1014	51
1854 x 1080	70
1920 x 1080	70

10.3 Configuring the display of the G-code groups

The "G-functions" pane is visible in the "Machine" operating area.

Up to a maximum of 16 G-code groups are displayed in this pane. Configure the "slmagcodeconfig.ini" file accordingly to determine which G-code groups should be displayed, and where.

Configuring G-code groups

Section	Meaning
Selected G groups	This area is intended for operation of the controller in Siemens mode.
Selected G groups ISO mode	This area is intended for operation of the controller in ISO mode.

Enter the G-code group and position as follows:

SelectedGGroupN = M	
N	Position where G-code group M will be displayed. If you want to leave a position empty, omit the number (M), e.g. "SelectedGGroup1 = "
M	The number of the G-code group to be displayed at position N

Structure of the file

```
[Selected G-Groups]
SelectedGGroup1 = 1
SelectedGGroup2 = 2
SelectedGGroup3 = 3
SelectedGGroup4 = 4
SelectedGGroup5 = 5
SelectedGGroup6 = 6
SelectedGGroup7 = 7
SelectedGGroup8 = 8
SelectedGGroup9 = 9
SelectedGGroup10 = 11
SelectedGGroup12 = 12
SelectedGGroup13 = 13
SelectedGGroup14 = 14
SelectedGGroup15 = 15
SelectedGGroup16 = 16
[Selected G-Groups ISO-Mode]
... (as with section for Siemens)
```

Procedure

1. Copy the "slmagcodeconfig.ini" file from the folder
/siemens/sinumerik/hmi/template/cfg.
2. Place the file in the following directory: **/oem/sinumerik/hmi/cfg** or **/user/sinumerik/hmi/cfg**.
As soon as the file is located in the user-specific directory, the entries for this file take precedence over the Siemens file. If an entry is missing in a user-specific file, the corresponding entry from the Siemens file is used instead.
3. Open the file and enter the number of the G code in question at the required position
"SelectedGGroup1 = **5**".
I.e. the 5th G code group will be displayed at the 1st position.

10.4 Configuring the channel operational message

Overview

The channel operational messages are displayed in the third line of the header in the "Machine" operating area. There are two types of channel operational messages:



1. Channel operational messages that require an operator action to continue a program, e.g. feed enable missing, M01 active.

The channel operational messages are identified by exclamation marks.



2. Channel operational messages that do not require an operator action to continue a program. A stop condition is active for a length of time (>1 s) and is interrupted by the program processing, e.g. dwell time active, waiting for tool change.

The channel operational message is identified by a clock icon and disappears after a certain time.

File

The settings for this are specified in the "slmahdconfig.ini" file.

Configuring the channel operational message

Section	Meaning
CondStopIcons	Specification of an icon that is to be displayed with a certain channel operational message. If no icon is specified for a certain channel operational message, then the icon specified for "DefaultIcon" is displayed.
CondDelayTime	Specification of how long (in milliseconds) a certain message must be present before it is displayed. • If no time is specified for a certain channel operational message, then the time specified at "DefaultDelayTime" is used. • If the channel operational message is to be displayed immediately, "0" must be specified as time.

Procedure

1. Save your own icon files under the following path in one of the intended subdirectories:

/oem/sinumerik/hmi/ico or

/user/sinumerik/hmi/ico

Depending on the screen resolution, there are the following subdirectories:

Directory	PNG image size (pixels)
/lco640	16 x 16
/lco800	17 x 17
/lco1024	27 x 27

2. Copy the sample file "slmahdconfig.ini" from the directory **/siemens/sinumerik/hmi/template/cfg**.

10.4 Configuring the channel operational message

3. Place the file in the following directory:
 /oem/sinumerik/hmi/cfg or
 /user/sinumerik/hmi/cfg
4. Open the file and make the required settings:
 - Specify an individual icon by changing the file name of the icon for channel operational messages.
 - Specify a different period by changing the time value for the channel operational message.
5. Save the settings.
 The configurations are activated after booting.

Example of file "slmahdconfig.ini"

Configuration

The following default messages are intended when technical faults occur:

```
[CondStopIcons]
DefaultIcon = condwait.png
1 =  condstop.png      ; No NC ready
2 =  condstop.png      ; No mode group ready
3 =  condstop.png      ; Emergency stop active
4 =  condstop.png      ; Alarm with stop active
...
26 = condwait.png      ; Waiting for position control
...
30 = condwait.png      ; Waiting for safe operation
31 = condwait.png      ; No channel ready
...
46 = condwait.png      ; Rapid retraction started
...

[CondDelayTime]
DefaultDelayTime=1000
1 = 0                  ; No NC ready
2 = 0                  ; No mode group ready
3 = 0                  ; Emergency stop active
4 = 0                  ; Alarm with stop active
...
```

10.5 Deactivating program test

There are several program test options to test and run-in a part program that are executed using the "Program Test" function.

This function is active as standard. You can select the program test with the "PRT" check box in the "Program control" window in the "Machine" operating area.

Deactivating the program test

You can deactivate the program test using the following configuration machine data. "PRT" is no longer displayed in the status line.

MD51039 \$MNS_PROGRAM_CONTROL_MODE_MASK		Options for machine - program control
Bit 0 = 0	Function program test not available	

Additional information

Additional information about the test options is provided in the Basic Functions Function Manual.

10.6 Display articulated joint position STAT and rotary axis position TU

Display STAT and TU in the "MCS" window

If you want to display the joint position of the machine with the value STAT and the position of the rotary axes with the value TU in the "Machine" operating area for Cartesian point-to-point or PTP traversing, set the following channel-specific configuration machine data $\neq 0$:

MD52032 \$MCS_STAT_DISPLAY_BASE		Number base for display of the joint position STAT
= 0	No display, value from MD51032 effective (default)	
= 2	Display as binary value	
=10	Display as decimal value	
= 16	Display as hexadecimal value	

MD52033 \$MCS_TU_DISPLAY_BASE		Number base, display of the rotary axes TU position
= 0	No display, value from MD51033 effective (default)	
= 2	Display as binary value	
=10	Display as decimal value	
= 16	Display as hexadecimal value	

The settings in MD52032 and MD52033 also work for Teach In.

Additional information

You can find additional information about STAT and TU in:

- Chapter "Activating the "Teach In" function (Page 177)"
- Transformations Function Manual

10.7 Activating the "Teach In" function

Activate Teach In

The Teach In function is activated in part via the general configuration machine data.

Settings

MD51034 \$MNS_TEACH_MODE	
Bit 0 = 1	The "Progr. teach in" softkey is displayed. The approached position is taken into the program with the "Accept" softkey. (default)
Bit 1 = 1	The acceptance of the teach-in block can be blocked by the PLC. DB19.DBX13.0 = 0 Block is accepted DB19.DBX13.0 = 1 Block is not accepted

Access to the function still depends on access rights.

MD51045 \$MNS_ACCESS_TEACH_IN		Protection level TEACH IN
= 7	The protection level for the execution of traversing movements to MDA buffer / part program for TEACH IN is specified. (default)	

MD51050 \$MNS_ACCESS_WRITE_PROGRAM		Protection level write part program
= 7	The protection level for the writing of part programs is specified. (default)	

Set the channel-specific machine data:

MD20700 \$MC_REFP_NC_START_LOCK		NC-Start disable without reference point
= 0		

MD52207 \$MCS_AXIS_USAGE_ATTRIB		Attributes of the axes [n] channel axis number
Bit 14	Activate spindle in axis mode for Teach In	
= 1	A spindle in axis mode should also be teachable	

Activating Teach In

1. Set the machine data and initiate a reset.
2. Now switch to the AUTO and MDA operating mode.
3. Select the TEACH IN machine function.
4. Press the "Teach prog." softkey.

Teach In not active

If the "Prog. teach in" softkey is not active, the reasons can be as follows:

- The program is not in the stop, reset or interrupt state.
- Not all of the axes that require referencing are referenced.

Accept STAT and TU

If for the Cartesian point-to-point or PTP travel you want to import the joint position with the value STAT of the machine and the position of the rotary axes with the value TU into the traversing block for Teach In, click on the checkboxes STAT and TU in the "Settings" window under "Prog. teach in".

The checkboxes are only displayed if the following general configuration machine data is set to $\neq 0$:

MD52032 \$MNS_STAT_DISPLAY_BASE		Number base for display of the joint position STAT
= 0	no display	
= 2	Display as binary value (default)	
= 10	Display as decimal value	
= 16	Display as hexadecimal value	

MD52033 \$MNS_TU_DISPLAY_BASE		Number base, display of the rotary axes TU position
= 0	no display	
= 2	Display as binary value (default)	
= 10	Display as decimal value	
= 16	Display as hexadecimal value	

10.8 Block search

10.8.1 Activating block search mode

Block search mode settings

The following machine data can be used to set the possible variants for the block search with G-code programming:

MD51028 \$MNS_BLOCK_SEARCH_MODE_MASK	Bit mask for the available search modes
Bit 0 = 1	Block search with calculation, without approach
Bit 1 = 1	Block search with calculation, with approach
Bit 4 = 1	Block search without calculation
Bit 5 = 1	Block search with test run

The following machine data can be used to set the possible variants for the block search in a JobShop program (ShopMill, ShopTurn):

MD51024 \$MNS_BLOCK_SEARCH_MODE_MASK_JS	Bit mask for the available search modes (ShopMill, ShopTurn, single-channel)
Bit 0 = 1	Block search with calculation, without approach (default setting)
Bit 1 = 1	Block search with calculation, with approach Notice: In a ShopMill/ShopTurn program, the search is performed only on G code-blocks.
Bit 3 = 1	Skip EXTCALL programs
Bit 5 = 1	Block search with test run

MD52212 \$MCS_FUNCTION_MASK_TECH	General function screen for all technologies
Bit 3	Block search cycle for ShopMill / ShopTurn
= 0	The E__ASUB or F_S__ASUB cycles are not called in the block search cycle PROG_EVENT.SPF
= 1	The E__ASUB (under ShopMill) or F_S__ASUB (under ShopTurn) cycles are called in the block search cycle PROG_EVENT.SPF
Bit 5	Call block search function for SERUPRO
= 0	CYCLE207 is not called in the block search cycle PROG_EVENT.SPF.
= 1	In the block search cycle PROG_EVENT.SPF (for block search cycle with program test - SERUPRO), the cycle for SERUPRO (CYCLE207) is called. After block search with program test (SERUPRO), cycle CYCLE207 triggers the output of the collected machine commands.
Bit 15	Do not set \$MC_TOOL_CARRIER_RESET_VALUE after block search
= 0	In the block search cycle Prog_Event.SPF, the current tool holder is written into the machine data \$MC_TOOL_CARRIER_RESET_VALUE.
= 1	In the block search cycle Prog_Event.SPF, the current tool holder is not written into the machine data \$MC_TOOL_CARRIER_RESET_VALUE.
Bit 16	Do not automatically execute swivel plane after block search

10.8 Block search

= 0	In the block search cycle PROG_EVENT.SPF, the section for standard cycles: Swivel plane is executed
= 1	In the block search cycle PROG_EVENT.SPF, the section for standard cycles: Swivel plane is not executed
Bit 17	Do not automatically align turning tool after block search
= 0	In the block search cycle PROG_EVENT.SPF, the section for aligning the turning tool is executed.
= 1	In the block search cycle PROG_EVENT.SPF, the section for aligning the turning tool is not executed.

Note

The "Block search mode" softkey is only displayed, if, in the machine data MD51024 or MD51028, more than one version for the block search has been defined; for example "Block search with calculation without approach" and "Block search with calculation with approach".

When so doing, take into account that the search versions set active in the "Block search mode" window are also referred to the program.

10.8.2 Accelerated block search for execution from external

The accelerated block search function allows you to run the part program forward until you reach the block you require.

Settings

If you activate the "Skip EXCALL" function, then you must set the following general configuration machine data:

MD51028 \$MNS_BLOCK_SEARCH_MODE_MASK	Bit mask for the available search modes
Bit 3 = 1 (33H to 3BH)	

For an external main program, a block search without calculation is always a fast block search. Only the blocks from the search position are loaded.

10.9 Multi-channel support

In the "Machine" operating area, up to any four channels of a mode group can be displayed side by side. The number of channels is dependent on the display size and resolution of the operator panel used.

Using the multi-channel editor, for a multi-channel machine, you can open, change or generate programs simultaneously that are independent of one another from a time perspective. In this case, the programs involved are displayed next to one another in the editor.

Further, you have the option of simulating the programs before they are actually processed at your control.

In addition, you can align the programs according to synchronization points.

View options of the operator panel

The operator panel supports the following views:

Operator panel	Maximum number of channels
OP12	2 channels
OP15	3 channels
OP15 black	4 channels
OP19	4 channels
TOP 1500	4 channels
TOP 1900	4 channels
TOP 2200	4 channels

Precondition

- Multi-channel data only involve machines where the first technology is turning.
- For multi-channel machine, the following data must be the same for all channels:
 - Measurement unit
 - Zero offset (e.g. G54)
 - Z value of the zero offset (optional)
 - Blank
 - Speed limitation
- Further, the following JobShop-specific data must be the same for all channels:
 - Retraction plane (one each for the main and counterspindle)
 - Tailstock (one each for the main and counterspindle)
 - Tool change point (one each for the main and counterspindle)
 - Safety clearance
 - Climbing and conventional

Creating a multi-channel program

For multi-channel machining, you require a job list with the following data:

- Program names
- Program type
- G code
- ShopTurn program
- Channel assignment



Software option

You require the "ShopMill/ShopTurn" option to generate and edit ShopTurn/ShopMill programs.

After you have created a job list, in the "multi-channel data" parameter screen, you can combine the data from the G code and JobShop, which is then saved as cycle call in the job list. The "multi-channel data" parameter screen is displayed as soon as at least one ShopTurn program is contained in a job list.

Only programming G code programs

If the job list only contains G code programs, then you can deactivate the "multi-channel data" function. To do this, set the following machine data:

MD51228 \$MNS_FUNCTION_MASK_Tech		General function screen for all technologies
Bit 0	G code programming without multi-channel data	
= 1	Multi-channel data is not listed for job lists that only contain G code programs. The "Multi-channel data" softkey is not displayed.	

10.10 Manual machine

General information

"Manual machine" allows you to work with large cycles in manual mode without having to write programs especially for this purpose.



Software option

You require the following software option in order to use this function:
"ShopMill/ShopTurn"

Activation

MD52212 \$MCS_FUNCTION_MASK_TECH	General function mask for all technologies
Bit 8	Manual machine (ShopMill/ShopTurn)

Enables

MD52214 \$MCS_FUNCTION_MASK_MILL	Function mask for milling
Bit 5	Enable spindle control, tool spindle
= 0	via the NC/PLC interface
= 1	via the user interface
Bit 6	Enable spindle control, rotating spindle
= 0	via the NC/PLC interface
= 1	via the user interface

MD52218 \$MCS_FUNCTION_MASK_TURN	Turning function screen
Bit 3	Enable spindle control, main spindle
= 0	via the NC/PLC interface
= 1	via the user interface
Bit 4	Enable spindle control, counterspindle
= 0	via the NC/PLC interface
= 1	via the user interface
Bit 5	Enable spindle control, tool spindle
= 0	via the NC/PLC interface
= 1	via the user interface

SD43200 \$SA_SPIND_S	Speed for spindle start using NC/PLC interface signal; value outputs using the operating software
SD43202 \$SA_SPIND_CONSTCUT_S	Cutting speed for spindle start using NC/PLC interface signal; value outputs using the operating software
SD43206 \$SA_SPIND_SPEED_TYPE	Spindle speed pipe for spindle start using NC/PLC interface signal; value outputs using the operating software

Additional parameter assignments

We recommend the following additional parameter assignments:

Handwheel	
MD11346 \$MN_HANDWH_TRUE_DISTANCE = 3	Handwheel path or velocity specification
MD11602 \$MN_ASUP_START_MASK bit 0, 3 = 1	Ignore stop conditions for ASUB
MD20150 \$MC_G_CODE_RESET_VALUE [7] = 2	Delete position of the G groups; run-up G54 active
MD20624 \$MC_HANDWH_CHAN_STOP_COND = 0xFFFF	Definition of the behavior of traveling with handwheel, channel-specific
MD32084 HANDWH_STOP_COND = 0x7FF	Behavior, handwheel travel
MD52212 FUNCTION_MASK_TECH Bit 9 = 1	Function screen across technologies; work offset via softkey

Note

If, in machine data MD52212 FUNCTION_MASK_TECH bit 9 is set, the "WO selection" softkey is displayed in the "Work Offset – G54 ... G599" window.

Working area limits	
MD28600 \$MC_MM_NUM_WORKAREA_CS_GROUPS > 0	Number of coordinate system-specific working area limits
MD20150 \$MC_GCODE_RESET_VALUES[59] = 2	Delete position of the G groups; activate working area limits of the group

Note

If \$MC_GCODE_RESET_VALUES[59] = 2 is set in the MD20150 machine data, the "Limit stops" softkey is displayed in the "Manual Machine" window. This requires that \$MC_MM_NUM_WORKAREA_CS_GROUPS also has the value 1 for MD28600.

Feedrate	
SD42600 \$SC_JOG_FEED_PER_REV_SOURCE = -3	Revolutional feedrate control in JOG mode
SD43300 \$SA_ASSIGN_FEED_PER_REV_SOURCE [X axis] = -3	Revolutional feedrate for positioning axis X
SD43300 \$SA_ASSIGN_FEED_PER_REV_SOURCE [Z axis] = -3	Revolutional feedrate for positioning axis Z

Note

Ensure that the axis-specific setting data SD43300 SA_ASSIGN_FEED_PER_REV_SOURCE are set the same.

Additional information

Additional information about working area limitation and working with the manual machine is provided in the:

- Turning/Milling Operating Manual
- NC Programming Programming Manual

10.11 User status display (OEM)

Function

User icons can be displayed in the Machine operating area in the second line in the header. In this case, the program name is displayed in the right-hand field of the third line in the header. Active hold conditions hide the program name.

The display of the user icons is controlled via PLC bits. The icons are provided in the form of PNG files and are stored in the file system in accordance with their resolution under: `/user/sinumerik/hmi/ico/ico640`, etc. For the display of user icons **in the header, there are a maximum 16 positions** available.

Configuration

The user icons are configured in the `slmahdconfig.ini` file in Section [UserIcons]. The following data is required:

- The start address of the PLC double word with the bits to control the display of the user icons.
- For each bit used, the file name of the icon and the position at which the icon should be displayed.

Alternatively, you can use the following parameters for the definition:

- **USER_ICON_BASE**
This means that 32 bits are available with UI_0 (highest bit) to UI_31 (lowest bit).
Example: `USER_ICON_BASE=DB80.DBB0`
⇒ `UI_0 = DB80DBX3.0` and `UI_31 = DB80.DBX0.7`
- **USER_ICON_BASE256**
This means that 256 bits are available with UI_0 (highest bit) to UI_255 (lowest bit).
Example: `USER_ICON_BASE256=DB19.DBB80`
⇒ `UI_0 = DB19.DBX111.0` and `UI_255 = DB19.DBX80.7`

Example

```
[UserIcons]
USER_ICON_BASE=DB19.DBB80
; set the start byte of the PLC double word that displays the icons (DB19.DBD80)
UI_0 = icon1.png,4
; show icon1.png on position 4 if bit 0 (DB19.DBX83.0) is set
UI_1 = icon2.png,6
; show icon2.png on position 6 if bit 1 (DB19.DBX83.1) is set
```

Offset

With a **non-unique** selection (bits for multiple identifiers whose image is to be displayed at the same position):

The image with the lower identifier number is superimposed with the image with the higher identifier number for the same position. Non-unique selection can also be used with less than 16 active selection bits. The PLC can deliberately use this superimposition to overlay less important displays (with lower identifier numbers) with important displays (high identifier numbers).

Note

If two HMI applications are assigned to one NC/PLC unit (M:N), the PLC must first determine from the interface which of the HMI interfaces is active. Icons can be requested by the PLC for the active HMI application only.

Possible applications

With a **unique selection**, a maximum of 16 bits are set simultaneously in the four selection bytes for each of the different positions.

- 32 alternative images for a position, each selected with a different bit (currently only one active selection bit)
- Two alternative images for each of the permissible 16 positions, each position requires two of the 32 selection bits (maximum 16 active selection bits at any one time)
- Combination thereof with a maximum total of 32 images for the maximum 16 positions (maximum of 16 active selection bits at any one time)
- More than 16 selection bits.

10.12 Configuring the offset display

Configuring the screen display

Overrides resulting from handwheel offsets (DRF) or tool length corrections from the value of system variable \$AA_TOFF can be directly displayed on the screen.

The screen display for the override is configured using the following channel-specific machine data:

MD52210 \$MCS_FUNCTION_MASK_DISP		Function screen display
Bit 14	Display DRF offset under Machine	
Bit 15	Display tool offset (\$AA_TOFF) under Machine	

10.13 Activate machining time recording

If you want to record and store the machining time in Automatic mode, you can make the settings on the user interface.

Additional information

Additional information about the setting is provided in the
Universal/Turning/Milling/Grinding Operating Manual

Activating the time recording

To use the function, the following channel machine data must be so set in all channels, even if the machining time recording is not activated for all channels:

MD18370 \$MN_MM_PROTOC_NUM_FILES[1]	Maximum number of log files
= 2	For OEM applications

MD18371 \$MN_MM_PROTOC_NUM_ETPD_STD_LIST[1]	Number of standard ETPD data lists
= 6	Number of standard data lists in the OPI module ETPD that are needed for Trace system functions.

MD28300 \$MC_MM_PROTOC_USER_ACTIVE[1]	Activate logging for one user
= 1	For system functions

MD28302 \$MC_MM_PROTOC_NUM_ETP_STD_TYP[1]	Number of ETP standard event types
= 5	Number of standard event types in the OPI module ETP that are needed

Note

Machine data MD18370, MD18371 and MD28302 are still valid for recording machining time when they are assigned higher values.

Simulation and simultaneous recording

11.1 Simulation overview



Software option

You require the "3D simulation 1 (finished part)" option for the 3D representation of the simulation.

Simulation is supported with its own program interpreter (SNCK) and a separate simulation-data environment in SINUMERIK Operate. The SNCK considers the complete syntax of the SINUMERIK control family, including the possibility of incorporating special user options on the machine by comparing data with the NC environment. The simulation data can be matched statically as required with the NC environment (initialization data, macros, user data, tool data, machining cycles) or also dynamically when tool data or machining cycles are changed.

Machining simulations, with emphasis on the drilling, milling, turning and grinding technologies, can be performed in the workpiece coordinate system for certain machine kinematics on the user interface of the controller:

- The simulation of the finished part is performed with the real NC data.
- The NC data is automatically compared at each change of the part program.
- The simulation allows a dynamic representation of the machining, even for active 5-axis transformation (TRAORI) and swiveled planes.
- Turning on milling machines.
- Simulation of a machining channel for conventional milling machines.
- Simulation of up to four machining channels for turning machines with B axis.
- Intelligent determination of the block times and the program execution time.
- Very fast graphical representation through the continuous refinement of the workpiece.
- Optimum resolution for each selected picture area.
- Any sections are possible.
- In parallel to the machining of one workpiece, the machining of another workpiece can be simulated (as of NCU 720.x).
- 3D representation of simulation (option).

General conditions for the simulation

- Very fast simulation result, this means, however, low dynamic resolution.
- For complex representations, fine recording is too slow or does not run for very complex parts.
- "Quickview" for mold-making part programs.
- The simulation cannot be used for compile cycles with special kinematics.

- Compile cycles are supported only to a limited extent.
- Blank CAD data cannot be imported (for example, for castings).
- Couplings cannot be simulated. (coupled motion, axial master-value coupling, electronic gearbox):
 - Coupled motion: TRAILON(<following axis>, <leading axis>, <coupling factor>)
 - Axial master-value coupling: LEADON(Faxis, LAxis, curve table n) actual value and setpoint coupling
 - Electronic gearbox: EGDEF(FA, LA1, coupl.1, LA2, coupl.2, ... LA5, coupl.5), EGON, EGONSYN, EGONSYNE
- Reference point approach G74 is not operative during simulation.
- The following is not supported:
 - Axis container
 - Dependencies on part programs and PLC
 - Multiple clamping
 - CNC function Synchronized actions for safe programmable logic (SPL) in the NC
- Different technologies in different channels with different axis coordinate systems are not fully supported.
- A 3D simulation is not possible for the grinding technology.
- The software limit switches are not evaluated:
 In a manufacturer cycle for the tool replacement, the "Software limit switch + the Z axis" machine data is used as replacement position:
 GO Z=\$MA_POS_LIMIT_PLUS[Z]-0.1
 This position is not used in the simulation, however, but rather the default setting for the machine data = 1e8 = 100.000.000. This specified position is traversed in the simulation. This makes the simulation very slow and causes the machining time to explode, e.g. 555 hours rather than 2 minutes.
- Program start in the simulation:
 If MD22622 \$MCS_DISABLE_PLC_START is set in a channel, then the channel is not automatically started in the simulation. It can then only be started from another channel using the part program command "START". This function is not available for the SINUMERIK 828D.
- Alarm display in the simulation:
 Alarms are output in the simulation exactly the same way as alarms in the normal program execution, but no more than five alarms are displayed (above the graphic, to distinguish them from the machine alarms).
 If a different error signaling behavior (e.g. syntax error) occurs between simultaneous recording and simulation, then, for example, the reason can be due to the hardware access operations in the programming. The simulation does not access the hardware, however, internally it reads the input with 0 and is then exited. On the other hand, for simultaneous recording, an alarm is output.

11.2 Setting the technology for simulation

Turning technology

Examples of machine kinematics:

- Conventional turning with two geometry axes
- Three spindles: Main spindle, counterspindle, tool spindle
- Counterspindle slides, tailstock as NC axis
- B axis: Aligning turning tools in the tool spindle
- Milling with geometry axes: TRANSMIT, TRACYL, TRAANG

Machine data for the turning technology:

MD52200 \$MCS_TECHNOLOGY = 1	Turning technology
MD52000 \$MCS_DISP_COORDINATE_SYSTEM = 34	Position of the coordinate system (example)

Milling technology

Examples of machine kinematics:

- Milling with five axes: Swivel/TRAORI
- Swivel head change

Machine data for the milling technology:

MD52200 \$MCS_TECHNOLOGY = 2	Milling technology
MD52000 \$MCS_DISP_COORDINATE_SYSTEM = 0	Position of the coordinate system (example)

Grinding technology

Machine data for the grinding technology:

MD52200 \$MCS_TECHNOLOGY = 3	Cylindrical grinding technology
MD52200 \$MCS_TECHNOLOGY = 4	Surface grinding technology
MD52000 \$MCS_DISP_COORDINATE_SYSTEM = 0	Cylindrical grinding and surface grinding with moving column (example)
MD52000 \$MCS_DISP_COORDINATE_SYSTEM = 6	Surface grinding with table machine (example)

Meaning of the axes

MD52206 \$MCS_AXIS_USAGE[n]	Meaning of the axes in the channel [n] channel axis number
= 0	No special meaning
= 1	Tool spindle (rotating tool)

= 2	Auxiliary spindle (rotating tool)
= 3	Main spindle (turning)
= 4	C axis of the main spindle (turning)
= 5	Counterspindle (turning)
= 6	C axis of the counterspindle (turning)
= 7	Linear axis of the counterspindle (turning)
= 8	Tailstock (turning)
= 9	Back rest (turning)

Note

To prevent errors occurring, the same axis must be defined as main or counterspindle for all channels.

Enter the direction of rotation for the rotary axes that are not configured in a tool holder or a 5-axis transformation via the following channel-specific machine data.

MD52207 \$MCS_AXIS_USAGE_ATTRIB[n]		Attributes of the axes [n] channel axis number
Bit 0	Rotates around 1st Geometry axis (for rotation axes)	
Bit 1	Rotates around 2nd Geometry axis (for rotation axes)	
Bit 2	Rotates around 3rd Geometry axis (for rotation axes)	
Bit 3	Reversal of direction of rotation (for rotary axes)	

The MD52290 \$MCS_SIM_DISPLAY_CONFIG machine data acts only on the OP019. It has no significance for SINUMERIK 828D.

MD52290 \$MCS_SIM_DISPLAY_CONFIG		Position of the status display of the channel in the simulation.
Bit 0	Upper left-hand corner	
Bit 1	Upper right-hand corner	
Bit 2	Lower left-hand corner	
Bit 3	Lower right-hand corner	

In the channel-specific machine data, for at least one geometry axis per channel, enter a value other than 0.0, e.g. 0.001. If the value is 0.0, the system assumes that this parameter has still not been set.

MD53230 \$MCS_SIM_START_POSITION		Axis position when starting the simulation
Simulation is only possible if a value not equal to 0 has been set for at least one geometry axis.		

Deactivating simulation

The following machine data must be set to deactivate the simulation:

MD51226 \$MNS_FUNCTION_MASK_SIM		Simulation function screen
Bit 1 = 1	Deactivating simulation	
Bit 10 = 1	Hide zero point symbol	

Simulation from kinematic chain

The following machine data must be set to use the simulation from kinematic chains:

MD51226 \$MNS_FUNCTION_MASK_SIM	Simulation function screen
Bit 22	Machine model for simulation from kinematic chain (also without collision avoidance)

Tool change time

The following machine data defines the estimated time for a tool change in the simulation:

MD10190 \$MN_TOOL_CHANGE_TIME	Tool change times for simulation
= 0	Seconds (default value 0)

The value only replaces times that are principally not incurred for a simulated tool change, e.g. wait times for PLC commands (M206).

Traversing commands are added to the calculated time for the duration of the simulation if the commands are included in the tool change cycle.

Add the following example to the programming in the tool change cycle, which means that the value from MD10190 can be incorporated as total tool change time in the estimated simulation time:

```
IF $MN_SIM_ENVIRONMENT B_AND 'B100'
  M206 ; see MD 22560 $MC_TOOL_CHANGE_M_CODE
  RET
ENDIF
```

11.3 Simultaneous recording overview



Software option

You require the option "Simultaneous recording (real-time simulation)" for the "Simultaneous recording" function.



Software option

You require the "ShopMill/ShopTurn" option to display the tailstock



Software option

You require the "3D simulation 1 (finished part)" option for the 3D representation of the simultaneous recording function.

During machining, the tool paths can be simultaneously recorded on the display of the controller in a three-side view or 3D view. Workpiece graphics and views correspond to the graphic simulation.

Note

To prevent an incomplete representation, you must activate the simultaneous recording prior to the NC start.

Example: Activating the tailstock representation in the spindle chuck data

Procedure:

1. Make the tailstock visible by making the selection in the program.
2. Specify the tailstock dimensions:
Select in the operating area "Parameters" → "Setting data" → "Spindle chuck data", and enter the "ZR" and "XR" parameters for the tailstock length and tailstock diameter.
The tailstock dimensions are written into the following machine data:

MD52218 \$MCS_FUNCTION_MASK_TURN	Turning function screen
Bit 2 = 1	Tailstock enable: The tailstock becomes visible if selected in the "tailstock" program.

MD53240 \$MAS_SPINDLE_PARAMETER[i]	Spindle chuck data in mm
[0]: Chuck dimension [1]: Stop dimension [2]: Jaw dimensions	

MD53241 \$MAS_SPINDLE_CHUCK_TYPE	Spindle jaw type
0 = clamp from the outside 1 = clamp from the inside	

MD53242 \$MAS_TAILSTOCK_PARAMETER[i]	Tailstock data in mm
[0]: Tailstock dimension [1]: Tailstock length	

Activating the machining time display

Timers are provided as system variables in the Program runtime function. While the NC-specific timers are always activated (for time measurements since the last controller power-up), the channel-specific timers must be started via the following channel-specific machine data.

MD27860 \$MC_PROCESSTIMER_MODE	Activate the program runtime measurement.
Bit 0 = 1	The measurement of the total runtime for all part programs is active (\$AC_OPERATING_TIME).
Bit 1 = 1	The measurement of the actual program runtime is active (\$AC_CYCLE_TIME).
Bit 4 = 1	Measurement also during active dry run feedrate.
Bit 5 = 1	Measurement also during program test.

11.4 Clamping a blank

The blank clamping function allows you to select and specify in more detail the clamping location for the blank.

You require this function if your machine satisfies one or more of the following requirements:

Requirements

- The machine has several clamping options available for selection.
- The machine has a clamping option that does not point in the Z direction as standard (e.g. a boring mill).

Under the following circumstances, you can specify the position and orientation of the rotary axes in the machine data MD53220 and MD52207:

- The position and orientation of the rotary axis is offset against the MCS zero point, but not specified by a tool holder or a TRAORI.
- In a turning machine, the reference points of the main spindle or counterspindle are offset against the MCS zero point in X or Z.
- The counterspindle cannot be traversed with a saddle, but rather is at a fixed position.

In order that for simulation / simultaneous recording, the rotary axes are displayed at the correct location, their positions in the machine coordinate system must be specified using the following machine data:

MD53220 \$MAS_AXIS_MCS_POSITION[n]	Position of the axis in the MCS [n] 0 = X, 1 = Y, 2 = Z
------------------------------------	--

Additional information about the transformation of a rotary axis is provided in Chapter "Technologies and cycles (Page 413)".

Function

Set the following channel-specific machine data:

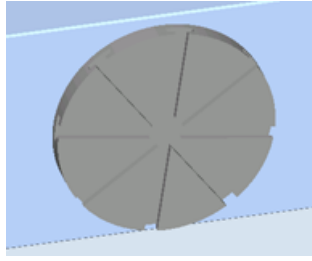
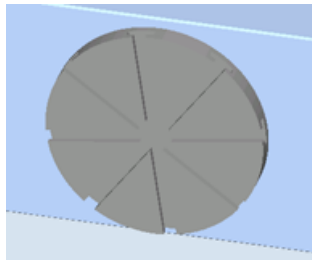
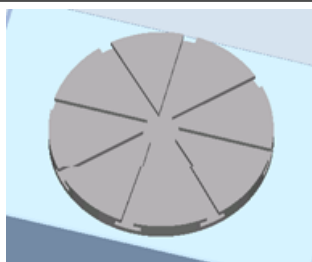
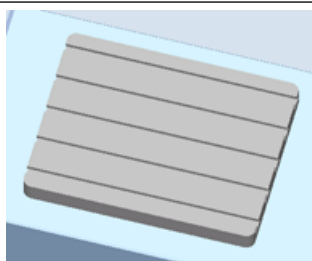
MD52207 \$MCS_AXIS_USAGE_ATTRIB[n]		Attribute of the axes in the channel [n] channel axis number
Bit 0	Rotates around 1st Geometry axis (for rotation axes)	
Bit 1	Rotates around 2nd Geometry axis (for rotation axes)	
Bit 2	Rotates around 3rd Geometry axis (for rotation axes)	
Bit 8	Lists rotary axis for blank clamping (on milling machines)	
Bit 13	Position of the axis for blank selection from active work offset (with rotary axes)	
= 0	When simulation or simultaneous recording are started, the mountable rotary axis is moved to the position from MD53220.	
= 1	With a blank command, The mountable rotary axis is moved into the zero point of the currently active work offset.	

MD52214 \$MCS_FUNCTION_MASK_MILL		Function mask for milling
Bit 1	Offer fixed table for blank clamping (on milling machines)	

Take the machine configuration for MD20080 from the example.

Function options

In the program header, a blank can be optionally set to A, B, C and table clamping:

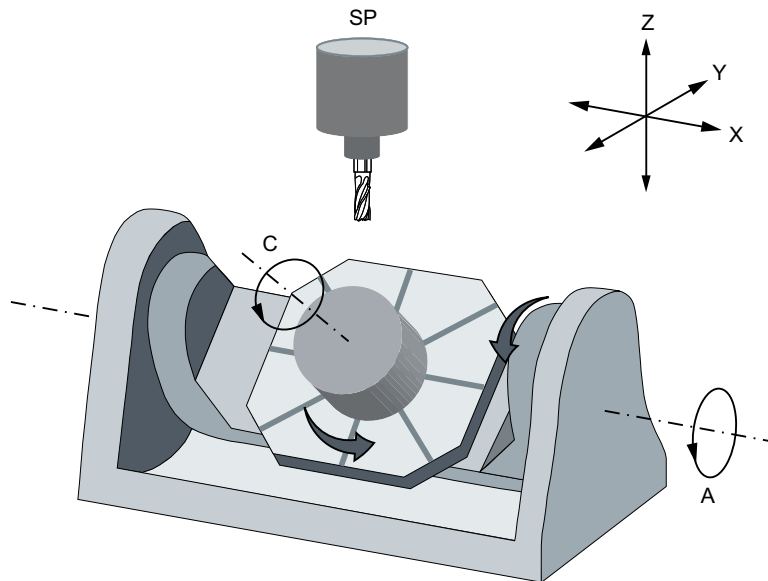
Clamping	View	Machine data
A axis		MD52207 \$MCS_AXIS_USAGE_ATTRIB bit 0 and bit 8 = 1
B axis		MD52207 \$MCS_AXIS_USAGE_ATTRIB bit 1 and bit 8 = 1
C axis		MD52207 \$MCS_AXIS_USAGE_ATTRIB bit 2 and bit 8 = 1
Table		MD52214 \$MCS_FUNCTION_MASK_MILL bit 1 = 1

Note

To obtain the selection option in the program header, two rotary axes must be defined for the raw part clamping.

Example for the machine configuration

Example for a machine configuration when the A axis should rotate at the X axis:



MD20080 \$MC_AXCONF_CHANAX_NAME_TAB[n]		Channel axis name in channel [n]
[0]	X	
[1]	Y	
[2]	Z	
[3]	Spindle	
[4]	A	
[5]	C	

MD52207 \$MCS_AXIS_USAGE_ATTRIB[4]		Attribute of rotary axis A
= 181H		
Bit 0 = 1	Rotates around 1st Geometry axis (for rotation axes)	
Bit 8 = 1	Lists rotary axis for blank clamping (on milling machines)	

Additional information

Additional information about setting ShopMill is provided in the
Milling Operating Manual

Spindle functions

12.1 Spindle control

You can select from the following spindle control settings:

End of program

The following M functions are used for the end of program:

M function from MD10714 \$MN_M_NO_FCT_EOP	Main program end	Spindle continues to run
M2, M30	End of main program and return jump to beginning of program	Spindle stops
M17	End of subprogram and return jump into the main program	Spindle continues to run

If machine data MD10714 \$MN_M_NO_FCT_EOP is not equal to zero, then a distinction is made between M2 / M30 (program end of an NC program) and the M function set in MD10714 \$MN_M_NO_FCT_EOP.

Example

MD10714 \$MN_M_NO_FCT_EOP = 32 means "M32" for the program end of a program generated in the "JOG" or "MDI" operating mode.

Among other things, this functionality is required in order to continuously start the spindle in manual operation (e.g. for scratching).

Configuring keys

If you implement a manual control using the keys on the machine control panel, then this is realized via the following interface signals in the spindle data block:

DB3x.DBX30.0	Spindle stop
DB3x.DBX30.1	Spindle start, clockwise rotation
DB3x.DBX30.2	Spindle start, counterclockwise rotation

The spindle can be started and stopped in the following state:

DB21.DBX35.7 = 1	Channel in reset state
DB21.DBX35.6 = 1	Channel state interrupted
DB21.DBX35.3 = 1	Program state interrupted

Note

If the spindle must be stopped when the program is running, then set the interface signal DB3x.DBX4.3, "Feedrate stop/spindle stop" in the user PLC.

Additional settings:

MD11450 \$MN_SEARCH_RUN_MODE		Parameterization for search run
Bit 1 = 1	Automatic ASUB start after output of the action blocks (see also MD11620 \$MN_PROG_EVENT_NAME). Alarm 10208 is not output until the ASUB is completed.	

More information

A detailed description on how to configure the spindle is provided in the Function Manual Axes and Spindles.

Direction of rotation (only for ShopTurn)

In the ShopTurn user interface, ensure that the direction of rotation of the spindle and C axis is correctly displayed and when programming ShopTurn functions, that the correct direction of rotation is executed. You must base these settings on the actual direction of rotation of the spindle / C axis on the machine.

- If you use the functions cylinder surface transformation and face machining, then a precondition is that the function was correctly commissioned.
See Cylinder surface transformation (TRACYL_K/TRACYL) (Page 459)
- The direction of rotation of the spindle / C axis for the M function M3 that is displayed in the ShopTurn interface is defined in part using machine data:
See: Defining the direction of rotation in Section: Setting-up ShopTurn cycles for turning (Page 448)
- The direction of spindle rotation (M3 / M4) is assigned to the positive direction of rotation of the C axis via interface signal DB31, ... DBX17.6. The bit defines whether M3 and C+ rotate in the same direction (= 0) or in opposite directions (= 1). The corresponding setting options is provided in the following sections:
 - Direction of rotation of counterspindle Setting up the counterspindle under ShopTurn (Page 453)
 - Direction of rotation of main spindle Setting-up ShopTurn cycles for turning (Page 448)

12.2 Analog spindle

Machine axis index for analog spindle

For a spindle which is not assigned to any drive (FDD, MSD), the utilization display can be controlled via a PLC.

In order that the operating software identifies the spindle as analog spindle, enter the axis index of the analog spindle in the following machine data:

MD51068 \$MNS_SPIND_DRIVELOAD_FROM_PLC1	Machine axis index spindle 1 Utilization display from the PLC
	Machine axis index of a spindle (analog) that draws the data for the utilization display in the T,F,S window from the PLC (DB19.DBB6).

MD51069 \$MNS_SPIND_DRIVELOAD_FROM_PLC2	Machine axis index spindle 2 Utilization display from the PLC
	Machine axis index of a spindle (analog) that draws the data for the utilization display in the T,F,S window from the PLC (DB19.DBB7).

12.3 Spindle diagnostics

12.3.1 Spindle diagnostics



Software option

For the "Spindle diagnostics" you require the "S-Monitor" option.

Main spindle drives are monitored via various status signals. The DRIVE-CLiQ connection at the spindle can be used to evaluate these signals in the drive. The status signals are evaluated for more effective diagnostics of the spindle operating states. The following information is displayed on the user interface with the aid of the "S-Monitor" software option:

- Operating hours
- Temperatures
- Speed/torque
- Clamping system
- Logistics data

Requirements

- A spindle with DQI encoder: r0459, bit 14 = 1.
- Drive telegram 139 is configured for the spindle.
- The spindle functionality for the machine axis is present when MD35000 \$MA_SPIND_ASSIGN_TO_MACHAX > 0
The value corresponds to the spindle number.

More information

More information on the spindle with SMI 24 (Weiss spindle) is provided in the Axes and Spindles Function Manual

Data overview

The "S1 Spindle Diagnostics" window shows the following information:

Parameter	Value
Operating hours • Spindle under control • Spindle under speed	h
Number of clamping cycles (tool change) Definition of a clamping cycle: Released clamping state [3] → Clamped clamping state [7, 8 or 10] → Released clamping state [3].	
Motor temperature	°C

Parameter	Value
Clamping state (sensor 1)	V
Piston free (sensor 4)	
e.g. defined rotary angular position of the shaft (sensor 5)	Yes/No
Maximum speed	rpm

Procedure

1. Select the "Diagnostics" operating area.
2. Press the menu forward key.
3. Press the "Spindle diagnostics" softkey to obtain a data overview.
The "S1 Spindle Diagnostics" window opens.

Note

If several spindles are in operation, select the desired spindle using the "Spindle +" or "Spindle -" softkey.

See also

Tool change with hybrid spindle from the company Weiss (<https://support.industry.siemens.com/cs/ww/en/view/109475707>)

12.3.2 Temperatures

Which temperatures are evaluated and displayed depends on the number and the mounting location (e.g. for sensor S6, bearing temperature front) of the sensors installed in the spindle. The motor temperature is not displayed when the temperature sensor type parameter p0601 = 0 or 1.

Note

Temperature limits

The limit values displayed here refer to the spindle monitoring and have no effect on the drive parameter values set in the drive that apply for the shutdown response of the spindle. The temperature limit values are preset in the SMI24 and cannot be changed in this window. If necessary, you must adapt the shutdown limit values for the drive.

Up to three temperatures can be evaluated:

Signal	Sensor	Column/meaning	Description
Motor temperature (Page 207)	KTY	Actual	Current motor temperature. If an overtemperature protection is present and responds, the value 250° C is displayed.
Motor temperature Alarm		Limit	Stored threshold for motor overtemperature as of which an alarm is issued due to KTY motor overtemperature.
		Duration of the upper limit violation	Displays the accumulated hours during which an upper limit violation was present.
		Last upper limit violation	Displays the time stamp [date] and [time] at which the last upper limit violation was present.
		Number of upper limit violations	Accumulated number of upper limit violations.
Motor temperature Fault		Limit	Stored threshold for motor overtemperature as of which a fault is issued due to KTY motor overtemperature.
		Duration of the upper limit violation	Displays the accumulated hours during which an upper limit violation was present.
		Last upper limit violation	Displays the time stamp [date] and [time] at which the last upper limit violation was present.
		Number of upper limit violations	Accumulated number of upper limit violations.
Overtemperature protection	PTC	Actual	When the overtemperature protection responds, "Active" is displayed (in red). The value 250° C is displayed in the "Actual" column as motor temperature.
		Limit	Stored threshold for motor overtemperature as of which a fault is issued due to PTC winding motor overtemperature.
		Last upper limit violation	Displays the time stamp [date] and [time] at which the last upper limit violation was present.
		Number of upper limit violations	Accumulated number of upper limit violations.
Additional temperature (Page 208) (e.g. bearing temperature front)	S6 (KTY)	Actual	Current temperature at the measuring point.

Signal	Sensor	Column/meaning	Description
Additional temperature Alarm		Limit	Stored temperature threshold as of which an alarm is issued, e.g. due to bearing overtemperature.
		Duration of the upper limit violation	Displays the accumulated hours during which an upper limit violation was present.
		Last upper limit violation	Displays the time stamp [date] and [time] at which the last upper limit violation was present.
		Number of upper limit violations	Accumulated number of upper limit violations.
Additional temperature Fault		Limit	Stored temperature threshold as of which a fault is issued, e.g. due to bearing overtemperature.
		Duration of the upper limit violation	Displays the accumulated hours during which an upper limit violation was present.
		Last upper limit violation	Displays the time stamp [date] and [time] at which the last upper limit violation was present.
		Number of upper limit violations	Accumulated number of upper limit violations.

12.3.3 Motor temperature sensor

Shutdown response

The alarm and fault thresholds of the motor temperature sensor that are displayed on the user interface as limits, are stored in the SMI24. They are used for the statistical evaluation of the SMI24 and for the shutdown response of the drive. A delay time setting for the violation of the alarm threshold stored in the SMI24 until the fault is triggered is not relevant for the display.

Please note: The motor parameter values of p0604, p0605 (alarm/fault threshold) and the delay time p0606 are predefined and cannot be changed.

The delay time in p0606 has no effect on the values displayed on the user interface. This means: When the alarm threshold is violated and the delay time set in p0606 has expired, the "Motor temperature fault" signal does not change the "Last upper limit violation" display value and the "Number of upper limit violations" is not incremented.

The parameter values of p0604, p0605 (alarm/fault threshold) and p0606 (delay time) have an effect on the shutdown response of the spindle. The spindle is shut down when the fault threshold is violated or the alarm threshold is violated and the delay time set in p0603 has expired.

Currently, the delay time is not predefined by the SMI24. The parameter value of p0603 is set to the factory setting (240 s).

Alarms:

- 207015 = motor temperature sensor alarm
- 207016 = motor temperature sensor fault

12.3.4 Additional temperature sensor

Shutdown response

The alarm and fault thresholds of the additional temperature sensor that are displayed on the user interface as limits, are stored in the SMI24. They are used only for the statistical evaluation of the SMI24. A delay time setting for the violation of the alarm threshold stored in the SMI24 until the fault is triggered is not relevant for the display.

Please note: The parameter values of p4102[0..1] (alarm/fault threshold) and p4103 (delay time) are predefined and cannot be changed.

Changing the parameter values of p4102[0..1] (alarm/fault threshold) and p4103 (delay time) has no effect on the values displayed on the user interface.

The parameter values of p4102[0..1] (alarm/fault threshold) and p4103 (delay time) have an effect on the shutdown response of the spindle. The spindle is shut down when the fault threshold is violated or the alarm threshold is violated and the delay time set in p4103 has expired. These parameters can be adapted accordingly to prevent an unwanted shutdown of the spindle.

Currently, the delay time is not predefined by the SMI24. The parameter value of p4103 is set to the factory setting (0 s). This means: The timer is deactivated.

Alarms:

- 207017 = additional temperature alarm threshold violated
- 207018 = additional temperature fault threshold violated

12.3.5 Temperature histograms

The motor temperature and optionally additional temperatures, such as bearing temperature or housing temperature, are displayed in a histogram. The color coding indicates the following temperature ranges:

Color	Meaning
	Temperature range up to the first limit.
	Temperature range between the first and second limit.
	Temperature range above the second limit.

The heights of the individual bar fields correspond to the parameterized temperature ranges of the relevant temperature measuring point.

The specified times for the individual temperature ranges of a measuring point (sensor) are the operating hours under speed.

The currently measured temperatures are displayed below the bars.

12.3.6 Speed/torque

To check the loads on the spindle, the speed and the torque are recorded in a histogram as a function of the operating hours. The color coding indicates the following states:

- Light green: low load
- Green: rated load
- Yellow: high load
- Orange: critical load

The heights of the individual bars correspond to the percentage time shares (dwell time) in relation to the operating hours under speed. The accumulated number of operating hours under speed for the spindle are shown above or below the respective bar for the corresponding speed or torque range. The width of the bar corresponds to the evaluated speed or torque range.

Possible conclusions

- The speed histogram is an indication of the load on the bearings and rotary gland caused by the speed.
- The speed histogram is an indication of the load on the bearings caused by the stock removal forces. The relationship between torque and radial force changes depending on the tool diameter (lever arm), the milling arc (superimposition of the cutting forces of the individual cutting edges) and the cutting force coefficients (the stock removal force consists of cutting force, feedrate force and passive force - only the cutting force is acquired via the torque).

12.3.7 Clamping system

The diagnosis of the clamping system offers the following capabilities:

- Fast and robust detection of the clamping states
- Monitoring of the clamping task and the clamping system
- Sensors S1 and S4 in the spindle provide information about the clamping device.
- Sensor S5 detects a position, e.g. the defined rotatory angular position of the shaft.

Clamping states

The preset limits for the three clamping states are displayed in the upper section of the window.

The clamping state is defined for the specified voltage range of the analog output signal of sensor S1.

The values in the "Voltage min." and "Voltage max." columns indicate in which voltage range the analog signal of sensor S1 must lie for the corresponding clamping state.

The preset speed limitation "Speed max." specifies the maximum permissible speed for the clamping state and is limited to this by the drive.

Signal overview

The current state values of the sensors, the tool clamping, the speed setpoint and the active speed limitation are displayed in the signal overview.

Signal	Sensor	Description	Value	Meaning
State	S1	Clamping state	3	Released
			7 or 8	Clamped with tool
			10	Clamped without tool
Piston free	S4	Plunger sensing	Yes	Release plunger not in contact with the shaft.
			No	Release plunger in contact with the shaft.
Shaft in the change position	S5	Position sensing	Yes	For example, the shaft is located at a defined rotary angular position.
			No	For example, the shaft is not located at a defined rotary angular position.
Speed set-point		Specification of the speed		Speed specification by the user.
State		Clamping states	0	Sensor S1 not available or state values inactive.
			1	The state initialization is in progress.
			2	Released with signal (error state)
			3	Released
			4	Clamping with tool
			5	Releasing with tool
			6	Releasing without tool
			7	Clamped with tool and S4 = 0 (No)
			8	Clamped with tool and S4 = 1 (Yes)
			9	Clamping without tool
			10	Clamped without tool
			11	Clamped with signal (error state)

State bar diagram

The clamping state is displayed by a state bar. The ranges shown in green indicate the state ranges for "Clamped with or without tool" and "Tool released". The arrow marking indicates the current analog sensor voltage of sensor S1.

More information

For information on the associated interface signals (NC → PLC), refer to the following documentation:

PLC Function Manual.

Procedure

1. The "S1 Spindle Diagnostics" window is open.
The "S1 Clamping System" window is open without the "S-Monitor" software option.
2. Press the "Clamping system" softkey.
The "S1 Clamping System" window opens and displays the acquired data.
3. Press the "Statistics" softkey to read out the clamping times and perform a diagnosis of the clamping system.
The "S1 Clamping System Statistics" window opens and displays the acquired data.
- OR -
Press the "Back" softkey to return to the data overview.

12.3.8 Clamping system: Speed limits

For safety reasons and to protect the spindle, only maximum speeds are permitted for certain clamping states. The drive limits the spindle speed in the respective clamping state to the entered speed.

Clamping state	Meaning
Released	The tool clamping system is in contact with the release plunger. Please note: The release plunger presses with the release force on the clamping system.
Clamping	The tool clamping system is in the transition state from "Released" to "Clamped with tool".
Releasing from state "Clamped with tool"	The tool clamping system is in the transition state from "Clamped with tool" to "Released".
Releasing from state "Clamped without tool"	The tool clamping system is in the transition state from "Clamped without tool" to "Released".
Clamped with tool	The tool clamping system is in the "Clamped with tool" state.
Clamping without tool	The tool clamping system is in the transition state from "Clamped with tool" to "Clamped without tool".
Clamped without tool	The tool clamping system is in the "Clamped without tool" state.

You can adapt the preset speed limits to your requirements by pressing the "Change" softkey.

NOTICE
Damage to the spindle through too high a speed Changes to the preset speed limits can result in changes of the operating states and to damage on the spindle.

Procedure

1. The "S1 Spindle Diagnostics" window is open.
The "S1 Clamping System" window is open without the "S-Monitor" software option.
2. Press the "Clamping system" softkey.
The "S1 Clamping System" window opens and displays the acquired data.
3. Press the "Speed limitation" softkey to change the limit values for the speeds of the clamping states.
The "S1 Speed Limitations" window opens.
4. Press the "Change" softkey to enter the desired speed limits depending on the clamping state.
Confirm with "OK".

12.3.9 Clamping system: Diagnostic statistics

This window displays the statistics for clamping operations and speed violations.

Statistical data	Meaning
Number of correct clamping cycles	Accumulated number of correct clamping cycles with or without tool. Correct clamping cycle means: "Released" clamping state [3] → "Clamped" clamping state [7, 8 or 10] → "Released" clamping state [3]. A clamping cycle is considered to be correct when a clamping and subsequent release operation are performed via the appropriate clamping states (without "State return"). Starting from one clamping state, the next clamping state that can be reached must not be the previous state. There is no dependency on time.
Clamping time (without tool)	The time within a clamping operation between the clamping states "Tool released" and "Clamped without tool".
• Within tolerance	Accumulated number of clamping operations without tool that were within the specified time.
• Outside tolerance	Accumulated number of clamping operations without tool that were outside the specified time.
• Specification	Factory specification of the time for the clamping operation without tool.
• Current	Measured time for the last performed clamping operation without tool.
Clamped (without tool)	Diagnostics during the "Clamped without tool" clamping state.
• Speed violations	Accumulated number of events during which the spindle speed was greater than the set limit as delivered.

Statistical data	Meaning
Speed threshold	Limit for the spindle speed in the "Clamped without tool" clamping state (as-delivered value). Changing this speed limit via the diagnostics overview "S1 clamping system" → "Speed limits" → "Change" has no effect on the value specified here.
Faulty clamping/releasing operations (total)	Accumulated number of clamping operations that have not run through the clamping states "Released" clamping state [3] → "Clamped" clamping state [7, 8 or 10] → "Released" clamping state [3] without interruption. A clamping cycle is considered to be faulty when, starting from one state, the next state that is reached is the previous state again ("State return").

12.3.10 Clamping system: Clamping time statistics

This window displays the statistics for the determined clamping times.

Statistical data	Meaning
Last determined clamping time	Measured time for the last performed clamping operation. Definition of a clamping operation: "Released" clamping state [3] → "Clamped with tool" clamping state [7 or 8]. Clamping state 3 = Released; clamping state 7 = Clamped with tool and S4 = 0 (No); clamping state 8 = Clamped with tool and S4 = 1 (Yes)
Reference clamping time (with tool)	During the spindle start-up phase, the first 100 clamping operations are measured by the SMI24 and the minimum value, maximum value and the mean value determined.
Minimum	The shortest clamping time determined from the first maximum 100 clamping operations.
Maximum	The longest clamping time determined from the first maximum 100 clamping operations.
Mean	The mean clamping time determined from the first maximum 100 clamping operations.
Mean clamping time (without tool)	After the first 100 clamping times determined for the reference time, the mean values for the other measured clamping times are calculated.
24 h	Mean clamping time of the clamping cycles determined in the last 24 hours.
10 days	Mean clamping time of the clamping cycles determined in the last 10 days.
100 days	Mean clamping time of the clamping cycles determined in the last 100 days.

If a Power On of the SMI24 is performed during the start-up phase, the previously determined values are discarded. The counter for the first 100 clamping operations is set to zero and the reference times up to the 100th clamping operation can be determined again. After the start-up phase (first 100 clamping operations), the values of the reference clamping time are "frozen". Even after a Power On of the SMI24, the values remain stored and can no longer be changed.

12.3.11 Fetching the logistics data

Requirement

The spindle characteristics can only be read out with the "Service" access level.

Spindle characteristics

The following spindle manufacturer characteristics can be read out via DRIVE-CLiQ:

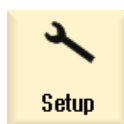
- Manufacturer's identifier
- Drawing number
- Serial number
- Date of manufacture
- Service date and service information (1...4):
The service information corresponds to the reference number for the service report from the WEISS Spindeltechnologie GmbH company.

Drive system

13.1 Commissioning of drives

Procedure

Once commissioning of the PLC has been completed, you can commission the SINAMICS drives via the user interface of SINUMERIK Operate.



1. Select the "Start-up" operating area.



2. Press the "Drive system" softkey.
The "Drive system overview" window opens.
A message is output whether the drive system has already been commissioned or not.

More information

The procedure for commissioning SINAMICS drives is provided in the Commissioning Manual CNC: NCK, PLC, drive.

Configuring alarms

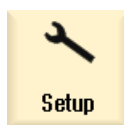
14.1 Creating alarm and message texts via the user interface

From the user interface, you can create and edit your alarm and message texts from the part program. In turn, the alarm and message texts are saved corresponding to their number in various text files.

Storage

The text files are created in the directory:
/oem/sinumerik/hmi/Ing

Procedure



1. Select the "Start-up" operating area.

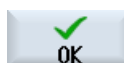


2. Press the "HMI" softkey.



3. Press the "Alarm texts" softkey.

The "Select File" window opens and offers the user-specific text files.



4. Select the desired file and press the "OK" softkey.

5. Enter the desired alarm number in the "Number" column.

Enter the desired alarm text in the "Alarm text" column.

Select the desired font color in the "Color" column.

In the column "PopUp" with "yes" or "no", select whether the alarm text should be displayed in a window that requires acknowledgment - or not.

- AND / OR -



Press the "Insert line" softkey.

A new line is inserted above your cursor.

- OR



Press the "Delete line" softkey to delete the selected line.



6. Press the "Search" softkey.

The "Search" window opens.

Enter the desired alarm text or the alarm number in the "Text" field.

14.1 Creating alarm and message texts via the user interface



Activate the "Case sensitive" checkbox if a distinction must be made between upper- and lower-case letters when entering text.

- OR

Press the "Search and replace" softkey.

The "Search and Replace" window opens.

Enter the search term in the "Text" field. Enter the replacing term in the "Replace with" field.



7. Position the cursor in the "Direction" field. Using the <SELECT> key, select the search direction (forwards, backwards).



8. Press the "OK" softkey to start search or search and replace.



Press the "Cancel" softkey if you wish to interrupt the action.



9. If you have entered the alarms with the help texts, press the "OK" softkey.

You will receive the message "The alarm texts have been saved and converted."

Restart SINUMERIK Operate

You must restart SINUMERIK Operate to ensure that the "color" and "PopUp" attributes take effect. Modified alarm texts, however, take effect immediately.

Further search options



The cursor jumps to the first entry of the selected alarm text file.



The cursor jumps to the last entry of the selected alarm text file.

Creating search directories

If you want a search to be made for alarm files in subdirectories other than the existing /lng directory, you have the following option:

1. Create the file "systemconfiguration.ini" in the following directory:
/oem/sinumerik/hmi/cfg
2. Create any subdirectory under /hmi, e.g. /oem_dir.
3. Create the following section in the configuration file "systemconfiguration.ini":
[oem_dirs]
OEM_3=oem_dir
4. Restart SINUMERIK Operate.
The subdirectory will now also be included in the search.

Foreign-language alarm and message texts

If you create foreign language alarm and message texts, switch to the desired language. All text files are automatically allocated the language code corresponding to the user interface language that has been selected. For instance, if you create alarm texts in the English user interface, then the text file is assigned the "eng" language code.

See also

Range of alarms (Page 237)

Creating OEM subdirectories (Page 616)

14.2 Configuring alarm and message texts via alarm text files

You have the option of creating customized alarm and message texts using alarm text files and adapting these.

The alarm texts are set up in standard format (".ts" format) by SINUMERIK Operate. The ".ts" format is XML-based.

You can create and edit these files not only with SINUMERIK Operate, but also externally on a PC.

Note

If you wish to edit alarm text files on a PC, use an editor supporting UTF-8 coding.

Note

Chinese alarm texts should only be implemented with character set GB2312.

Chinese logograms are not supported in Korean.

Creating and editing alarm texts

- Creating your own alarm texts
- Creating texts for indexed alarm parameters
- Creating part program message texts
- Changing alarm attributes
- Replacing standard alarm texts
- Converting alarm texts

14.2.1 Creating in-house alarm texts

Creating an alarm text file

1. You can copy a sample file "oem_alarms_eng.ts" from the following directory: **/siemens/sinumerik/hmi/template/lng**.
2. Store or create the file in the **/oem/sinumerik/hmi/lng** or **/user/sinumerik/hmi/lng** directory. Create a separate file for each country language that is supported.
3. Assign a unique name to the file, e.g. "my_alarms_eng.ts". You can freely select the file names with the exception of the language code and the extension.
The file name always ends with the language code of the particular language and always has the ".ts" extension; e.g. "my_alarms_deu.ts" for German or "my_alarms_eng.ts" for English.

Creating alarm texts

1. Open the "my_alarms_eng.ts" file.
2. For each alarm text, you must insert your own area in the file that is marked using the `<message>` tag.
3. The `<name>` tag contains the context names. Normally, you should not change the specified name "slaeconv".
4. The `<source>` tag contains the alarm number and the name of the alarm source (source URL). In the example "700000" is the alarm number and "/PLC/PMC" is the name of the alarm source. The possible alarm sources can be found in the tables in Chapter "Range of alarms (Page 237)".
5. The `<translation>` tag contains the alarm text.

Example:

```
<!DOCTYPE TS>
<TS>
  <context>
    <name>slaeconv</name>
    <message>
      <source>700000/PLC/PMC</source>
      <translation>First OEM alarm text</translation>
    </message>
    <message>
      <source>700001/PLC/PMC</source>
      <translation>Second OEM alarm text</translation>
    </message>
  </context>
</TS>
```

Registering the alarm text file

You still have to register your alarm text file so that the system knows your alarm texts during the program runtime:

1. You can copy a sample configuration file "oem_slavesvcadapconf.xml" from the following directory: **/siemens/sinumerik/hmi/template/cfg**.
2. Save the file in the directory **/oem/sinumerik/hmi/cfg** or **/user/sinumerik/hmi/cfg**

3. Assign the name "slaesvcadapconf.xml" to the file.
4. Open the file and in the <BaseNames> tag, enter the file name of the alarm text file without language code and file extension, e.g. "my_alarms", as "value".
The registration of your alarm text file starts, for example, with the name "OEM_BaseName_01".

Note

The names of the <BaseNames> tag can be freely selected. They must be unique in the system and must not clash with names used by Siemens.

The "Siemens_BaseName_01" name is reserved for Siemens.

Several alarm text files can also be registered. To do this, use names such as "OEM_BaseName_02", "OEM_BaseName_03", etc.

Example:

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<!-- Configuration of the Alarm & Event Service Adapter -->
<CONFIGURATION>
  <AlarmTexts>
    <BaseNames>
      <OEM_BaseName_01 type="QString" value="my_alarms"/>
    </BaseNames>
  </AlarmTexts>
  ...
</CONFIGURATION>
```

Restart SINUMERIK Operate

The files must still be converted into a binary format so that the alarm texts can be displayed during the program runtime. This data is only converted during run-up.

To do this, restart SINUMERIK Operate. In the same directory where the .ts files are located, files with the same name are created with the ".qm" file extension.

The result of the conversion is written to the "alarmtext_conversion.log" or "oem_text_conversion.log" file. Errors that occur during the conversion, such as syntax errors in a parameter file, are also written to the file.

This file is located in the "/user/sinumerik/hmi/log" directory.

Note

The conversion is only made if the .ts file is newer than the associated .qm file.

14.2.2 Creating texts for indexed alarm parameters

If a string, the so-called "Index identifier", is specified in the alarm text in pointed brackets after a space holder (e.g. "%1<OEM>"), the parameter itself is not inserted in the alarm text, but a text from another alarm text file, called an index text file. In this case, the alarm parameter value serves as index in order to select the text in the index file. The index text can, in turn, include parameters, also index parameters.

Note

Explanation for the "Index identifier" string

- "<" ≙ opening pointed bracket "<"
 - ">" ≙ closing pointed bracket ">"
-

Creating an index text file

1. You can copy a sample index text file "oem_indexparams_eng.ts" from the following directory: **/siemens/sinumerik/hmi/template/lng**.
2. Store or create the file in the **/oem/sinumerik/hmi/lng** or **/user/sinumerik/hmi/lng** directory. Create a separate file for each country language that is supported.
3. Assign a unique name to the file, e.g. "my_indexts_eng.ts". You can freely select the file names with the exception of the language code and the extension.
The file name always ends with the language code of the particular language and always has the ".ts" extension; e.g. "my_indexts_deu.ts" for German or "my_indexts_eng.ts" for English.

Creating index texts

1. Open the "my_indexts_eng.ts" file.
2. In the <name> tag, enter a name that you have selected, e.g. "my_context".
3. For each index text, a separate area must be inserted between the <message> and </message> tags.
4. The <source> tag contains the alarm parameter value, e.g. the values "1" and "2".
5. The <translation> tag includes the index text that is displayed if the alarm parameter involved has the value specified between <source> and </source>.

Example

```
<!DOCTYPE TS>
<TS>
    <context>
        <name>my_context</name>
        <message>
            <source>1</source>
```

```

        <translation>First OEM parameter text</translation>
    </message>
    <message>
        <source>2</source>
        <translation>Second OEM parameter text</translation>
    </message>
</context>
</TS>

```

Registering an index text file

You still have to register your index text file so that the system knows your index texts during the program runtime. The registration is made in the "slaesvcadapconf.xml" file.

1. Open the file "slaesvcadapconf.xml" already created for the alarm texts `/oem/sinumerik/hmi/cfg` or `/user/sinumerik/hmi/cfg` directory.
2. Remove the lines "`<!-- Start of comment`" and "`End of comment -->`".
3. Enter the index identifier, e.g. `<Identifier type="QString" value="OEM"/>`. The index identifier is always specified in pointed brackets next to the parameter specification in the alarm text, e.g.: `"%1<OEM>"`.
4. Enter the BaseName of the index text file, e.g. `<BaseName type="QString" value="my_indextexts"/>`.
5. Enter the context name that you selected, e.g. `<ContextName type="QString" value="my_context"/>`.
6. You can also use several different indices. Then, in this case, a dedicated section must be created for every index between the `<IndexTexts>` and `</IndexTexts>` tags. The tags for these sections are called, e.g. `<OEM_IndexText_01>`, `<OEM_IndexText_02>`, `<OEM_IndexText_03>`, etc. The tags `<IndexText_01>` to `<IndexText_99>` are reserved for Siemens.

Example

```

<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<!-- Configuration of the Alarm & Event Service Adapter -->
<CONFIGURATION>
...
    <!-- The following narrated part of the configuration is used
    only when 'Indexparameters' (e.g. '%1&lt;OEM&gt;') are used
    within OEM alarm texts. In this case, the value of the parameter
    is used as an index into an additional text list to reference
    another text, which is placed into the alarm text instead of the
    original parameter value. -->
    <IndexTexts>
        <OEM_IndexText_01>

```

```

<Identifier type="QString" value="OEM"/>
<BaseName type="QString" value="my_indexttexts"/>
<ContextName type="QString" value="my_context"/>
<MetaTextID type="QString" value="%ParamValue%"/>
</OEM_IndexText_01>
</IndexTexts>
</CONFIGURATION>

```

Restart SINUMERIK Operate

The files must still be converted into a binary format so that the alarm texts can be displayed during the program runtime. This data is only converted during run-up.

To do this, restart SINUMERIK Operate. In the same directory where the .ts files are located, files with the same name are created with the ".qm" file extension.

The result of the conversion is written to the "alarmtext_conversion.log" or "oem_text_conversion.log" file. Errors that occur during the conversion, such as syntax errors in a parameter file, are also written to the file.

This file is saved in the /user/sinumerik/hmi/log directory.

Note

The conversion is only made if the .ts file is newer than the associated .qm file.

14.2.3 Creating part program message texts

Message texts from the part program

In order to output message texts from the part program, use the MSG instruction in the part program. The message texts are referenced via the number after the "\$" character, e.g. MSG("\$4711"). You can configure channel-specific message texts for each NC channel.

Creating message texts

Procedure:

1. You can copy a sample message text file "oem_pp_messages_eng.ts" from the following directory: /siemens/sinumerik/hmi/template/lng.
2. Store or create the file in the /oem/sinumerik/hmi/lng or /user/sinumerik/hmi/lng directory. Create a separate file for each country language that is supported.
3. Assign a unique name to the file, e.g. "my_msgs_eng.ts". You can freely select the file names with the exception of the language code and the extension.
The file name always ends with the language code of the particular language and always has the ".ts" extension; e.g. "my_msgs_deu.ts" for German or "my_msgs_eng.ts" for English.

14.2 Configuring alarm and message texts via alarm text files

4. Open the "oem_msgs_eng.ts" file and in the <name> tag enter the "partprogmsg01" character string. This is the default for the part program message texts from all channels.
5. For each message text, a separate area must be inserted between the <message> and </message> tags.
6. The <source> tag contains the number from the MSG command in the part program.
7. The <translation> tag contains the message text.

Example

```
<!DOCTYPE TS>
<TS>
  <context>
    <name>partprogmsg01</name>
    <message>
      <source>4711</source>
      <translation>part program message No. 4711</translation>
    </message>
  </context>
</TS>
```

Registering the message text file

You still have to declare your message text file so that the system knows your message texts during the program runtime.

1. You can copy a sample configuration file "oem_slaesvcadapconf.xml" from the following directory: **/siemens/sinumerik/hmi/template/cfg**.
2. Save or create the file in the **/oem/sinumerik/hmi/cfg** or **/user/sinumerik/hmi/cfg** directory.
3. Change the name to "slaesvcadapconf.xml".
4. Open the file and in the <BaseNames> tag enter the file name of the message text file without language code and file extension, e.g. "my_msgs", as "value". The registration of your message text file starts, for example, with the name "OEM_BaseName_01".

Note

The names of the <BaseNames> tag can be freely selected. They must be unique in the system and must not clash with names used by Siemens.

The "Siemens_BaseName_01" name is reserved for Siemens.

Several message text files can also be registered. To do this, use names such as "OEM_BaseName_02", "OEM_BaseName_03", etc.

Example

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<!-- Configuration of the Alarm & Event Service Adapter -->
<CONFIGURATION>
    <AlarmTexts>
        <BaseNames>
            <OEM_BaseName_01 type="QString" value="my_msgs"/>
        </BaseNames>
    </AlarmTexts>
    ...
</CONFIGURATION>
```

Message texts for several channels

It is possible to assign different message texts the same message number, e.g. the number 4711 in different NC channels. This means, different message texts are output depending on the channel in which the part program is executed.

1. Open the "oem_msgs_eng.ts" file in the editor.
2. Change the text between the two <name> and </name> tags from "partprogmsg01" into "partprogmsgXY", whereby "XY" should be replaced by the particular channel number, e.g. "partprogmsg02" for channel 2.
3. Now open the "slaesvcconf.xml" configuration file.
4. Enter the respective NC channel in the <Connections> tag. Only use the XML tags from the following table to specify the NC channel.

NC chan- nel	XML tag	ContextName
1	PartprogramMessageChannel_01	partprogmsg01
2	PartprogramMessageChannel_02	partprogmsg02
3	PartprogramMessageChannel_03	partprogmsg03
4	PartprogramMessageChannel_04	partprogmsg04
5	PartprogramMessageChannel_05	partprogmsg05
6	PartprogramMessageChannel_06	partprogmsg06
7	PartprogramMessageChannel_07	partprogmsg07
8	PartprogramMessageChannel_08	partprogmsg08
9	PartprogramMessageChannel_09	partprogmsg09
10	PartprogramMessageChannel_10	Partprogmsg10

Example

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<!-- Configuration of the Alarm & Event Service Adapter -->
<CONFIGURATION>
  <Connections>
    <PartprogramMessageChannel_02>
      <ContextName type="QString" value="partprogmsg02"/>
    </PartprogramMessageChannel_02>
  </Connections>
</CONFIGURATION>
```

Restart SINUMERIK Operate

The files must still be converted into a binary format so that the alarm texts can be displayed during the program runtime. This data is only converted during run-up.

To do this, restart SINUMERIK Operate. In the same directory where the .ts files are located, files with the same name are created with the ".qm" file extension.

The result of the conversion is written to the "alarmtext_conversion.log" or "oem_text_conversion.log" file. Errors that occur during the conversion, such as syntax errors in a parameter file, are also written to the file.

This file is saved in the /user/sinumerik/hmi/log directory.

Note

The conversion is only made if the .ts file is newer than the associated .qm file.

14.2.4 Changing alarm attributes

Color types of the alarms

You can individually change the colors of the alarms and messages displayed in the message line.

You can change the following for each alarm number and alarm source:

- Font color of the alarm/message text
- Background color of the alarm/message text
- Font color of the alarm number
- Background color of the alarm number

Create alarm attribute file

Procedure:

1. You can copy a sample alarm attribute file "oem_slaedatabase.xml" from the directory: `/siemens/sinumerik/hmi/template/cfg/`.
2. Save the file in the directory `/oem/sinumerik/hmi/cfg/` or `/user/sinumerik/hmi/cfg/`
3. Assign a unique name to the file, e.g. "muster_slaedatabase.xml".
The file name can be freely selected; however, it must only contain lower-case letters.

Defining alarm colors

Procedure:

1. Open the file "muster_slaedatabase.xml" in the editor.
2. First, enter which alarm colors you generally wish to change.
To do this, create a separate section `<Attribute>` for each alarm color that you wish to change in the `<Attributes>` area.
3. Enter the attribute name of the alarm color to be changed in the `<Attribute AttrName=...>` tag. You can change the following colors:
 - Font color of the alarm/message text = `TEXTCOLOR`
 - Background color of the alarm/message text = `TEXTBACKGROUND`
 - Font color of the alarm number = `NUMBERCOLOR`
 - Background color of the alarm number = `NUMBERBACKGROUND`
4. Alarm sources are defined in the `<Sources>` area for whose alarms the alarm colors are to be changed, e.g. the alarm sources `"HMI"` and `"PLC/PMC"`.

Note

If you insert further alarm sources, make sure that the alarm number is always assigned to the correct alarm source.

The possible values for source ID and URL can be found in the Table in Chapter "Range of alarms (Page 237)".

5. In the `<Alarms>` tag, create a separate sub-area for each alarm or for an alarm number range.
6. Enter the alarm number in tag `<Alarm AlarmID= "...">` or enter the alarm number range in the tag `<Range FromAlarmID= "... ToAlarmID= "...>`.
7. Enter the required color values in the following tags:
 - `<TEXTCOLOR>`
 - `<TEXTBACKGROUND>`
 - `<NUMBERCOLOR>`
 - `<NUMBERBACKGROUND>`

The attributes of the color values are defined by specifying an RGB value:

 - An RGB value always starts with the `"#"` character.
 - The individual color values R, G and B are represented by double-digit hexadecimal numbers. Syntax: `"#RRGGBB"`, e.g.: `"#FF9A00"`.

Example

Note the order in the XML configuration file for the assignment of the colors to alarm number ranges:

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE SIaAlarmAttributes>
<SIaAlarmAttributes Version="01.00.00.00">
<Types>
  <Type TypeName="Condition" TypeID="32">
    <Category Version="1.0" CatID="1">
      <CatDescr>Alarms of the SINUMERIK.</CatDescr>
      <Attributes>
        <Attribute AttrName="TEXTCOLOR" AttrID="5003"
          AttrDataType="10">
          <AttrDescr>
            Text color of an alarm used when displayed within the
            header panel.
          </AttrDescr>
        </Attribute>
        <Attribute AttrName="TEXTBACKGROUNDCOLOR" AttrID="5004"
          AttrDataType="10">
          <AttrDescr>
            Background color of an alarm used when displayed within
            the header panel.
          </AttrDescr>
        </Attribute>
        <Attribute AttrName="NUMBERCOLOR" AttrID="5005"
          AttrDataType="10">
          <AttrDescr>
            Text color of an alarm used when displayed within the
            header panel.
          </AttrDescr>
        </Attribute>
        <Attribute AttrName=" NUMBERBACKGROUNDCOLOR " AttrID="5006"
          AttrDataType="10">
          <AttrDescr> Background color of an alarm used when
            displayed within the header panel.
          </AttrDescr>
        </Attribute>
      </Attributes>
    </Category>
  </Type>
</Types>
<Sources>
```

```

<Source> CatLink="1" SourceID="10000" SourceURL="/HMI">
  <Alarms>
    <Alarm AlarmID="130000">
      <TEXTCOLOR>#000000</TEXTCOLOR>
      <TEXTBACKGROUNDCOLOR>#FFFFFF</TEXTBACKGROUNDCOLOR>
      <NUMBERCOLOR>#FFFFFF</NUMBERCOLOR>
      <NUMBERBACKGROUNDCOLOR>#000000</NUMBERBACKGROUNDCOLOR>
    </Alarm>
  </Alarms>
</Source>
<Source> CatLink="1" SourceID="51" SourceURL="/PLC/PMC">
  <Alarms>
    <Range FromAlarmID="700100" ToAlarmID="700199">
      <TEXTCOLOR>#000000</TEXTCOLOR>
      <NUMBERCOLOR>#00FF00</NUMBERCOLOR>
    </Range>
    <Alarm AlarmID="700000">
      <TEXTCOLOR>#000000</TEXTCOLOR>
      <TEXTBACKGROUNDCOLOR>#FFFFFF</TEXTBACKGROUNDCOLOR>
      <NUMBERCOLOR>#FFFFFF</NUMBERCOLOR>
      <NUMBERBACKGROUNDCOLOR>#000000</NUMBERBACKGROUNDCOLOR>
    </Alarm>
  </Alarms>
</Source>
</Sources>
</SlAeAlarmAttributes>

```

Registering the alarm attribute file

The alarm attribute file with the color definitions must be registered in order that the alarm colors can be assigned to the alarms during the program runtime:

1. You can copy a sample configuration file "oem_slaesvcconf.xml" from the following directory: **/siemens/sinumerik/hmi/template/cfg**.
2. Save or create the file in the **/oem/sinumerik/hmi/cfg** or **/user/sinumerik/hmi/cfg** directory.

3. Name the file "slaesvcconf.xml".
4. Open the file and in the <DataBases> tag enter, for example, the file name of the alarm attribute file without language code and file extension, e.g. "muster_slaedatabase", as "value". The registration of your alarm attribute file starts, for example, with the name "OEM_DataBase_01".

Note

The names of the <DataBases> tag can be freely selected. They must be unique in the system and must not clash with names used by Siemens.

The "Siemens_DataBase_01" name is reserved for Siemens.

If you register additional alarm attribute files, i.e. you wish to include them in the configuration file, use names such as "OEM_DataBase_02", "OEM_DataBase_03", etc.

Restart SINUMERIK Operate

The files still have to be converted into a binary format in order that the alarm colors become effective during the program runtime. This data is only converted during run-up.

To do this, restart SINUMERIK Operate. A file with the same name is created with the ".hmi" file extension, e.g. "sample_slaedatabase.hmi" in the same directory in which the alarm attribute file is also located.

The result of the conversion is written to the file "oem_ae_database_conversion.log". This file is located in the "/user/sinumerik/hmi/log" directory.

Note

The conversion is only carried out if the XML file is newer than the associated hmi file.

14.2.5 Replacing standard alarm texts

You can replace alarm texts of the standard SINUMERIK Operate with own alarm texts.

Creating an alarm text file

1. You can copy a sample alarm text file "oem_alarms_eng.ts" from the following directory: **/siemens/sinumerik/hmi/template/lng**.
2. Store or create the file in the **/oem/sinumerik/hmi/lng** or **/user/sinumerik/hmi/lng** directory. Create a separate file for each country language that is supported.
3. Assign the file a user-specific name, e.g. "my_nck_alarms_eng.ts". You can freely select the file names with the exception of the language code and the extension.
The file name always ends with the language code of the particular language and always has the ".ts" extension; e.g. "my_nck_alarms_deu.ts" for German or "my_nck_alarms_eng.ts" for English.

Creating alarm texts

1. Open the "my_nck_alarms_eng.ts" file.
2. A separate area must be inserted for each alarm text, marked by the <message> tag.
3. The <name> tag contains the context names. Change the name and ensure that the name is unique in the system, e.g. "myNckAlarms".

Note

The name for the <name> tag can always be freely selected. However, the name must not clash with the "slaeconv" name used by Siemens.

4. The <source> tag contains the alarm number of the standard alarm, e.g. 10000.
5. The <translation> tag contains the actual alarm text, e.g. "OEM alarm text example for NCK alarm 10.000".

Example

```
<!DOCTYPE TS>
<TS>
  <context>
    <name>myNckAlarms</name>
    <message>
      <source>10000/NCK</source>
      <translation> OEM alarm text example for NCK alarm 10.000</translation>
    </message>
  </context>
</TS>
```

Registering the alarm text file

You still have to register your alarm text file so that the system knows your alarm texts during the program runtime:

1. You can copy a sample configuration file "oem_slaesvcadapconf.xml" from the following directory: **/siemens/sinumerik/hmi/template/cfg**.
2. Save or create the file in the **/oem/sinumerik/hmi/cfg** or **/user/sinumerik/hmi/cfg** directory.

3. Assign the name "slaesvcadapconf.xml" to the file.
4. Open the file and in the <BaseNames> tag enter the file name of your alarm text file without language code and file extension, e.g. "my_nck_alarms", as "value". The registration of your alarm text file starts, for example, with the name "Siemens_BaseName_01".

Note

The names of the <BaseNames> tag can be freely selected. They must be unique in the system and must not clash with names used by Siemens.

The "Siemens_BaseName_01" name is reserved for Siemens.

Several alarm text files can also be registered. To do this, use names such as "OEM_BaseName_02", "OEM_BaseName_03", etc.

Example:

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<!-- Configuration of the Alarm & Event Service Adapter -->
<CONFIGURATION>
  <AlarmTexts>
    <BaseNames>
      <OEM_BaseName_01 type="QString" value="my_nck_alarms"/>
    </BaseNames>
  </AlarmTexts>
</CONFIGURATION>
```

Replacing standard alarm texts

You still have to define which standard alarm texts should be replaced by your alarm texts so that during the program runtime, the original alarm text is replaced by your alarm text.

1. Create a new alarm attribute file (see Chapter "Changing alarm attributes (Page 228)") in the **/oem/sinumerik/hmi/cfg** or **/user/sinumerik/hmi/cfg** directory. The file name can be freely selected, e.g. "my_nck_alarms_db.xml".
2. Open the file.
3. The file always comprises the two areas <Types> and <Sources>.
4. The <sources> tag includes the reference, assigned to an alarm source, e.g. "NCK", to the associated alarm text.
5. Link the contents of the <context> <name> tags with the contents of the <message> <source> tags from your alarm text file.
 - <context> <name> = the context name that you assigned
 - <message> <source> = the number of the alarm whose text is to be replaced.

For example, enter the following link in the alarm attribute file:

```
<MSGTEXT>myNckAlarms I 10000</MSGTEXT>
```

Make sure that the context name and the alarm number are separated by the pipe character "|".

6. If you include an additional NCK alarm, copy the range from <Alarms> to </Alarms> and adapt the alarm number.
7. If you include an additional alarm from another number range (e.g. PLC alarm), copy the range <Sources> to </Sources> and then adapt the SourceID and SourceURL as well as the alarm number.
You can take the corresponding SourceID and SourceURL from the table in Chapter "Range of alarms (Page 237)".

Note

A dedicated link must be created for each standard alarm for which the text is to be replaced.

Example

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE SlAeAlarmAttributes>
<SlAeAlarmAttributes Version="01.00.00.00">
<Types>
  <Type TypeName="Condition" TypeID="32">
    <Category Version="1.0" CatID="1">
      <CatDescr>Alarms of the SINUMERIK.</CatDescr>
      <Attributes>
      </Attributes>
    </Category>
  </Type>
</Types>
<Sources>
  <Source CatLink="1" SourceID="0" SourceURL="/NCK">
    <Alarms>
      <Alarm AlarmID="10000">
        <MSGTEXT>myNckAlarms|10000/NCK</MSGTEXT>
      </Alarm>
    </Alarms>
  </Source>
</Sources>
</SlAeAlarmAttributes>
```

Registering the alarm attribute file

The alarm attribute file still has to be registered in order that the standard alarm texts are replaced during the program runtime:

1. You can copy a sample configuration file "oem_slaesvcconf.xml" from the following directory: **/siemens/sinumerik/hmi/template/cfg**.
2. Save or create the file in the **/oem/sinumerik/hmi/cfg** or **/user/sinumerik/hmi/cfg** directory.
3. Change the name to "slaesvcconf.xml".
4. Open the file and in the <DataBases> tag enter the name of the alarm attribute file, e.g. <OEM_DataBase_01 type="QString" value="my_nck_alarms_db">

Note

The names of the <DataBases> tag can be freely selected. They must be unique in the system and must not clash with names used by Siemens.

The <Siemens_DataBase_01> tag name is reserved for Siemens.

If you register additional alarm attribute files, i.e. you wish to include them in the configuration file, use the names <OEM_DataBase_02>, <OEM_DataBase_03>, etc.

Restart SINUMERIK Operate

The files with the alarm texts and the attribute file still have to be converted into a binary format in order that the alarm texts can be displayed during the program runtime. This data is only converted during run-up.

To do this, restart SINUMERIK Operate. In the same directory where the .ts files or the alarm attribute file are located, files with the same name are created with the ".qm" and .hmi file extension.

The result of the conversion is written to the "alarmtext_conversion.log" or "oem_text_conversion.log" file. Errors that occur during the conversion, such as syntax errors in a parameter file, are also written to the file.

This file is located in the "/user/sinumerik/hmi/log" directory.

Note

The conversion is only made if the .ts file is newer than the associated .qm file.

14.2.6 Range of alarms

Number ranges of alarms

Numerical range	Description		SourceID	SourceURL
000 000 ... 009 999	General alarms		0 (standard NCU)	/NCK
010 000 ... 019 999	Channel alarms		100 (1. NCU)	//configuration_spec. Designation>/NCK
020 000 ... 029 999	Axis/spindle alarms		...	
030 000 ... 039 999	Functional alarms	General	9999 (99. NCU)	
040 000 ... 059 999		Reserved		
060 000 ... 064 999		Siemens cycle alarms		
065 000 ... 069 999		Cycle alarms user		
070 000 ... 079 999		Compile cycles		
		Manufacturer and OEM		
080 000 ... 084 999		Siemens cycles message texts		
085 000 ... 089 999		User cycles message texts		
090 000 ... 099 999		Reserved		
100 000 ... 129 999	System		10 000	/HMI
130 000 ... 139 999	OEM			
140 000 ... 199 999	Reserved			
200 000 ... 299 999	SINAMICS drive		0	/NCK
300 000 ... 399 999	Drive and I/O alarms			
400 000 ... 499 999	General alarms		51	/PLC/PMC
500 000 ... 599 999	Channel alarms			
600 000 ... 699 000	Axis/spindle alarms			
700 000 ... 799 999	User area			
800 000 ... 899 999	Sequencers/graphs			
810 000 ... 810 009	System error messages		50 150 (1st NCU)	/PLC/DiagBuffer //<configuration-spec. Designation>/PLC/DiagBuffer
900 001 ... 965 999	HMI PRO sl Runtime			
966 000 ... 999 999	Reserved			

SourceIDs 1 ... 10

The SourceIDs 1 ... 10 have the following relationship:

SourceID	SourceURL
1	/NCK/Channel#1/Partprogram
2	/NCK/Channel#2/Partprogram
3	/NCK/Channel#3/Partprogram
4	/NCK/Channel#4/Partprogram

SourceID	SourceURL
5	/NCK/Channel#5/Partprogram
6	/NCK/Channel#6/Partprogram
7	/NCK/Channel#7/Partprogram
8	/NCK/Channel#8/Partprogram
9	/NCK/Channel#9/Partprogram
10	/NCK/Channel#10/Partprogram

14.2.7 Parameter specifications in alarm texts

Alarm texts can contain alarm parameters (accompanying values) that specify the cause of an alarm in more detail. These parameters are usually numerical values that are transmitted from an alarm source when the alarm is signaled along with the other alarm data.

How the parameters are incorporated into the alarm text is specified via place holders (parameter specifications) in the language-specific alarm texts, e.g. "Channel %1 Axis %2 in machine data %3 defined for several channels".

When an alarm occurs, the text is replaced by the corresponding parameters, e.g. "Channel 5 Axis A3 in machine data 4711 defined for several channels".

Standard parameter specifications

The following table shows the standard parameter specifications:

Table 14-1 Standard parameter specifications

Parameter specifier	Description
%1	First parameter from the alarm data of the alarm source.
%2	Second parameter from the alarm data of the alarm source.
%3	Third parameter from the alarm data of the alarm source.
%4	Fourth parameter from the alarm data of the alarm source.
%5	Fifth parameter from the alarm data of the alarm source. Only for NCK alarms: First part (up to the separator) of the fourth parameter from the alarm data of the alarm source.
%7	Seventh parameter from the alarm data of the alarm source Only for NCK alarms: Third part (between the 2nd and 3rd separator) of the fourth parameter from the alarm data of the alarm source.
%8	Eighth parameter from the alarm data of the alarm source Only for NCK alarms: Fourth part (between the 3rd and 4th separator) of the fourth parameter from the alarm data of the alarm source.
%9	Ninth parameter from the alarm data of the alarm source.
%0	Tenth parameter from the alarm data of the alarm source.

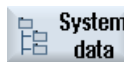
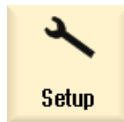
Parameter specifier	Description
%Z	As for %1, in the case of S7-HiGraph alarms the step number of the graph is shown.
%K	Specially for PLC alarms: Second digit of the decimal alarm ID: 123456, corresponds to channel number (0 = channel 10).
%A	Specially for PLC alarms: Third and fourth digit of the decimal alarm ID: 12 34 56, corresponds to the axis number.
%N	Specially for PLC alarms: Fifth and sixth digit of the decimal alarm ID: 1234 56 , corresponds to the signal number.

14.2.8 Opening error file

The errors that occur during the conversion are written to the "alarmtext_conversion.log" or "oem_text_conversion.log" file.

File loc.: /user/sinumerik/hmi/log

Opening the error file



1. Select the "Start-up" operating area.
 2. Press the "System data" softkey.
 3. Open the "System CF card" folder.
 4. Open the storage directory and select the required file.
 5. To open the error file, press the "Open" softkey.
- OR -
- Press the <INPUT> key.

14.3 Configuring an alarm log

Default setting

Per default, the alarm log contains all alarms and messages - with their incoming and outgoing time stamps - in chronological order since the last boot. The exceptions are messages from the NC part program (msg command).

Contrary to the "Alarm List" or "Messages" window, all of the alarms or messages that are no longer active when the log is displayed are also displayed (historical alarm events).

Specifying the number of events

The alarm log is organized as a ring buffer: When the maximum size is exceeded, the oldest entries are overwritten by the new alarm events. Each event (Incoming, Outgoing, Acknowledgement, etc.) represents a separate entry. The maximum size of the alarm log does not refer to the number of alarms it contains but the number of entries.

Persistent storage (permanent storage)

If required, the alarm log can be set up as a persistent log that also contains alarm events from before the last time it was switched on. This means that the log is then either time controlled or is backed-up in an internal binary format to the `card/user/sinumerik/hmi/log/alarm_log` file system for each alarm event.

Depending on the hardware being used, the alarm log for the NCU is saved on the CompactFlash card or for the PC/PCU, on the hard disk.

NOTICE

Shorter CF card service life

If the alarm log is continuously written to the CompactFlash card, then only a limited number of write cycles is possible. Therefore, ensure that storage is only performed when there is a justifiable need! Undo the setting "at every event" when you no longer require the alarm log to be saved.

Delete the `slaapp_<nr>.hmi` alarm logs in the `/alarm_log` directory to free up memory space on the CompactFlash card.

The CompactFlash card has a service life of over 10 years for an average written data volume of approx. 60 MB/day.

The alarm log is not saved in the default configuration.

Configuring an alarm log

- Via the operator software in the "Diagnostics" operating area
- Via the "slaesvccnf.xml" configuration file

14.3.1 Setting alarm logs from the user interface

Procedure



1. Select the "Diagnostics" operating area.



2. Press the "Alarm log" and "Settings" softkeys.



3. Enter a number in the "Number of entries" field to change the maximum number of administered incoming and outgoing events.

The alarm log is organized as a ring buffer: When the maximum size is exceeded, the oldest entries are overwritten by the new alarm events. Each incoming or outgoing time stamp represents a separate event.

You can specify a value between 500 and 32000. Default value is 500.

4. In the "Write mode file" field, under the following entry, select:
 - "off", the changes are not logged (default setting)
 - "for each event", each alarm event immediately initiates backup of the alarm log (persistent save).
 - "time controlled" if the alarm log is to be backed up again after a certain time. An additional input field called "Time interval" appears in which you can specify a time in seconds.

You receive a warning if you only save to a CompactFlash card.

Restart SINUMERIK Operate

The settings made take effect only after a restart of the operating software. To do this, restart SINUMERIK Operate.

14.3.2 Loading alarm log via configuration file

Creating the configuration file

Adjustments are made in file "slaesvcconf.xml". Copy a sample configuration file "oem_alarmprot_slaesvcconf.xml" from the following directory:

/siemens/sinumerik/hmi/template/cfg.

Procedure:

1. Save or create the file in the **/oem/sinumerik/hmi/cfg** or **/user/sinumerik/hmi/cfg** directory.
2. Assign the name "slaesvcconf.xml" to the file.

14.3 Configuring an alarm log

3. Open the file and enter the number of events to be output in the tag <Records type .../>. The default value is 500. The maximum number depends on the storage medium.
4. Enter the backup mode in the <DiskCare type="int" value="-1"/> tag. The following values are possible:
 - 1: There is no backup of the alarm log (default setting).
 - 0: Each alarm event triggers an immediate backup of the alarm log (persistency backup).
 - >0: Rhythm of the log saving in seconds: When there is a change, the log is time-triggered saved every n > 0 seconds (persistency backup).
5. You adapt the filter for the entry type in the <Filter> tag. Please observe the following:
 - An alarm event is only entered in the log when it satisfies the filter criterion.
 - If several filters are specified in succession, they are linked by a logical OR.
 - Several filters must be combined in series with the keyword AND for an AND operation.

Note

Each incoming or outgoing event of an alarm or message requires a separate entry, even when they belong to the same alarm or message.

Acknowledgement events are also contained in the alarm log. You require such entries even when these are presently not recognizable in the alarm log.

Filter properties

A filter consists of the following three elements <identification> <relation> <value>.

Entry <identification>	Description
AlarmID	Alarm number
SourceID	Default values for SourceID and SourceURL can be found in the table in Chapter "Range of alarms (Page 237)".
SourceURL	
<Attribute name>	Arbitrary alarm attribute from the "slaedatabase.xml" file, such as "SEVERITY" or "CLEARINFO".

Entry <relation>	Description
EQUAL	Equal to
NOT	Not equal to
LOWER	Less than
HIGHER	Greater than

Entry <value>	Description
Numbers	-
Character strings	-

Cancel criteria

Cancel criterion (ClearInfo)	Alarm source (Source)	Description
0	/HMI	Alarms that are canceled by the HMI.
1	/NCK	Alarms that are canceled by power-on of the NCU.
2		Conditions are canceled by a hardware reset of the NCU.
3		Conditions are deleted by a "CANCEL" command to the NCU.
4		Conditions are canceled by the NCK itself.
5		Conditions are canceled by an "NC Start" command on the NCU.
6		Conditions are canceled by a reset of the mode group (BAG).
7		Conditions are canceled by an "NC Reset" command on the NCU.
8	/PLC	PLC messages of the FB15 (basic program).
9		PLC alarms of the FB15 (basic program).
10		Dialog alarms of the HMI that are canceled by the "Recall" key [^].
11		Reserved
12		S7-PDiag, S7-Graph, S7-HiGraph or other Alarm_S(Q) alarms of the PLC (SFC17/18) with alarm state "not acknowledged"
13		S7-PDiag, S7-Graph, S7-HiGraph or other Alarm_S(Q) alarms of the PLC (SFC17/18) with alarm state "acknowledged".
14	/NCK	Drive alarms via NCK.
15		Part program messages.
16		SINAMICS Safety Integrated messages

Examples

Log all alarms with a ClearInfo not equal to 15, i.e. no part program messages:

```
<CONFIGURATION>
  <Protocol>
    <Filters>
      <Siemens_Filter_01 type="QString" value="CLEARINFO NOT 15" />
    </Filters>
  </Protocol>
</CONFIGURATION>
```

Log all alarms with the SourceURL "/NCK" or "/HMI":

```
<CONFIGURATION>
  <Protocol>
    <Filters>
      <Filter_01 type="QString" value="SourceURL EQUAL /NCK" />
      <Filter_02 type="QString" value="SourceURL EQUAL /HMI" />
    </Filters>
  </Protocol>
</CONFIGURATION>
```

14.3 Configuring an alarm log

In the <FilePath> tag, adapt the path and file name for the file in which the alarm log is stored persistently:

```
<CONFIGURATION>
  <Protocol>
    <Filters>
      <FilePath type="QString" value="$(HMI_INSTALL_DIR)user/
        sinumerik/hmi/ log/alarm_log/slaep_" />
    </Filters>
  </Protocol>
</CONFIGURATION>
```

- Path
Environment variables can also be incorporated in the path, e.g. for the installation directory: \$(HMI_INSTALL_DIR).
- File name
A 4-digit number in the value range 0000 to 0009 and the file extension "hmi" are automatically added by default to the specified file name during operation. The number is automatically increased when:
 - The file has reached the maximum size (DiskCare = 0), or
 - The specified period has elapsed (DiskCare > 0).
Older files are deleted.
- Number of logs
 - The number of stored logs can be changed via MaxFileNumbers between 2 and 9999 (default: 10).

Example: Switching off existing filters

To switch off the existing Siemens filter - without overwriting the filter - proceed as follows:

1. An "empty" filter switches off **all** previously set filters.
Knowledge of the filter designation is not required.
2. For the effect of the filters, the order in which they are set is important:
siemens → addon → oem → user

Example of the filtering of alarms 700000 to 700010, 700500 to 700599, and the part program messages (CLEARINFO = 15):

```
<CONFIGURATION>
  <Protocol>
    <Filters>
      <Filter_00 value="" type="QString"/>
      <Filter_01 value="CLEARINFO NOT 15 AND AlarmID LOWER 700000"
        type="QString"/>
      <Filter_02 value="CLEARINFO NOT 15 AND AlarmID HIGHER 700010
        AND AlarmID LOWER 700500" type="QString"/>
    </Filters>
  </Protocol>
</CONFIGURATION>
```

```
        <Filter_03 value="CLEARINFO NOT 15 AND AlarmID HIGHER 700599"  
        type="QString"/>  
    </Filters>  
</Protocol>  
</CONFIGURATION>
```

Result

For the changes to the protocol settings to take effect, restart SINUMERIK Operate.

14.4 PLC alarms with parameters

Introduction

For alarms that are triggered via the PLC blocks SFC17 and SFC18, a parameter can be transferred each time the block is called. If the "Octet string" data type is selected, up to 12 bytes can be transferred.

With an appropriate configuration of the operating software, a maximum of 12 bytes can be interpreted, e.g. also as an array of bytes or as a structure with any order of simple data types. In this way, several parameters can be displayed in the alarm text.

A parameter description must be stored for each alarm in the operating software. Two aspects must be taken into account with this parameter description:

- How the parameter has to be interpreted correctly (data type and, if necessary, length)
- How the parameter has to be prepared for display (string or number, decimal, hexadecimal, binary, etc.)

Point 1 is irrespective of the language selected for the display, point 2 can be different depending on the national language.

The possible parameter descriptions are therefore divided into a language-independent parameter statement and a language-dependent format statement and stored in the following directories:

- Parameter statement: `/oem/sinumerik/hmi/cfg/` or `/user/sinumerik/hmi/cfg/`
- Format statement: `/oem/sinumerik/hmi/lng` or `/user/sinumerik/hmi/lng`

The names of the files can be freely selected. The parameter statement is added to the configured data of the relevant alarm in the database in the form of the alarm attribute "HMIPROPARAMDESCR2". Because of the language dependency, the format statement is part of the alarm text.

14.4.1 Definition of a parameter of the octet string data type

Parameter statement

The parameter statement describes how one or more parameters can be defined with the maximum 12-bytes long octet string supplied with the alarm PDU.

Syntax

The following syntax applies for the parameter statement:

```

<Parameter directive ext>      ::=      [% <Parameter description> ]
<Parameter description ext>    ::=      <No. of the associated value><Element type><Off-
                                         set>

```

<No. of the associated value>	::=	Always 1 (reserved for future applications)
<Offset>	::=	Data type-dependent offset of the parameter within the associated value: • BOOL data type (B): Bit offset within the associated value • All except for BOOL data type (Y, W, X, I, D, C, R): Byte offset within the associated value

Element type	Data type
Y	BYTE (8-bit, unsigned)
W	WORD (16-bit, unsigned)
X	DWORD (32-bit, unsigned)
I	INTEGER (16-bit, signed)
D	INTEGER (32-bit, signed)
B	BOOL (1-bit)
C	CHAR (8-bit)
R	REAL (32-bit)

Examples

%1W0%1W2	→	1st parameter: 1st associated value, WORD at byte offset 0 2nd parameter: 1st associated value, WORD at byte offset 2
%1Y0%1Y1%1W2	→	1st parameter: 1st associated value, BYTE at byte offset 0 2nd parameter: 1st associated value, BYTE at byte offset 1 3rd parameter: 1st associated value, WORD at byte offset 2
%1B0%1B1%1B2%1B3%1I1	→	1st parameter: 1st associated value, BOOL at bit offset 0 2nd parameter: 1st associated value, BOOL at bit offset 1 3rd parameter: 1st associated value, BOOL at bit offset 2 4th parameter: 1st associated value, BOOL at bit offset 3 5th parameter: 1st associated value, INTEGER (16-bit, signed) at byte offset 1

Example of an alarm attribute file (information on how to create an alarm attribute file is provided in Chapter "Changing alarm attributes (Page 228)":

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<SlAeAlarmAttributes Version="01.00.00.00">
<Types>
  <Type TypeID="32" TypeName="Condition">
    <Category CatID="1" Version="1.0">
      <CatDescr>Alarms of SINUMERIK.</CatDescr>
      <Attributes>
        <Attribute AttrName="MSGTEXT" AttrID="-1" AttrDataType="10"/>
        <Attribute AttrName="HMIPROPARAMDESCR2" AttrID="5012" AttrDataType="10"/>
      </Attributes>
    </Category>
  </Type>
</Types>
<Sources>
  <Source CatLink="1" SourceID="51" SourceURL="/PLC/PMC">
    <Alarms>
      <!-- Alarm 700000 with 3 BYTE parameters -->
      <Alarm AlarmID="700000">
        <MSGTEXT>my_oem_plc_alarms_context|700000/PLC/PMC</MSGTEXT>
        <HMIPROPARAMDESCR2>%1Y0%1Y1%1Y2</HMIPROPARAMDESCR2>
      </Alarm>
      <!-- Alarm 700001 with 3 WORD parameters -->
      <Alarm AlarmID="700001">
        <MSGTEXT>my_oem_plc_alarms_context|700001/PLC/PMC</MSGTEXT>
        <HMIPROPARAMDESCR2>%1W0%1W2%1W4</HMIPROPARAMDESCR2>
      </Alarm>
      <!-- Alarm 700002 with 3 16-bit integer parameters -->
      <Alarm AlarmID="700002">
        <MSGTEXT>my_oem_plc_alarms_context|700002/PLC/PMC</MSGTEXT>
        <HMIPROPARAMDESCR2>%1I0%1I2%1Y4</HMIPROPARAMDESCR2>
      </Alarm>
      <!-- Alarm 700003 with 4 parameters: BYTE -> WORD -> 32-bit INTEGER -> BYTE -->
      <Alarm AlarmID="700003">
        <MSGTEXT>my_oem_plc_alarms_context|700003/PLC/PMC</MSGTEXT>
        <HMIPROPARAMDESCR2>%1Y0%1W1%1D3%1Y7</HMIPROPARAMDESCR2>
      </Alarm>
    </Alarms>
  </Source>
</Sources>
</SlAeAlarmAttributes>
```

14.4.2 Definition of the language-dependent formatting

Format statement

The format statement is part of the alarm text and is used as a placeholder for a parameters to be displayed.

Syntax

The following syntax applies for the format statement:

<Format directive>	::=	@ <No. of the parameter description><Format specification> @
%[i]x	::=	Hexadecimal number with i digits
%[i]u	::=	Decimal number without sign with i digits
%[i]d	::=	Decimal number with sign with i digits (incl. sign)
%[i]b	::=	Binary number with i digits
%[i][.y]f	::=	Fixed-point number: Signed value of the form [-]xxx.yyyy, where i specifies the total number of digits including sign and decimal point and y specifies the number of digits after the decimal point. Missing digits both before and after the decimal point are filled with 0. If there are more places after the decimal point than permitted by y, this is rounded off.

If the optional digit specification i is not specified, then only the number of digits is used required to completely display the number. The same applies when the number of digits specified by i is not sufficient to completely display the number including sign, i.e. i is then ignored.

The number contained in the format statement does not relate to the position of the associated value in the alarm PDU, but to the position of the parameter description in the parameter statement. Any number of format statements can be present in an alarm text.

Examples

@1%b@	→	Value from the first parameter description to be displayed as a binary number, e.g. "1011011"
@2%8X@	→	Value from the second parameter description to be displayed as a hexadecimal number with 8 digits, missing digits are filled with 0, e.g. "00AF37FE"
@1%7.2f@	→	Value from the first parameter description to be displayed as a fixed point number with 7 digits (incl. sign and decimal point) and 2 digits after the decimal point, missing digits are filled with 0, e.g. "-012.34"

Example of an alarm text file (information on how you can create alarm texts is provided in Chapter "Creating in-house alarm texts (Page 220)":

```
<!DOCTYPE TS>
<TS>
<context>
```

```
<name>my_oem_plc_alarms_context</name>
<message>
  <source>700000/PLC/PMC</source>
  <translation>Text with 3 BYTE parameters: @1%X@, @2%u@, @3%b@</
translation>
</message>
<message>
  <source>700001/PLC/PMC</source>
  <translation>Text with 3 WORD parameters: @1%X@, @2%u@, @3%b@</
translation>
</message>
<message>
  <source>700002/PLC/PMC</source>
  <translation>Text with 3 16-bit integer parameters: @1%X@, @2%u@,
@3%b@</translation>
</message>
<message>
  <source>700003/PLC/PMC</source>
  <translation>Text with 4 parameters: @1%X@, @2%u@, @3%r@, @4%b@</
translation>
</message>
</context>
</TS>
```

14.5 Deactivating a warning

Generally, alarms/messages are not used without alarm texts. If the alarm text is missing, the warning "No text available" is output.

To deactivate the warning, add the <ControlFlags> area to your "slaescvadapconf.xml" configuration file.

You can copy this area from the original file. The "slaescvadapconf.xml" file is in the following directory: /**siemens**/sinumerik/hmi/base

Setting

In the <MissingTextWarning type="bool" value="FALSE"/> tag, deactivate/activate the warning.

Entry	Meaning
TRUE	The warning is displayed.
FALSE	The warning is deactivated.

Example

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<CONFIGURATION>
    <ControlFlags>
        <MissingTextWarning type="bool" value="FALSE"/>
    </ControlFlags>
</CONFIGURATION>
```


Data backup

15.1 Overview

Data backup

The following times are recommended for performing a data backup:

- After a start-up
- After changing machine-specific settings
- After replacing a hardware component
- For a software upgrade
- Before the activation of memory-configuring machine data

Note

A start-up archive is saved as a file of the type ".arc" (archive).

There are various ways of creating and reloading archives via the SINUMERIK Operate user interface.

- Standard archive: Data can be selected specifically in the data tree and backed up by pressing the "System data" softkey.
- Start-up archive: The "Start-up archive" softkey offers the following selection:
 - Create and read-in a start-up archive
 - Create PLC hardware upgrade archive (only SDBs)
 - Create and read in archive of original status

Storage locations

Archives can be stored in the following directories:

- CompactFlash card at: System CF-Card/**user**/sinumerik/data/archive or System CF-Card/**oem**/sinumerik/data/archive
- PCU: F:\hmis**user**\sinumerik\data\archive or **oem**\sinumerik\data\archive
- All configured logical drives (USB, network drives)

Note

USB FlashDrive

USB-flash drives are not suitable as persistent memory media.

Setting line checksums

To read in a data archive, you need, at a minimum, the authorization that is needed to carry out existing machine data assignments in the archive without any errors. The "Manufacturer" authorization is usually used for this. To ensure that the data archive can also be read in with the "Service" authorization, for example, generate the archive beforehand with line checksums. The machine data assignments that exist in the data archive are thus given valid line checksums and are carried out even if the original authorization is lacking.

Note

If you change a line checksum in the data archive with a secured machine data assignment, the line checksum becomes invalid when the archive is read in and alarm 12600 is displayed.

The generation of a line checksum in the archive is activated with the following machine data (default):

MD11230 \$MN_MD_FILE_STYLE	Structure of the machine data backup files
Bit 0 = 1	Line checksum is generated
Bit 1 = 1	MD numbers are generated

15.2 Creating a start-up archive

Overview

A start-up archive can be generated, for example, after the control has been commissioned. To do this, control components can be saved individually or jointly. It is also possible to transfer the backed-up data to other controls so that they can be updated to the same status.

Note

When generating the start-up archive, programs that have been moved outside the system (network drive) and any global part program memory that has been set up are not taken into account. Only the programs from the NC memory and the local drive are archived.

Requirement

You require at least access level 3 (user).

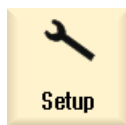
Data of the control components

Control components		Data
NC data		Machine data Setting data Option data Global (GUD) and local (LUD) user data Tool and magazine data Protection zone data R parameters Zero offsets Workpieces, part programs and subprograms Standard and user cycles Definitions and macros
	With compensation data	• QEC - quadrant error compensation • CEC - operation/angularity compensation • EEC - leadscrew pitch / encoder error compensation It only makes sense to archive machine-specific compensation data if the start-up file is reloaded into the same control.
	With compile cycles	Compile cycles (*.elf) are displayed, if compile cycles are available.
PLC data (including CP)		OB (organization blocks) FB (function blocks) SFB (system function blocks) FC (functions) SFC (system functions) DB (data blocks) SDB (system data blocks)

15.2 Creating a start-up archive

Control components		Data
Drive data		Archiving the drive data, either in binary or ASCII format.
HMI data, all		
HMI data, selection:		If data is available, you must set the check mark to activate the components.
	Texts	User texts, alarm texts
	Templates	Individual templates, workpiece templates
	Applications	HMI applications, OEM applications
	Engineering data	Engineering data
	Configuration	Configurations, incl. display of machine data
	Help	Help files
	Version data	Version data
	Logs	Error logs
	Program lists	Program lists
	Dictionaries	Dictionaries
	Data backups	Files located in the data tree of the "System data" in the "HMI data / data backups" directory.
	Programs on local drive/ NC Extend	Programs contained in the user memory area. Note: Remember that the user data may be large in volume and any archive file that you create from it will require more memory.
Comment		Entry field for possible comments regarding the start-up archive.
Created by		Entry field for the creator as well as creation date of the start-up archive.

Procedure



1. Select the "Start-up" operating area.

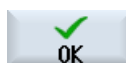


2. Press the menu forward key.



3. Press the "Start-up archive" softkey.

The "Start-up" window opens.

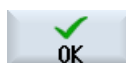


4. Activate "Create a start-up archive" and press the "OK" softkey.

The "Create Start-up Archive" window opens.

5. Select the desired control components.

6. When required, enter a comment as well as your name and the date of creation.



7. Press the "OK" softkey.

The "Generate Archive: Select Storage Location" window opens.



8. Position the cursor at the required storage location, press the "Search" softkey and enter the required search term in the search dialog. Then press the "OK" softkey if you want to search for a certain directory or subdirectory.

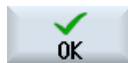


Note: The place holders "*" (replaces any character string) and "?" (replaces any character) make it easier for you to perform a search.

- OR -



Select the required storage location, press the "New directory" softkey, enter the required name in the "New Directory" window and press the "OK" softkey to create a directory.



9. Press the "OK" softkey.
The "Generate Archive: Name" window opens.



10. Enter the required name and press the "OK" softkey.
An archive file with the ARC format type is stored in the selected directory.

15.3 Reading-in a start-up archive

NOTICE**Loss of additional languages during software upgrade**

All the system languages are overwritten during software upgrades. If there are more languages in the system than in the upgrade archive, these additional languages are lost when the archive is read in. It is not possible to back up the languages before software upgrade.

Note

Reading in a start-up archive with drive configurations will overwrite the drives in the logdrive.ini file. The system creates a backup copy with the name logdrive_ini.sav or logdrive.oldstyle. Before the archive is read in, the new drive configurations are activated.

Note

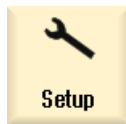
To prevent the NCU from shutting down unintentionally, you must disable all energy saving profiles before you read in a start-up archive.

More information: Universal/Turning/Milling/Grinding Operating Manual

Requirement

You require at least access level 2 (service).

Procedure



1. Select the "Setup" operating area.



Press the menu forward key.



2. Press the "Setup archive" softkey.



3. Activate "Read-in a start-up archive" and press the "OK" softkey.
The "Select Start-up Archive" window opens.

4. Select a storage location and position the cursor at the required start-up archive (ARC).

- OR -



Select the required storage location, press the "Search" softkey and enter the required search term. Then press the "OK" softkey if you wish to search for a certain directory, subdirectory or start-up archive.





5. Press the "OK" softkey.

The "Read-in Start-up Archive" window opens.

You obtain an overview with path details, version information, name of the archive, etc., as well as a list of the archived components.

Remove the tick of a checkbox to exclude a component from the read-in process.

6. Press the "OK" softkey to download the selected archive file.

The "Read-in Archive" window opens and a progress indicator appears for the read-in process.



7. Press the "Overwrite all" softkey if you want to overwrite the existing files.

- OR -



Press the "No overwriting" softkey if you want to keep existing files.

- OR -



Press the "Skip" softkey if you only want to overwrite certain files.

You will then obtain a "Read error log for archive" in which the skipped or overwritten files are listed.

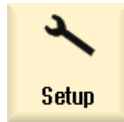


8. Press the "Cancel" softkey to cancel the read-in process.

15.4 Backing up the hardware configuration

The hardware is configured via the system data blocks (SDB) and only these are stored in the archive.

Procedure



1. Select the "Start-up" operating area.



Press the menu forward key.



2. Press the "Start-up archive" softkey.

The "Start-up" window opens.



3. Activate "Create PLC hardware upgrade archive (SDBs only)" and press the "OK" softkey.

The "Create PLC hardware upgrade archive (SDBs only): Select Storage Location" window opens.

4. Select the desired storage location in the displayed data tree.

- OR -



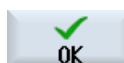
Press the "New directory" softkey to create a separate directory.



The "New Directory" window opens.

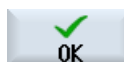
5. Enter the required name and press the "OK" softkey.

The directory is created below the created folder.



6. Press the "OK" softkey.

The "Generate Archive: Name" window opens.



The file type of the archive is ARC and is displayed in the window. Enter the desired name and press the "OK" softkey.

The archive is generated and stored in the selected directory.

15.5 Creating an archive with original data

You can select this type of start-up in order to save the original status of the control. The files are archived in the "original.arc" file.

The file is stored on the CompactFlash card in the Archives/Manufacturer directory.

If there is no "original.arc" file in the directory, it is recommended that an archive be generated from the data of the original control state as delivered.

As for "Create start-up", control components can be saved individually or jointly.

Requirement

In order to save NC data, you require access level 2 (service).

To back up programs/workpieces, you require access level 6 (keyswitch position 1).

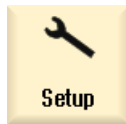
Data of the control components

Control components		Data
NC data		Machine data Setting data Option data Global (GUD) and local (LUD) user data Tool and magazine data Protection zone data R parameters Zero offsets Compensation data Workpieces, part programs and subprograms Standard and user cycles Definitions and macros
	With compensation data	• QEC - quadrant error compensation • CEC - operation/angularity compensation • EEC - leadscrew pitch / encoder error compensation • It only makes sense to archive machine-specific compensation data if the series start-up file is reloaded into the same control.
	With compile cycles	Compile cycles (*.elf) are displayed if compile cycles are available.
PLC data (including CP)		OB (organization blocks) FB (function blocks) SFB (system function blocks) FC (functions) SFC (system functions) DB (data blocks) SDB (system data blocks)
HMI data, all		
HMI data, selection:		

15.5 Creating an archive with original data

Control components	Data
Cycle storage	Definitions and cycles
Texts	User texts, alarm texts
Templates	Individual templates, workpiece templates
Applications	HMI applications, OEM applications
Engineering data	Engineering data
Configuration	Configurations, incl. display machine data
Help	Help files
Version data	Version data
Logs	Error logs
User views	Individually compiled tables with selected machine and setting data.
Dictionaries	Dictionaries
Programs on local drive/ NC Extend	Programs contained in the user memory area. Note: Remember that the user data may be large in volume and any archive file that you create from it will require more memory.

Procedure



1. Select the "Start-up" operating area.



2. Press the menu forward key.



3. Press the "Start-up archive" softkey.

The "Start-up" window opens.



4. Activate the "Create archive of original status" checkbox and press the "OK" softkey.

The "Create Start-up for Original Status" window opens.

5. Select the desired control components.



6. When required, enter a comment into the field as well as your name and the date of creation - and then press the "OK" softkey.

A warning is output if an "original.arc" archive file already exists.



7. Press the "OK" softkey to overwrite the file.

A new archive file is generated and stored in the Archives/Manufacturer directory.

- OR -



Press the "Cancel" softkey so that the existing file is not overwritten.

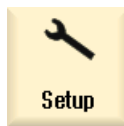
15.6 Reading in an archive with original data

The data of the original controller state is stored in the "original.arc" file. If you want to restore the controller to the as-delivered state, you can read in the original data archive.

Precondition

You require access level 2 (service).

Procedure



1. Select the "Start-up" operating area.



2. Press the menu forward key.



3. Press the "Start-up archive" softkey.

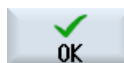
The "Start-up" window opens.



4. Activate the "Read in archive of original status" checkbox and press the "OK" softkey.

SINUMERIK Operate automatically accesses the "original.arc" file.

A window opens prompting whether you want to perform a start-up.



5. Press the "OK" softkey.

The read-in process is started and a progress message box is displayed in the window.

Any errors that occur are then displayed in the "Write Error Log for Archive" window.

15.7 Generating the complete archive

You have the option of generating an archive of the complete data of your control on an external storage medium that you can provide to Technical Support for diagnostic purposes.

Procedure

1. Insert the storage medium in the USB port.
2. Press the key combination <Ctrl> + <Alt> + S.
All data required for diagnostics are compiled in an archive.
Note:
Operator control is not possible while the archive is being generated.
3. You will receive a message once archiving has been completed.
The system assigns an archive name and this is: CompletArchiv<Date>_<Time>.arc.
The dialog box is closed and you can re-operate the control.

15.8 Serial interface (V24 / RS232)

15.8.1 Reading-in and reading-out archives via a serial interface

You have the option of reading out and reading in archives in the "Program manager" operating area as well as in the "Startup" operating area via the V24 serial interface.

Availability of the V24 serial interface

If you want to change the availability of the V24 interface, you can adjust the following parameters in file "slpmconfig.ini":

Parameters	Description	
[V24]	Describes the section in which the relevant setting parameters are located.	
useV24	Setting for the availability of the V24 serial interface	
	= true	Interface and softkeys are available (default)
	= false	Interface and softkeys are not available

Storage of file "slpmconfig.ini"

The template of the file "slpmconfig.ini" for SINUMERIK Operate is stored in the following directory:

<Installation path>/siemens/sinumerik/hmi/template/cfg

Copy the file to one of the following directories:

<Installation path>/**user**/sinumerik/hmi/cfg

<Installation path>/**oem**/sinumerik/hmi/cfg

Note

If you want to achieve a better overview of the changes you have made yourself, simply delete the unchanged parameters from the file copy "slpmconfig.ini".

Reading-out archives

The files to be sent (directories, individual files) are zipped in an archive (*.arc). If you send an archive (*.arc), this is sent directly without being additionally zipped. If you have selected an archive (*.arc) together with an additional file (e.g. directory), then these are zipped into a new archive and are then sent.

Reading-in archives

Use interface V24 if you want to read in archives. They are transferred and then subsequently unzipped.

Note

Reading in commissioning archives

When you read in a commissioning archive via the V24 interface, then this is immediately activated.

Externally processing the punched tape format

If you wish to externally process an archive, then generate this in the punched tape format.

Procedure



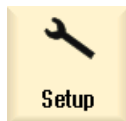
1. Select the "Program manager" operating area, and press the "NC" or "Local. drive" softkey.



...



- OR -



Select the "Startup" operating area and press the "System data" softkey.



Reading-out archives



2. Select the directories or the files that you wish to send to V24.
3. Press the ">>" and "Archive" softkeys.

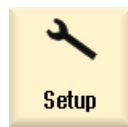


4. Press the "V24 send" softkey.

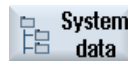
- OR -

Reading in an archive

Press the "V24 receive" softkey if you wish to read-in files via V24.

15.8.2 Setting interface parameters**Procedure**

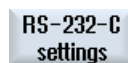
1. Select the "Start-up" operating area.



2. Press the "System data" softkey.



3. Press the ">>" and "Archive" softkeys.



4. Select the "RS-232-C settings" softkey.
The "Interface: RS-232-C" window is opened and the interface settings are displayed.



5. Press the "Details" softkey if you wish to view and process additional settings for the interface.

RS-232-C settings

Parameter	Meaning
Protocol	The following protocol is supported for transfer via the RS-232-C: • RTS/CTS
Transfer	It is also possible to use a secure protocol for data transfer (ZMODEM protocol). • Normal (default setting) • Secure For the selected interface, secure data transfer is set in conjunction with handshake RTS/CTS.
Baud rate	Transfer rate: The baud rate that can be used depends on the connected device, the cable length and the general electrical conditions. • 19200 (default setting, maximum baud rate for NCU (Linux)) • 115200 (maximum baud rate for PC/PCU (Windows))
Archive format	• Punched tape • Binary format (PC format)
RS-232-C settings (details)	

Parameter	Meaning
Interface	• COM1 • COM2 (only relevant for SINUMERIK Operate on PC)
Parity	Parity bits are used for error detection: The parity bits are added to the coded characters to make the number of positions set to "1" an uneven number (uneven parity) or to an even number (even parity). • None (default setting) • Odd • Even
Stop bits	Number of stop bits for asynchronous data transfer. • 1 (default setting)
Data bits	Number of data bits for asynchronous data transfer. • 8 bits (default setting)
XON (hex)	Only for punched tape format
XOFF (hex)	Only for punched tape format
End of data transfer (hex)	Only for punched tape format Stop with end of data transfer character The default setting for the end of data transfer character is (HEX) 1A.
Time monitoring (sec)	Time monitoring For data transfer problems or at the end of data transfer (without end of data transfer character) data transfer is interrupted after the specified number of seconds. The time monitoring is controlled by a time generator (clock) that is started with the first character and is reset with each transferred character. The time monitoring can be set (seconds).

15.9 Backing up setup data

Setting for "Backup setup data"

The "Backup setup data" function should only be used if MD11280 \$MN_WPD_INI_MODE is set to 1 (default setting). Otherwise, when the NC is started for the first time after selecting the part program, a file with the same name with the ".ini" extension would be automatically executed.

Machine data:

MD11280 \$MN_WPD_INI_MODE		
Processing mode of ini files in the workpiece directory		
= 1	When the NC is started for the first time, after the workpiece selection, ini files with the name of the selected part program and the following extensions are executed:	
	CEC	Sag compensation (Cross Error Compensation)
	GUD	User data (Global User Data)
	PRO	Protection zones
	RPA	R parameters
	SEA	Value assignments (Setting Data Active)
	TMA	Magazine data (Tool Magazine Active)
	TOA	Tool offsets (Tool Offset Active)
	UFR	Work offsets (User Frame)

15.10 Network settings

Activating

By default, the network settings cannot be backed up. The archiving of the network settings must be enabled:

1. Copy the "slpmconfig.ini" file from the /siemens/sinumerik/hmi/template/cfg directory.
2. Store the file in the /oem/sinumerik/hmi/cfg or /user/sinumerik/hmi/cfg directory.
3. Open the file and enter the following for [SeriesSetup]:
SupportNetworkSettings=true
4. Restart SINUMERIK Operate.

Note

This setting also affects the creation of a complete standard archive using Ctrl+Alt+S or Ctrl+Alt+C.

More information

A description of the various key combinations is provided in the Operating Manual Universal/Turning/Milling/Grinding.

Restrictions

- The leases files are not saved:
 - /system/etc/udhcpd-eth0.leases
 - /system/etc/udhcpd-ibn0.leases
- A configuration in the system network must be based on the DNS name rather than IP addresses.

Basic procedure

- Backup of network settings
After activation, the network settings can also be backed up when a commissioning archive is created when a check mark is set, see Creating a start-up archive (Page 255).
- Importing network settings
The saved archives can be imported in the same manner as a commissioning archive, see Reading-in a start-up archive (Page 258).

Note**Importing network settings for replacement components**

Disconnect the replacement components from the system network before you import the saved network settings.

NCU

With SINUMERIK Operate on the NCU, the following NCU settings are backed up:

- /user/system/etc/basesys.ini
- /user/common/tcu (complete directory)

Note

The network settings of an NCU can only be backed up and read on the PG/PC via SINUMERIK Operate.

The NC address in mmc.ini on the PC/PG is 192.168.215.1.

PCU

The following PCU settings and, if applicable, NCU settings are saved with SINUMERIK Operate on the PCU:

- PCU
 - /user/system/etc/basesys.ini
 - mmc.ini for SINUMERIK Operate
- NCU (when present as master)
 - /user/system/etc/basesys.ini
 - /user/common/tcu (complete directory)

The following archives are created:

- <Archive_name>_pcu.arc
- <Archive_name>_ncu.arc

Importing an archive for a configuration with NCU as master (DHCP) and PCU (on_low):

1. Import the archive for Archivename_pcu.arc on a PCU with SINUMERIK Operate.
2. Depending on the replaced parts of the NCU, note the following:
 - If the NCU was not replaced, the system restarts.
 - If the NCU has been replaced, <Archive_name>_ncu.arc must be read in via a separate user interface with the X127 interface.

Configuring the network

Overview

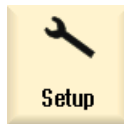
If you wish to perform network settings in SINUMERIK Operate, you have the following options:

- The Start-up operating area allows you to set up all of the basic configurations for the plant and company networks (see Section "Displaying the network overview (Page 274)").
- The Diagnostics operating area gives you an effective overview of all available network adapters and allows you to assign and check settings for the company network or the DHCP server, for example (see Section "Configuring TCP/IP diagnostics (Page 296)").

16.1 Displaying the network overview

All the available interfaces and their network settings are listed in the "Overview of the network settings" window. For example, the IP addresses, subnet masks and MAC addresses for the company and system network are displayed here. You have the option of editing the settings.

Procedure



1. Select the "Start-up" operating area.



2. Press the "Menu forward" key.



3. Press the "Network" softkey.



The "Overview of the Network Settings" window opens.



4. Press the "Change" softkey to edit settings.

See also

Settings of the system network (Page 275)

Settings of the factory network (Page 279)

Saving network settings (Page 281)

16.2 Settings of the system network

The configuration for the DHCP server, the routing, active protocols, for DNS servers and other properties of the system network is performed in the "Settings of the system network" window.

Setting	Description
DHCP activated	Activates or deactivates the DHCP mode for the system network. This automatically assigns IP addresses to the nodes in the system network.
DHCP server synchronization mode	Activates or deactivates the DHCP server synchronization mode. If this setting is active, then the DHCP servers synchronize themselves in the system network (X120) so that only one of them actively assigns addresses. This makes it possible to operate multiple NCUs or PCUs concurrently without having to adjust the network settings. The DHCP servers that are not active go into "standby" mode; in this mode they regularly get the current address data and TCU data from the active server so that if the active server fails, a standby server can take over the active role without data loss. • With the "Master priority" setting you can influence the synchronization in such a manner that the server with the "Master" setting is always the active server (it must be active in the network). This means that in the normal situation, deterministically the same control is always the DHCP server and you can find the actual address data and the TCU data there. "Master priority" must only be set for a single DHCP server in the system network. • The settings "Low priority" and "High priority" can be used to specify which DHCP server takes precedence as the active server. A DHCP server with low priority is then only used as active server when a server with high priority cannot be found in the network. Default: "High priority"
DHCP address range	Specifies the range for DHCP addresses. The range starts at the address specified at "Start" and ends at the address entered at "End". The resulting range of numbers has the following default setting: Start address = first address in the system network End address = start address + 10 or + 2 (if less than 16 addresses are available)

Setting	Description
Timeout when waiting for master	Specifies a maximum waiting time (in seconds) for the response of the master server (see DHCP server synchronization mode). After this time elapses, the server itself becomes the active server. This additional pause makes it possible for the intended DHCP master to become the active DHCP server without displacement even if it is shortly switched on thereafter, or takes longer to boot than other controls. Default: 120 seconds
Host name	Assigns the DHCP server a fixed host name. In this way, the server can also be addressed via the host name and not only via the IP address. Because the host name is also used as DNS name, it must satisfy the corresponding requirements of the RFC: • ASCII letters (a-z, A-Z), digits (0-9) and '-' • maximum 63 characters
DNS domain	This is used to specify the Top Level Domain (TLD) name used in the system network. The DNS server of the NCU assigns names to the devices in the system network in this zone. Name requests for all other zones are forwarded to an external name server in the company network. The "local" default setting recommended by the RFC1035 is used for local networks, to avoid conflicts with globally defined domain names. As a rule, this default setting is sufficient.
PN station name	A separate machine name can be defined here for PROFINET purposes. This is used at the ERTEC interface (when available), transferred to the ERTEC system program and also used by DCP at this network interface.
Station name	This string is used for the SINUMERIK-specific OID mcSinumerikMIB.mcSinumerikMiscStation. The value is the name of a station to which the device belongs. Devices with the same station name can therefore be identified as belonging together. This is for information purposes only.
Location	This string is used for the standard OID SNMPv2-MIB::sysLocation. If required, a location can be specified here which can be called by an SNMP client. This is for information purposes only.
Contact person	This string is used for the standard OID SNMPv2-MIB::sysContact. If required, a contact address can be specified here which can be called by an SNMP client. This is for information purposes only.

Setting	Description
Function	This string is used for the Siemens Industry-specific OID automationSystemIdent.automationFunction-Tag. If required, a function designation can be specified here which can be called by an SNMP client. This is for information purposes only.
Fixed domain	Defines an additional DNS domain name (suffix for DNS queries). This is of especial interest when the DHCP server is switched off at the X120 because this cannot set the "local" domain, but it is required for some DNS queries (e.g. for machine control panels).
Fixed DNS server	Specifies up to three DNS servers that are to be used by the DHCP server. This is of especial interest when the DHCP server is switched off at the X120 because this is also a DNS server or determines DNS servers in the network.
Routing	
Routing X120/X127 -> X130	Specifies whether the routing of packets from the system network (X120) and/or service connection X127 to the company network (X130) is active: - Released: Activates the routing for X120 and X127 - Disabled: Deactivates the routing for X120 and X127 - X127: Activates only the routing from X127 to the company network - X120: Activates only the routing from the system network to the company network
Routing X127 -> X120	Activates or deactivates the NAT routing of packets from the service connection X127 to the system network (X120).
Routing X120 -> X127	Activates or deactivates the routing of packets from the system network (X120) to the service connection X127. This is normally prohibited by the firewall. Note that there is no NAT and the sender must ensure that packets to the PG or service PC at X127 with address 192.168.215.x actually reach the NCU to which the device is connected.
Active protocols	Specifies which protocols are to be used in the system network. "DCP" (Discovery and Basic Configuration Protocol) and "LLDP" (Link Layer Discovery Protocol) are available for selection. The appropriate active protocol is also used for the service connection X127 at the NCU.

Procedure



1. The network overview is open.



2. Press the "System network" softkey.
The "Settings of the System Network" window opens.



3. Press the "Change" softkey to edit settings.



4. Press the "Reset DHCP server" softkey to return the current settings of the DHCP server to the original settings.



5. Press the "Distribute DHCP data" softkey to synchronize the settings with all nodes in the system network.

Note

You can only use the "Reset DHCP server" and "Distribute DHCP data" softkeys with a connection to the active DHCP server.

16.3 Settings of the factory network

The network interface, active protocols and firewall exceptions of the company network are configured in the "Settings of the company network" window.

Setting	Description
Gateway	If this value is not empty, the host specified there is used as the default gateway, which means that all IP packets that cannot be directly assigned are sent there for routing.
DNS server	If DNS name servers are specified here (maximum three), then they must be used to resolve symbolic host names, i.e. at most of the points where an IP address is expected, a computer name can also be used instead. The name server setting is also sent to its DHCP clients (TCU, PG) via the DHCP server of the NCU, so that they can also work with symbolic names.
Time server	Here you can specify up to three NTP servers (UDP/123) that can be used by the NTPD on the NCU for time synchronization.
Host name	Here you can define a name for the local host. This manually assigned name takes priority over all other names. The host name is determined in the following order: • This entry (identical to the host name from the basesys.ini file) • A name received from the DHCP server (reverse DNS lookup, i.e. which name belongs to the received IP address) • Default name ("NONAME_...") Because the host name is also used as DNS name, it must satisfy the corresponding requirements of the RFC: • ASCII letters (a-z, A-Z), digits (0-9) and '-' • maximum 63 characters
Active protocols	Specifies which protocols are to be used in the company network. DCP (Discovery and Basic Configuration Protocol) and LLDP (Link Layer Discovery Protocol) are available for selection.
Firewall exceptions	You can specify ports here that are to be enabled in the external network interface.
• S7 communication (TCP/102)	Port for the S7 communication
• VNC access (TCP/5900)	Port for the VNC access
• Additional ports	Any further ports can be enabled here. The entry starts with the protocol name (TCP or UDP), followed by a slash '/' and the port number of the service to be enabled. Several entries are separated by a space. Example (enabling of the VNC servers): TCP/5900 TCP/5904 TCP/5905

NOTICE

Security risk

Note that opening the ports in the firewall can represent a security risk. Only enable the ports that you actually require.

Note that every accessible service can have security gaps.

Procedure



1. The network overview is open.



2. Press the "Company network" softkey.
The "Settings of the Company Network" window opens.



3. Press the "Change" softkey to edit settings.

16.4 Saving network settings

You have the option of saving the NCU settings as file.

In window "Save network settings: Select archive", select a target folder. The network configuration is saved there, or an existing file is selected, which is overwritten with the new settings.

Procedure



1. The network overview is open and you have made network settings.
2. Press the "Save NCU settings" softkey.
Window "Save network settings: Select archive" is opened.
3. Select the folder in which the network configuration is be stored. If a file is already available, it will be overwritten.
- OR -
Press the "New directory" softkey to create a new directory.
- OR -
Press the "Find" softkey, for example, to find the archive location of the network configuration file.
4. Press the "Find next" softkey if the file found during the search does not correspond to the required configuration file.
5. Press the "Cancel" softkey to reject the settings.

- OR -
Press the "OK" softkey to save the network configuration.

16.5 Configuring operator panels

16.5.1 Displaying the available operator panels

A list with all the available operator panels is displayed in the upper part of the **Available Operator Panels ...** window. One line corresponds to one operator panel and contains the following information:

Column	Description
	Consecutive number to identify the operator panel
Status	Status of the operator panel:  : The operator panel is available on the bus.  : The operator panel is not available on the bus.
HW	Information on the hardware of the operator panel Possible values are unknown (no information available), NCU, PCU, PPU, TCU (all TCU including HT 8, etc.). Default value: Unknown
Name	Name of the operator panel
MCP	DIP switch position for the machine control panel The values can be freely selected from 1 to 254 (0 means that the last active machine control panel is retained, 255 means that a machine control panel is not being used). Default value: 192
DCK	Availability of direct control keys Active: The TCU has direct control keys Inactive: The TCU has no direct control keys
TCU	Index for the TCU (Thin Client Unit) The value is freely configurable from 0 to 255 and is used for identification in the PLC.
EKS	DIP switch position for the chip reader for access levels (Electronic Key System) Possible values range from 1 to 255. The value 0 means that an EKS is not used.
Virtual key-board	Use of a virtual keyboard Possible values are "Never", "Always" and "Auto", whereby "Auto" is set as default value.

Note

The information of the operator panels is read-only and cannot be changed in the **OPs** window.

Update of the overview

When switching to the **OPs** window, a search for available operator controls is performed automatically. This is also possible later via the "New display" or "Reload OP data" softkeys. The latter action results in a completely new scan during which already available operator controls are deleted from the local cache. New operator controls and data are sought during a reload.

The active DHCP server that contains the data for the operator panels can be a different NCU, but also the local NCU itself. Irrespective of this, a copy of the data is stored and used on the local NCU.

Procedure



1. Select the "Start-up" operating area.



2. Press the "OPs" softkey.



The "OPs" window is opened.

All the presently available operating elements are displayed.



3. Press the "New display" softkey to refresh the overview.
A search is performed for new operator controls and data.



4. Press the "Reload OP data" softkey to start a completely new search.
Already available operator controls are deleted from the buffer during this search.



5. Press the "Distribute TCU data" softkey to synchronize the available controls with all participants in the system network.

Note

You can only use the "Distribute TCU data" softkey with a connection to the active DHCP server.

16.5.2 Configuring VNC connections

A list of the available VNC connections is displayed in the lower part of the "Available Operator Panels ..." window. It contains the following information:

Column	Description
	Consecutive number to identify the VNC connection
VNC server	IP address or name of the NC
Displacement	Specifies whether it is possible that the TCU will be displaced by other nodes.
/Priority	Displacement priority: Specifies the priority which influences whether the TCU will be displaced by other nodes. The possible values lie between 0 and 10. The smaller the value, the faster the TCU will be displaced. If the displacement is blocked, the priority will be ignored.
Start	Specifies whether the TCU is to be started active, i.e. as operator panel.
/Priority	Start-up priority: Specifies the priority of the TCU connection to be used. Any value greater than 0 is permitted. The larger the value, the lower the connection priority.
Display area	Specifies which HMI screen is displayed when activating the TCU.
Channel	Specifies which channel is displayed when activating the TCU.

Editing the list of VNC connections



1. The "Available Operator Panels ..." window is open.
2. Press the "Change" softkey.
The information on the VNC connections can be edited.
- OR -
3. Press the "Add" softkey to establish a new VNC connection.

- OR -
4. Press the "Remove" softkey to remove a selected VNC connection from the list.

- OR -
5. Press the "Move up" or "Move down" softkey to move a VNC connection within the list.
6. Make the required change and press the "OK" softkey.

- OR -
Press the "Cancel" softkey to cancel the changes.

See also

Displaying the available operator panels (Page 282)

16.5.3 T:M:N configuration

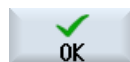
By T:M:N configuration we mean a grouping of t operating stations (TCUs with MCP), m HMI systems and n NCK systems, in which the operating stations can be freely switched to the various HMI systems in order to operate. In a two-stage process, the switchover targets for each operating station are individually configured in a channel menu.

From the point of view of the HMI, T:M:N operation is active if a channel menu is configured. Available switchover targets are defined directly via the address of the HMI and optionally via an NC channel, which must be assumed on switchover from the HMI. These switchover targets can be combined into so-called channel groups. Channel groups are displayed on horizontal softkeys in the channel menu, the switchover targets themselves (HMI, NC channel) are displayed on the vertical softkeys assigned to a channel group.

Linking of softkeys to channel groups

A list for the linking of the HMI softkeys to configured channel groups is displayed in the lower part of the window. The channel groups can in turn contain switchover targets that execute functions of the operator panel, for example. Up to 32 softkeys (SK_1 to SK_32) can be linked to a specific channel group (e.g. CH_GRP_0).

Procedure



1. The "Available Operator Panels ..." window is open.
 2. Select the required operator panel and press the "T:M:N" softkey
A list for the linking of the HMI softkeys to configured channel groups is displayed in the lower part of the window.
 3. Press the "Change" softkey.
The list can be edited.
 4. Make the required change and press the "OK" softkey.
- OR -
- Press the "Cancel" softkey to cancel the changes.

See also

Displaying the available operator panels (Page 282)

16.6 Station-related network diagnostics

Using the station-related network diagnostics, you have the possibility of identifying faulty or incorrectly parameterized components or those components that have not been connected.

You obtain an overview of all of the components belonging to the system network:

- NCU
- PCU
- TCU
- MCP
- EKS

If components are either faulty or absent (or unavailable), they will be marked as such in this overview.

Error analysis

You have the option of initiating a fault analysis for the components involved. You obtain the result of a such a diagnostics in the form of a fault message. The possible fault states and causes are described in this fault message together with how to resolve the fault.

16.6.1 Displaying network adapters

The actual network adapters (system network X120, company network X130 or system network ETH2 and company network ETH1) and their availability are displayed in a tree-like structure in the "TCP/IP diagnostics" window.

Displaying the components

The following components are displayed in the window:

- The control is displayed at the topmost level.
- System network (X120 / ETH2) with configured operator stations with IP address
 - Operator panels with IP address
 - Machine control panels
 - EKS
- Company network (X130 / ETH1) with
 - Operator panels with IP address
 - Machine control panels
 - EKS

Components that cannot be accessed



If a component cannot be accessed, then it is marked using this symbol.

Input rights

Operator panels, which have input rights, have a green background.

Detailed view

You have the option to display the following information about a selected component.

TCU

- IP address
- SW version
- MCP index from the configuration
- TCU index from the configuration
- DNS name
- Resolution

MCP

- IP address
- DNS name
- MCP index from the configuration
- MCP index requested from HMI
- MCP index requested from PLC

Procedure



1. Select the "Diagnostics" operating area.



2. Press the menu forward key and the "Bus TCP/IP" softkey.



3. Press the "TCP/IP diagnostics" softkey.
The "TCP/IP Diagnostics" window opens and displays the current availability of the network connections.
4. Position the cursor on the component for which you wish to display the detailed information.



5. Press the "Details" softkey to display all available parameters of the configured network connections.



6. Press the "Details" softkey to hide the detailed display.



7. Press the "Return" softkey in order to exit the "TCP/IP diagnostics" window and return to the "PROFIBUS diagnostics" window.

16.6.2 Error analysis

16.6.2.1 Performing error diagnostics

Precondition

Error analysis only functions for a PCU.

Procedure



1. The "TCP/IP Diagnostics" window opens.
2. Position the cursor on the component that is marked as having an error (NCU).
3. Press the "Error analysis" softkey.
The corresponding error message is displayed.

16.6.2.2 MCP/EKS as network participant cannot be accessed

Error	Possible error causes and remedies
The MCP/EKS cannot be accessed as network participant.	
	Error cause 1
	There is no physical network connection. Notice: The display only refers to the circumstance that the direct connection from MCP/EKS to the next connection nodes has not been established, i.e. • The Ethernet cable is not directly inserted at the MCP/EKS, • The Ethernet cable is not inserted at the direct connection partner or the partner is not available (e.g. MCP), • The Ethernet cable connected to the MCP/EKS is defective.
	Remedy
	Establish the physical network connection (check the plug-in connections, replace the cable, check the connection partner).
	Error cause 2
	The physical network connection does not exist after the next connection node to the system network. There is no physical connection from the MCP/EKS to the computer with the active DHCP server. The cables are either defective, have not been inserted or switches have not been closed. Switches can also be located on the MCP or distribution box.
	Remedy
	Establish the physical network connection (check the plug-in connections, replace the cable, check the connection partner). Once the connection has been established, the TCU continues to boot.
The MCP/EKS cannot be accessed as network participant. There is a physical network connection to the system network.	
	Cause of the error

Error	Possible error causes and remedies
	No active DHCP server is found in the system network. Possible causes: • Only a single computer has been configured in the system network with active DHCP server - and this computer is not available. The system network is not operated with synchronizing DHCP servers. • No computer has been configured in the system network with active DHCP server. DHCP operation is disabled on all potential computers (NCU, PCU). This is a configuration error. • In the system network, there is no NCU or PCU computer available that has DHCP operation activated on it and could be a server.
	Remedy
	In the system network, configure a computer that is available as DHCP server.

16.6.2.3 HMI on the PCU cannot establish a network connection to the NC

Error	Error cause 1	Remedy
HMI displays alarm 120202 "Wait for connection to NC/ PLC" and/or no values (only '#').	The IP address of the target NCK/PLC set on the PCU is incorrect.	From the HMI, correct the target address for NCK/PLC and restart the PCU.

Error	Error cause 2.1	Remedy
HMI displays alarm 120202 "Wait for connection to NC/ PLC" and/or no values (only '#').	The PCU has an IP address that does not belong to the network or has an invalid IP address. The TCU support is deactivated on the PCU (= DHCP is disabled) and the PCU either operates with a permanently set IP address that does not belong to the network, or with the standard Windows DHCP client to dynamically retrieve addresses. This is a configuration error.	Correctly set the network settings for the system network in the Windows service mode (set the fixed specified IP address and subnet mask for the system network, use the addressing mode, fixed IP address). Execute the following actions using the "System Network Center" program: • Connect the DHCP service to the interface for the system network • Set the DHCP mode (TCU support, DHCP SyncMode, address range of the addresses that can be assigned) • Initiate DHCP clear

Error	Error cause 2.2	Remedy
HMI displays alarm 120202 "Wait for connection to NC/PLC" and/or no values (only '#').	The PCU has an IP address that does not belong to the network or has an invalid IP address. The TCU support is activated on the PCU (= DHCP is enabled) and the PCU is active DHCP-/DNS server (either as a result of the DHCP SyncMode ON_MASTER or as a result of the Sync priority - just the same as the other server candidates and random selection) - or the PCU is a DHCP client. As a result of a software error or the actual network configuration, the PCU cannot obtain a valid IP address (e.g. '0 address').	Correctly set the network settings for the system network in the Windows service mode (set the fixed specified IP address and subnet mask for the system network, use the addressing mode, fixed IP address). Execute the following actions using the "System Network Center" program: • Connect the DHCP service to the interface for the system network • Set the DHCP mode (TCU support, DHCP SyncMode, address range of the addresses that can be assigned) • Initiate DHCP clear In addition, at the station with DHCP master (DHCP SyncMode = ON_MASTER) a DHCP clear should be initiated.

Error	Error cause 2.3	Remedy
HMI displays alarm 120202 "Wait for connection to NC/PLC" and/or no values (only '#').	The PCU has an IP address that does not belong to the network or has an invalid IP address. The TCU support is activated on the PCU (= DHCP is enabled) and the PCU is active DHCP-/DNS server (either as a result of the DHCP SyncMode ON_MASTER or as a result of the Sync priority - just the same as the other server candidates and random selection). The PCU is set with an incorrect IP address and an incorrect IP range for the IP addresses that can be dynamically allocated. The PCU possibly changed from DHCP standby to active server as the computer with DHCP MASTER has failed or been switched-off.	Correctly set the network settings for the system network in the Windows service mode (set the fixed specified IP address and subnet mask for the system network, use the addressing mode, fixed IP address). Execute the following actions using the "System Network Center" program: • Connect the DHCP service to the interface for the system network • Set the DHCP mode (TCU support, DHCP SyncMode, address range of the addresses that can be assigned) • Initiate DHCP clear In addition, at the station with DHCP master (DHCP SyncMode = ON_MASTER) a DHCP clear should be initiated.

Error	Error cause 2.4	Remedy
HMI displays alarm 120202 "Wait for connection to NC/PLC" and/or no values (only '#').	The PCU has an IP address that does not belong to the network or has an invalid IP address. TCU boot support is activated on the PCU (= DHCP is enabled) and the PCU is the standby DHCP/DNS server (i.e. in the role of the DHCP client). An additional active DHCP server was switched into the system network while operational; this active DHCP server also has an incorrect address range. This is a configuration error.	Correctly set the network settings for the system network in the Windows service mode (set the fixed specified IP address and subnet mask for the system network, use the addressing mode, fixed IP address). Execute the following actions using the "System Network Center" program: • Connect the DHCP service to the interface for the system network • Set the DHCP mode (TCU support, DHCP SyncMode, address range of the addresses that can be assigned) • Initiate DHCP clear In addition, at the station with DHCP master (DHCP SyncMode = ON_MASTER) a DHCP clear should be initiated. Switch the complete system off and on again.

Error	Possible error causes and remedies
HMI displays alarm 120202 "Wait for connection to NC/PLC" and/or no values (only '#').	
	Error cause 3.1
	The NCU has an IP address that does not match the network or has an invalid IP address. The NCU does not participate in DHCP operation and runs with a permanently set IP address that is incorrect and does not match the system network.
	Remedy 3.1
	Connect the service PG to the NCU via X127. Log into Linux via WinSCP or Putty. Using the service command 'sc show ip -eth0', display the actual settings - and check these. If the cause of the error is confirmed, then the NCU must be reparameterized. Perform the service commands and settings: • sc enable DHCPSPvr -X120 or the equivalent sc enable DHCPSPvr -eth0 to activate DHCP operation • sc enable DHCPSSync -X120 -LOW HIGH MASTER or equivalent sc enable DHCPSSync -eth0 -LOW HIGH MASTER to set the DHCP synchronization mode of this NCU Enter the following entries correctly in the /user/system/etc/basesys.ini file <pre>:[InternalInterface] ; With InternalIP and InternalNetMask (both must be set together), ; you can change the address on the internal/TCU/automation/system net. InternalIP=192.168.214.1 InternalNetMask=255.255.255.0 ... ; This is the range of dynamic IPs given out by the DHCP server ; Defaults should be sensible InternalDynRangeStart=192.168.214.10 InternalDynRangeEnd=192.168.214.239</pre> The values in green should be set corresponding to the overall system. Then restart the NCU.

Error	Possible error causes and remedies
	Error cause 3.2
	The NCU has an IP address that does not match the network or has an invalid IP address. The NCU participates in DHCP operation and the NCU is an active DHCP/DNS server (either as a result of the DHCP SyncMode ON_MASTER or as a result of the Sync priority - just the same as the other server candidates and random selection). The NCU is set with an incorrect IP address and an incorrect IP range for the IP addresses that can be dynamically allocated. The NCU possibly changed from DHCP standby to active server as the computer with DHCP MASTER has failed/has been switched-off.
	Remedy 3.2 The same as for remedy 3.1
	Error cause 3.3
	The NCU has an IP address that does not match the network or has an invalid IP address. The NCU participates in DHCP operation and operates with the incorrect IP address. After the NCU booted, an additional component that is already operational (NCU or PCU) with active DHCP server was connected to the network. An additional active DHCP server was switched into the system network while operational; this active DNCP server has an incorrect address range. This is a configuration error.
	Remedy 3.3 The same as for remedy 3.1
HMI displays alarm 120202 "Wait for connection to NC/PLC" and/or no values (only '#').	
	Error cause 4.1
	The NCU has a valid IP address in the system network, however, not the required IP address. The NCU does not participate in DHCP operation and operates with a permanently set target address that is different from that saved in MMC.INI in the system network - however, this is a valid address. This is a configuration error.
	Remedy 4.1
	Connect the service PG to the NCU via X127. Log into Linux via WinSCP or Putty. If the set NCU mode (no DHCP) is to be kept, the fixed IP address of the NCU must be changed. Correctly enter the following entries into the file /user/system/etc/basesys.ini [InternalInterface] ; With InternalIP and InternalNetMask (both must be set together), ; you can change the address on the internal/TCU/automation/system net. InternalIP=192.168.214.1 InternalNetMask=255.255.255.0 Then restart the NCU.
	Error cause 4.2
	The NCU has a valid IP address in the system network, however, not the required IP address. The NCU does not participate in DHCP operation and operates with a permanently set target address that is different from that saved in MMC.INI in the system network - however, this is a valid address. This is a configuration error.
	Remedy 4.2 The same as for remedy 4.1
	Error cause 4.3

Error	Possible error causes and remedies
	The NCU has a valid IP address in the system network, however, not the required IP address. The NCU participates in DHCP operation and was not able to obtain the corresponding required IP with the target address saved in the MMC.INI; this is the reason that it was dynamically allocated an address. A reason for this could be that the required IP was configured twice in the system network, or the required IP is not in the reserved range, but is located in the dynamic address range. This is a configuration error.
	Remedy 4.3 The same as for remedy 4.1
	Error cause 4.4
	The NCU has a valid IP address in the system network, however, not the required IP address. The NCU participates in DHCP operation as DHCP client and has a required IP that has been set but which does not match the system network. For instance, this situation occurs if a network address was used in the system network other than the default network address, but it was forgotten to change over the required IP of the NCU to this address range. The NCU is allocated an IP address that matches the system network from the dynamically allocated range, but which is different from its 'old' required IP that was not changed over. Up to and including SW 2.4.1, in this situation, the NCU cannot be addressed in the system network. The reason for this is that it has internally established its firewall regarding the required IP that was entered for it, which does not match the system network - which is why it does not respond at X120.
	Remedy 4.4 The same as for remedy 4.1
HMI displays alarm 120202 "Wait for connection to NC/PLC" and/or no values (only '#').	
	Error cause 5.1
	There is no physical connection. Possible error causes include: • A switch is not closed/has failed; this can also be the switch of an MCP • The cable connection has become loose (poor contact) • An incorrect cable was used (crossover/not crossover) • A cable being used as data link is defective
	Remedy 5.1
	Establish a physical connection.

16.6.2.4 TCU cannot establish a network connection to the HMI

Error	Possible error causes and remedies
When booting, TCU signals 'ERROR: Network connection not established'.	
	Cause of the error
	There is no physical connection. Notice: The display only refers to the situation where the direct connection of the TCU to the next connection nodes has not been established, i.e. • The Ethernet cable is not directly inserted at the TCU, • The Ethernet cable is not inserted at the direct connection partner or the partner is not available (e.g. MCP), • The Ethernet cable at the TCU is defective.

16.6 Station-related network diagnostics

Error	Possible error causes and remedies
	Remedy
	Establish the physical network connection (check the plug-in connections, replace the cable, check the connection partner). Once the connection has been established, the TCU continues to boot.
When the TCU boots, it signals 'connection established – no DHCP server available'.	
	Cause of the error
	The physical network connection does not exist after the next connection node to the system network. There is no physical connection from the TCU to the computer with the active DHCP server. The cables are either defective, have not been inserted or switches have not been closed. Switches can also be located on the MCP or distribution box.
	Remedy
	Establish the physical network connection (check the plug-in connections, replace the cable, check the connection partner). Once the connection has been established, the TCU continues to boot.
When the TCU boots, it signals 'connection established – no DHCP server available'. There is a physical network connection to the system network.	
	Cause of the error
	No active DHCP server is found in the system network. Possible error causes include: • Only a single computer has been configured in the system network with active DHCP server - and this computer is not available. The system network is not operated with synchronizing DHCP servers. • No computer has been configured in the system network with active DHCP server. DHCP operation is disabled on all potential computers (NCU, PCU). This is a configuration error. • In the system network, there is no NCU or PCU computer available that has DHCP operation activated on it and could be a server.
	Remedy
	In the system network, configure a computer that is available as DHCP server.
After it has booted, the TCU displays 'Waiting for HMI'. (The TCU cannot establish its connection to the HMI.)	
	Error cause 1
	The connection to the HMI has not been established - neither the connection configured in config.ini nor the default connection. An incorrect address for the HMI connection after booting has been set in the config.ini file.
	Remedy
	Correct the configuration using the "System Network Center" program. The TCU automatically reboots.
	Error cause 2
	The connection to the HMI has not been established - neither the connection configured in config.ini nor the default connection. The computer, to which the TCU should connect after booting according to the configuration in config.ini, cannot be reached because the computer is not switched on/is not available.
	Remedy
	Switch off the computer (NCU or PCU) and switch on again.
	Error cause 3

Error	Possible error causes and remedies
	The connection to the HMI has not been established - neither the connection configured in config.ini nor the default connection. The HMI on the computer, to which the TCU should connect after booting according to the configuration in config.ini, cannot be reached because the HMI is deactivated.
	Remedy
	Activate the HMI on the NCU using the service command <code>sc enable HMI</code> .
	Error cause 4
	The connection to the HMI has not been established - neither the connection configured in config.ini nor the default connection. The HMI on the computer, to which the TCU should connect after booting according to the configuration in config.ini, cannot be reached because the HMI has either not start or has crashed due to a software error.
	Remedy
	Switch off the computer (NCU or PCU) and switch on again.

16.6.2.5 The TCU cannot establish a network connection to the assigned PCU

Error	Possible error causes and remedies
	The PCU does not have the IP address specified in the configuration, but an address from the IP range of the system network that can be dynamically allocated. In this error case, the TCU cannot reach its configured PCU for display.
	Error cause 1
	IP address assigned twice The PCU has a default IP address which is also configured for another NCU/PCU. This means that an IP address has been assigned twice and therefore there is a system configuration error. The PCU is not an active DHCP server (otherwise, it would have the required IP), however, it is operated in the synchronizing DHCP mode. As the address requested from the PCU has already been assigned, the PCU is allocated an address from the dynamic address range via DHCP.
	Remedy
	A decision has to be made which computer should keep the IP address that has been assigned twice. If it is the PCU, then - on the PCU, under network settings, this address should be again set as fixed IP address in the system network, - at the NCU/PCU which runs in the DHCP synchronization mode ON_MASTER, a 'Clear DHCP' should be executed (for an NCU <code>sc clear dhcp -X120</code>, for a PCU using the "System Network Center" program). - at the computer, which uses the IP address assigned twice as second computer, the IP address should be re-configured. Notice: If this is a PCU, then it should be linked to this new address using the "System Network Center" program (this is the first screen in the program). If the PCU is to change its address, then on the PCU - under network settings, the new address should be set as fixed IP address in the system network, - linked to this new address using the "System Network Center" program (first screen in the program) - at the NCU/PCU, which runs in the DHCP synchronization mode ON_MASTER, a 'Clear DHCP' should be executed (for an NCU using the <code>sc</code> command, for a PCU, using the "System Network Center" program). Restart the system.

Error	Possible error causes and remedies
	Error cause 2
	This was preceded by replacing the PCU hardware. As a result of the hardware replacement, in spite of the same settings of the new PCU, the requested (set) IP address is still internally reserved for the previous hardware as this is an inherent feature of the system. The PCU is either active or non-active DHCP server, however, is operated in the synchronizing DHCP mode. As the address requested from the PCU is still reserved, the PCU is allocated an address from the dynamic address range via DHCP.
	Remedy
	Perform the following steps: • Under network settings, on the PCU, set the required address again as fixed IP address in the system network. • At the NCU/PCU, which runs in the DHCP synchronization mode ON_MASTER or is active DHCP server, execute a 'Clear DHCP' (for an NCU using the sc command <code>sc clear dhcp -X120</code>, for a PCU, using the "System Network Center" program). • Restart the system.
	Error cause 3
	An address that does not belong to the network has been configured for the PCU. An address has been configured for the PCU, which does not match the network address in the system network, and is therefore dynamically assigned an IP address from the active server via DHCP. The PCU is not an active DHCP server, but is operated in the synchronizing DHCP mode.
	Remedy
	Perform the following steps: • Under network settings, on the PCU, set the required address again as fixed IP address in the system network. • On the PCU, using the "System Network Center" program, link the DHCP service to this new address (first screen in the "System Network Center" program), if required, adapt the other DHCP settings (dynamic address range). • At the NCU/PCU, which runs in the DHCP synchronization mode ON_MASTER or is active DHCP server, execute a 'Clear DHCP' (for an NCU using the sc command <code>sc clear dhcp -X120</code>, for a PCU, using the "System Network Center" program). • Restart the system.

16.6.3 Configuring TCP/IP diagnostics

The configuration of the network adapter is displayed in the "TCP/IP Configuration" window.

System network

On the system network, process data communication and image transmission of the components are executed with the operating software for the display units (TCUs).

A TCU and NCU are connected to the plant network via Ethernet interface X120.

A PCU is connected via the ETH2 Ethernet adapter.

Company network

The company network is used, for example, to access the network drives.

An NCU is connected to the company network via Ethernet interface X130.

A PCU is connected via the ETH1 Ethernet adapter.

Availability of the network connections

Network adapter connection



White Network cable inserted



Red Network cable not inserted

Availability

The availability describes the percentage of packets with errors as compared with all the packets sent and received.

Problems in the company network (e.g. logical drives that cannot be accessed, double IP address, etc.) as well as settling time during power up can result in fluctuations in availability.



Green Greater than 95%



Yellow 50 - 95 %



Red Less than 50%

Details of the network connections

- **Computer name**
- **DNS name**
Computer name of the controller as stored at the DNS server (**D**omain **N**ame **S**ervice).
- **MAC address**
Physical address of the network adapter

- **Address type**

Information about the configuration of the network adapter in the configuration file "basesys.ini":

- **DHCP:** DHCP is active for this network adapter.
The information behind the hyphen "-" specifies the DHCP mode of operation:
off - DHCP is deactivated for this adapter
Client - a DHCP client that receives an IP address and further data from a server, is running on the interface
Server - the NCU provides a DHCP server on this interface that supplies clients on this network with IPs
Synced Server - a protocol is active with which multiple NCUs synchronize with each other. This ensures that only ever one of these NCUs functions as the DHCP server and, for example, no duplicate IP addresses are assigned.
If a network adapter operates as "Synced Server", the "State of synch. DHCP server" line displays additional information.
If no changes have been made for the network adapters in the configuration file, "Default" is also output.
- **Manual**
The settings IP address, subnet mask, DNS server 1, DNS server 2 and gateway are configured in the "basesys.ini".
Note:
In the "Change" mode, either "Manual" or "DHCP" can be selected (only for company network, X130).

- **IP address assigned**

Current IP address of the network adapter.

- **Subnet mask assigned**

- **DHCP server**

IP address of the network adapter (for address type "DHCP").

- **State, DHCP server**

State of the synch. DHCP server:

- Active (current NCU is active in the group of all NCUs in the "Synced Server" mode and transfers the IP addresses);
- Standby (NCU is not active, if the active server fails, this NCU could take over the role of server).

- **Mode, DHCP synchron.**

Priority of the synch. DHCP server:

Low, High, Master

- **DNS server 1, DNS server 2**

Domain Name Server

- **Gateway**

- **Note**

All information that is not available is marked in the relevant table line with a hyphen "-".

Modifiable parameters

The following parameters of the company network adapter (X130) can be set by selecting the "Address type":

- Address type
- IP address
- Subnet mask
- DNS server 1 and 2
- Gateway (applies for system and company network)

Address types

- DHCP
The values for the settable parameters IP address, subnet mask, DNS server 1, DNS server 2 and gateway are defined automatically by the DHCP server, in accordance with the entry in the "basesys.ini".
- Manual
The values for the settable parameters IP address, subnet mask, DNS server 1, DNS server 2 and gateway can be specified manually; these are then stored in the "basesys.ini".

Procedure



1. Select the "Diagnostics" operating area.



2. Press the menu forward key and the "Bus TCP/IP" softkey.



3. Press the "TCP/IP diagnostics" and TCP/IP Config." softkeys. The "TCP/IP Configuration" window opens.



4. Press the "Modify" softkey to change specific parameters. The fields that can be edited have a white background.



5. Enter the desired changes and press the "OK" softkey to confirm the entries.



6. Press the "New display" softkey to refresh the display.

16.6.4 Ethernet network diagnostics

16.6.4.1 Diagnostics of the network and DHCP server

In order to more effectively influence the commissioning, press the "Network diagnostics" softkey to easily represent the data and availability of each network node on the Ethernet. The results display of this scan process delivers, among other things, the following information:

- Component identification of the hardware
- TCP/IP address / MAC address
- DHCP server detection
- Status of the nodes

This gives you the option to test whether the current topology matches the reference topology.

Procedure



1. Select the "Diagnostics" operating area.



2. Press the menu forward key and the "Bus TCP/IP" softkey.



3. Press the "TCP/IP diagnostics" softkey.
The "TCP/IP Diagnostics" window opens and displays the current availability of the network connections.



4. Press the "Network diagnostics" softkey to browse your networks.
The "Network Status" window opens and displays the addresses of the HMI (X120) system network, the PN (X150) system network and the (X130) company network.
The corresponding fields in the window remain empty for non-accessible networks.



5. Press the "New display" softkey to refresh the display.

- OR -



Press the "DHCP server" softkey to fetch information and query the status of the DHCP server.

The "DHCP Server" window opens.

For each active DHCP server, the status, the role (priority), the MAC address, the TCU version and the lease version are displayed in tabular form in the upper part of the window. The required IP with the associated address area appears in the lower part of the window.

Any differing data is displayed in red.



6. Press the "Address list" softkey to acquire all information about the active DHCP server.

The "Address list" window is opened.

The IP address, the client ID in the form of the MAC address or the CF card number, the lease version, the device number, the DNS name and additional information are displayed for each node in a tabular form.

Inactive nodes are grayed out.

16.6.4.2 Messages

All the system-relevant state and error messages from the "syslog" log file are displayed via the "Messages" softkey.

Procedure



1. The "Network Status" window opens.



2. Press the "Messages" softkey.
The "Messages" window opens.



3. Press the "Show all", "DHCP", "MCP" or "TCU" softkey to filter the display.



16.6.4.3 Network trace

If network problems occur, you can record the data traffic as a log file for analysis and evaluation via the "Network Trace" window.

General information

- The function is protected with the default password NETWORK

Note

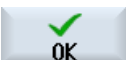
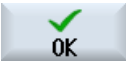
Change the default password to prevent improper use.

- The log is recorded via the tcpdump program (Linux) or the windump program (Windows). **Further information** can be found at www.tcpdump.org

Requirement

Access level 2 (service) is required to change the password.

Procedure

- | | |
|---|--|
|  | 1. The "Network Status" window is open. |
|  | 2. Press the "Network trace" softkey.
The "Set Password" window opens. |
|  | 3. Enter the password and press the "OK" softkey to confirm the entry.
The "Network Trace" window opens. |
|  | 4. If you have stored parameters in a file, press the "From file" softkey, for example, to read in the file from a USB.
The "Select File" window opens. |
|  | 5. Select the file from a directory and confirm with "OK". |
| | - OR - |
|  | 4. If required, parameterize the recording conditions in the "Parameters (tcpdump)" input field. |
|  | 5. Press the "Start" softkey to record the log.
Note: Recording stops automatically after 20 minutes. |
|  | 6. Press the "Stop" softkey to complete the recording.
The "Export Trace File" window opens. |
|  | 7. Select a storage location, assign a file name and confirm with "OK".
The trace file is moved to the storage location. With "Cancel", the log remains in the following directory:
HMI data/Logs/Network trace/tcpdump.pcap or windump.pcap |
|  | 8. If the log already exists, press the "Export trace file" softkey to save the current log file, for example, on a USB storage medium.
The "Select Storage Location" window opens. |
| | 9. Select a storage location, assign a file name and confirm with "OK". |

Change password



1. The "Network Trace" window is open.
2. Press the "Change password" softkey.
The "Change Password" window opens.
Enter a new password and confirm with "OK".

Trace parameters

You can parameterize the conditions for the log recording via the "Parameters (tcpdump)" input field in the Network Trace window.

Syntax

<switch> <option>

<switch> parameters

Value	Meaning
-D	Displays a list of all network interfaces. All other <Switch> parameters are ignored.
-i <interface>	Defines which network interface has to be checked.
-n	Host names are not resolved.
-c <number>	The recording is stopped after a defined number of packets.
-C <file size>	Limits the file size. When the file size is reached, a new file with name and consecutive number, starting with 1, is created. The unit of the file size corresponds to million bytes.
-e	Outputs the Ethernet header.
-q	Creates an abbreviated log version.
-vv	Creates more detailed packet information.
-S	Changes the packet sequence number from absolute to relative.
-A	Outputs the contents of a packet as ASCII.
-xx	Outputs the contents of a packet as Hex.
-XX	Outputs the contents of a packet as Hex and as ASCII.
-s <bytes>	Specifies the packet size in bytes that has to be recorded per packet. The default is 68 bytes.

Note

The value `-w` is always implicitly contained in the call for the creation of the standard log file:
HMI data/Logs/Network trace/tcpdump.pcap or windump.pcap

Parameter <option>

Option	Value	Meaning
host	IP address or host name	Only those packets are recorded that have the specified IP address or host name as source or as destination.
net	Network range	Only those packets are recorded that have an IP address or host name from the specified network range as source or as destination.
port	A number from 0 to 65535	Records packets that have the specified port, e.g. 5900, on the source or on the destination side.
portrange	A range between 0 and 65535	Records packets that have a port in the specified range on the source or on the destination side.
src	host, net, port or portrange	Only those packets are recorded that have the specified value as source.
dst	host, net, port or portrange	Only those packets are recorded that have the specified value as destination.
proto	ether, fddi, tr, wlan, ip, ip6, arp, rarp, decnet, tcp and udp	Network protocol in which packets can be recorded.

You can link several options using the following expressions:

and, or, not

You can limit extended expressions using the following characters:

() and ' '

Reference

Further parameter assignments can be found at www.tcpdump.org

Examples

```
-n port 22 ; Records whether packets arrive at port 22 of the local system.
```

```
-i eth0 port 4080 ; Records all data for port 4080 arriving at the eth0 interface.
```

```
-i 2 ; Records all data arriving at the interface with adapter number 2.
```

```
-n host 10.113.20.0 ; Records the network traffic from system 10.113.20.0, whereby the IP address is not changed to the host name.
```

```

192.168.214.4 and not net 10.113.20.0 ; Records the entire network
                                     traffic of system
                                     192.168.214.4 which does not
                                     run via system 10.113.20.0.

-i 10.113.20.0 -q '(tcp port 80) or   ; Records HTTP and also HTTPS
(tcp port 443) '                     packets of the network
                                     interface from system
                                     10.113.20.0.

```

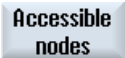
16.6.4.4 Accessible nodes

By actuating the "Accessible nodes" softkey in the network, the list of accessible nodes on X120 and, if necessary, on X150, is created and displayed. The list content can be compared as current topology with a reference topology.

Note

Although handheld terminals and EKS identification systems are not determined for the list of accessible nodes, they can be added as additional nodes to the topology.

Procedure

- | | |
|---|--|
|  | 1. The "Network Status" window opens. |
|  | 2. Press the "Accessible nodes" softkey.
The "Accessible Nodes" window opens.
The IP address, HW-Id/type, status and location are displayed in tabular form for each node. |
|  | 3. Press the "Sort" softkey. |
|  | 4. Press the "By name", "By IP", "By type" or "By location" softkeys to sort the display. |
|  | |
|  | |
|  | |

- OR -



3. Press the "Topology" softkey if you require an overview of all of the networked nodes, e.g. to check if there are connection problems.
The "Network Topology" window opens.
The interface, port and the actual connection are displayed for each node using a tree topology.

Note: The station name must be defined for all nodes so that the topology is correctly displayed.



4. Press the "Expand all" or "Close all" softkey to maximize or minimize the tree topology.



5. Press the "Follow connection" softkey to follow nodes in the structure tree using the marked line.

- OR -



3. If further information is provided for a selected node, press the "Details" softkey to open the Web user interface.

Note: The installed operating software must be located in the same network as the device to be displayed. If necessary, this is achieved by the assignment of a second IP address (alias).

The "Details" window opens.



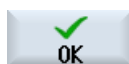
4. Press the "Zoom +" or "Zoom -" softkey until the desired display size is reached.



Additional nodes



3. Press the "Additional nodes" softkey to search for nodes that are not listed under "Accessible nodes".



The "Search for Additional Nodes" window opens. If necessary, change the address range and confirm with "OK".

The found nodes are appended in the table; the HW-Id/type, Location, Contact and Description fields can then be edited and, by activating the checkbox, added to the first column, and, with a subsequent save, added to the reference topology.

Comparing



3. Press the "Compare" softkey to compare the current list of nodes either with the previously saved manufacturer topology, a reference topology or a saved topology in the .xml format.



The "Compare with" window opens. Position the cursor on the desired option box and confirm with "OK".

Deviations during the comparison are identified by being color-highlighted:

- Red: missing or non-accessible components compared with the reference topology.
- Pink: components that deviate in their attribute values compared with the reference topology.
- Blue: new components not contained in the reference topology.

Saving



3. Press the "Save" softkey to save the current topology.
The "Save as" window opens.



4. Position the cursor on the desired option box, specify a file name and possibly a comment, and confirm with "OK".

Note

Manufacturer topology and reference topology can be created with access level 3 (user) or higher and are always saved on the active DHCP server.

Default storage locations:

- Current topology (.xml or .csv):
The following storage locations are offered depending on the configuration:
 - Network topology (storage location: HMI-data / data backups)
 - Local drive
 - Network drives
 - USB

In CSV format, ";" is preset as a separator; it can be changed in sldgconfig.xml

- Reference topology:
/user(_base)/common/tcu/\$soll
- Manufacturer topology:
/oem(_base)/common/tcu/\$soll

Service and diagnostics

17.1 NC/PLC variables

17.1.1 Displaying and editing PLC and NC variables

Changes can only be made to the NC/PLC variables with the appropriate password.

WARNING

Incorrect parameterization

Changes in the states of NC/PLC variables have a considerable influence on the machine. Incorrect configuration of the parameters can endanger life and cause damage to the machine.

In the "NC/PLC Variables" window, enter the NC system variables and PLC variables that you want to monitor or change in the list:

- **Variable**
Address for NC/PLC variable.
Incorrect variables have a red background and are displayed with a # character in the value column.
- **Comment**
Any comment on the variables.
The columns can be displayed and hidden.
- **Format**
Specify the format in which the variable will be displayed.
The format can be specified (e.g. floating point).
- **Value**
Displays the actual value of the NC/PLC variables.

PLC variables	
Inputs	• Input bit (Ex), input byte (EBx), input word (EWx), input double word (EDx) • Input bit (Ix), input byte (IBx), input word (IWx), input double word (IDx)
Outputs	• Output bit (Ax), output byte (ABx), output word (AWx), output double word (ADx) • Output bit (Qx), output byte (QBx), output word (QWx), output double word (QDx)
Bit memory	Memory bit (Mx), memory byte (MBx), memory word (MWx), memory double word (MDx)
Times	Time (Tx)

PLC variables	
Counters	- Counter (Cx) - Counter (Cx)
Data	- Data block (DBx): Data bit (DBXx), data byte (DBBx), data word (DBWx), data double word (DBDx) - Data block (VBx): Data bit (VBXx), data byte (VBBx), data word (VBWx), data double word (VBDx)

Formats	
B	Binary
H	Hexadecimal
D	Decimal without sign
+/-D	Decimal with sign
F	Floating point (for double words)
A	ASCII character

Notation examples

Permissible notation for variables:

- PLC variables: EB2, A1.2, DB2.DBW2, VB32000002
- NC variables:
 - NC system variables: Notation \$AA_IM[1]
 - User variables / GUD: Notation GUD/MyVariable[1,3]
 - OPI notation: /CHANNEL/PARAMETER/R[u1,2]

Note

If the PLC user program writes a string in an NC/PLC variable, the string will only be displayed correctly if the variable is parameterized as a field variable of the type "A" (ASCII) on the NC side.

Example of a field variable

Variable	Format
DBx.DBBy[<number>]	A

Inserting variables

The start value for "Filter/Search" of variables differs. For example, to insert the variable \$R[0], enter the following start value:

- The start value is 0 if you filter according to "System variables".
- The start value is 1 if you filter according to "All (no filter)". In this case, all signals are displayed and shown in the OPI notation.

The GUD from the machine data is only displayed in the Search window for the variable selection when the associated definition file has been activated. Alternatively, enter the variable you are searching for manually, e.g. GUD/SYG_RM[1]

The following machine data is representative for all variable types (INT, BOOL, AXIS, CHAR, STRING): MD18660 \$MN_MM_NUM_SYNACT_GUD_REAL[1].

Note

- System variables can be dependent on the channel. When the channel is switched over, the values from the selected channel are displayed.
You have the option of having the variable displayed for a specific channel, e.g. \$R1:CHAN1 and \$R1:CHAN2. The values of channel 1 and channel 2 are displayed, irrespective of the channel you are in.
- For user variables (GUD), it is not necessary to specify whether they are global or channel-specific GUD. The first element of a GUD array starts with index 0 as for NC variables.
- Use the tooltip to show the OPI notation for NC system variables (except for GUD).

Servo variables

Servo variables can only be selected and displayed at "Diagnostics" → "Trace".

Changing and deleting values

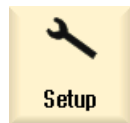


1. Select the "Diagnostics" operating area.



2. Press the "NC/PLC variables" softkey.

- OR -



1. Select the "Setup" operating area.



2. Press the "PLC" and "NC/PLC variab." softkeys.



The "NC/PLC Variables" window opens.

3. Position the cursor in the "Variable" column and enter the required variable.



4. Press the <INPUT> key.
The operand is displayed with the value.



5. Press the "Details" softkey.
The "NC/PLC Variables: Details" window opens. The information for "Variable", "Comment" and "Value" is displayed in full length.



6. Position the cursor in the "Format" field and select the required format with <SELECT>.



7. Press the "Display comments" softkey.
The "Comments" column is displayed. You have the option of creating comments or editing existing comments.
Press the "Display comments" softkey once again to hide the column.



8. Press the "Change" softkey if you would like to edit the value.
The "Value" column can be edited.



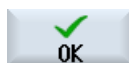
9. Press the "Insert variable" softkey if you wish to select a variable from a list of all existing variables and insert this.
The "Select Variable" window opens.



10. Press the "Filter/search" softkey to restrict the display of variables (e.g. to mode group variables) using the "Filter" selection box and/or select the desired variable using the "Search" input box.



11. Press the "Delete all" softkey if you would like to delete all the entries for the operands.



12. Press the "OK" softkey to confirm the changes or the deletion.

- OR -



Press the "Cancel" softkey to cancel the changes.

Editing a variable list

You can edit the variable list using the "Insert line" and "Delete line" softkeys.



When you press the softkey, a new line is inserted before the line marked by the cursor.

You can only use the "Insert line" softkey if there is at least one empty line at the end of the variable list.

The softkey is deactivated if there is no empty line.



When you press the "Delete line" softkey, the line marked by the cursor is deleted.

An empty line will be added at the bottom of the variable list.

Changing operands

Depending on the type of operand, you increment or decrement the address or address index by one place at a time using the "Operand +" and "Operand -" softkeys.

Note

Axis name as index

If the axis name is the index, the "Operand +" and "Operand -" softkeys have no effect, e.g. \$AA_IM[X1].



Examples

DB97.DBX2.5

Result: DB97.DBX2.6

\$AA_IM[1]

Result: \$AA_IM[2]



MB201

Result: MB200

/Channel/Parameter/R[u1,3]

Result: /Channel/Parameter/R[u1,2]

17.1.2 Saving and loading screen forms

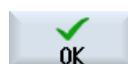
You have the option of saving the configurations of the variables made in the "NC/PLC variables" window in a screen form that you reload again when required.

Editing screen forms

If you change a screen form that has been loaded, then this is marked using with * after the screen form name.

The name of a screen form is kept in the display after switching-off.

Procedure



1. You have entered values for the desired variables in the "NC/PLC variables" window.
2. Press the ">>" softkey.
3. Press the "Save screen" softkey.
The "Save screen: Select archiving" window opens.
4. Position the cursor on the template folder for variable screen forms in which your actual screen form should be saved and press the "OK" softkey.
The "Save screen: Name" window opens.



5. Enter the name for the file and press the "OK" softkey.

A message in the status line informs you that the screen form was saved in the specified folder.

If a file with the same name already exists, then you will receive a prompt.



6. Press the "Load screen" softkey.

The "Load screen" window opens and displays the sample folder for the variable screen forms.

7. Select the desired file and press the "OK" softkey.

You return to the variable view. The list of all of the predefined NC and PLC variables is displayed.

17.1.3 Loading PLC symbols to the controller

Requirement

You require the SIMATIC STEP 7 software and the "PLC Symbols Generator" program that is provided in the toolbox.

Generating PLC symbols

To edit PLC blocks via symbolic names, you can generate the symbols of the STEP 7 project for SINUMERIK Operate and store them on the CompactFlash card on the controller.

Procedure:

1. Open the "PLC Symbols Generator" program and navigate to the corresponding PLC project.
2. To start the generation, first select the required language.
3. Save the "PlcSym.snh" and "PlcSym_xx.snt" files. xx is the language code specified when creating the file. The generation is then started.
4. Create the following directory on the CompactFlash card and store the generated files (PlcSym_xx.snt, PlcSym.snh) under the following path: **/oem/sinumerik/plc/symbols**
5. After restarting SINUMERIK Operate, the symbol tables are loaded when booting. Select the "Insert variables" softkey to display the imported symbols in the table of the "NC/PLC variables".

17.2 Displaying the Service overview

The operating state of machine axes and drives is displayed in the "Service Overview" window. You configure the display via the "Extended selection >" softkey or directly via the drop-down list according to the following criteria:

- All NC axes and drives (= default)
- NC axes
- Drives without NC axis assignment

Enable displays

- On/Off1
- Off2
- Off3
- From the drive: Operation enabled
- From the infeed: Operation enabled
- Enable pulses
- Speed controller enable NC
- Pulses enabled
- Drive ready
- Heat sink temperature
- Power section in i²t limiting
- Motor temperature
- **Measuring system 1 active / measuring system 2 active**
The states for measuring system 1/2 have the following meaning:

Symbol	Meaning
	The position measuring system is active.
	The position measuring system is parked. - OR: - The position measuring system is not configured.
	The position measuring system is passive.

Procedure

1. Select the "Diagnostics" operating area.



2. Press the menu forward key and the "Axis diag" softkey.



3. Select an overview in the "Selection" field.

- OR -



Press the "Go to selection" softkey to select an overview.

17.2.1 Selecting axes and drives

To display certain enable signals and statuses of machine axes, you can arrange a selection of all the axes and drives that are available in any sequence you wish.

Note

The following selection configurations have been previously defined, and cannot be changed or deleted:

- All NC axes and drives
- NC axes
- Drives without NC axis assignment

Selection overview

The following information is provided in the selection overview.

Column	Description
Bus No.	Bus number for drives without NC assignment. No entry for NC axes.
Slave address	Slave address for drives without NC assignment. No entry for NC axes.
Device No.	Device number for drives without NC assignment. No entry for NC axes.
Drive object No.	Drive object number for drives without NC assignment. No entry for NC axes.

Column	Description
Name/identifier	For NC axes contains the standard machine axis identifier and the user-defined machine axis names. For drives without NC assignment, contains the drive object names.
Assignment	NC is displayed for an internal object assignment. PLC is displayed for an external object assignment.

Note

The selection overview differs in the information provided regarding the slave address and device number between PROFIBUS and PROFINET configuration.

Procedure

1. Select the "Diagnostics" operating area.



2. Press the menu forward key and the "Axis diag" softkey.
The "Service Overview" window opens.



3. Press the "Extended selection" softkey.
The window "Extended selection: Axes and drives" opens.



4. Press the "New selection" softkey.
The "New selection" dialog is opened.



5. Enter a display and a file name in the entry fields.
6. Confirm the entry with the "OK" softkey.
The "Edit selection" window is opened for the newly created selection.
7. Set checkmarks in the check boxes for the axes and drives that you wish to display.

- OR -

Press one of the following softkeys to obtain a certain selection:
All axes/drives are selected.



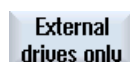
No axis/drive is selected.



Only internal drives are selected.



Only external drives are selected.



Those axes are selected that are assigned to a real drive.



	All axes are selected, which are defined in a minimum of one channel.
	8. Press the "OK" softkey to confirm your selection.
	9. Press the "Delete selection" softkey to delete the actual selection.
	10. Press the "Edit selection" softkey to edit the actual selection. The "Edit selection" window opens.
	11. If you click the "Back" softkey, you will return to the "Service Overview" main screen.

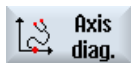
17.2.2 Axis diagnostics

Application

The following information is displayed in the "Service Overview" window:

- Check of the setpoint branch (e.g. programmed position setpoint, speed setpoint, spindle speed setpoint)
- Check of the actual value branch (e.g. actual position value, measuring system 1 or 2, actual speed value)
- Optimization of the position control loop of the axis (e.g. following error, control deviation, servo gain factor)
- Check of the entire control loop of the axis (e.g. through position setpoint/actual-value comparison and speed setpoint/actual-value comparison)
- Check of hardware errors (e.g. by checking the encoder: If the axis is moved mechanically, the actual position value must change)
- Setting and checking the axis monitoring functions

Procedure

	1. Select the "Diagnostics" operating area.
	2. Press the menu forward key and the "Axis diagnostics" softkey. The "Service Overview" window opens.
	
	3. Press the "Service axis" softkey. The "Service Axis/Spindle" window opens.

4. Press the "Axis +" or "Axis -" softkey to scroll the axes forward or backward.
- OR -
- Press the "Axis selection" softkey.
The "Axis Direct Selection" window opens.
Select the required axis directly from those available in the drop-down list box.
6. Confirm the selection with "OK".
The values of the axis are displayed.



Display data

Display data	Meaning
Following error	The difference between the position setpoint and the actual position value of the active measuring system 1 or 2 Unit: mm, inch or degrees
System deviation	The difference between the position setpoint at the position controller input and the actual position value of the active measuring system 1 or 2 Unit: mm, inch or degrees
Contour deviation (axial)	The current contour deviation is displayed with this value (fluctuations of the following error caused by settling on the speed controller caused by load changes). The contour deviation results from the difference between an actual position pre-calculated from the position setpoint and the actual position value of active measuring system 1 or 2. Unit: mm, inch or degrees
Servo gain factor (calculated)	The servo gain factor in the display is calculated by the NC according to the following equation: $K_v - \text{factor} = \frac{\text{Speed setpoint}}{\text{Following error}} ;$ Unit (for default setting): $\frac{[m/min]}{[mm]} ;$ Velocity setpoint = setpoint currently being output to the axis/spindle More information: Function Manual Axes and Spindles
Active measuring system	0: No measuring system active. 1: Measuring system 1 active. 2: Measuring system 2 active.
State of measuring system 1 State of measuring system 2	The state of measuring system 1 or 2 is output here: Active - Parked - Passive

Display data	Meaning
Actual position value measuring system 1	The actual position of the axis measured via measuring system 1 or 2 The position is displayed in the machine coordinate system (no work offsets or tool offsets taken into account). Unit: mm, inch or degrees
Actual position value measuring system 2	
Position setpoint	Specified position output from the interpolator to the position control Unit: mm, inch or degrees
Absolute compensation value measuring system 1	Display of the absolute compensation value for measuring system 1 or 2 The compensation value consists of the sum of backlash and leadscrew error compensation for the current axis position. Unit: mm, inch or degrees
Absolute compensation value measuring system 2	
Compensation, sag + temperature	Display of the compensation value calculated for the current axis position based on the total of the sag and temperature compensations. Unit: mm, inch or degrees
Actual speed value, active encoder	The pulses supplied by the encoder are evaluated by the NC and displayed. Unit: % 100% means maximum speed.
Speed setpoint, drive	Speed setpoint transferred to the drive (= speed setpoint from position controller and feedforward control) Unit: % 100% means maximum speed setpoint.
Programmed spindle speed setpoint	Speed setpoint programmed by the user Unit: rpm e.g. Input: S1000; display: 1000 rpm Display applies to spindles only.
Spindle speed setpoint current	Current active speed setpoint with correct sign, including calculated compensation value and any active speed limitation (specified in setting data or machine data) Unit: rpm Display applies to spindles only.
Position offset to the leading axis / spindle actual value	The currently valid position offset value is displayed here (relative to the actual value) if a position offset (angular offset between the following and leading spindle) has been programmed within the synchronous spindle functionality. Unit: mm, inches, degrees More information about the synchronous spindle: Function Manual Axes and Spindles
Position offset to the leading axis / spindle setpoint	The currently valid position offset value is displayed here (relative to the setpoint) if a position offset (angular offset between the following and leading spindle) has been programmed within the synchronous spindle functionality. Unit: mm, inches, degrees
Override	The effective correction factor of the feed or spindle correction switch is displayed. Unit: %

Display data	Meaning
Current gear stage	Display of the current actual gear stage For axes, this is only displayed if a spindle is assigned to the axis. The display corresponds to the NC/PLC interface signal: DB31, ... DBX16.0-2 (actual gear stage) More information about the spindle: Function Manual Axes and Spindles
Parameter set (axis)	Displays which of the six parameter sets of the position controller is active. More information: Function Manual Axes and Spindles
Controller mode	Display of the current controller state: • Position control • Speed control • Stopping • Parking • Follow-up • Braking More information: Function Manual Basic Functions
Feedforward control mode	Indicates whether and if so, which mode of the dynamic feedforward control for the axis is active: • Inactive • Velocity The velocity-dependent speed feedforward control is active. • Torque The acceleration-dependent torque feedforward control is active (in combination with the speed feedforward control) More information on compensation: Function Manual Monitoring and Compensating
"Referenced" state	Status display for reference point approach (axis): • Curr. MS need not be ref.ed (active measuring system does not require referencing) • Current MS referenced • Curr. MS must be referenced (active measuring system requires referencing) The display depends on the settings in the machine data: • MD34110 \$MA_REFP_CYCLE_NR • MD20700 \$MC_REFP_NC_START_LOCK The display corresponds to the NC/PLC interface signal: DB31, ... DBX60.4 and 60.5 (referenced/synchronized 1 or 2) More information on reference point approach: Function Manual Axes and Spindles

Display data	Meaning
QEC state	Indicates whether and if so, which method of the quadrant error compensation (QEC) is active for the axis: • Inactive • Neural QEC learning active • Conventional QEC active • Conventional QEC w. adapt. Corr. v. active (conventional QEC with adaptation of the compensation value active) • Neural QEC active • Neural QEC w. adapt. Measurement duration active (neural QEC active with adaptation of the measuring time active) • Neural QEC w. adapt. Decay time corr. v. active • (neural QEC with adaptation of decay time of compensation value active) • Neural QEC w. adapt. Meas. dur. + decay time Corr. v. active (neural QEC active with adaptation of measuring time and decay time of compensation value active) More information on compensation: Function Manual Monitoring and Compensating
"Travel to fixed stop" state	Indicates whether or not the axis has fulfilled the conditions for "Fixed stop reached" when the "Travel to fixed stop" function is active (IS DB31, ... DBX62.5): • Normal control ("Travel to fixed stop" function not activated) • Fixed stop reached • Failed More information on travel to fixed end stop: Function Manual Monitoring and Compensating
Torque limitation value	Indicates the value programmed via FXST[x] or SD43510 \$SA_FIXED_STOP_TORQUE or the value defined via MD37010 \$MA_FIXED_STOP_TORQUE_DEF for the clamping torque for "Travel to fixed stop". Unit: % of maximum torque
Adaptation	Indicates whether adaptation of dynamic response and control parameters is activated on the axis. • Inactive • Active More information: Function Manual Axes and Spindles

17.2.3 Service drive

Display drive and motor data

The "Service Drive" window displays important information about the status of the motors and drive modules, such as motor temperature and DC-link voltage.

Procedure



1. Select the "Diagnostics" operating area.



2. Press the menu forward key and the "Axis diag" softkey.
The "Service Overview" window opens.



3. Press the "Service drive" softkey.
The "Service Drive" window opens.



4. Press the "Drive +" or "Drive -" softkey to scroll forward or backward.



- OR -



Press the "Drive selection" softkey.
The "Drive direct selection:" window opens.
Select the desired drive directly from the selection list.



5. Confirm the selection with "OK."
The drive data is displayed.

Overview

The individual status displays, warnings, messages, etc. that are displayed in the "Service Drive" window are explained in the following.

More information

More information about interface signals is provided in:

- Function Manual Basic Functions
- List Manual NC Variables and Interface Signals

Information about switching over encoder data sets is provided in the Function Manual Monitoring and Compensating.

More information about drive parameters (SERVO drive object) is provided in the List Manual SINAMICS S120/S150.

PLC pulse enable

The display, whether the pulse enable from the PLC is available for the drive corresponds to the interface signal:
DB31, ... DBX21.7 "Pulse enable".

Status	Meaning	Display
1	Pulse enable for this drive is activated by the PLC.	Yes
0	The pulses for the drive module are disabled from the PLC.	No

Speed controller enable NC

The display, whether the speed controller enable from the NC is available for the drive corresponds to the interface signal:
DB31, ... DBX61.6 "Speed controller active".

Status	Meaning	Display
1	Speed controller enable from the NC present.	Yes
0	Speed controller enable from the NC not present.	No

Rampup function generator quick stop

The status display for the ramp-function generator quick stop corresponds to the interface signal:
DB31, ... DBX92.1 "Ramp-function generator disable active".

Status	Meaning	Display
1	Ramp-up function generator quick stop is active. The drive is stopped without a ramp function with speed setpoint = 0 and without pulse suppression.	Yes
0	Ramp-up function generator quick stop is not active for the drive.	No

Pulses enabled

The message whether the pulses have been enabled for the drive corresponds to the interface signal:
DB31, ... DBX93.7 "Pulses enabled".

Status	Meaning	Display
1	The drive module pulses are enabled. The axis/spindle can now be traversed.	Yes
0	The drive module pulses are suppressed. The axis/spindle can therefore not be traversed.	No

Drive ready

The display of the current status of the selected drive corresponds to the interface signal: DB31, ... DBX93.5 "Drive ready".

Status	Meaning	Display
1	The drive is ready.	Yes
0	The drive is not ready.	No

Ramp-up phase

The display of the current ramp-up phase of the selected drive corresponds to the drive parameter:

r0002 "Drive operating display".

Number of faulty signs-of-life

Display of communications errors detected in hardware between NC and drive.

Note

If the display shows a value other than "0", please contact your Siemens regional office!

SC1 drive alarm message

Displays (yes/no) whether messages of status class 1 are active. Status class 1 messages are alarms with the following properties:

- They lead to internal responses (e.g. regenerative braking, immediate pulse suppression)
- They are modal.

This is a group message. For details on the actually pending drive alarms, please refer to the "Drive System Diagnostics" window, see Section "Displaying drive states (Page 358)."

DC-link voltage, smoothed

The display of the smoothed actual value of the DC-link voltage of the selected drive corresponds to the drive parameter:

r0026 "DC-link voltage smoothed".

Unit: Volts

Speed setpoint, smoothed

The display of the smoothed speed setpoint - measured according to the setpoint limitation for the P component of the speed controller - corresponds to the drive parameter: r1438 "Speed controller speed setpoint".

Unit: rpm

Actual speed value

The display of the smoothed actual value of the motor speed corresponds to the drive parameter: r0021 "Actual speed value smoothed".

Unit: rpm

Actual current value, smoothed

The display of the smoothed actual current value corresponds to the drive parameter: r0078[1] "Actual current value, torque-generating".

Unit: A

Motor temperature

The display of the current temperature in the motor corresponds to the drive parameter: r0035 "Motor temperature"

Unit: °C

Integrator disabling

The display as to whether the integrator of the speed controller is active, corresponds to the interface signal:

DB31, ... DBX93.6 "n-controller integrator disabled".

Status	Meaning	Display
1	The requested shutdown of the speed controller integrator is active in the drive. The speed controller has been switched over from the PI to P control response.	Yes
0	The integrator of the speed controller is enabled. The speed controller functions as a PI controller.	No

Parking axis

Displays (yes/no) whether it is a parking axis/spindle.

Note

With parking axes/spindles, all encoder-specific monitoring and evaluation functions are switched off. This allows the encoder to be withdrawn without initiating an alarm.

Specified drive data set

The display (default: DDS0) of which of the 8 drive parameter sets is to be activated by the PLC corresponds to the interface signal:

DB31, ... DBX21.0 to 21.2 "Drive parameter set selection A, B, C".

More detailed information on working with the drive and motor data sets is provided in: Commissioning Manual IBN CNC: NCK, PLC, Drive

Actual drive data set

The display (default: DDS0) of which of the 8 drive parameter sets is currently active corresponds to the interface signal:

DB31, ... DBX93.0 to 93.2 "Active drive parameter set A, B, C".

Setpoint/actual Encoder Data Set active encoder

Shows the required and the active Encoder Data Set of the encoder.

Specified motor data set

The display (MDS0...3) of which motor data set is to be activated by the PLC corresponds to the interface signal:

DB31, ... DBX21.3 to 21.4 "Motor selection A, B".

The following assignment applies:

Motor data set	Coding	
MDS0	0	0
MDS1	0	1
MDS2	1	0
MDS3	1	1

Actual motor data set

The display (MDS0...3) of which motor data set is currently active corresponds to the interface signal:

DB31, ... DBX93.3 to 93.4 "Active motor A, B".

Operating mode

The display of the control type of a drive corresponds to the drive parameter: p1300[0...n] "Open-loop/closed-loop control mode".

Depending on "n", the following "values" are displayed:

n	Display
20	Speed control (without encoder)
21	Speed control (with encoder)
23	Torque control (with encoder)

Position actual value measuring system 1/2

The actual position of the axis measured via measuring system 1/2. The position is displayed in the machine coordinate system (no work offsets or tool offsets taken into account).

Unit: mm, inch or degrees

Heat sink temperature

The display of whether the heat sink temperature is OK corresponds to the interface signal: DB31, ... DBX94.1 "Heat sink temperature prewarning".

Status	Meaning	Display
1	The drive signals a "Heat sink temperature prewarning" to the PLC.	Overtemperature
0	The drive module heat sink temperature pre-warning has not responded.	OK

Motor temperature

The display of whether the motor temperature is OK corresponds to the interface signal: DB31, ... DBX94.0 "Motor temperature prewarning".

Status	Meaning	Display
1	The motor temperature has exceeded the warning threshold configured in the drive.	Overtemperature
0	The motor temperature is below the warning threshold.	OK

Ramp-up function completed

The status display of the drive as to whether the ramp-up has been completed corresponds to the interface signal: DB31, ... DBX94.2 "Ramp-up completed".

Status	Meaning	Display
1	The actual speed value has reached the speed tolerance band specified via p2164 after a new speed setpoint specification and has not left the band for the duration of p2166.	Yes
0	The ramp-up procedure is still active after the speed setpoint has been changed.	No

Torque lower than threshold setting

The status display of the drive as to whether the threshold torque has been undershot corresponds to the interface signal: DB31, ... DBX94.3 " $|M_d| < M_{dx}$ ".

Status	Meaning	Display
1	The current torque utilization lies below the torque utilization threshold set in p2194. The drive signals the PLC that the torque setpoint $ M_d $ does not exceed the threshold torque M_{dx} .	Yes
0	The torque setpoint $ M_d $ is larger than the threshold torque M_{dx} . This signal can be used to determine whether the motor is overloaded.	No

Speed lower than minimum setting

The status display of the drive as to whether the minimum speed has been undershot corresponds to the interface signal:

DB31, ... DBX94.4 " $|n_{act}| < n_{min}$ ".

Status	Meaning	Display
1	The actual speed value $ n_{act} $ is less than the threshold minimum speed n_{min} set in p2161.	Yes
0	The actual speed value is greater than the threshold minimum speed.	No

Speed lower than threshold setting

The status display of the drive as to whether the threshold speed has been undershot corresponds to the interface signal:

DB31, ... DBX94.5 " $|n_{act}| < n_x$ ".

Status	Meaning	Display
1	The actual speed value $ n_{act} $ is less than the threshold speed n_x set in p2155.	Yes
0	The actual speed value is greater than the set threshold speed.	No

Actual speed = set speed

The status display of the drive as to whether the actual speed value matches the speed setpoint corresponds to the interface signal:

DB31, ... DBX94.6 " $|n_{act}| < n_{set}$ ".

Status	Meaning	Display
1	The speed deviation between the setpoint and actual value is within the tolerance specified in p2163.	Yes
0	The speed deviation between setpoint and actual value is outside the specified tolerance.	No

Diagnostics for alarms

This information is also provided as a diagnostic tool for diagnosing the causes of alarms such as:

- Drive fault:
⇒ **SC1 drive alarm message** is set.
⇒ Check **specified drive data set, specified motor data set, DC-link voltage**.
- Alarm 25040 "Standstill monitoring",
Alarm 25050 "Contour monitoring",
Alarm 25060 "Speed setpoint limitation",
Alarm 25080 "Positioning monitoring"
⇒ the drive enable may be missing (**PLC pulse enable** not present); this results in the display **Pulses enabled** = No.
- **Motor temperature** = exceeded
⇒ check the actual motor temperature.

More information

Information on how the NC control responds to individual alarms and the associated remedial action is provided in the

Diagnostics Manual.

17.3 System utilization

You have the option of displaying the system resources currently used for NC areas (utilization display).

- Total NC load
- NC load due to position controller and interpolator
- Runtime for the position controller, interpolator and preprocessing
- Time required for synchronized actions
- Interpolator buffer level

Note

The utilization evaluation of the synchronized actions is only displayed when the value in MD11510 \$MN_IPO_MAX_LOAD $\neq$ 0.

Procedure



1. Select the "Diagnostics" operating area.



2. Press the menu forward key.
Further horizontal softkeys are displayed.



3. Press the "System utilization" softkey.
The "System Utilization" window opens.
You can track the dynamic utilization display.



4. Press the "Stop" softkey to stop the display update.



5. Press the "Start" softkey to refresh the values.

17.4 Creating screenshots

You can create screenshots of the current user interface.

Each screenshot is saved as a file and stored in the following folder:

`/user/sinumerik/hmi/log/screenshot`

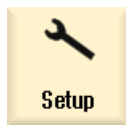
Procedure

Ctrl + P Press the <Ctrl+P> key combination.

A screenshot of the current user interface is created in .png format.

The file names assigned by the system are in ascending order from "SCR_SAVE_0001.png" to "SCR_SAVE_9999.png". You can create up to 9,999 screenshots.

Copy file



1. Select the "Start-up" operating area.



2. Press the "System data" softkey.



3. Open the folder specified above, and select the required screenshots.

4. Press the "Copy" softkey.

- OR -



Press the "Cut" softkey.



5. Open the required archive directory, e.g. on a USB flash drive and press the "Paste" softkey.

Note

You can also copy the screenshots using "WinSCP" to a Windows PC.

Note

If you wish to view the screenshots, then you can open the files in SINUMERIK Operate. On a Windows PC, you can open the data using a graphic program, e.g. "Office Picture Manager".

17.5 Machine identity

Important information about the machine that was previously only available on paper can now be stored electronically, e.g. for an end-user certificate. When the equipment is serviced, these entries can be viewed by means of remote diagnostics or can be transmitted for the purpose of registering the machine on the Siemens Service Platform Industry.

You can store the following data for each machine:

- Machine type
- Machine number
- Manufacturer information
- Dealer information
- End user information
- Component list of the control technology that has been installed
- Logbook entries for changes to the machine

You save the machine information and address information in the "identSNAPSHOT" window. You can either enter the data manually or import it from templates.

Machine information

Entries	Meaning
Machine No.	The unique machine number (serial number of the CompactFlash card) is displayed in the header. This number serves as information only and cannot be changed.
Machine name	The manufacturer assigns a unique machine number in this field which is stored in machine data MD17400 \$MN_OEM_GLOBAL_INFO. Note: The machine name is a mandatory field. No data can be stored until this field is completed.
Machine type	Machine type.

Address information

Under Addresses you can enter the following data for the manufacturer/manufacturer's regional office, dealer and end customer:

- Customer number
- Manufacturer name and, if required, Branch name / Dealer name / End user name
- Street, Postal code/ZIP code, Location, Country (can be selected from a selection list), Region/State
- Address of contact: Name, Phone, Fax, E-mail, URL

17.5.1 Entering machine-specific information

Preconditions

You must have the following access rights to be able to enter or change machine-specific information.

	Access level 1 (manufacturer)
	Access level 2 (service)
	Access level 3 (user)

Procedure

-  1. Select the "Diagnostics" operating area.
-  2. Press the "Version" softkey.
It takes some time to call the version display. While the version data is being determined a progress message box and the appropriate text are displayed in the dialog line.
-  3. Press the "Logbook" softkey.
-  4. Press the "Change" softkey.
The "IdentSNAPSHOT" window opens.
5. Enter the machine name and the machine type.
- or -
Import a template: Import template (Page 337)
-  6. Select which address information you wish to enter. To do this, press one of the following softkeys:
 - "Manufacturer"
If you press the "Manufacturer" softkey again, it changes to "Manufacturer branch".
 - "Manufacturer branch"
Pressing the softkey once again changes it back to "Manufacturer".
 - "Dealer"
 - "End user"
-  7. Enter the address data in the respective text fields.
- or -
Import a template: Import template (Page 337)
Press the "OK" softkey to save the changes.

See also

1. Documenting startup (Page 342)
 2. Defining start-up (Page 342)
- Making a logbook entry (Page 343)

17.5.2 Create a template

You use the templates to prepare the machine information and address information and transfer it to the controller. This means that it does not have to be manually entered.

Alternatively, you can use the "PridaNet identSNAPSHOT" program to export the machine and address information from the Service Platform Industry database and use it as a template. This ensures that the information is clear.

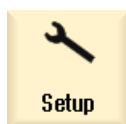
Templates

The directory HMI Data/Templates/Examples/Machine identity contains a selection of templates.

You will find the following templates on the controller:

- "dealer.xml" for dealer data
- "ma_types.xml" for machine types
- "oem.xml" for manufacturer data
- "oemsubs.xml" for manufacturer data of a regional office
- "user.xml" for end user data

Procedure



1. Select the "Start-up" operating area.
 2. Press the "System data" softkey.
 3. Copy the files from the folder /HMI-data/templates/examples/machine identity to a data carrier.
 4. Copy the files to your PC for processing.
 5. After processing, copy the data to a data storage medium and transfer them to the controller.
 6. Insert the copies into the folder HMI-data/Templates/Manufacturer/ Machine identity or use the "Import data" softkey.
- The addresses or machine types are displayed in drop-down list boxes. When you select a list, the data stored for that address is automatically entered in the input fields.

Entering dealer data

You enter the address data of any number of dealers in the file "dealer.xml". If you want to enter additional dealers, copy the <Dealer> to <Dealer> area for each dealer.

```
<?xml version="1.0" encoding="utf-8" ?>
<Addresses>
  <Dealer>
    <Customer-Id></Customer-Id>
    <Name></Name>
    <Street></Street>
    <ZIP code></ZIP code>
    <Location></Location>
    <Country></Country>
    <State></State>
    <Contact></Contact>
    <Phone></Phone>
    <Fax></Fax>
    <E-mail></E-mail>
    <URL></URL>
  </Dealer>
</Addresses>
```

You enter the address data of any number of manufacturers in the "oem.xml" file. If you want to enter additional manufacturers, copy the area <Manufacturer> to </Manufacturer> for each dealer.

You enter the address data of any number of manufacturer subsidiaries in the "oemsubs.xml" file. If you want to enter additional subsidiaries, copy the area <Manufacturer-Subsidiary> to </Manufacturer-Subsidiary> in each case.

You enter the address data of any number of users in the "user.xml" file. If you want to enter additional users, copy the area <User> to </User> in each case.

Example of file "ma_types.xml"

You enter the available machine types in the file "ma_types.xml".

```
<?xml version="1.0" encoding="utf-8" ?>
<Machinetypes>
  <Type>LC 80</Type>
  <Type>LC 82</Type>
  <Type>LC 120</Type>
  <Type>LC 122</Type>
  <Type>LC 150</Type>
</Machinetypes>
```

17.5.3 Import template

You read your templates directly into the controller. You select and import the files from a local drive, network drive or USB depending on the configuration. The data is then automatically copied into the following folder: **/oem/sinumerik/hmi/template/identity** or **HMI-data/templates/manufacturer/machine identity**.

Templates

You have the capability of importing files with any name. The content of the files is evaluated. The new file name is derived from the contained information.

File	Information
ma_types.xml	Machine types
dealer.xml	Dealer's data
oem.xml	Manufacturer's data
oemsubs.xml	Manufacturer's data of a regional office
user.xml	End customer data

Procedure



1. Select the "Diagnostics" operating area.



2. Press the "Version" softkey.
It takes some time to call the version display. The progress of the data determination is displayed in the dialog line.



3. Press the "Logbook" and "Change" softkeys.



4. Press the "Import data" softkey.



5. Select the appropriate drive and the required file.
6. Press the "OK" softkey.
The file is automatically copied to the correct location in the system.
If the template only contains one data set, the data is transferred directly to the entry fields and saved.



7. If the entry fields already contain data, use the "Yes" softkey to confirm overwriting of this information.
8. If the template contains several data sets, select one data set from the list.
The relevant data is transferred to the entry fields.



9. Press the "OK" softkey.
The selection or the manual change is confirmed and saved.

See also

Create a template (Page 335)

17.5.4 Save information

All the machine-specific information of the control is combined in a configuration via the user interface. You then have the option of saving the machine-specific information on the drives that have been set up.

Procedure

1. Select the "Diagnostics" operating area.



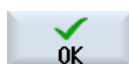
2. Press the "Version" softkey.
It takes some time to call the version display. While the version data is being determined a progress message box and the appropriate text are displayed in the dialog line.



3. Press the "Save" softkey.
The "Save version information: Select Archive" window opens. The following storage locations are offered depending on the configuration:
 - Local drive
 - Network drives
 - USB
 - Version data (archive: Data tree in the "HMI data" directory)



4. Then press the "New directory" softkey if you wish to create your own directory.

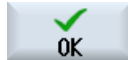


5. Press the "OK" softkey. The directory is created.



6. Press the "OK" softkey again to confirm the storage location.
The "Save version information: Name" window opens.
7. Specify the desired settings.
 - "Name:" input field
the file name is pre-assigned with <Machine name/no.>+<CF-card number>. "_config.xml" or "_version.txt" is automatically attached to the file names.
 - "Comment:" input field
You can enter a comment that is stored with the configuration data.

- Version data (.TXT)
Activate the checkbox if you wish to output the pure version data in the text format.
- Configuration data (.XML)
Activate the checkbox if you wish to output the configuration data in the XML format.
The configuration file contains the data you entered under Machine identity, the license requirements, the version information and the logbook entries.



8. Press the "OK" softkey to start the data transfer.

17.5.5 Adding hardware components

Most of the hardware components supplied by Siemens are already electronically acquired. You can add further hardware components.

You can view and supplement the hardware components in the version screen at the user interface.

All of the hardware components are listed in the version display and in the configuration data.

Precondition

You require access level 2 (service) to add more hardware components.

Entering additional components

If new hardware components are added, they must be assigned to the appropriate categories. The "Select component" drop-down list box offers the following categories in the "Add HW Comp." window:

Category

- NCU/PLC
- Operator Panel
- PLC-peripheral devices
- Drive/Motor
- Cable
- Accessories/Miscellaneous

You record the following data in the "Enter Additional Components (Configuration Data)" window.

Entries	Meaning
Name	Hardware designation
Version	Version of the program
Order No.[MLFB]	Order number

Entries	Meaning
Serial number	Serial number
Number	Number of components

Procedure



1. Select the "Diagnostics" operating area.



2. Press the "Version" softkey.

It takes some time to call the version display. While the version data is being determined a progress message box and the appropriate text are displayed in the dialog line.



3. Select the "Hardware" area and press the "Details" softkey. The "Version Data / Hardware" window opens.

The "Add HW comp." softkey appears.



4. Press the "Add HW comp." softkey.

The "Select component type" drop-down list box opens.

5. Select a category under which you would like to store the hardware information.

The "Enter Additional Hardware Components" input window opens.

6. Enter additional hardware components via the keyboard.

- OR -

If you are using a CSV file (CSV = Comma Separated Values), for example a Service Platform Industry parts list, you can also read in the data.

Select the storage location where the CSV file is located.

Select the file and press "OK".



The data is transferred from the CSV file into the table. It is read-in according to the CSV format of the Service Platform Industry parts list. For each component, quantity, MLFB, name and serial number are entered. The version is not saved and is not transferred.

Example:

QUANTITY;MLFB;Z_OPTION;SERIAL

12;6AV7812-0BB11-2AC0;;

1;6FC52030AB110AA2;;T-0815



7. Press the "OK" softkey.

The data is written to the "versions.xml" configuration file and is therefore electronically acquired.

All hardware components are displayed in the "Version Data / Hardware" window.

The manually entered components are assigned a "+", e.g. Cable+.

17.5.6 Configuration data

The machine-specific information is stored in the configuration data. This file stored in XML format is the basis for further processing on the Service Platform Industry.

- The data can be read by remote diagnostics.
- The data can also be transferred directly to the Service Platform Industry.
Further information at the address (<https://www.siemens.com/sinumerik/register>).

Configuration data

The configuration data includes:

- Machine-specific data that is stored in the "Machine identity" dialog box
- Hardware/software versions that are stored in the "Versions" dialog box
- Options requiring licenses that are stored in the "Licensing" dialog box
- Logbook whose entries are stored in the "Logbook" dialog box

Storage path

Depending on how the drives have been configured, the configuration data can be stored in the available directories.

See also

Machine identity (Page 333)

Adding hardware components (Page 339)

Licensing (Page 113)

Logbook (Page 342)

17.6 Logbook

The logbook provides an electronic machine history.

The time and date of commissioning is recorded in the logbook, and if the machine is serviced, this can also be logged electronically. This helps to optimize the service.

Stored entries cannot be changed or deleted.

17.6.1 1. Documenting startup

Precondition

As a minimum, the machine name/No., the customer No. and the country where the manufacturer is located must be entered into the machine identity.

Procedure



1. The machine-specific information data are entered.



2. Start-up (commission) the machine.
3. Press the "1st startup completed" softkey.
The "1.SETUP" entry is displayed in the "Machine logbook" window together with the time and date.

Note

2. Perform commissioning

On completion of first commissioning, you will be prompted to perform the 2nd commissioning.

If the 2nd commissioning is not performed, then you will be prompted at regular intervals to complete the 2nd commissioning.

See also

Entering machine-specific information (Page 334)

17.6.2 2. Defining start-up

Precondition

As a minimum, the country of the end customer must be entered into the machine identity.

Procedure



The machine-specific information data are entered.



2. Start-up (commission) the machine.
3. Press the "2nd startup completed" softkey.
The "2.SETUP" entry is displayed in the "Machine logbook" window together with the time and date.

Note

Registering the machine identity on the Service Platform Industry.

After completion of the 2nd start-up, you are prompted to send the machine identity to the Service Platform Industry database via the Internet.

See also

Entering machine-specific information (Page 334)

17.6.3 Making a logbook entry

Using the "New logbook entry" window to make a new entry into the logbook.

Enter your name, company and department and a brief description of the measure taken or a description of the fault.

Note

Setting line breaks

If you wish to make line breaks in the "Fault diagnostics/measure" field, use the key combination <ALT> + <INPUT>.

The date and entry number are automatically added.

Sorting the entries

The logbook entries are displayed numbered in the "machine logbook" window.

More recent entries are always added at the top in the display.

Procedure

1. The logbook is opened.
2. Press the "New entry" softkey.
The "New logbook entry" window opens.
3. Enter the required data and press the "OK" softkey.
You return to the "Machine logbook" window and the entry is displayed below the machine identity data.

Note**Deleting logbook entries**

Up to the completion of the 2nd commissioning, you have the option to delete the logbook entries up to the time of the first commissioning using the "Clear" softkey.

Searching for a logbook entry

You have the option for searching for specific entries using the search function.



1. The "Machine logbook" window is opened.
2. Press the "Find" softkey.
3. Enter the desired term in the search form. You can make a search according to date/time, company name/department or according to fault diagnostics/measure.
The cursor is positioned on the first entry that corresponds to the search term.
4. Press the "Continue search" softkey if the entry found is not the one that you are looking for.

Additional search option

Press the "Go to Beginning" softkey to start the search at the latest entry.

Press the "Go to End" softkey to start the search at the oldest entry.

17.7 Action log

17.7.1 Setting the action log

In the "Action Log Settings" window you specify whether the operating sequences are to be logged.

Here, you select which control actions should be logged, so that operator actions and sequences can be tracked and understood at a later date.

Note

No liability

Siemens accepts no responsibility for the completeness of the action log data or for any subsequent data manipulation.

When the action log is active, you can display recorded traces in the system data using the following files:

- "actual_actionlog.com", actual action log report
- "actual_crashlog.com", crashlog backup

Data that can be logged

Logging on	Logging is activated or deactivated.
Alarm status change	Incoming and outgoing alarms are logged.
Keyboard actions	All actions on the operator panel front and on an external keyboard are logged.
Channel status change	NC/PLC states are logged via the information channel status. If this information can be obtained in a timely manner, in many cases these states can be used to verify the operation of the machine control panel.
Window switchover	The form and dialog names (assigned by the programmer) are logged each time a window is opened or closed.
Writing NCK/PLC data	The writing of NCK and PLC variables is logged.
File access	Copying to the NC is logged.
Function calls in the NCK (PI service)	Some program calls, for example, ASUB, are logged.
Curr. program status	Additional information for particular events is activated. For important alarms that require NC stop, NC start, or NC reset, actual values and the current block are recorded for example. The program ascertains which channel and which spindle are used for the additional information.

Write interval file

Settings for updating files:

- "automatic": The action log saves the information to an internal buffer. If the buffer is full the entries are written to the CF card. The entries may be lost when the controller is switched off.
- "after every event": All entries are backed up directly, this prevents data loss due to a power failure or similar.
Notice: As CF cards only permit a limited number of write accesses, this setting is not recommended for normal operation.
- "time-controlled": New entries are backed-up for a particular length of time. An additional input field appears in which you can specify a period in seconds.

Save log as file for alarm(s) The alarm numbers for which a "crash log" is generated are specified. The alarms are entered separated by a comma.

Generating a crashlog file

"actual_crashlog.com" is a backup file of the actual log when a critical event occurs (for example, Emergency Stop alarm).

The file is then no longer stored in the ring buffer of the action log and can no longer be overwritten with new entries.

The entries in the crash log file are only overwritten when yet another critical events occurs.

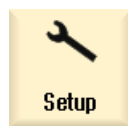
At the beginning, the file has no entries and is only written to after the following events:

- Interface signal DB19.DBX0.6 "Save teleprinter log" changes from 0 to 1.
- The alarm entered in the "Save log as file for alarm(s)" entry field is output.

Interface signal

DB19 (PLC → HMI)								
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
DBB00		Save action log						

Procedure



1. Select the "Start-up" operating area.



2. Press the "HMI", "Diagnostics", and "Action log" softkeys



The "Action Log Settings" window opens.

The "Data selection" area is active by default.

3. Activate the "Logging on" checkbox to activate the action log.
4. Check the relevant checkbox if you want to acquire particular events in the action log.

17.7.2 Inserting variables

In the "Action Log Settings" window, you can insert up to 50 variables that you want to log or monitor.

You select available variables from the drop-down list or add them manually to the list.

Inserting variables from a variable list

1. You are in the "Action Log Settings" window.
2. Press the "Variable selection" softkey.
Window "Action log variables for continuous monitoring" opens.
3. Press the "Insert variable" softkey to insert a variable from a list of all existing variables.
The "Select variable" window opens.
4. Select the desired variable from the list.
5. Click the "Add" softkey.
The "Variable attributes" window opens.
6. Accept or, if necessary, change the displayed properties, for example, the axis assignment.
7. To limit the variable display, select the relevant category in the header, e.g. "System variables".
- OR -
Press the "Filter/search" softkey to limit the display of variables via the "Filter" selection box and/or select the desired variable via the "Search" entry field.
8. To delete the search query, press the "Clear search" softkey.
9. Press the "OK" softkey to confirm changes.
- OR -
Press the "Cancel" softkey to cancel the changes.

Inserting variables manually

1. You are in the "Action Log Settings" window.
2. Press the "Variable selection" softkey.
The "Variables for ongoing monitoring" window opens.
3. Position the cursor in the "Variable" column and enter the required variable.

4. In the "Format" column, select the supported variable format from the drop-down list.
5. Press the "OK" softkey to confirm the changes or the deletion.
- OR -
Press the "Cancel" softkey to cancel the changes.

17.7.3 Displaying the log file

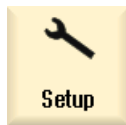
Loggable data that was logged when the action log function was active is displayed in the "Action Log File" window.

Log files

The actual data can be displayed using the following files:

- "actual_actionlog.com"
- "actual_crashlog.com"

Procedure



1. Select the "Start-up" operating area.



2. Press the "System data" softkey.
The data tree is displayed.
You will find the saved files in the HMI data folder under /logs/action log.
3. Select the desired com file and press the "Open" softkey or double-click the file.



4. Press the "Display new" softkey to update the display of events in the log (actual_actionlog.com).
The entries made since the log file was called up are displayed.

17.7.4 Searching in the log files

You can search for specific events in the log.

Precondition

The relevant log file is open.

Procedure



1. Press the "Search" softkey.

A new vertical softkey bar appears. The "Search" window opens at the same time.



2. Enter the desired search term in the "Text" field.

3. Position the cursor in the "Direction" field and choose the search direction (forward, backward) with the <SELECT> key.



4. Press the "OK" softkey to start the search.

If the text you are searching for is found, the corresponding line is highlighted.



Press the "Continue search" softkey to continue the search, as necessary.

- OR -



Press the "Cancel" softkey when you want to cancel the search.

Additional search option



1. Press the "Go to End" softkey to scroll to the end of a large log. You get to the oldest entry of the recording.



2. Press the "Go to Beginning" software to return quickly to the most recent log entry.

17.7.5 Storing a log

You can store the displayed log, e.g. in the "HMI data/Logs/Alarm logs" directory. It is stored as a binary file as well as ASCII file. You can read an ASCII file with any editor.

In addition, you can save logs in the file format "*csv" (Comma Separated Value). You can evaluate the CSV file in Microsoft Excel.

The following logs can be generated:

- action.com (binary file)
- action.log (ASCII file)
- action.csv (Comma Separated Value file)
- crash.com (binary file)
- crash.log (ASCII file)
- crash.csv (Comma Separated Value file)

Requirement

The relevant log file is open.

Procedure

1. Press the "Save" softkey.
2. Select the storage path under which the log is to be saved.
3. You can choose between two file types for the action log ("action").
Select the file type from the "Type" drop-down list:
 - LOG
 - CSV

The log is saved in the specified directory under the name suggested by the system by default.

Note

If required, you can also assign your own name for the log file when saving it.

Note

The "Save" softkey is only available for files that have not yet been saved.

17.7.6 Structure of a log file

Content of the log file

The following data is recorded for every logged event:

HMI version		NC version	
System	Entry keyword		Date/time
	Entry text		
	DETAILS		

Entry		Description
HMI and NC version output		
System:		
	HMI	Keystrokes, window change
	NC	Write variables, PI services
	MSG	Alarm entries
	USR	Entries generated by the machine manufacturer for the user
	ERR	Action log error, e.g. log file not found
Entry keyword:		
	HMI_START	Entry of an HMI boot
	HMI_EXIT	Entry of an HMI shutdown
	PLC_CRASH	Entry of a PLC crash
	KEY_PRESSED	Entry of a keystroke

Entry		Description	
	KEY_HOLD	Entry of a key hold	
	KEY_RELEASED	Entry of a key released	
	ALARM_ON	Entry of an incoming alarm event	See below "Alarm display"
	ALARM_OFF	Entry of an alarm going event	
	ALARM_ACK	Entry of an alarm acknowledgement event	
	OPEN_WINDOW	Entry of a window opening	
	CHN_STATE_CHANGED	Entry of a channel status change	
	OPMODE_CHANGED	Entry of an operating mode change	
	TOOL_CHANGED	Entry of a tool change	
	OVERRIDE_CHANGED	Entry of override changes	
	DOM_CMD	Entry of a download to the NC	
	PI_CMD	Entry of a PI service	
	WRITE_VAR	Entry of a write to NCK/PLC variable	
	AREA_CHANGED	Entry of an area changeover	
	NC_CONNECTION	Entry of an coming/going NC connection	
	USER	User entry via the OEM interface	
	ACTIVATED	Action log was activated	
	DEACTIVATED	Action log was deactivated	
	INTERNAL	Internal action log entry	
Date/time		Date and time of the event For HMI_Start, PLC_Crash or date change since the last entry, the intermediate period between the entry keyword and date is designated with an "-".	
Entry text		Event data is written in plain text.	
DETAILS		If additional information regarding an entry is known, e.g. a recorded IPO trace.	

Example

Note

DB19.DBW24 interface signal

The DB19.DBW24 interface signal used in the example does not apply to the SINUMERIK 840D sl. It is DB1900.DBW4 for the SINUMERIK 828D.

```

NCK    WRITE_VAR                                18.02.2009  09:40:12
       ncui.local wrote variable: DB19.DBW24 = 0

HMI    KEY_PRESSED                              18.02.2009  09:40:12
       Key up: "Return" (1000004/ 0)

HMI    HMI_START -----                        18.02.2009  09:34:15
       HMI started.
```

Alarm display

```
MSG      ALARM                                     Date/time
      No.      Deletion criterion  Text
DETAILS
```

Entry		Description
MSG		
ALARM		Type of alarm: ALARM_ON, ALARM_OFF, ALARM_ACK
Date/time		Data and time of the event
No.		Alarm number
Deletion criterion:		Information as to how the alarm was acknowledged
	AUTOMATIC	Automatic acknowledgement
	POWER ON	Acknowledgement using PowerOn
	RESET	Acknowledgement using NCK reset
	NC START	Acknowledgement using NC start
	NC RESET	Acknowledgement using NC reset
	ALARM CANCEL	Acknowledgement using Alarm Cancel key
	RECALL	Acknowledgement using the Recall key
	HMI	Acknowledgement using HMI
	PLC	Acknowledgement using PLC
Text		Display of the English alarm text
DETAILS		If additional information regarding an entry is known.

Example

```
MSG      ALARM_ON                                     20.02.2009   14:25:37
      8020   POWER ON   : Option 'activation of more than 1 channels' not
      set
      DETAILS:
      Mode: JOG Program: canceled Channel: interrupted
      Program-Level information:
      Level Program running:                               Invoc      Offset
      1      /_N_MPF0                                     0          0
```

17.7.7 Advanced settings

You define the size of the log file of the action log in the "actlog.ini" configuration file.

Procedure

1. You can copy a sample configuration file "actlog.ini" from the following directory: /siemens/sinumerik/hmi/template/cfg.
2. Save or create the file in the /oem/sinumerik/hmi/cfg or /user/sinumerik/hmi/cfg directory.
3. Open the file and after "; ActionLogSize=", enter the file size (in bytes).

"actlog.ini" configuration file

Template for the configuration of Action Log

```
;
; To activate the settings remove the
; commentary ';' at the beginning of the line
[ActionLogSettings]
;To change the path of the internal action log file use the following
setting
;ActionLogPath=/user/sinumerik/hmi/ac_log/action.com
;To change the size of the internal action log file use the following
setting
;ActionLogSize=5000000
;To change the path of the internal crash log file use the following
setting
;CrashLogPath=/user/sinumerik/hmi/ac_log/crash.com
```

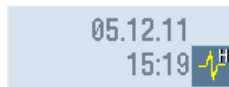
17.8 HMI trace

Creating an HMI trace

The "HMI trace" function is available for extended diagnostics of the operating software. The prerequisite is at least access level 3 (user).

Procedure to create an HMI trace file:

1. An expert of the Service & Support Center provides a sltrc_keybitset.ini file. Copy the sltrc_keybitset.ini file to a USB memory medium and load the file on the controller or operator panel.
2. In the operating area, select "Start-up" → "HMI" → "Diagnostics >" → "HMI trace".
3. Select the INI file on the USB memory medium with the "Load configuration" softkey.
4. Start the trace by activating the checkbox or from any place on the user interface with the following key combination:
<Alt> + <T> on the operator panel
<Alt> + <Shift> + <T> on an external keyboard
The following icon is displayed at the top right in the header to show that a trace is active:



5. On the user interface, repeat the operating sequence whose cause is to be clarified.
6. Stop the trace by deactivating the checkbox or from any place on the user interface with the following key combination:
<Ctrl> + <T> on the operator panel
<Ctrl> + <Shift> + <T> on an external keyboard
7. A sltrc.out output file is generated which you can copy to the storage medium with the "Export data" softkey.
8. Send the sltrc.out file for analysis back to the Service & Support Center.

Note

On completion of the analysis, it is recommended to delete all files under the following path: ../user/sinumerik/hmi/log/sltrc

Note

"Extended" softkey

The other options in this dialog support suitably qualified service engineers in the analysis of the system and evaluation of the HMI trace.

17.9 PROFIBUS diagnosis

Display the PROFIBUS status for diagnostic purposes during the configuration or when errors occur. This diagnostics window is only intended for information purposes. You cannot make any changes in it.

PROFIBUS connections

- DP1 X126
- DP2 X136
- DP integrated

Display	Meaning/information
Status	
Bus status	POWER_ON (0): State after the control has been switched on OFFLINE (1): Basic initialization has been performed STOP (2): Start in accordance with the hardware configuration (SDB) CLEAR (3): PROFIBUS slaves have been parameterized and configured in accordance with the hardware configuration (SDB) and taken into the cyclic data exchange with zero output data OPERATE (4): Cyclic data exchange with the PROFIBUS slaves running ERROR (9): A fatal error had been detected (e.g. invalid or faulty SDB) (<n>) corresponds to the OPI variable value for the bus state.
Bus configuration	
S7 Subnet ID	S7 Subnet ID of the PROFIBUS subnet
Baud rate	Transmission rate in Mbd
Cycle time	Configured bus cycle time in ms; defines the position control cycle clock at the same time
Sync. Component (TDX)	Configured interval in ms for the cyclic data exchange within a PROFIBUS DP cycle
PROFIBUS diagnostics/slaves	
Slave address	Configured number of the DP slave
Assignment	Information as to whether the DP slave is assigned to the NC or to the PLC. NC: e.g. one or more drives controlled by the NC PLC: e.g. I/O peripherals or an axis controlled by the PLC NC/PLC (for DP integrated)
Communication state	Information as to whether the DP slave is identified on the bus via the communication state.  Green: DP slave has been detected on the PROFIBUS DP and data exchange with the assigned component (NC and/or PLC) is working error-free  Red: Incorrect response / no communication

Display	Meaning/information
Synchr. with NC	Information as to whether the DP slave is running synchronously to NC on the bus.  Green: DP slave runs synchronously to NC on the PROFIBUS DP, i.e. there is an isochronous data exchange  Red: Incorrect response / no communication  Gray: DP slave is not assigned to the NC, but to the PLC
Number of slots	Number of configured slots within the DP slave

More information

More information about the configuration of the properties of the network interface for PROFIBUS can be found in

CNC Commissioning Manual: NCK, PLC, drive.

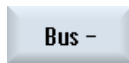
Procedure



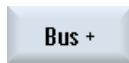
1. Select the "Diagnostics" operating area.



2. Press the menu forward key and the "Bus TCP/IP" softkey. The "PROFIBUS Diagnostics" window opens.



3. If multiple PROFIBUS connections have been configured, press the "Bus -" or "Bus +" softkey to select the configuration you require.



- OR -



Press the "Select bus" softkey and, when the list is displayed, select the required configuration in it.



Press the "OK" softkey.

17.9.1 Displaying details for DP slaves

Further information about the slots of a selected DP slave is displayed here.

Display	Meaning/information
Slave	
Address	The DP slave selected in the PROFIBUS diagnostics / slaves pane
Communication state	Data regarding the NC and/or PLC assignment of the DP slave

Display	Meaning/information
In synchronism with NC	Data regarding NC synchronous operation of the DP slave If a synchronous value is not available for the DP slave, then the display remains hidden.
Slots	
No.	Slot number within the DP slave
I/O addr.	I/O address in the I/O address space of the PLC, assigned to this slot For NC axes, the setpoint and the actual value must always be configured on the same I/O address.
Type	Data as to whether the slot is input, output or diagnostic slot If the slot is assigned to an NC axis, then the output is always denoted as setpoint value and the input always as actual value.
Length (bytes)	Length of the I/O area reserved for the slot in the STEP7 I/O address space
Communication state	Actual communication state of the slot If a value is not available for the NC axes, then the display remains hidden.  Green: Slot used by the NC, communication active  Red: Slot used by the NC, communication currently not active  Gray: No NC axis
Machine axis	Display of the name defined in the machine data for this slot If the slot is not assigned to any NC axis, then the display remains hidden.
Telegr. type (NC)	Displays the assigned telegram type If a telegram type is not assigned in the NC machine data, then the display remains hidden.

Procedure



1. Select the "Diagnostics" operating area.



2. Press the "Menu forward" key and the "Bus TCP/IP" softkey.
The "PROFIBUS Diagnostics" window is opened.



3. Select the PROFIBUS configuration for which you want to display details.



4. Press the "Details" softkey.
The "PROFIBUS Diagnostics ... - Details" window is opened.

17.10 Drive system

17.10.1 Displaying drive states

Status display

The "Drive System Diagnostics" window displays the status information about the drive units and the associated drive objects. The status symbols have the following meaning:

Display icon		Meaning
	Green	The drive object is in (cyclic) operation, without any detected problems.
	Yellow	The drive object has detected a less serious problem, i.e. a warning is pending, for example, or enables are missing.
	Red	This drive object has detected a serious problem, for example, an alarm is pending.
	Gray	The drive status could not be determined for this drive object.
#	Special characters	Error when reading the data.

Procedure



1. Select the "Diagnostics" operating area.



2. Press the menu forward key and the "Drive system" softkey.



3. The "Drive System Diagnostics" window opens.
The name of the selected drive object is displayed in the window title.



Press the "Drive object +" or "Drive object -" softkey.
The next (+) or previous (-) drive object is selected.



- OR -



4. Press the "Select drive unit" softkey.
The "Select Drive Unit" window opens.
Select the desired drive unit via the drop-down list box and press "OK" to confirm the selection.

See also

Displaying details of the drive objects (Page 359)

17.10.2 Displaying details of the drive objects**Drive system diagnostics - details**

The following information is displayed for the drive objects:

- Status display (r0002)
 - The status display (parameter r0002) of the drive object is displayed.
- Missing enable signals (r0046)
 - The enable signals are diagnosed except for the drive objects that do not have enable signals (e.g. Control Unit). Missing enables are shown in a pane below the displays.
- Commissioning parameter filter
 - (p0009) – control unit
The value of the "Device commissioning parameter filter" control unit parameter (p0009) is displayed.
 - (p0010) – further drive object
The value of the "Drive object commissioning parameter filter" parameter (p0010) is displayed.
- Current fault
The alarm number of the actual drive object fault is displayed or "No fault present", when no drive object fault is pending.
You obtain an overview of the pending faults with the following data in an additional window:
 - Alarm number
 - Time: Date and time
 - Alarm text
- Current warning
The number of the current drive object warning is displayed or "No warning present", when no drive object warning is pending.
You obtain an overview of the pending alarms with the following data in an additional window:
 - Alarm number
 - Time: Date and time
 - Alarm text

Meaning of the symbols

Display icon		Meaning
	Green	The relevant value of the drive object signals no problem detected.
	Yellow	The relevant value of the drive object signals a less serious problem, i.e. a warning is pending, for example, or enables are missing.
	Red	The relevant value of the drive object signals a serious problem, for example, an alarm is pending.
	Gray	The drive status could not be determined for this drive object.
#	Special characters	Error when reading the data.

Procedure



1. Select the "Diagnostics" operating area.



2. Press the menu forward key and the "Drive system" softkey.



The "Drive System Diagnostics" window opens.



3. Select the drive object for which you want to display further details.
4. Press the "Details" softkey.

The "Drive System Diagnostics - Details" window opens.

The name of the drive object is displayed in the window header.



Press the "Faults" softkey.

The "Drive Unit Faults" window opens that shows an overview of the faults that have been output.



Press the "Alarms" softkey.

The "Drive Unit Alarms" window opens that shows an overview of the alarms that have been output.



You can display the pending SI messages if Safety Integrated is integrated in your controller.

17.11 Remote diagnostics

17.11.1 Adapting remote diagnostics

Depending on the operating mode, the initiative for remote diagnostics comes from the service provider or from the controller.

If the initiative comes from the controller, the "Request remote diagnostics" softkey is set-up.

The display of the "Request remote diagnostics" softkey is defined in the "tcu.ini" file under the [PINGSERVICE] section.

- Variable PingServiceMode
0 = disable
1 = enable

In additional variables of this section, the data for the request telegram for service should be set.

- Variable PingServerIP
IP address of the service provider to which the request telegram should be sent, e.g.
PingServerIP = 128.45.234.19
- Variable PingTransmissionData
A text that should be sent out as data content in the request telegram,
e.g. PingTransmissionData = help at machine 35
- Variable PingTransmissionPeriod
The length in minutes that the telegram should be sent,
e.g. PingTransmissionPeriod = 5
- Variable PingTransmissionInterval
Duration in seconds after which send is repeated,
e.g. PingTransmissionInterval = 15
- Variable PingServerPort
Port number of the Ping service with the manufacturer,
e.g. PingServerPort=6201

17.11.2 Remote diagnostics via Teleservice adapter IE at X127

The following settings must be made for remote diagnostics via modem using a Teleservice adapter IE (TS Adapter) that is connected at X127.

Settings in the TS Adapter required

- IP address of the adapter: 192.168.215.30, subnet mask 255.255.255.224
- IP address of the caller: 192.168.215.29
These two addresses are also stored as standard in the "tcu.ini" file. If other addresses are used, then appropriately change the entries "X127ModemIP" and "X127RemoteAccessIP" in the "tcu.ini" file.
- Enable the ports for the services for S7 communication, http, HTTPS, SSH as well as VNC (port 5900) in the firewall.

Connecting the modem for remote diagnostics



Figure 17-1 Basic system with SINUMERIK Operate on NCU (and operating station with TCU)

With the previously mentioned settings and the default values, in this configuration, remote diagnostics via TS Adapter is possible without any additional changes having to be made.

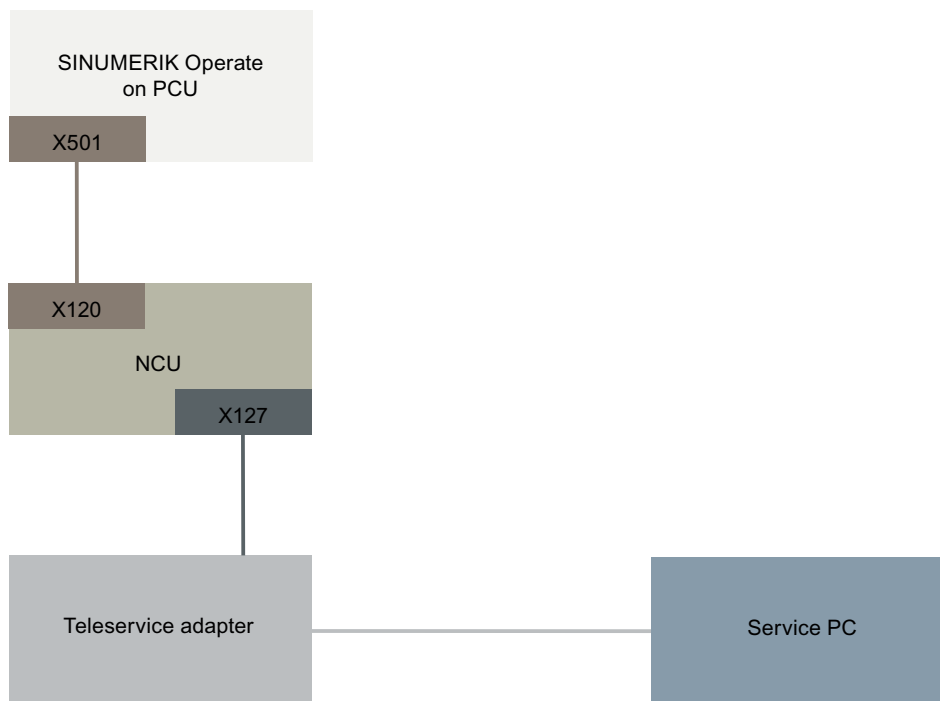


Figure 17-2 Basic system with SINUMERIK Operate on PCU

With the previously mentioned settings and the default values, in this configuration, remote diagnostics via TS Adapter is possible without any additional changes having to be made. When operating a SINUMERIK Operate on a PCU, the SINUMERIK Operate in the NCU must be switched off.

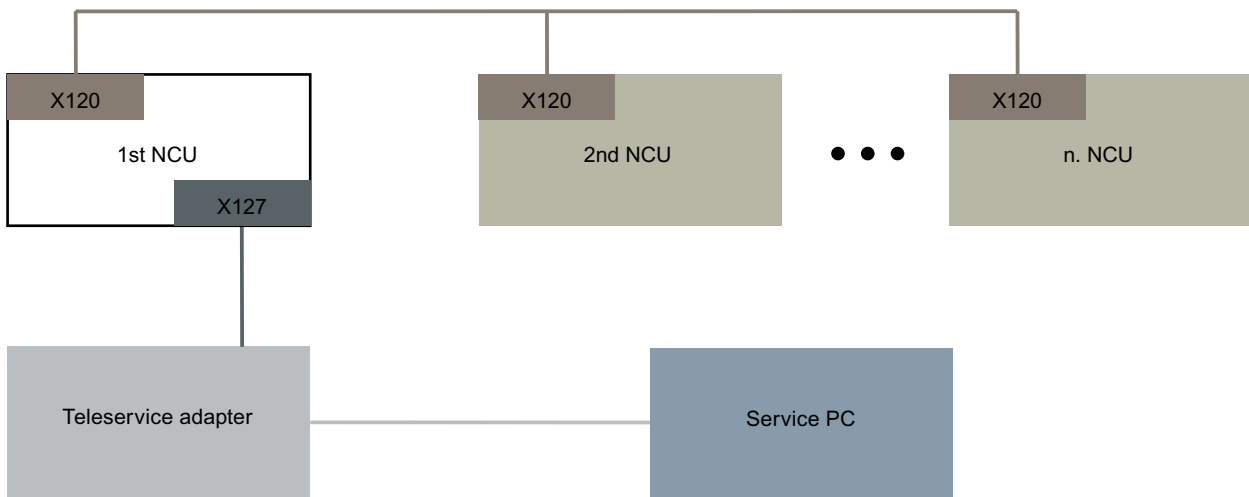


Figure 17-3 System with several NCUs and a fixed modem

The "Access MyMachine /P2P" option only has to be set for the NCU to which the TS Adapter is connected at the X127 interface. Modem access can only be permitted by making the appropriate entries at the SINUMERIK Operate in this NCU and the "Request remote control" function executed. If modem access is permitted, then the service PC implicitly has access to all other NCUs and their operating software. On the other hand, the operating screens to control the remote access can be used and set at each station (SINUMERIK Operate in the NCU) individually for the station in conjunction with the relevant local PLC.

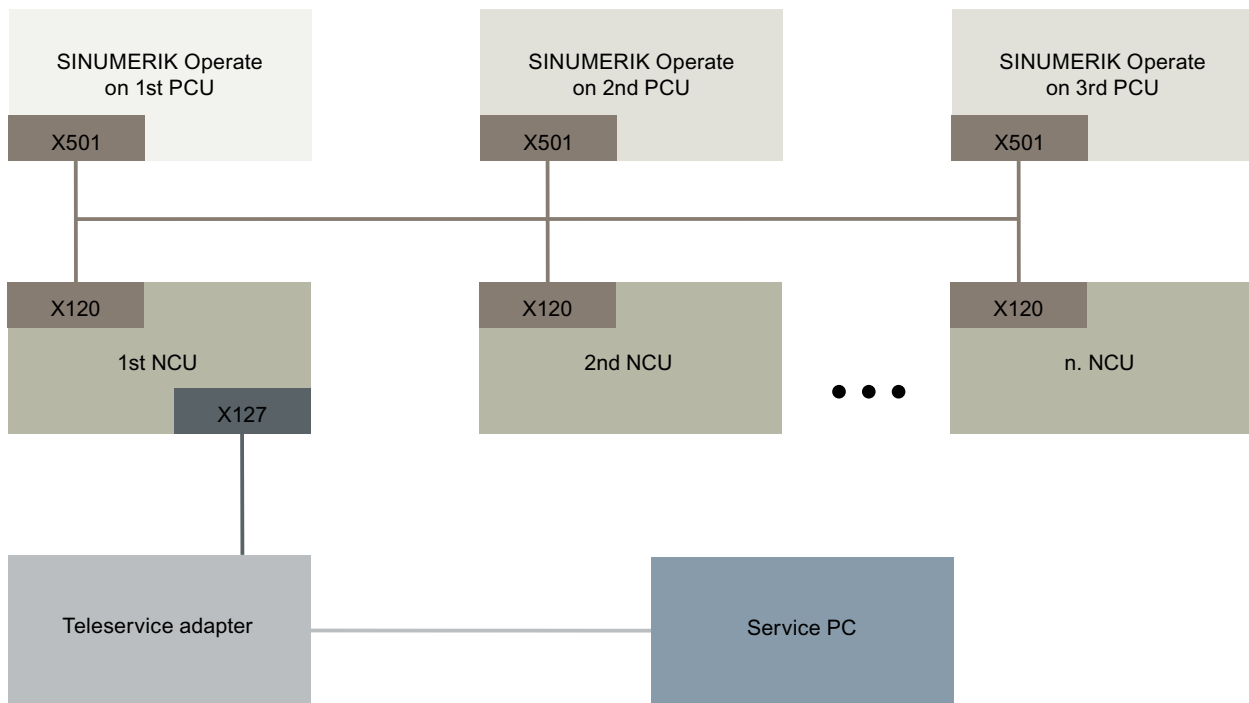


Figure 17-4 System with several NCUs, several PCUs and a fixed modem

The "Access MyMachine /P2P" option only has to be set for the NCU to which the TS Adapter is connected at the X127 interface. Modem access can only be permitted by making the

appropriate entries at the SINUMERIK Operate on the PCU that is assigned to this NCU and the "Request remote control" function executed. If modem access is permitted, then the service PC implicitly has access via the plant or system network to all other NCUs and PCUs and their operating software. The operating screens to control the remote access can be individually used and set at each station (SINUMERIK Operate in the NCU) for the station in conjunction with the relevant local PLC.

17.11.3 PLC control for remote access

In the PLC user program, you can control external viewers using the following settings.

DB19.DBX1.0	PLCExtViewerReject		
Value	= 0	= 1	
Meaning	Permit remote control	No remote control	
DB19.DBX1.1	PLCExtViewerMode		
Value	= 0	= 1	ignored
Meaning	Operating rights for remote control	Only monitoring for remote control	-
Result	Operating rights for remote control	Only monitoring for remote control	No remote control

17.12 Trace

The trace provides you with an oscilloscope function that allows the following data (signals) to be graphically displayed:

- General NC data
- PLC data

Trace session

The function serves for troubleshooting and resolving faults as well as to analyze the machine and process performance. In a session, data (signals) are recorded briefly before and after an event.

Graphic display

The recorded data is optically displayed in the form of curves, the so-called characteristics graphs.

You have the option of individually setting the recording type.

Saving and downloading data

You can store the recorded data in an XML file. The saved file can then be re-loaded so that it can be evaluated at a later time.

Recording fundamentals: Signals (data)

Signals (data) specify what is to be recorded:

- NC variables (axis data, drive data, channel data, etc.)
- PLC data

Cyclic events



Interpolation clock cycle (IPO clock cycle)

PLC cycle OB1



Position control clock cycle (servo clock cycle)

Non-cyclic events



Starting a session

- Recording using a trigger
- Manually starting and stopping a trace

Analyzing the result

The following functions are available to analyze the result:

- Scaling characteristic graphs
- Zooming characteristic graphs
- Defining a characteristic range using markers

17.12.1 General procedure

Sequence

- Create a trace session file as follows:
 - Select the variable and define its representation type.
 - Set the graphics window, and the save mode
 - Set the trigger property to define the start and end of recording
- Save the recording and its associated properties that have been set
- Analyze the result by making the settings for the display in order to view additional details (e.g. zoom in, scroll, select section, etc.)

See also

Trace options (Page 377)

Saving the trace file (Page 367)

Variable for trace (Page 369)

Trace settings (Page 374)

Evaluate a trace (Page 378)

17.12.2 Trace session

17.12.2.1 Creating a session file

Procedure



1. Select the "Diagnostics" operating area.



2. Press the menu forward key and the "Trace" softkey.





3. Press the "Load trace" and "New" softkeys.
The "New Session" window opens in which the "Session" name is recommended. The file format is automatically specified as ".xml".
4. Supplement the file name or enter a new file name.
5. Select a variable type and press the "OK" softkey.
You return to the "Select variables for trace:...." window.
The name of the session that has been newly created is displayed in the header.

See also

Variables filter/search (Page 369)

17.12.2.2 Saving the trace file

There are two options of saving a trace session:

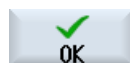
- Variables and settings: Only the variables and the settings are saved.
- Variables, settings and recorded values: The variables, settings and the recorded values are saved.

Note

Save option

If you have activated the "Save file in both formats" checkbox at "Trace" → "Options (Page 377)", the session file is saved as a csv file in addition to xml format.

Procedure



1. You have edited an active trace session.
2. Press the "Store trace" softkey.
The "Save Trace: Session ..." window opens and offers the following storage options.
3. Activate the corresponding checkbox and press the "OK" softkey.
The "Store Trace" window opens and specifies the file name in the "Name of trace file:" entry field. The file format is automatically specified as ".xml" and cannot be changed.
4. Press the "OK" softkey to save the session file.
If the session file already exists, then you obtain a corresponding confirmation prompt.
5. Press the "OK" softkey if you wish to overwrite the existing session file.
- OR -



Press the "Save as" softkey if you do not wish to overwrite the existing session file.

A new name is suggested but you can specify a name yourself.

- OR -



Press the "Change directory" softkey if you wish to store the session file in a directory other than in the standard "Trace" directory.

The data tree opens and you can select between the configured drives.



Press the "New directory" softkey if you wish to create a new directory.

The "New Directory" window opens in which you can assign a directory name.



Press the "OK" softkey.

The "Store Trace" window opens in which the names of the target directory and the session file are displayed.

You can change the name of the session file.



6. To save the session file, press the "OK" softkey one more time.

- OR -

If the session file with this name already exists, then you obtain a corresponding confirmation prompt.

17.12.2.3 Load trace session file

You have the option of loading already saved session data, to restart them or to display the trace that has been recorded.

Settings	Meaning
Variables, settings	You can restart a trace session that has already been created.
Variables, settings and recorded values	You can view the result of a trace session, change the variable and if required, restart.

Precondition

A session file of recorded traces is available.

Procedure



1. You have selected the "Trace" function.



2. Press the "Load trace" softkey.
The "Load Session File: Please Select File" window opens.



3. Select the desired session file from the appropriate directory, e.g. "Trace", and press the "Display trace" softkey.
The "Load trace: session..." is opened.
4. Select the checkbox "Variables, settings", if you wish to immediately start the trace session.



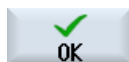
5. Press the "OK" softkey and the "Start trace" softkey to restart the trace.



- OR -

Select the checkbox "Variables, settings and recorded values", if you wish to display the trace session.

Press the "OK" softkey.



The data of the selected session are loaded displayed in the "Trace" window.

17.12.3 Variable for trace

17.12.3.1 Variables filter/search

Searching for PLC/NC/servo variables

To limit the selection of variables for PLC/NC/servo, set a filter and/or enter a start value for the search:

Filter:	Display of the following variables:
System variable	System variables
NC	NC variables
Axis	Axis variables
Channel	Channel variables
Mode groups	Variables of the mode groups in OPI notation
Servo	Servo trace variables
Global user data	GUD such as: SGUD, MGUD, UGUD, GUD4, ...
PLC	PLC variables
PLC alarms	Manufacturer-specific PLC alarm signals
All (no filter)	All variables in alphabetical order

Inserting variables

The start value for "Filter/Search" of variables differs. For example, to insert the variable \$R[0], enter the following start value:

- The start value is 0 if you filter according to "System variables".
- The start value is 1 if you filter according to "All (no filter)". In this case, all signals are displayed and shown in the OPI notation.

The GUD from the machine data is only displayed in the Search window for the variable selection when the associated definition file has been activated. Otherwise, the sought variables must be entered manually, e.g. GUD/SYG_RM[1]

The following machine data is representative for all variable types (INT, BOOL, AXIS, CHAR, STRING): MD18660 \$MN_MM_NUM_SYNACT_GUD_REAL

Searching for drive variables

The restriction of the search is performed in this case via the selected drive object. In the Search window, you can restrict the selection by entering alphanumeric values, for example. Further restrictions of the selection are possible via the "All" or "Recommended" interconnections.

Procedure

For a trace session, in the "Selected Variables for Trace: Session ..." window, set the variables whose signals are to be traced.



1. In the "Select variables for trace: Session..." window, a trace session is displayed.

2. Position the cursor in the "Variable" column in an empty line.

- OR -

Position the cursor in the "Variable" column on a variable that you wish to replace by another.



3. Press the "Insert variable" softkey.

The "Select Variable" window opens.

Note:

When selecting a "Drive parameter", firstly select the drive object (DO) and then insert the desired parameter from the list of corresponding parameters.



4. Press the "Filter/search" softkey to start a specific search.

In the "Filter" selection box, select a variable area.

- OR -

Directly enter the variable into the "Search" entry field.

The cursor jumps to the term that is found.

Press the "Delete search" softkey if you wish to terminate the search.

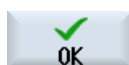


5. Press the "Add" softkey to enter the required variable into a trace session. The "Variable Attributes" window opens and you can select the appropriate value (e.g. channel data, drive bus no.) from a combobox.

- OR -



Press the "Replace" softkey to replace an already selected version by another one.



6. Press the "OK" softkey to add or replace the variable.

Each variable is automatically allocated a reference number, which is displayed in the upper section of the window. This number is opened automatically allocated. If a version is removed, then the following variables are re-numbered.

7. Now, select the desired settings for display, such as color, pen, qty., event, etc.

Editing variables of a trace session

Key combination	Effect
Ctrl + X or right-click, shortcut menu "Cut"	Press the key combination or open the shortcut menu in order to cut out a variable.
Ctrl + C or right-click, shortcut menu "Copy"	Press the key combination or open the shortcut menu in order to copy a variable.
Ctrl + V or right-click, shortcut menu "Paste"	Press the key combination or open the shortcut menu in order to insert a variable.

17.12.3.2 Selecting attributes of a variable

Attributes

For a trace session, select the variables and assign the corresponding attributes:

Column	Meaning
Variable	Address of the variables

Attributes	Meaning
Comment	- Name of the selected variables - A general description for the variables.
Color	Color selection, the representation of the characteristic graphs. When creating a variable, the next color from the available palette is automatically used.
Pen	Line type selection to display the characteristic graphs. - No line - Solid line - Dashed line - Dash-dot line - Dash-dot-dot line - Dotted line - Stepped line XY - Stepped line YX "* line" (line made up of * symbols) + line - X line
Qty.	Defines whether the characteristic of the variables is displayed in the "Trace" window. If the checkbox is not selected, then no characteristic graphs are displayed.
Events	Event selection which triggers that the signal is traced:

Attributes	Meaning
	• Interpolation clock cycle (IPO clock cycle) • Interpolation cycle (IPO2) • Position control clock cycle (servo clock cycle) • PLC cycle OB1 • Drive trace rate • Start geometry axis/direction change • Stop geometry axis • Machine axis start / direction change • Machine axis stop • NC start (program runs) • NC start (program ran) • Start of the data recording
	• Block start, type 1 or block end (all program levels, without intermediate blocks) • Block start, type 2 or block end (all program levels, with intermediate blocks) • Block start, type 3 or block end (all main programs, without intermediate blocks) • Block start or block end, block search (all program levels, without intermediate blocks) • Geo axis start / direction change (2nd event) • Geo axis stop (2nd event) • Block start, type 2 (2nd event: all program levels, without intermediate blocks) • Block end, type 2 (2nd event: all program levels, with intermediate blocks) • Block start, block advance, type 1 (2nd event) • OEM test event 1 (non-cyclic, block advance) • OEM test event 2 (non-cyclic, main run)
	• Activate/deactivate synchronized action • Synchronized action initiated (condition fulfilled) • Signaled alarm • Cancel softkey pressed • Program level change • Block end (Interpreter) • Trace end (last event!) • Start trace

Attributes	Meaning
	• WRTPR part program command • WRTPR part program command (block search) • Tool change • Cutting edge change • Tool change (block search) • Cutting edge (block search) • Start trigger initiated • Stop trigger initiated • Block end (block advance) • Block end (2nd event: Block search) • WRTPR part program command (block advance) • Tool change (block advance) • Cutting edge (block advance)
Event channel	This means that the channel can be defined in SINUMERIK in which a specific event occurs. For events which are not channel-specific, the field remains empty.
Bit mask	In the case of an integer variable, a bit mask can be specified in this field. For a bit mask, the particular signal value is AND'ed before being displayed. After the mask has been applied, all of the selected bits are moved to the right so that it looks as if the bit or the bits all start with bit zero. This means, if all bits with the exception of bit 7 have been masked, then the integer number that would have been obtained would either have a value of 0 or 1, however, not 0 or 128. If all of the bits with the exception of bit 7 and 0 have been masked, the resulting integer number would either have the value 0, 1, 2 or 3, however, not 0, 1, 128 or 129.
Decimal places	This setting is used to define how many places to the right of the decimal point are displayed at the axis identifiers.
Coord. axis	The coordinate axes are displayed to the left or right in the graphic window or there is no display.
Display Y	Value input or 0
Scale factor	Defines the scale.
Units	Displays the measurement unit, e.g. mm/min. The system specifies this and it cannot be changed.

17.12.3.3 Displaying details of a variable

The most important information and settings are displayed at a glance in the detail window:

- Variable address
- Comment with a description of the variables
- Events

- Channel, axis, access level, mode group, etc.
- Smaller graphic display with the event; when this event occurs the characteristic graphs are recorded as well as their attributes, such as color or line type.

Procedure



1. You are in the "Select variables for trace: ..." window.
2. Position the cursor to the required variable, and press the "Details" softkey. A subscreen with the most important information as well as the graphic display is shown in the lower half of the window.
3. Press the "Details" softkey again to display the subscreen.

17.12.4 Trace settings

17.12.4.1 Trace settings (PLC, NC, servo)

In the "Trace Settings (PLC, NC, Servo)" window, you define the conditions for starting and stopping the trace session.

Condition for Start trace

With "Start trace" softkey	The recording is started immediately after pressing the "Start trace" softkey.
If variable	The session is activated by a variable. The desired variable is selected via the "Insert variable" softkey or "Quick list" softkey.
• Condition and value	After the session has been activated, this defines at which value the trace recording is started. The following values are offered: =, ≠, >, >=, <, <=, ascending, descending, changed.
Data acquisition [s]	
Specifies where the recorded data is saved: • With "On NCK", the recorded data is saved in the NC work memory until the recording is stopped. Only then is the session file saved on the CompactFlash card. • With "CF card" or "On hard disk", the data is saved during the recording on the CompactFlash card or hard disk (e.g. of the PCU). As a consequence, more signals can be processed.	

Condition for Stop trace

With "Stop trace" softkey	The recording is stopped after pressing the "Stop trace" softkey.
If the time has expired	Defines the period which after expiry, the trace recording is exited.
If the memory is full	The trace session is terminated when the specified data volume (KB) is reached.

If variable	The recording is stopped by a variable. The desired variable is selected via the "Insert variable" or "Quick list" softkey.
Condition and value	After the session has been activated, this defines at which value the trace recording is exited. The following values are offered: =, ≠, >, >=, <, <=, ascending, descending, changed.
Delay time [s]	This defines how long the trace still runs after the session has been exited.
Overwrite at memory limit (KB)	Defines from which memory limit the data is overwritten (ring buffer).

Note**Loss of recorded data when maximum duration is exceeded**

Traces with the parameter assignment "Stop trace - If variable - Overwrite at memory limit" may not exceed a maximum period between the start and the finish of the recording.

If the maximum period is exceeded, the stop event is ineffective and the recording cannot be completed as usual.

The maximum period can be calculated as follows:

Use the temporary setting "Stop trace - When time expired" to find out how much memory space is required per minute for the set recording, e.g. 602 kB/min.

The maximum permissible time in minutes which may pass between the start and finish of a recording is computed using the following formula:

$$2^{31} (2\,147\,483\,648) \text{ bytes} / \text{memory space required for the set recording in bytes per minute}$$

$$602 \text{ kB} = 602 * 1\,024 \text{ bytes} = 616\,448 \text{ bytes, per minute } 2\,147\,483\,648 \text{ bytes} / 616\,448 \text{ bytes per minute} = 3\,483 \text{ minutes} = 58 \text{ hours}$$
Note**Stop condition with non-effective overtravel time and memory limit**

The settings for the overtravel time and memory limit are not effective if you select PLC signals with the result "PLC cycle OB1" for the trace.

Set at least one PLC signal before the trace to the result "Interpolation cycle (IPO cycle)" so that the data for the overtravel time and memory limit are recorded.

17.12.4.2 Trace settings (drive)

In the "Trace Settings (Drive)" window, you define the conditions for starting and stopping the trace session:

Condition for Start trace

With "Start trace" softkey	The recording is started immediately after pressing the "Start trace" softkey.		
If variable	The recording is activated after pressing the "Start trace" softkey when the selected variable clearly satisfies the condition and the specified value. The following conditions are offered: • Positive edge • Negative edge • With bit mask The "Bit mask" softkey is displayed when the "Bit mask" condition is selected in order to select the desired bits. Irrespective of the maximum value (hexadecimal) which is possible through the bit mask, a "Value" (decimal) can be entered at which the trace recording starts precisely. Example: The trace recording is started when the following bits are set: Bit 0 = 0; bit 1 = 1; bit 2 = 0; bit 3 = 1		
	Bit mask = fH	Condition	Value (decimal)
	Variable: CU/r722/3.3.1	With bit mask ☒ Bit 0 ☒ Bit 1 ☒ Bit 2 ☒ Bit 3	10
Preprocessing time [s]:	The input of a preprocessing time corresponds to the functional parameter p4722 "Trace trigger delay": • A positive preprocessing time starts the recording before the trigger event. • A negative preprocessing time starts the recording after the trigger event. When entering a preprocessing time, the entire duration of the recording must be taken into account: • If the preprocessing time is greater than the entire duration of the recording, the entry is rejected. • If too large a preprocessing time is entered, the trigger event may not be recorded.		
Data storage on CU			
Drive trace rate [μs]:	Enter a factor with the "Sampling rates" softkey to set the effective sampling rate. With a higher sampling rate, the recording duration is also longer.		

Condition for Stop trace

If the time has expired	Defines the period which after expiry, the recording is exited.
If the memory is full	The recording is terminated when the specified data volume (KB) is reached.

17.12.4.3 Trace options

You define the following properties of a trace session in the "Trace - Options" window.

- Setting the graphic window
 - Displaying main grid lines: You define whether a horizontal grid is displayed and in which color.
 - Displaying grid sub-lines: You define whether a vertical grid should be displayed and in which color.
 - Background: You select the background color of the graphic window.
- Defining storage options
 - Activate the "Confirm file overwrite" checkbox in order to receive a confirmation prompt each time a trace session is to be overwritten. If the checkbox is deactivated, the trace session is overwritten without a confirmation prompt.
 - Activate the "Save file in both formats" checkbox in order to also save the data as a csv file (Page 367) in addition to the xml session file. The file in csv format cannot be imported again.
 - Activate the check box "Save file in HMI Advanced Servo Trace Format" in order to store additional export data in the HMI Advanced servo-trace format. The following file formats are supported:
 - SVT files (trace session settings)
 - st1 files (variables of the first and second trace sessions)
 - st2 files (variables of the third and fourth trace sessions)

Procedure



1. You are in the "Select Variables for Trace: ..." window and a trace session has been selected.



2. Press the "Options" softkey.
The "Trace - Options" window opens.



3. Select the desired settings and press the "OK" softkey in order to accept the settings.

17.12.4.4 Starting the trace

In the "Trace" window, you obtain the curve with the data of the variables selected for a trace session.

The diagram comprises two Cartesian coordinates:

- Time axis
The horizontal x axis supplies the time values.
- Value axis
The vertical y axis displays the resolution fineness (amplitude).

Note**Display of real values of PLC variables**

If the value format is displayed incorrectly in the trace, extend the variable specification in the "Select variable for trace" window with the parameter assignment :REAL, e.g. to DB21.DBD76:REAL. The real values of the variable will then be displayed in the trace.

Recording the trace session

- Manually starting and stopping a trace
- Starting and stopping recording using a trigger

Procedure

1. You have listed the desired variables for a trace section.



2. Press the "Display trace" softkey.
The "Trace" window is opened. The recording is loaded and the procedure is displayed in progress window.



3. Press the "Start trace" softkey if you wish to immediately start recording.

- OR -

The recording is triggered by the trigger condition.



4. If you wish to manually end the recording, press the "Stop trace" softkey.

- OR -

The recording is stopped by the trigger condition.

17.12.5 Evaluate a trace**17.12.5.1 Setting trace views**

In order to permit a precise evaluation of the recorded signals, you have the option to edit the view as well as the display of the characteristic graphs:

- Selection/legend
 - Show legend: In addition to the graphic display, the data of the variable is displayed as comment, numbered and in color.
 - Make a selection: You define which variables are displayed in the graphic window.
- Scale
 - Specifying scaling factors for minimum and maximum X and Y value

- Zoom
 - Increasing or decreasing the section
- Cursors: The cursor display provides functions that allow one, two or both curves to be precisely measured.
 - Cursor A
 - Cursor B
 - Both cursors
 - Snap to curve: The cursor precisely moves along the curve
 - Point mode: Cursor jumps directly to various values.
 - High point mode: The cursor jumps from one peak value to the next.
 - Low point mode: Cursor jumps to the lowest values.

Requirement

The "Trace" graphic window is open and the trace has been recorded.

Editing curves



You jump from one variable to the next using the <TAB> key.



You jump back using the <Ctrl> and <TAB> keys.



With the cursor keys, you set marks, move to individual values and can define a zoom range.



17.12.5.2 Selecting a variable

You have the option of displaying the selected variables as legend and to make a selection using a checkbox.

Legend
Numbering the variables
Axis identifier
Comment of the variables

Displaying a legend and selecting a variable



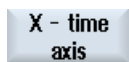
1. A recording is opened in the "Trace" graphics window.
2. Press the "Legend / selection" softkey.
The graphic window is halved. The variables are displayed as comment and with checkbox in the left-hand section of the window.
3. Activate or deactivate the required variable using the checkbox to display it as curve.
4. Press the softkey again to hide the legend area again.

17.12.5.3 Scaling the display

The scaling allows you to make a precise measurement of selected variables from the X time axis as well as from the Y value axis. You have the option of saving the larger or smaller display in a user-defined way

Setting	Meaning	
X minimum or X maximum	Highest or lowest value of the X time axis. The values are used for recording when the trace is started again.	
	Fixed scale, X axis	Values of the X time axis are kept.
	Strip chart recorder mode	The values of the X time axis are used while recording.
Y minimum or Y maximum	Defining the highest or lowest value of the Y value axis (amplitude).	
Offset or resolution	Defining the rms values (mean values) of the amplitudes. The scale is changed by a factor of 10.	

Scaling the time and value axis



1. A recording is opened in the "Trace" graphics window.
2. Press the "Scale" softkey in order to scale the display.

The "Select X-Y Scaling" input window opens and the values of the X time axis are displayed.
3. Press the "X time axis" softkey again if you wish to hide the values.

- OR -
Press the "Y selected curves" softkey to display the values of the Y value axis.

Press the softkey again if you wish to hide the values.

- OR -

- You have selected both axes.
4. Press the "Scale +" or "Scale -" softkey until the desired scaling is reached.
-  
- OR -
- Enter the scaling values directly into the input window and select the appropriate property.
5. Press the "Scale" softkey to save the settings.
- 
- OR -
- Press the "Adapt selected" softkey to display the selected characteristic graphs in the full graphic window.
- 
- Press the "Fit one" softkey to display the selected characteristic graphs in the full graphic window.
- 

17.12.5.4 Zooming the display

Using the zoom function, you have the option of viewing selected sections of curves in detail. After you have defined an area or a section, you can increase or decrease the size of it (zoom in or zoom out).

Procedure

1. A recording is opened in the "Trace" graphics window.
- 
2. Press the "Zoom" softkey if you wish to zoom-in or zoom-out on the characteristic graphs.
- 
3. The "X time axis" or "Y value axis" softkey is selected.
-  
4. Press the "Adapt individually" or "Adapt all" softkey if you wish to display all selected characteristic graphs in a separate area positioned one above the other.
- 
- or
- 
- OR -
- Press the "Adapt together" softkey if you wish to adapt all of the characteristic graphs to the graphic window. As all of the curves fill the complete window area, they are displayed superimposed on one another.
- 
- OR -



Press the "Individually adapt X" softkey if you wish to normalize the X time axis only in the graphic window.

- OR -



Press the "Individually adapt Y" or "Adapt all" softkey if you only wish to scale the Y value axis in the graphic window.

or



- OR -



Press the "Adapt Y together" softkey if you wish to adapt the value axis of all characteristic graphs to the graphic window. As all curves fill the complete window area, they are displayed superimposed.



5. Press the "Zoom +" or "Zoom -" softkey until the desired display size is reached.



Zoom in/zoom out area



Press the "Zoom area" softkey to define a specific section.

A frame is displayed.



Press the "Zoom +" or "Zoom -" softkey to change the frame step-by-step.



Press the "OK" softkey to display the zoom area.

17.12.5.5 Position the cursor

Using the cursor, you have the option of determining the precise values from a defined section. To do this, the cursor is positioned directly on the curve.

Procedure



1. A recording is opened in the "Trace" graphics window.



2. Press the "Cursor A" softkey. The reference number, color of the variables and the color of the coordinate crossing point are displayed on the softkey.



3. Position "(A)" at the position on the curve where you wish to start the measurement.

The coordinates are specified in a tooltip and in the status line.



4. Press the "Cursor B" softkey.

The reference number, color of the variables as well as the color of the coordinate crossing point are also displayed on this softkey.



Position "(B)" at the position on the curve where you wish to end the measurement.



5. Press the "Both cursors" softkey to display the area between A and B.

The coordinates of A and B as well as the difference " Δ " are displayed in the status line.



Press the active "Cursor A" and "Cursor B" softkeys again to deselect the position.



When re-selected, the positions are reset.



Press the "Crop to screen" softkey to display the area, defined by "Cursor A" and "Cursor B", in the complete graphic window.



Press the "Snap to waveform" softkey to move the cursor along the curve step-by-step.

17.12.5.6 Acquiring measured values

You have the option of directly determining the following values of a curve:

- Peak-to-peak value
- Peak-to-valley value

Procedure



A recording is opened in the "Trace" graphics window.



Press the "Point Mode" softkey to continuously move the cursor along the curve.



Press the "Peak Mode" softkey to position the cursor at the highest value.



Press the "Valley Mode" softkey to position the cursor at the lowest value.

17.12 Trace



If you press the "Peaks" softkey, the cursor only goes to the peak-peak values.



If you press the "Minimum" softkey, the cursor only goes to the peak-valley values.

17.13 PROFIBUS/PROFINET and AS-i bus diagnostics

17.13.1 PROFIBUS/PROFINET

With the PROFIBUS/PROFINET diagnostics, you obtain a quick overview from which, when required, you can call status and detailed information for external DP master systems and PROFINET IO systems.

Precondition for detailed diagnostics

When using HMI PRO RT, the diagnostics can be extended by additional information (e.g. module and Order No.). This data involves offline data, which can be extracted from the associated Step7 project.

- You can create offline data using the HMIPRO CS program.
- You transfer data to the control using the HMIPRO program.



Software option

For faulted modules, in order that in addition to the status information, detailed information can also be displayed, you now require the following option: "Operating software SW HMI PRO sl RT".

In order that detailed information can be displayed for PROFINET-IO systems, the PLC block FB_SL_COM from the HMI PRO block library must be used. Use DB449 as the associated instance DB.

Note

Detailed information for DP master systems is also available without using FB_SL_COM.

Diagnostics information from the DP master systems

You can configure the following versions:

1. Software option not available and HMIPRO offline data not available
2. Software option available and HMIPRO offline data not available
3. Software option available and HMIPRO offline data available

17.13.2 Displaying PROFIBUS/PROFINET diagnostics

Diagnostics information from the DP master systems

From the user interface, you can display the fieldbus diagnostics known from HMIPRO. The module state is displayed using diagnostic symbols.

The following diagnostics information is displayed depending on the particular version that you have configured:

Information for all versions		
Status		Module has a fault
		Module has failed
		Module is OK
		Module is suppressed (this is only possible with HMI PRO RT)
PROFIBUS address		PROFIBUS address data

Additional information for the second version	
PROFIBUS/PROFINET module or channel diagnostics	
Device diagnostics	For Siemens DP/DP coupler and diagnostics repeater

Additional diagnostic information for the third version	
Name	Module designation from the HMI offline data
Name	Module name from the HMI offline data
Order no.	Order number of the module from the HMI offline data
IP address	IP address of the module from HMI offline data (only for PROFINET)
Graphic display of the complete hardware configuration in a dedicated window	

Procedure



1. Select the "Diagnostics" operating area.



2. Press the "Menu forward" key twice and the "PB/PN diag." softkey. The "PROFIBUS/PROFINET Diagnostics" window opens.



3. Select the required DP master system. The complete diagnostics information is displayed.



4. Press the "Available devices" softkey to display the diagnostics data of the available modules.

- OR -



Press the "Suppressed devices" softkey to display the diagnostics data of the suppressed modules.

- OR -



Press the "Failed devices" softkey to display the diagnostics data of the failed modules.

- OR -



Press the "Faulty devices" softkey to display the diagnostics data of the faulty modules.

17.13.3 Configuring the AS-i bus

You obtain a fast overview of the existing AS-Interface network using the AS-Interface (AS-i) diagnostics. Permanent monitoring and an error search function provide you with the following information:

- Status flags acc. to the AS-i specification
- States of the AS-i slaves

Precondition

- For AS-i diagnostics, it is absolutely necessary to use the FB_SL_COM PLC block from the HMI PRO block library.
- The configuration file "sltprodiaghmi.ini" must be available.

AS-i components

The following AS-i components are supported:

CP142-2	(Type ID 1)
CP343-2	(Type ID 2)
DP/AS-i link	(Type ID 3)
DP/AS-i link 20E	(Type ID 4)
DP-AS-i link Advanced	(Type ID 6)

Diagnostic information

All of the AS-i components to be diagnosed must be parameterized in the "sltprodiaghmi.ini" configuration file.

Entry	Description
[SKO]	
ComboCount=x	Number of entries (x) in the selection list
[SKO_Index0]	1. Entry
DiagType= 6	Type ID of the AS-i component (refer above)
TypeSection=DP-AS-i-Link-Advanced 1	Designation of the AS-i component, which should be output in the selection list

Entry	Description
Logical_Address=43	E address of the AS-i component from the hardware configuration
RequestDB=449	Instance DB of the function block "FB_SL_COM" being used

Example of the "sltprodiaghmi.ini" with 5 components

```
[SK0]
```

```
ComboCount=5
```

```
[SK0_Index0]
```

```
DiagType= 1
```

```
TypeSection=CP142-2
```

```
Logical_Address=43
```

```
RequestDB=449
```

```
[SK0_Index1]
```

```
DiagType= 2
```

```
TypeSection=CP343-2
```

```
Logical_Address=75
```

```
RequestDB=449
```

```
[SK0_Index2]
```

```
DiagType= 3
```

```
TypeSection=DP-AS-i-Link
```

```
Logical_Address=75
```

```
RequestDB=449
```

```
[SK0_Index3]
```

```
DiagType= 4
```

```
TypeSection=DP-AS-i-Link-20E
```

```
Logical_Address=75
```

```
RequestDB=449
```

```
[SK0_Index4]
```

```
DiagType= 6
```

```
TypeSection=DP-AS-i-Link-Advanced
```

```
Logical_Address=75
```

```
RequestDB=449
```

Procedure

1. Copy the "sltprodiaghmi.ini" file from the **/siemens/sinumerik/hmi/template/cfg** directory.
2. Place the file in the directory: **/oem/sinumerik/hmi/cfg** or **/user/sinumerik/hmi/cfg**.
If the file is already available in the directory, then just supplement this by the corresponding entries.
3. Open the file and enter the corresponding data of the AS-i components.
4. Save and close the file.
The diagnostics information is displayed on the user interface.

17.13.4 Displaying AS-i bus diagnostics

Diagnostics information from AS-i components

Using the user interface, you have the option of displaying information about the networking of binary sensors and actuators (AS-i).



Software option

Additional error counter can be displayed for the component DP-AS-i Link Advanced if the option "Operating SW HMI PRO sl RT" is set.

Diagnostic information

Flags acc. to the AS-i specification	Description
Offline	Offline operating state
Internal	Internal operating state
EEPROM OK	Internal EEPROM OK
Auto-Addr.progr. enabled	Automatic address assignment enabled
I/O fault	Peripheral fault present
Master Power On - Start	Starting after Master Power On
Offline ready	Offline phase completed
AS-i cable voltage too low	AS-i cable voltage too low
CP in normal operation	CP in normal operation
Operating mode	Operating mode state
Auto.-Addr.progr. executed	Automatic address assignment executed
Auto-Addr.progr. possible	Automatic address assignment possible

Flags acc. to the AS-i specification	Description
AS-i slave with addr.=0 available	Slave with address 0 available
Reference config. = Actual config.	Target configuration equal to actual configuration

State	Marking
Slave OK	Green
Slave fault	Red
Slave is available, but not configured	Yellow

Procedure



1. Select the "Diagnostics" operating area.



2. Press the menu forward key twice and the "AS-i diag." softkey.
The "Diagnostics AS-Interface" window opens.



3. Select the required DP AS-Interface.
The complete diagnostics information is displayed.
The values in italics indicate an error counter > 0.

OEM-specific online help

18.1 Overview

In addition to the existing extensive online help, you also have the option of generating a manufacturer-specific online help and then linking this into SINUMERIK Operate.

This online help is generated in the HTML format, i.e. it comprises HTML documents that are linked with one another. The subject being searched for is called in a separate window from a contents or index directory. Similar to a document browser (e.g. Windows Explorer), a list of possible selections is displayed in the left-hand half of the window and when you click on the required subject, the explanation is displayed in the right hand half of the window.

Context sensitive selection of online help pages is not possible.

Procedure

1. Generating HTML files
2. Generating a help book
3. Integrating the online help in SINUMERIK Operate
4. Saving help files

Other application cases

Online help for the following OEM-specific expansions can be created and used to supplement the SINUMERIK Operate online help system:

- Online help for **cycles and/or M functions** of the machine manufacturer which extend the programming options for SINUMERIK control systems. This online help is called in just the same way as the SINUMERIK Operate online help "Programming".
- Online help for OEM-specific **variables** of the machine manufacturer. This online help is called from the variable view of SINUMERIK Operate.

Programming online help

You can use the "SINUMERIK HMI programming package sl" for additional options for configuring the online help. Using this programming package, it is possible to develop high-level language applications in the C++ programming language for SINUMERIK Operate on the NCU 7x0.

Note

The "SINUMERIK HMI programming package sl" must be ordered separately as a software option. The associated documentation is provided together with the programming package.

18.2 Generating HTML files

Generating help files in the HTML format. It is possible to save all information in a single HTML file or to distribute the information over several HTML files.

You can assign the file names yourself, however, you must observe the following:

- References within HTML files should always be specified with relative paths. Only then can it be ensured that the references function in precisely the same way on both the development computer as well as on the target system.
- If jumps are to be made to certain points within an HTML file per link, then so-called anchors must be defined for this purpose.

Example of an HTML anchor:

```
<a name="myAnchor">This is an anchor</a>
```

- The contents of HTML documents must be saved with the UTF-8 coding. Only then is it guaranteed that the HTML documents are correctly displayed in all of the country languages supported by SINUMERIK Operate.
- The following sub-sets of the HTML functional scope are supported:

HTML tags

Tag	Description	Comment
a	Anchor or link	Supported attributes: href and name
address	Address	
big	Larger font	
block quote	Indented paragraph	
body	Document body	Supported attributes: bgcolor (#RRGGBB)
br	Line break	
center	Centered paragraph	
cite	Inline citation	Same effect as tag i
code	Code	Same effect as tag tt
dd	Definition data	
dfn	Definition	Same effect as tag i
div	Document division	The standard block attributes are supported
dl	Definition list	The standard block attributes are supported
dt	Definition term	The standard block attributes are supported
em	Emphasized	Same effect as tag i
font	Font size, family, color	Supported attributes: size, face, and color (#RRGGBB)
h1	Level 1 heading	The standard block attributes are supported
h2	Level 2 heading	The standard block attributes are supported
h3	Level 3 heading	The standard block attributes are supported
h4	Level 4 heading	The standard block attributes are supported
h5	Level 5 heading	The standard block attributes are supported
h6	Level 6 heading	The standard block attributes are supported
head	Document header	

Tag	Description	Comment
hr	Horizontal line	Supported attributes: width (can be specified as absolute or relative value)
html	HTML document	
i	Italic	
img	Image	Supported attributes: src, width, height
kbd	User-entered text	
meta	Meta information	
li	List item	
nobr	Non-breakable text	
ol	Ordered list	The standard attributes for lists are supported
p	Paragraph	The standard block attributes are supported (default setting: left-aligned)
pre	Preformatted text	
s	Strikethrough	
samp	Sample code	Same effect as tag tt
small	Small font	
span	Grouped elements	
strong	Strong	Continuous text is heavily emphasized, replaces tag b
sub	Subscript	
sup	Superscript	
table	Table	Supported attributes: border, bgcolor (#RRGGBB), cellpadding, cellspacing, width (absolute or relative), height
tbody	Table body	No effect
td	Table data cell	The standard attributes for table cells are supported
tfoot	Table footer	No effect
th	Table header cell	The standard attributes for table cells are supported
thead	Table header	This is used to print tables that extend over several pages
title	Document title	
tr	Table row	Supported attributes: bgcolor (#RRGGBB)
tt	Typewrite font	
u	Underlined	
ul	Unordered list	The standard attributes for lists are supported
var	Variable	Same effect as tag tt

Block attributes

The following attributes are supported by the tags div, dl, dt, h1, h2, h3, h4, h5, h6, p:

- align (left, right, center, justify)
- dir (ltr, rtl)

Standard attributes for lists

The following attributes are supported by tags ol and ul:

- type (1, a, A, square, disc, circle)

Standard attributes for tables

The following attributes are supported by tags td and th:

- width (absolute, relative, no-value)
- bgcolor (#RRGGBB)
- colspan
- rowspan
- align (left, right, center, justify)
- valign (top, middle, bottom)

CSS properties

The following table includes the supported CSS functional scope:

Property	Values	Description
background color	<color>	Background color for elements
background-image	<uri>	Background image for elements
color	<color>	Foreground color for text
text-indent	<length>px	Indent the first line of a paragraph in pixels
white-space	normal pre nowrap pre-wrap	Defines how whitespace characters are handled in HTML documents
margin-top	<length>px	Width of the upper edge of the paragraph in pixels
margin-bottom	<length>px	Width of the lower edge of the paragraph in pixels
margin-left	<length>px	Length of the left hand edge of the paragraph in pixels
margin-right	<length>px	Width of the right-hand edge of the paragraph in pixels
vertical-align	baseline sub super middle top bottom	Vertical alignment for text (in tables, only the values middle, top and bottom are supported)
border-color	<color>	Border color for text tables
border-style	none dotted dashed dot-dash dot-dot-dash solid double groove ridge inset outset	Border style for text tables
background	[<'background-color'> <'background-image'>]	Short notation for background property
page-break-before	[auto always]	Page break before a paragraph/table
page-break-after	[auto always]	Page break after a paragraph/table
background-image	<uri>	Background image for elements

Supported CSS selectors

All of the CSS 2.1 selector classes are supported, with the exception of so-called pseudo-selector classes, such as :first-child, :visited and :hover.

18.3 Generating the help book

The help book is an XML file in which the structure of the online help is defined. In this file, you define:

- HTML documents
- Contents and subject index

Syntax for the help book

Tag	Number	Meaning
HMI_SL_HELP	1	Root element of the XML document
I-BOOK 	+	Identifies a help book. The name can be freely selected under the constraint that no name predefined by the system is used (such as sinumerik_alarm_plc_pmc). In the example, the name of the help book is "hmi_myhelp" Attributes:
		ref Identifies the HTML document that is displayed as the entry page for the help book.
		title Title of the help book that is displayed in the table of contents.
		helpdir Directory that contains the online help of the help book.
I-ENTRY 	*	Section of the online help Attributes:
		ref Identifies the HTML document that is displayed as entry page for the section.
		title Title of the section that is displayed in the table of contents.
II-INDEX_ENTRY 	*	Subject (keyword) to be displayed Attributes:
		ref Identifies the HTML document that is jumped to for this subject index entry.
		title Title of the subject that is displayed in the subject index.

The following applies for the "Number" column:

* means 0 or more

+ means 1 or more

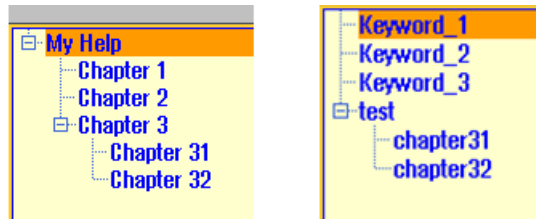
Example for a help book

In the following example, the structure of a help book with the "My Help" name is described. Further, it forms the basis for the table of contents and subject index.

```
<?xml version="1.0" encoding="utf-8"?>
<HMI_SL_HELP language="en-US">
  <BOOK ref="index.html" title="My Help" helpdir="hmi_myhelp">
```

```
<ENTRY ref="section_1.html" title="Section 1">
  <INDEX_ENTRY ref="section_1.html#Keyword_1" title="Keyword_1"/>
  <INDEX_ENTRY ref="section_1.html#Keyword_2" title="Keyword_2"/>
</ENTRY>
<ENTRY ref="section_2.html" title="Section 2">
  <INDEX_ENTRY ref="section_2.html#Keyword_3" title="Keyword_3"/>
</ENTRY>
<ENTRY ref="section_3.html" title="Section 3">
  <ENTRY ref="section_31.html" title="Section 31">
    INDEX_ENTRY ref="section_31.html#test" title="test;section31"/>
  </ENTRY>
  <ENTRY ref="section_32.html" title="Section 32">
    INDEX_ENTRY ref="section_32.html#test" title="test;section32"/>
  </ENTRY>
</ENTRY>
</BOOK>
</HMI_SL_HELP>
```

The book comprises three sections, whereby the third section has two subsections. The various subject words (keywords) are defined within the section.



You have the following three options to format the subject index:

1. Single entry:

```
<INDEX_ENTRY ...title="index"/>
```
2. Two two-stage entry, whereby each title has a main and a subentry. Separate the entries from one another using a comma.

```
<INDEX_ENTRY ...title="mainIndex_1,subIndex_1 with mainIndex_1"/>
```
3. Two-stage entry, whereby the first title is the main entry and the second title is the subentry. Separate the entries from one another using a semicolon.

```
<INDEX_ENTRY ...title="mainIndex_2;subIndex_2 without mainIndex_1"/>
```



18.4 Integrating the online help in SINUMERIK Operate

If you wish to integrate the generated help book into the online help system of SINUMERIK Operate, then you require the "shlp.xml" file.

Format description of the "shlp.xml"

Tag	Number	Meaning
CONFIGURATION	1	Root element of the XML document. Designates that this involves a configuration file.
I-OnlineHelpFiles	1	Introduces the section about the online help books.
II-<help_book>	*	Introduces the section of a help book.
III-EntriesFile III III III III III	1	File name of the help book with the list of contents and subject (keyword) entries. Attributes:
		value Name of the XML file
		type Data type of the value (QString)
III-Technology III III III III III III III III III	0, 1	Specifies the technology that applies to the help book. "All" applies to all technologies. If the help book applies to several technologies, then the technologies are listed separated by comma. Possible values: All, Universal, Milling, Turning, Grinding, Stroking, Punching Attributes:
		value Technology data
		type Data type of the value (QString)
III -DisableSearch III III III III III	0, 1	Disable the subject (keyword) search for the help book. Attributes:
		value true, false
		type type, data type of the value (bool)
III-DisableFullTextSearch III III III III	0, 1	Disable the full text search for the help book. Attributes:
		value true, false
		type type, data type of the value (bool)
III-DisableIndex III III III III	0, 1	Disable the subject index for the help book. Attributes:
		value true, false
		type type, data type of the value (bool)
III-DisableContent III III III III	0, 1	Disable the table of contents for the help book. Attributes:
		value true, false
		type type, data type of the value (bool)

Tag	Number	Meaning
III-DefaultLanguage	0, 1	Abbreviation for the language that should be displayed if the actual country language is available for the help book.
III		Attributes:
III		value chs, deu, eng, esp, fra, ita, ...
III		type Data type of the value (QString)

The following applies for the "Number" column:

* means 0 or more

Example of a file "shlp.xml"

The help book "hmi_myhelp.xml" is made known to SINUMERIK Operate in the following example.

The subject index has not been activated for the help book.

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<!DOCTYPE CONFIGURATION>
<CONFIGURATION>
  <OnlineHelpFiles>
    <hmi_myHelp>
      <EntriesFile value="hmi_myhelp.xml" type="QString"/>
      <DisableIndex value="true" type="bool"/>
    </hmi_myHelp>
  </OnlineHelpFiles>
</CONFIGURATION>
```

18.5 Saving help files

Saving help files in the target system

1. Open the `/oem/sinumerik/hmi/hlp` directory and create a new folder for the required language. For this purpose, use the specified language code.
It is mandatory that the folder names are written in lower-case letters.
For instance, if you are integrating a help function for German and English, then create the "deu" and "eng" folders.
2. Place the help book, e.g. "hmi_myhelp.xml" in the "deu" and "eng" folders.
3. Copy the help files into the directories, e.g. `/oem/sinumerik/hmi/hlp/deu/hmi_myhelp` for German and `/oem/sinumerik/hmi/hlp/eng/hmi_myhelp` for English help files.
4. Place the configuration file "slhlp.xml" into the directory `/oem/sinumerik/hmi/cfg`.
5. Restart the HMI.

Note

When displaying the list of contents and subject index of a help book, the help files are saved in the binary format (slhlp_<Hilfe-Buch_*.hmi) under the directory `/siemens/sinumerik/sys_cache/hmi/hlp` for faster use. If you change the help book, you must always delete these files.

See also

Supported languages (Page 597)

18.6 Generating online help for user alarms and machine data

You have the option to create a dedicated online help for user-specific PLC alarms. These can be opened context-sensitive from the alarm list when the alarms occur.

The help texts for the user-specific PLC alarms are realized in the HTML file "sinumerik_alarm_oem_plc_pmc.html".

Creating an HTML file

1. Create the HTML file in the following directory: `/oem/sinumerik/hmi/hlp/<lng>/sinumerik_alarm_plc_pmc/` or `/user/sinumerik/hmi/hlp/<lng>/sinumerik_alarm_plc_pmc/`.
<lng> signifies the language code, e.g. eng, deu, etc. When creating a language directory, always use the language code from the table in Section "Supported languages (Page 597)".
2. Assign the "sinumerik_alarm_oem_plc_pmc.html" name to the file. If you create help texts for several languages, then create the corresponding number of HTML files with precisely these names. This file name must not be changed and is applicable for all languages.
3. Store the files in the corresponding language directories. For example, store the file for the German help text in the following directory: `/oem/sinumerik/hmi/hlp/deu/sinumerik_alarm_plc_pmc/sinumerik_alarm_oem_plc_pmc.html`
4. Delete the file "slhlp_sinumerik_alarm_plc_pmc_*.hmi" in the `/siemens/sinumerik/sys_cache/hmi/hlp` directory and restart the operating software.

"sinumerik_alarm_oem_plc_pmc.html" file

Entry	Meaning
<code>AlarmNr</code>	Hyperlink to the alarm number
<code></code>	Help text for the corresponding alarm
<code><td width="85%">.....</td></code>	Text that is displayed after the "Explanation" or "Remedy" field.

Example

The alarm number is used as HTML anchor.

```
<?xml version="1.0" encoding="UTF-8"?><!DOCTYPE html PUBLIC "-//W3C//DTD
HTML 4.0 Transitional//EN" >
- <html>
    <head><title></title></head>
- <body>
-   <table>
-     <tr>
-       <td width="15%">
-         <b><a name="510000">510000</a></b>
-       </td>
-       <td width="85%">
-         <b>This is the help for user alarm 510000</b>
```

```

        </td>
      </tr>
    -   <tr>
    -     <td valign="top" width="15%">
    -       <b>Explanation</b>
    -     </td>
    -     <td width="85%"> This is the explanation of user alarm 510000.</td>
    -   </tr>
    -   <tr>
    -     <td valign="top" width="15%"><b>Remedy:</b></td>
    -     <td width="85%">Eliminate reason for alarm. </td>
    -   </tr>
  </table>

</body>
</html>

```

Distribute the online help for user alarms over several HTML files

You have the option of distributing the online help for user alarms over several HTML files.

1. Store an XML file with the name "sinumerik_alarm_plc_pmc.xml" in the following directory: `/oem/sinumerik/hmi/hlp/<lng>/` or `/user/sinumerik/hmi/hlp/<lng>/`
<lng> stands for the language code, e.g. deu, eng, etc. When you create a language directory, use the language code from the table in Section "Supported languages (Page 597)".
2. Open the XML file and in the tag <NUM_AREAS> enter the number ranges of the alarms and the corresponding HTML files.
3. Store the HTML files that are specified in the XML file in the following directory:
`/oem/sinumerik/hmi/hlp/<lng>/sinumerik_alarm_plc_pmc` or
`/user/sinumerik/hmi/hlp/<lng>/sinumerik_alarm_plc_pmc` file

Example: Creating an XML file

Entry	Meaning
<BOOK>	Help book
<NUM_AREAS>	Number ranges of the alarms and the reference to the particular HTML file

The following example includes the online helps for the alarms from 500000 to 599999 in the HTML file "sinumerik_alarm_oem_1.html", the alarms from 600000 to 699999 in the HTML file "sinumerik_alarm_oem_2.html", the alarms from 700000 to 799999 in the HTML file "sinumerik_alarm_oem_3.html", the alarms from 800000 to 899999 in the HTML file "sinumerik_alarm_oem_4.html".

```

<?xml version="1.0" encoding="utf-8" standalone="yes"?>
<!DOCTYPE HMI_SL_HELP>
<HMI_SL_HELP>
  <BOOK>

```

```

<NUM_AREAS>
  <NUM_AREA from="500000" to="599999"
    ref="sinumerik_alarm_oem_1.html" />
  <NUM_AREA from="600000" to="699999"
    ref="sinumerik_alarm_oem_2.html" />
  <NUM_AREA from="700000" to="799999"
    ref="sinumerik_alarm_oem_3.html" />
  <NUM_AREA from="800000" to="899999"
    ref="sinumerik_alarm_oem_4.html" />
</NUM_AREAS>
</BOOK>
</HMI_SL_HELP>

```

Replacing the standard online help

You have the option of generating your own online help for the HMI, NC and PLC alarms as well as machine data. This means that you can replace the standard online help by your own online help.

You can call your own online help directly at the control using the INFO key. Instead of the standard online help, your own online help is displayed.

Directory for HTML files

Area	Directory
PLC alarms	/oem/sinumerik/hmi/hlp/<Lng>/sinumerik_alarm_plc_pmc/ or /user/sinumerik/hmi/hlp/<Lng>/sinumerik_alarm_plc_pmc/
HMI alarms	/oem/sinumerik/hmi/hlp/<Lng>/sinumerik_alarm_hmi/ or /user/sinumerik/hmi/hlp/<Lng>/sinumerik_alarm_hmi/
NC alarms	/oem/sinumerik/hmi/hlp/<Lng>/sinumerik_alarm_nck/ or /user/sinumerik/hmi/hlp/<Lng>/sinumerik_alarm_nck/
NC MD	/oem/sinumerik/hmi/hlp/<Lng>/sinumerik_md_nck/
Channel MD	/oem/sinumerik/hmi/hlp/<Lng>/sinumerik_md_chan/
Axis MD	/oem/sinumerik/hmi/hlp/<Lng>/sinumerik_md_axis/

<Lng> stands for the language code, e.g. deu, eng, etc. Only use the language codes from the table in Section "Supported languages (Page 597)".

Procedure:

1. Create the corresponding directory, refer to the table "Directory for HTML files".
2. Generate the help file and as file names, use the alarm/machine data number as well as the extension ".html" for HTML help files and ".pdf" for PDF help files. If you create help texts for several languages, then create the corresponding number of help files with precisely these names and then create the file in the corresponding language directory.

Examples:

- Your own German online help for the PLC Alarm 510000:
/oem/sinumerik/hmi/hlp/deu/sinumerik_alarm_plc_pmc/510000.html
/oem/sinumerik/hmi/hlp/deu/sinumerik_alarm_plc_pmc/510000.pdf
- Your own German online help for the NC machine data 14510 \$MN_USER_DATA_INT:
/oem/sinumerik/hmi/hlp/deu/sinumerik_md_nck/14510.html

18.7 Example: This is how you create an online help for NC/PLC variables

Overview

In order to create context-sensitive online help for NC/PLC variables or system variables as shown in the following example, the descriptive texts are managed in language-dependent html files.

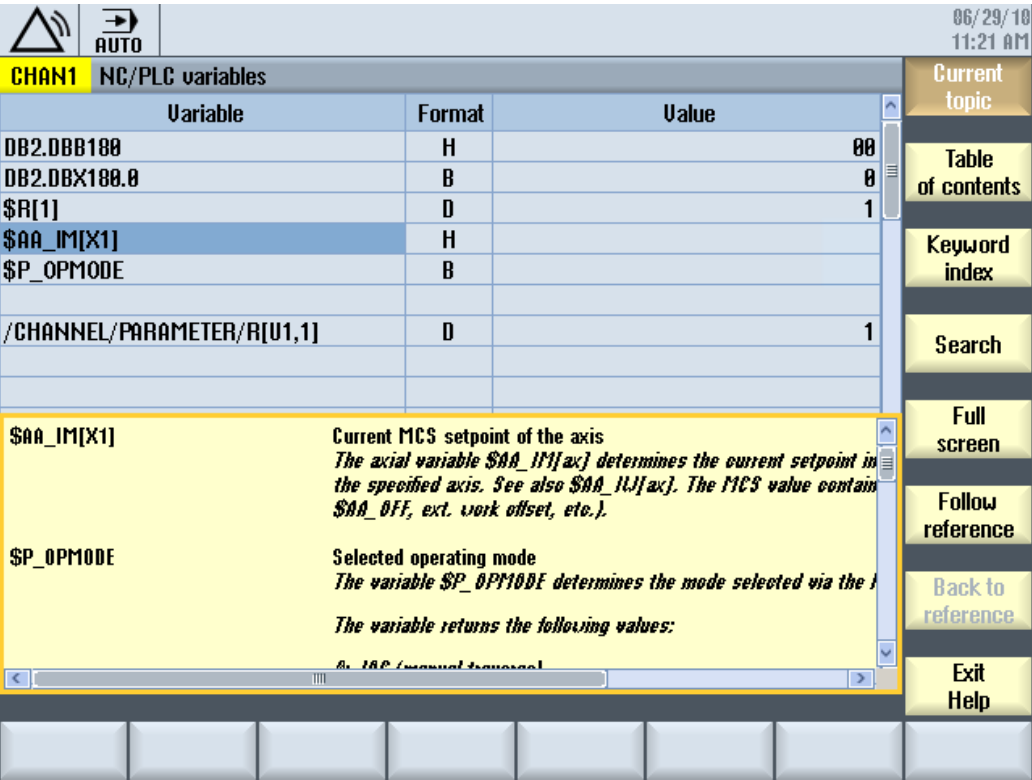


Figure 18-1 Example: Online help for user variables

Structure of the online help

The following files are required for the online help:

File	Meaning
sldgvarviewhelp.ini	Configuration file to manage an html file or several html files
<lng>/<name>1.html	The contents of all html files of the online help are language-dependent and are saved in the relevant language directory <lng>.
<lng>/<name>2.html	
. . .	
<lng>/<name>n.html	

Structure of the configuration file

The file is **independent of any language** and is structured as follows:

```
sldgvarviewhelp.ini

[HelpBindings]
/BAG/STATE/OPMODE = var1_help.html#var1
$AA_IM[X1] = var1_help.html
$R[1] = var1_help.html#var2
/Channel/Parameter/R[u1,1] = var2_help.html#var2
DB2.DBX180.0 = var2_help.html#var1
GUD/MyVar[2] = var2_help.html
```

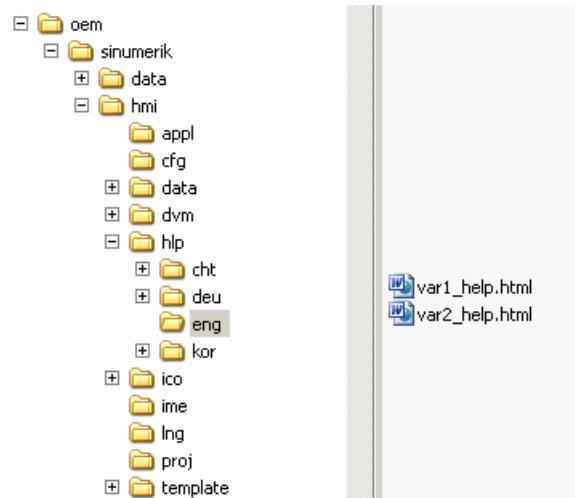
Note

The html files can be generated with any html editor. A definition is provided in the configuration file as to which html files belong to the online help.

The description can comprise one or several html files: For example, one html file for each variable or several identical variables in one file.

Procedure:

1. Copy the configuration file to the following directory:
/oem/sinumerik/hmi/cfg/sldgvarviewhelp.ini
2. Copy the html files to one of the following directories:
/oem/sinumerik/hmi/hlp/<lng>/
/user/sinumerik/hmi/hlp/<lng>/
<lng> stands for the language code.



3. Delete all files in the directory:
/siemens/sinumerik/sys_cache/hmi//hlp

The settings become effective only after restarting the system.

18.8 Example: This is how you create a programming online help

Preconditions

Create the following files:

- Configuration file "prog_help.ini"

```
[milling]
CYCLE1=cycle1_help.html
CYCLE2=cycle2_help.html#TextAnchor1
CYCLE3=cycle3_help.html
CYCLE4=cycle4_help.html

[turning]
CYCLE3=cycle2_help.html
CYCLE4=cycle3_help.html
```

- Configuration file for the help book "shlp.xml" (optional)

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<!DOCTYPE CONFIGURATION>
<CONFIGURATION>
  <OnlineHelpFiles>
    <hmi_prog_help>
      <EntriesFile value="hmi_prog_help.xml" type="QString"/>
      <DisableIndex value="true" type="bool"/>
    </hmi_prog_help>
  </OnlineHelpFiles>
</CONFIGURATION>
```

- Configuration file for the help book "hmi_prog_help.xml" (optional)

```
<?xml version="1.0" encoding="UTF-8"?>
<HMI_SL_HELP language="en-US">
  <BOOK ref="index.html" title="OEM_CYCLES" helpdir="hmi_prog_help">
    <ENTRY ref="cycle1_help.html" title="Cycle1"></ENTRY>
    <ENTRY ref="cycle2_help.html" title="Cycle2"></ENTRY>
    <ENTRY ref="cycle3_help.html" title="Cycle3"></ENTRY>
    <ENTRY ref="cycle4_help.html" title="Cycle4"></ENTRY>
    <ENTRY ref="cycle_help.html" title="OEM_Cycles"></ENTRY>
  </BOOK>
</HMI_SL_HELP>
```

18.8 Example: This is how you create a programming online help

- Language-dependent file "<prog_help_eng>.ts": this filename is permanently specified.

```
<?xml version="1.0" encoding="utf-8" standalone="yes"?>
<!DOCTYPE TS>
<TS>
  <context>
    <name>oem_cycles</name>
    <message>
      <source>CYCLE1</source>
      <translation>short description for cycle 1</translation>
      <chars>*</chars>
    </message>
    <message>
      <source>CYCLE2</source>
      <translation>short description for cycle 2</translation>
      <chars>*</chars>
    </message>
    <message>
      <source>CYCLE3</source>
      <translation>short description for cycle 3</translation>
      <chars>*</chars>
    </message>
  </context>
</TS>
```

Saving help files in the target system

Procedure:

1. Copy the configuration file "prog.ini" to the following directory:
/oem/sinumerik/hmi/cfg
2. Copy the file "slhlp.xml" to the help book in the following directory:
/oem/sinumerik/hmi/cfg
3. Create a directory for the desired language of the online help under the following path: /oem/sinumerik/hmi/hlp/<lng> and copy the file "hmi_prog_help.xml" to this directory
Use the specified language code from the list of language codes for file names. The directory names must be written in lower case.
4. Copy the language-dependent prog_help_<lng>.ts file for the Product Brief to the following path: /oem/sinumerik/hmi/<lng>/prog_help_<lng>.ts
5. Copy the html files with the description of the OEM cycles to the following directory:
/oem/sinumerik/hmi/hlp/<lng>/hmi_prog_help/cycle<n>_help.html

The settings become effective only after restarting the system.

18.9 Help files in PDF format

In addition to help files in HTML format, you can also include PDF-format information in the operating software. Individual PDF helps can be opened with links from the table of contents or index, or directly from HTML files.

Storing PDF helps

Copy the PDF helps to one of the following directories:

```
/oem/sinumerik/hmi/hlp/<lng>/<hmi_myhelp>
```

```
/user/sinumerik/hmi/hlp/<lng>/<hmi_myhelp>
```

Including PDF helps

Bind in dialog configurations or configurations of table of contents and indexes with the extension "pdf" in the same manner as for the "html" extension:

```
<ENTRY ref="myFile.pdf" title="Help 1">
```

Create a link from HTML files to the PDF help:

```
<a href="myFile.pdf">My Help File</a>
```

Note

It is not possible to select context-sensitive jump labels in the PDF help, select jump labels or make jumps to other HTML or PDF files.

The search function is possible only within a PDF file. A higher-level search over multiple PDF helps is not supported.

18.10 Language support for PDF files

For standard languages, SINUMERIK Operate allows the language of open PDF files to be switched over. If the selected language of the appropriate PDF file is available in operation, each time the operating language is changed, then the corresponding language version of the PDF file is automatically loaded.

Note

If the corresponding language version of the PDF file is not available, the English version of the PDF file opens as standard default language version. If, in this case, the standard default version is not available or is corrupted, then the last visible PDF file remains active.

Additional information about the standard default languages and language IDs is available in Chapter "Supported languages (Page 597)".

You have the following options of archiving language-supported PDF files:

PDF files with language ID in the group directory

Copy the PDF files with language ID into a directory, e.g.:

```
/card/<home>/<myFolder>/<abc>_eng.pdf  
/card/<home>/<myFolder>/<abc>_deu.pdf  
/card/<home>/<myFolder>/<abc>_fra.pdf  
...
```

PDF files in the language directory

Copy the PDF files into a language directory, e.g.:

```
/card/<home>/<myFolder>/eng/<abc>.pdf  
/card/<home>/<myFolder>/deu/<abc>.pdf  
/card/<home>/<myFolder>/fra/<abc>.pdf  
...
```

PDF help in specific language directory

Copy the PDF help files to one of the following directories, e.g.:

```
/oem/sinumerik/hmi/hlp/eng/<abc>.pdf  
/oem/sinumerik/hmi/hlp/deu/<abc>.pdf
```

or

```
/user/sinumerik/hmi/hlp/eng/<abc>.pdf  
/user/sinumerik/hmi/hlp/deu/<abc>.pdf  
...
```

SINUMERIK Integrate - AMB, AMC, AMM

Precondition

To start the "SINUMERIK Integrate - AMB, AMC, AMM" software, configure a softkey using a display machine data. To do this you require, as a minimum, authorization for access level 3 (user).

Configuring a softkey

MD9108 \$MM_SINUMERIK_INTEGRATE	
= 1	The "SINUMERIK integrate" softkey is displayed on the extended user interface bar.

More information

Information about the software is available in the
Function Manual SINUMERIK Integrate - AMB, AMC, AMM.

Technologies and cycles

20.1 Activating turning/milling/drilling/grinding technologies

The cycles are automatically loaded when the control runs up (power on).

The configuration is realized using cycle machine data and cycle setting data. In so doing, a differentiation is made between the following data:

- General cycle machine data
- Channel-specific cycle machine data
- Axis-specific cycle machine data
- General cycle setting data
- Channel-specific cycle setting data
- Axis-specific cycle setting data

Requirement for memory configuration

To ensure that the cycles run correctly, the following default setting must be checked:

MD28082 \$MC_MM_SYSTEM_FRAME_MASK	System frames (SRAM)
Bit 5	System frame for cycles
= 1	Default setting

MD52201 \$MCS_TECHNOLOGY_EXTENSION	Technology extension for combined machines with several technologies
= 1	Additional settings for turning
= 2	Additional settings for turning, e.g. turning machine with milling technology MD52200 \$MCS_TECHNOLOGY = 1 MD52201 \$MCS_TECHNOLOGY_EXTENSION = 2

Note

Cylindrical and surface grinding are not supported as a technology extension by SINUMERIK Operate.

Adapting the user interface

The softkey display for the selection of the cycle support in the program editor is set using the following channel-specific configuration machine data:

MD52200 \$MCS_TECHNOLOGY	Technology
= 1	Setting for turning
= 2	Setting for milling
= 3	Setting for the cylindrical grinding technology
= 4	Setting for the surface grinding technology

More information

Information about grinding technology is available in:

- Chapter "Grinding (Page 464)"
- Operating Manual Grinding
- Programming Manual NC Programming
- Function Manual Monitoring and Compensating

Configuring the screen display

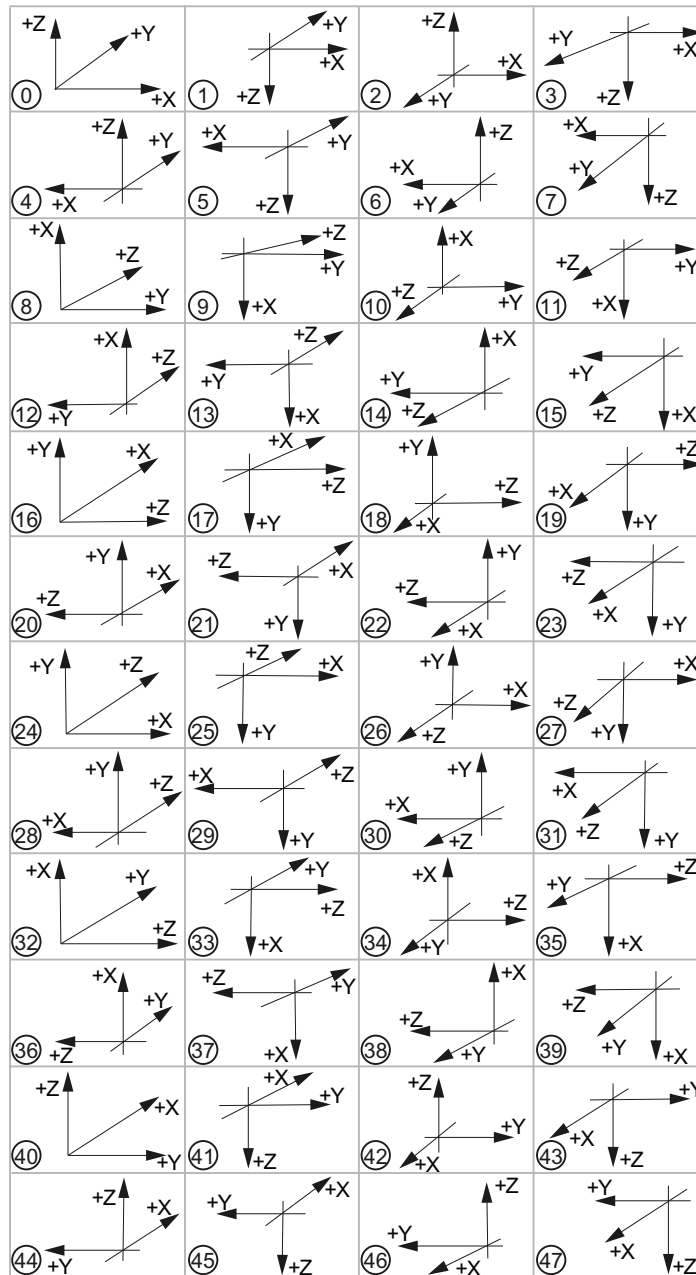
The screen display can be configured using the following channel-specific machine data:

MD52210 \$MCS_FUNCTION_MASK_DISP	Function screen display
Bit 0	Dimension system for programs always in the basic system
Bit 1	Front view when turning in the school coordinate system
Bit 2	Hide "T,S,M" softkey in the JOG area
Bit 3	Generate end of program automatically in MDI (with "Delete blocks" softkey)
Bit 4	Display follow-on tool in the T,F,S window
Bit 5	Hide "MCS" softkey
Bit 6	Hide tool radius/diameter in the T,F,S window
Bit 7	Hide tool lengths in the T,F,S window
Bit 8	Hide tool icon in the T,F,S window
Bit 9	Display "Easy" input selection, see Section ""Easy" input in cycle support"
Bit 10	Do not offer channel in job lists
Bit 11	For WCS, activate the display of the logical spindles
Bit 12	Hide mold making view for G code

Setting the coordinate system

MD52000 \$MCS_DISP_COORDINATE_SYSTEM	Position of the coordinate system
= 0	Default setting
With this machine data you adapt the position of the coordinate system of the user interface to the coordinate system of the machine. In the user interface, all help screens, sequence graphics, simulations, and entry fields with circle direction indication change automatically according to the selected position.	

The following settings can be selected for the coordinate system:



Meaning of the axes

MD52206 \$MCS_AXIS_USAGE[n]		Meaning of the axes in the channel [n] channel axis number
= 0	No special meaning	
= 1	Tool spindle (rotating tool)	
= 2	Auxiliary spindle (rotating tool)	

= 3	Main spindle (turning)
= 4	Separate C axis of the main spindle (turning)
= 5	Counterspindle (turning)
= 6	Separate C axis of the counterspindle (turning)
= 7	Linear axis of the counterspindle (turning)
= 8	Tailstock (turning)
= 9	Steady (turning)
=10	B axis (turning)
= 12	B axis in counterspindle (turning)
= 13	Transverse travel X of the counterspindle (turning)

Defining the direction of rotation

Enter the direction of rotation for the rotary axes that are not configured in a tool holder or a 5-axis transformation via the following channel-specific machine data.

MD52207 \$MCS_USAGE_ATTRIB[n]		Attribute of the axes in the channel [n] channel axis number
Bit 0	Rotates around 1st geometry axis (for rotation axis)	
Bit 1	Rotates around 2nd geometry axis (for rotation axis)	
Bit 2	Rotates around 3rd geometry axis (for rotation axis)	
Bit 3	Direction of rotation is counterclockwise (for rotary axis / C axis).	
Bit 4	Displayed direction of rotation of the spindle/C axis for the M function M3 is counterclockwise	
Bit 5	Inverts M3 / M4 (for spindles) This bit must be set analogous to PLC bit DB31, ... DBX17.6!	
Bit 6	Display rotary axis as offset target for measurement	
Bit 7	List rotary axis in the position pattern	
Bit 8	List rotary axis to accept blank (on milling machines)	
Bit 9	Spindle is not SPOS-capable	
Bit 10	Rotary axis rotates around 1st geometry axis (only for position pattern)	
Bit 11	Rotary axis rotates around 2nd geometry axis (only for position pattern)	
Bit 12	Rotary axis rotates around 3rd geometry axis (only for position pattern)	

"Easy" input in cycle support

You can influence the number of visible input parameters via MD52210 \$MCS_FUNCTION_MASK_DISP with bit 9:

- All input parameters are displayed with the default setting bit 9 = 0 for "Complete".
- With the setting bit 9 = 1, you can select "Complete" or "Easy" input parameters in the cycle support.

If you select the "Easy" input screen for input of the parameters, the values from the following setting data are used for the invisible parameters (can be adapted machine-specifically):

SD55300 \$SCS_EASY_SAFETY_CLEARANCE		Easy input: Safety clearance
= 1	mm	

20.1 Activating turning/milling/drilling/grinding technologies

SD55301 \$SCS_EASY_DWELL_TIME	Easy input: Dwell time
= 0.6	s

SD55305 \$SCS_EASY_DRILL_DEEP_FD1	Easy input: Percentage of 1st deep-hole drilling feedrate
= 90	%

SD55306 \$SCS_EASY_DRILL_DEEP_DF	Easy input: Percentage of deep-hole drilling in-feed
= 90	%

SD55307 \$SCS_EASY_DRILL_DEEP_V1	Easy input: Min. deep-hole drilling depth infeed
= 1.2	mm

SD55308 \$SCS_EASY_DRILL_DEEP_V2	Easy input: Deep-hole drilling retraction distance
= 1.4	mm

SD55309 \$SCS_EASY_THREAD_RETURN_DIST	Easy input: Thread turning return distance
= 2	mm

Note

The specified default values are valid for the metric system and are converted by the NC automatically on the machine with the inch setting.

Additional settings

MD52005 \$MCS_DISP_PLANE_MILL	Plane selection G17, G18, G19
= 0	Milling: Plane selection in the cycle support when programming under "programGUIDE G code"
= 17	G17 plane (default value)
= 18	G18 plane
= 19	G19 plane

MD52006 \$MCS_DISP_PLANE_TURN	Plane selection G17, G18, G19
= 18	G18 plane (permanently set)

MD52212 \$MCS_FUNCTION_MASK_Tech		General function mask for all technologies
Bit 0	Enable swivel	
= 0	Swivel plane, swivel tool not enabled	
= 1	Swivel plane, swivel tool enabled	
Bit 1	No optimized travel along software limit switches	
= 0	No optimized travel along software limit switches	
= 1	Optimized travel along software limit switches	

MD52240 \$MCS_NAME_TOOL_CHANGE_PROG		Tool change program for G code steps
= Program name	The associated program is called for tool change.	

See also

Technology cycles for swiveling (Page 467)

20.2 Technology cycles for drilling

Drilling technology

You can set drilling technology using the following channel-specific configuration machine data and channel-specific cycle setting data.

MD52216 \$MCS_FUNCTION_MASK_DRILL		Drilling function screen form
Bit 0	Tapping cycle CYCLE84, technology input fields	
= 0	Hide input fields	
= 1	Display input fields	
Bit 1	Tapping cycle CYCLE840, technology input fields	
= 0	Hide input fields	
= 1	Display input fields	

SD55216 \$SCS_FUNCTION_MASK_DRILL_SET		Drilling function screen form
Bit 1	Boring CYCLE86: Take into account the rotation of the tool plane when positioning the spindle Note: Spindle direction of rotation M3/ M4 and direction of rotation of the rotary axes must be set according to DIN. For SPOS=0, the tool cutting edge points in the + direction of the 1st axis of the plane (for G17, to X+).	
= 0	Do not take into account the rotation of the tool plane when positioning the spindle (SPOS).	
= 1	Take into account the rotation of the tool plane when positioning the spindle (SPOS).	
Bit 2	Boring CYCLE86: When positioning the spindle, take into account swiveled table kinematics (tool carrier)	
= 0	When positioning the spindle, do not take into account the components of the swiveled table kinematics (swiveling with CYCLE800, tool carrier). Note: Only the rotary axis of the machine kinematics that rotates the workpiece is taken into account. In the initial state of the kinematics, this rotary axis must be orientated parallel to the tool axis. e.g. rotary axis C rotation around Z (for G17) rotary axis vector of the swivel data set V2xyz = 0 , 0 , -1.	
= 1	When positioning the spindle, take into account the components of the swiveled table kinematics (swiveling with CYCLE800, tool carrier).	
Bit 3	Tapping CYCLE84: Monitoring of the machine data MD31050 \$MA_DRIVE_AX_RATIO_DE-NOM and MD31060 \$MA_DRIVE_AX_RATIO_NUMERA of the spindle	
Bit 4	Tapping CYCLE84, set monitoring of the machine data MD31050 \$MA_DRIVE_AX_RATIO_DE-NOM and MD31060 \$MA_DRIVE_AX_RATIO_NUMERA of the spindle	
= 0	No monitoring	
= 1	Monitoring	
Bit 6	Boring CYCLE86: Adapt the spindle position to the tool orientation Tool orientation can be realized using TOOLCARR or TRAORI before the cycle is called.	
= 1	Bits 1 and 2 are no longer effective.	
Bit 7	Boring CYCLE86: Adapt the direction of retraction travel in the plane to the active mirroring	

= 0	Retraction in the plane is realized as programmed.
= 1	When mirroring is active, the direction when retracting in the plane is adapted in the cycle to the active mirroring.

Tapping (CYCLE84 and CYCLE840)

If the technology screens are hidden using the channel-specific configuration machine data MD52216 \$MCS_FUNCTION_MASK_DRILL, then the settings in the following channel-specific cycle setting data are effective:

SD55481 \$SCS_DRILL_TAPPING_SET_GG12[0]	Setting tapping G group 12: Block change behavior for exact stop
= 0	Exact stop response as before the cycle call (default value).
= 1	G601
= 2	G602
= 3	G603

SD55482 \$SCS_DRILL_TAPPING_SET_GG21[0]	Setting tapping G group 21: Acceleration behavior
= 0	Acceleration behavior as before the cycle call (default value).
= 1	SOFT
= 2	BRISK
= 3	DRIVE

SD55483 \$SCS_DRILL_TAPPING_SET_GG24[0]	Setting tapping G group 24: Precontrol
= 0	Precontrol, the same as before the cycle call (default value).
= 1	FFWON
= 2	FFWOF

Tapping (CYCLE84)

SD55484 \$SCS_DRILL_TAPPING_SET_MC[0]	Spindle operation for MCALL
= 0	For MCALL, reactivate spindle operation (default value).
= 1	For MCALL, remain in position controlled spindle operation.

20.3 Manufacturer cycles

20.3.1 Manufacturer cycles

Note

Protect your technological knowledge

To protect your know-how, you can protect your cycles with individual access rights and additional file encryption. Implement this cycle protection by means of the following measures:

- Encrypt your cycle data with the additional SIEMENS application SINUCOM Protector.
More information on SINUCOM can be found on the Internet ([https://support.industry.siemens.com/cs/document/109474775/sinumerik-828d-840d-sl%3A-cycle-protection-with-protector-for-sinumerik-\(oem-system-integrator\)?dti=0&lc=en-WW](https://support.industry.siemens.com/cs/document/109474775/sinumerik-828d-840d-sl%3A-cycle-protection-with-protector-for-sinumerik-(oem-system-integrator)?dti=0&lc=en-WW)).
- Assign individual access rights to your cycle data and adapt the authorization levels for the user.
More information on assigning individual access rights can be found in Chapter "Access levels for programs (Page 72)".

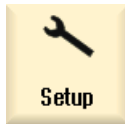
The following cycles are also available in the cycle package for individual adaptation:

CUST_TECHCYC.SPF	Manufacturer cycle for the adaptation of technology cycles.
CUST_782.SPF	Manufacturer cycle for adaptation to determine loading function (CYCLE782), see Chapter "Manufacturer cycle CUST_782.SPF (Page 544)".
CUST_800.SPF	Manufacturer cycle for the adaptation of the swivel plane and the swivel tool functions (CYCLE800), see Chapter "Manufacturer cycle CUST_800.SPF (Page 515)".
CUST_832.SPF	Manufacturer cycle for the adaptation of the high-speed settings function (CYCLE832), see Chapter "Manufacturer cycle CUST_832.SPF (Page 550)".
CUST_MEACYC.SPF	Manufacturer cycle for the adaptation of the measuring functions, see Chapter "Manufacturer and user cycle CUST_MEACYC.SPF (Page 556)".
CUST_MEAPROT.SPF	Manufacturer cycle and user cycle for the adaptation of the log form and content, see Chapter "Manufacturer and user cycle CUST_MEAPROT.SPF (Page 588)".
PROG_EVENT.SPF	Standard cycle to support the following functions: • Block search when milling or turning is activated • Block search and swivel plane • Block search and align / advance tool Note MD52212 \$MCS_FUNCTION_MASK_Tech bits 3, 5 and 15 ... 17.
CUST_T	Cycle is used to track the T preparation after SERUPRO.
CUST_M6	Cycle is used to track the tool change after SERUPRO.
CUST_MULTICHAN	Manufacturer cycle for turning machines with several channels
CUST_CLAMP	Manufacturer's cycle for clamping elements

Copying manufacturer cycles

Copy the cycle from the NC data/Cycles/Standard cycles directory to the NC data/Cycles/

User cycles directory before making any changes. Changes for the cycle take effect only in this directory.



1. Select the "Start-up" operating area.



2. Press the "System data" softkey.

3. Open the directory NC data/Cycles/Standard cycles and select the manufacturer cycles.



4. Press the "Copy" softkey and open the NC data/Cycles/Manufacturer cycles directory.



5. Press the "Paste" softkey.
The cycles are available for you to individually adapt them.

Note

When upgrading the software, please refer to the upgrade instructions.

20.3.2 Prerequisites for the simulation mode

Configuration

If you use feedback signals regarding the machine state, e.g. in CYCPE1MA, for tool change cycles, measuring cycles or CUST_800, then in the NC program you must link in the following system variables in order to avoid PLC access. Otherwise, PLC access prevents data alignment, results in alarms or the simulation being canceled:

System variable	Meaning
\$P_SIM	NCK simulation active

Example

In the following example, the simulation mode in PROG_EVENT or CYCPE1MA.SPF is stopped by the PLC access:

```
N100 REPEAT
N110 UNTIL PLC_VAR <> 0
```

If you use the system variable \$P_SIM, then PLC access in the simulation mode is prevented:

```
N099 IF NOT $P_SIM
```

```
N100 REPEAT  
N110 UNTIL PLC_VAR <> 0  
N111 ENDIF
```

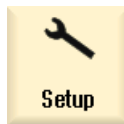
20.3.3 Extending the PROG_EVENT standard cycle

If you wish to extend the functionality of the PROG_EVENT, then you must not copy this into the manufacturer cycles directory, but you must create two new manufacturer cycles. Use the names CYCPE1MA.SPF or CYCPE_MA.SPF names for the manufacturer cycles.

For the manufacturer cycles CYCPE1MA.SPF or CYCPE_MA.SPF, the corresponding jump markers are prepared at the beginning and at the end of PROG_EVENT.SPF.

If the CYCPE1MA.SPF and CYCPE_MA.SPF manufacturer cycles are created in the NC, the program correspondingly branches from PROG_EVENT to the manufacturer cycles.

Procedure



1. Select the "Start-up" operating area.



2. Press the "System data" softkey.



3. Select the directory /NC data/Cycles/Manufacturer cycles
4. Press the "New" softkey.

The "New G Code Program" window opens.

5. Assign the name CYCPE1MA or CYCPE_MA.
Only use these names.



6. Press the "OK" softkey.
The cycle has been created and you can now adapt it.

20.3.4 Manufacturer cycle for tool change CUST_T and CUST_M6

Function

The two cycles are used to track the T preparation (CUST_T) and the tool change (CUST_M6) according to SERUPRO. In so doing, depending on the specific tool holder, the following is output:

- Last programmed change
- Last programmed preparation

Precondition

The cycles can only be used when tool management is active.

Sequence

The two cycles are called in the "SERUPRO-END-ASUB", which also provides the two transfer parameters.

Parameter	Meaning
_THnr	Tool holder or master spindle number that was programmed for the change or the preparation.
_MTHnr	Number of the active tool holder or master spindle at the time of programming.

The cycles themselves do not contain any "machine logic". Pure data operations are performed.

The active tool holder or the master spindle is saved.

Using the transfer parameter, the situation at the time of the T or M6 programming is determined. This situation is established, T and/or M06 output or a branch is made into the manufacturer cycles. After the output of T and M06 or after returning from the manufacturer cycles, the tool holder, saved at the beginning, is reactivated.

A change cycle can then only be called without any restriction, if the corresponding queries such as program test, block search,...exist.

T replacement cycle

If a T replacement cycle is being used, then the following note must be observed:

Note

The CUST_T cycle uses the language command TCA (ToolChangeAbsolut) for the T call and therefore also has the possibility of inserting tools that have been disabled. However, this language command cannot be substituted.

The following must be observed if working at a machine with T replacement:

- The T preparation cycle must be explicitly called at the specified position.
- If the call is realized using the CUST_T cycle, then the parameter evaluation (\$C_TS_PROG, ...) is skipped.

Alternatively, the original TCA language command can be reprogrammed.

More information

More information about "SERUPRO and ASUB" is provided in the Function Manual Basic Functions.

20.3.5 CUST_TECHCYC.SPF manufacturer cycle

Function

For technological cycles, the CUST_TECHCYC cycle is called from ShopMill and ShopTurn cycles, if the machine builder must make certain adaptations to a specific machine (e.g. activate specific M commands). For instance, this may be necessary in order to retract or extend part catchers when cutting off parts on lathes or to position a spindle for clamping (only in JobShop).

The CUST_TECHCYC.SPF cycle can be used to program and execute the necessary sequences.

Adapt manufacturer cycle CUST_TECHCYC.SPF

You can execute the following actions with the aid of the _MODE parameter:

Marker	Action	
_M1	Main spindle:	Changeover to C axis mode
_M2		Changeover to spindle mode
_M3		Clamp C axis
_M4		Release C axis clamping Damping brake off
_M5		Rinse chuck
_M6		Close chuck
_M7		Open chuck when spindle is stationary
_M8		Open chuck when spindle is rotating
_M9		Flush chuck
_M11	Tool spindle:	Changeover to C axis mode
_M12		Changeover to spindle mode
_M13		Clamp C axis
_M14		Release C axis clamping
_M21	Counterspindle:	Changeover to C axis mode
_M22		Changeover to spindle mode
_M23		Clamp C axis
_M24		Release C axis clamping Damping brake off
_M25		Rinse chuck
_M26		Close chuck
_M27		Open chuck when spindle is stationary
_M28		Open chuck when spindle is rotating
_M29		Rinse chuck off
_M30	Position 4th axis after block search (e.g. counterspindle, tailstock, back rest)	
M41	Engage driven tool	

Marker	Action	
_M42	Disengage driven tool	
_M61	Changeover to turning	
_M62	Changeover to peripheral surface machining C	
_M63	Changeover to face machining C	
_M64	Changeover to peripheral surface machining Y	
_M65	Changeover to face machining Y	
_M66	Changeover to face machining B (swivel)	
_M67	Deselection of the face machining B (swivel)	
_M68	After block search to ST block before swiveling	
_M100	Drawer:	Position before cut-off
_M101		Open during cut-off
_M102		Close after cut-off
_M103	Cut-off completed	
_M110	Tool change	
_M111	After end of tool change cycle (with tool change)	
_M112	Before tool change on retraction plane	
_M113	Before cutting edge reselection	
_M114	After end of tool change cycle (without tool change)	
_M115	after tool preselection (ShopTurn)	
_M116	To tool change point (ShopTurn)	
_M117	Before tool change T command	
_M118	Output of M and H functions after tool change (ShopMill, ShopTurn)	
_M120	Definition: Coupling of counterspindle / main spindle	
_M121	After COUPOF switch off position control	
_M122	Definition: Coupling, main/counterspindle	
_M123	After COUPOF switch off position control	
_M125	Changeover to main spindle	
_M126	Changeover to counterspindle	
_M131	Start of program (ShopTurn program)	
_M132	End of program header (ShopTurn program)	
_M135	End of program loop (ShopTurn program)	
_M136	End of program (ShopTurn program)	
_M140	Block search	Before tool change
_M141		After tool change
_M142		After tool change (new tool from ShopTurn)

Marker	Action	
_M150	2-channel stock removal:	Leading channel before Balance Cutting
_M151		Leading channel after Balance Cutting
_M152		Following channel before Balance Cutting
_M153		Following channel after Balance Cutting
_M154		Start machining in the leading channel
_M155		End machining in the leading channel
_M156		Start machining in the following channel
_M157		Start machining in the following channel
_M160	Start multichannel programming	
_M170	Start block with spindle	
_M171	End block with spindle	
_M231	Start of program (ShopMill program)	
_M232	End of program header (ShopMill program)	
_M235	End of program loop (ShopMill program)	
_M236	End of program (ShopMill program)	
_M300	Boring CYCLE86 Adapt the spindle to the tool position (SD55216 \$SCS_FUNCTION_MASK_DRILL_SET bit 6 = 1) For specific machine kinematics, it may be necessary to make an additional adjustment of the correction angle for the spindle positioning (e.g. intermediate gear at the spindle). The _M300 marker is run through after the correction angle is calculated. There the correction angles _MEA_CORR_ANGLE[0] (for the manufacturer) and _MEA_CORR_ANGLE[1] (system) can be changed, if applicable. For subsequent spindle positioning operations, both angles act additively in CYCLE86.	
_M403	Main spindle:	Damping brake on
_M423	Counterspindle:	Damping brake on
_M900	Before blank output (only ShopMill + ShopTurn)	

20.3.6 CUST_MULTICHAN user cycle

Function

The CUST_MULTICHAN cycle is used for multi-channel programming at lathes. It is called at the start of the block when programming with blocks.

In the cycle, e.g. the master spindle is set to the spindle specified at the start of the block. The return value (= 1) can be used to control whether the complete block is skipped.

CUST_MULTICHAN

Parameter	Meaning
_S_NR	Spindle number to which the master spindle is set.
_RET	Return value
= 0	The block is executed corresponding to the run-in mode.
= 1	The entire block is skipped.

20.4 Milling

20.4.1 General

All settings for machine and setting data of the standard cycles are also applicable for milling under ShopMill and turning under ShopTurn.

20.4.2 Technology cycles for milling

Milling function screen

SD52214 \$SCS_function_MASK_MILL		Milling function screen
Bit 0	Enable cylinder surface transformation (ShopMill)	
Bit 1	List table to accept blank (on milling machines) (This bit only has to be set, if the machine has a rotary axis and a fixed table for accepting the blank.)	
Bit 2	reserved	
Bit 3	Enable machining inside/outside	
Bit 4	Enable spindle clamping (C axis)	
Bit 5	Enable spindle control of the tool spindle via user interface	
Bit 6	Enable spindle control of the main spindle via user interface	

SD55214 \$SCS_FUNCTION_MASK_MILL_SET		Milling function screen
Bit 0	Basic setting, milling in climbing.	
Bit 2	Depth calculation of the milling cycles, with or without safety clearance.	
= 0	Depth calculation of the milling cycles is performed between the reference plane + safety clearance and the depth.	
= 1	Depth calculation is performed without including the safety clearance. Bit 2 is effective in the following milling cycles: CYCLE61, CYCLE71, CYCLE76, CYCLE77, CYCLE79, CYCLE899, LONGHOLE, SLOT1, SLOT2, POCKET3, POCKET4.	

Contour milling (CYCLE63, CYCLE64)

SD55460 \$SCS_MILL_CONT_INITIAL_RAD_FIN		Finishing approach circle radius The radius of the approach circle during the finishing of contour pockets is affected.
= 0	The radius is selected so that at the starting point the safety clearance to the finishing allowance is maintained (default value).	
> 0	The radius is selected so that at the starting point the value of this channel-specific setting data to the finishing allowance is maintained.	

SD55212 \$SCS_FUNCTION_MASK_TECH_SET	General function screen for all technologies
= 6	
Bit 3	Delete programs generated by contour cycles (CYCLE63, CYCLE64, CYCLE952)
= 0	Generated programs are not deleted (compatibility as before)
= 1	Generated programs are deleted as soon as they have been executed by the calling cycle.

Engraving (CYCLE60)

SD55400 \$SCS_MILL_ENGRAVE_POINT_RAD	Engraving cycle CYCLE60: Circular arc radius for generating the "dot" character
= 0	
= 0	The "dot" character is produced by a simple linear insertion movement of the tool (default setting for conventional engraving tools, compatibility).
> 0	The "dot" character is executed as a circle with the radius value from this setting data (setting for some special tools).

Multiple edge (CYCLE79), circular position pattern (HOLES2), circumferential groove (SLOT2)

SD55230 \$SCS_CIRCLE_RAPID_FEED	Rapid feed in mm/min for positioning on a circular path between the circumferential grooves or the contour elements.
= 10000	

20.4.3 Setting-up ShopMill cycles for milling

Load ShopMill cycles for milling

When the control boots, the ShopMill cycles are automatically loaded into the following directory: ../siemens/sinumerik/cycles/sm/prog

Setting the coordinate system

MD52000 \$MCS_DISP_COORDINATE_SYSTEM	Position of the coordinate system
= 0	

Examples:

=0 for vertical milling machines

=16 for horizontal milling machines, boring mill

A detailed description of the MD52000 is provided in Section:

Activating turning/milling/drilling/grinding technologies (Page 413)

For plane selection when milling, appropriately set the following machine data:

MD52005 \$MCS_DISP_PLANE_MILL	Plane selection for milling
= 17	
= 0	In the cycle support
= 17	G17 (default value)
= 18	G18
= 19	G19

Simulation and simultaneous recording

In order that simulation and simultaneous recording are displayed without any errors, set the machine data as described in the following section:

Setting the technology for simulation (Page 193)

Defining the direction of rotation

In order that the direction of rotation is correctly displayed in the ShopMill user interface, and when programming ShopMill functions, the correct direction of rotation is executed, you must make some settings that are coordinated with one another. You must align these settings to the actual direction of rotation of the axis at the machine.

MD52207 \$MCS_USAGE_ATTRIB[n]	Attribute of the axes in the channel [n] channel axis number
Bit 4	Displayed direction of rotation for M3 is counter-clockwise (for spindles)
Bit 5	Direction of rotation M3 corresponds to rotary axis minus (for spindles) This bit must be set analog to PLC bit DB31, ... DBX17.6!

Specify other direction of rotation for position pattern

You can specify a position pattern for the tool axis. Rather than Bit 12, you must set Bit 10 to active in the MD52207 so that, for example, the position pattern can be machined on rotary axis C with an appropriate swivel position.

MD52207 \$MCS_USAGE_ATTRIB[n]	Attribute of the axes in the channel [n] channel axis number
Bit 2	Rotates around 3rd geometry axis (for rotary axes)
Bit 4	Displayed direction of rotation for M3 is counter-clockwise (for spindles) The viewing direction can be selected. Either from the interior looking out or from outside looking toward the spindle. However, the same selection must be made for all spindles.
Bit 5	Direction of rotation for M3 corresponds to rotary axis minus (for spindles)
Bit 6	Display rotary axis as offset target for measuring
Bit 7	Offer rotary axis in position pattern The orientation of the axis is determined with Bits 0 to 2. If one of the Bits 10 to 12 is set, they determine the orientation of the axis for position patterns.

Bit 8	Offer rotary axis for blank clamping (on milling machines) The orientation of the axis is determined with Bits 0 to 2.
Bit 10	Rotary axes turns around the 1st geometry axis (only for position pattern)

Additional channel-specific machine data

MD52216 \$MCS_FUNCTION_MASK_DRILL	Drilling function screen form
Bit 2	Tapping also without encoder The setting depends on whether at the machine the tool spindle is equipped with an encoder.
= 0	Tapping only possible with encoder
= 1	Tapping also possible without encoder
Bit 3	Constant cutting speed referred to the diameter of the centering
= 0	Constant cutting speed referred to the diameter of the tool
= 1	Constant cutting speed referred to the diameter of the centering

MD52229 \$MCS_ENABLE_QUICK_M_CODES	Enable fast M commands
= 0	
Bit 0	Coolant OFF (default value)
Bit 1	Coolant 1 ON
Bit 2	Coolant 2 ON
Bit 3	Coolants 1 and 2 ON

MD52230 \$MCS_M_CODE_ALL_COOLANTS_OFF	M code for all coolants Off
= 9	You define the M function to switch off the coolant that is output when the tool is changed.

MD52231 \$MCS_M_CODE_COOLANT_1_ON	M code for coolant 1 On
= 8	You define the M function for coolant 1 that is output when the tool is changed.

MD52232 \$MCS_M_CODE_COOLANT_2_ON	M code for coolant 2 On
= 7	You define the M function for coolant 2 that is output when the tool is changed.

MD52233 \$MCS_M_CODE_COOLANT_1_AND_2_ON	M code for both coolants On
= -1	You define the M function for coolant 1 and 2 that is output when the tool is changed.

MD52281 \$MCS_TOOL_MCODE_FUNC_ON[]	M code for tool-specific function ON
= -1	M function is not output. If both M commands of a function "= -1", the corresponding field is not displayed on the interface.
[0]	M code for tool-specific function 1 ON
[1]	M code for tool-specific function 2 ON

[2]	M code for tool-specific function 3 ON
[3]	M code for tool-specific function 4 ON

MD52282 \$MCS_TOOL_MCODE_FUNC_OFF[]	M code for tool-specific function OFF
= -1	M function is output. If both M commands of a function "= -1", the corresponding field is displayed on the interface.
[0]	M code for tool-specific function 1 OFF
[1]	M code for tool-specific function 2 OFF
[2]	M code for tool-specific function 3 OFF
[3]	M code for tool-specific function 4 OFF

Channel-specific cycle setting data

SD55212 \$SCS_FUNCTION_MASK_TECH_SET	Cross-technology function screen
= 6	
Bit 0	Tool preselection active. The next tool is prepared directly after a tool change. Note: For a revolver, the setting data must be set to "0".
Bit 1	Automatic calculation of the thread depth for metric threads.
Bit 2	Take the thread diameter and thread depth from the table.

20.4.4 Cylinder surface transformation (TRACYL_K/TRACYL)



Software option

You require the following software option to use this function:
"Transmit and peripheral surface transformation".

Precondition

- There must be at least one rotary axis at the machine.
- The milling tool must be radially oriented to the cylinder to be machined.

Function

The following groove machining operations can be performed with the Cylinder surface transformation functions:

- Longitudinal grooves on cylindrical bodies
- Transverse grooves on cylindrical objects
- Grooves with any path on cylindrical bodies

The path of the grooves is programmed with reference to the unwrapped, level surface of the cylinder. Programming can be realized using straight line/circle, drilling or milling cycles or contour milling (free contour programming).

There are two variants of cylinder surface transformation, i.e.

1. with groove side compensation (ON)
2. without groove side compensation (OFF)

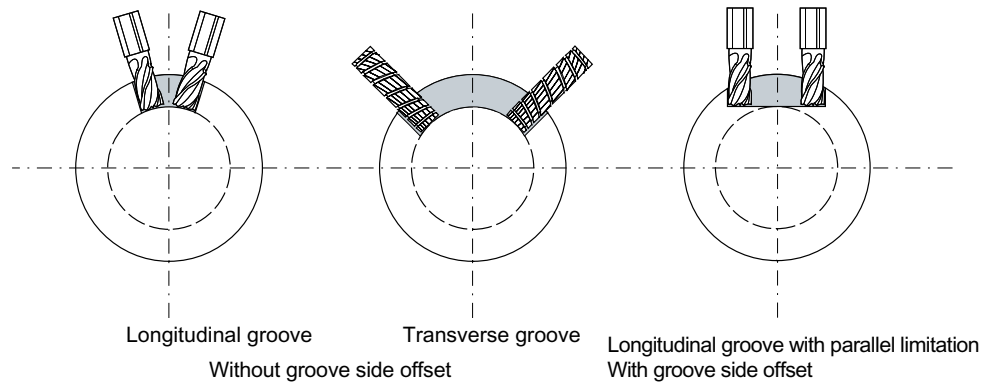
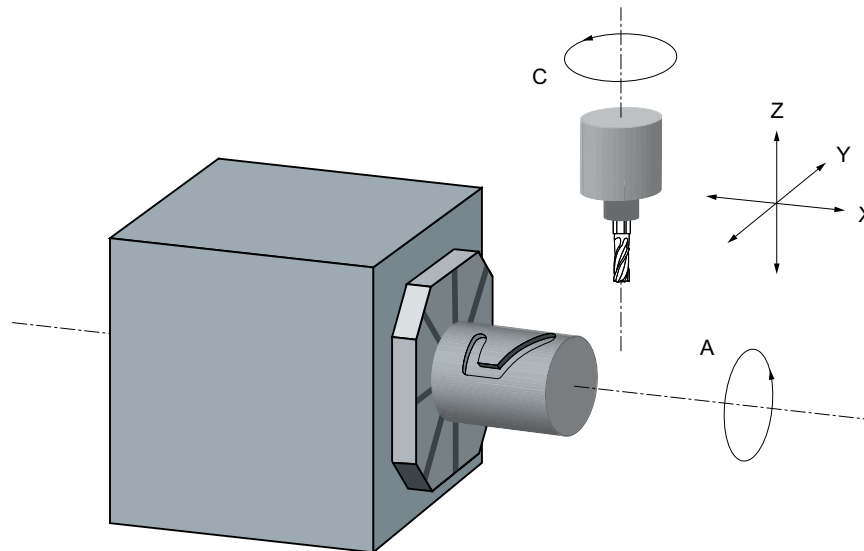


Figure 20-1 Grooves with and without groove side compensation

Example 1a: Milling machine with the XYZ-AC axis configuration

Example of an axis configuration on the following machine:

Axis configuration



- X 1st axis of the machining plane parallel to the rotary axis
- Y 2nd axis of the machining plane
- Z Infeed axis (tool axis) perpendicular (radial) to the rotary axis
- A Rotary axis
- C Main spindle

Figure 20-2 Machining slots on a cylinder surface with X-A-Z kinematics

You must configure two data sets with the following machine data for the machine illustrated above:

MD20070 \$MC_AXCONF_MACHAX_USED[4]	Machine axis number valid in channel
= 5	Number of channel axes

MD20080 \$MC_AXCONF_CHANAX_NAME_TAB[]	Name of channel axis in the channel
[0] = XC	Channel axis XC, corresponds to channel axis 1
[1] = YC	Channel axis YC, corresponds to channel axis 2
[2] = ZC	Channel axis ZC, corresponds to channel axis 3
[3] = A	Channel axis A, corresponds to channel axis 4
[4] = C	Channel axis C, corresponds to channel axis 5

MD28082 \$MC_MM_SYSTEMFRAME_MASK	System frames (SRAM)
= 21H	Default setting
Bit 0 = 1	System frame for actual value setting and scratching
Bit 5 = 1	System frame for cycles
Bit 6 = 1	System frame for transformations

General settings for the transformation

MD10602 \$MN_FRAME_GEOAX_CHANGE_MODE	Frames when switching over geometry screen forms
= 1	When switching over geometry axes (selecting - deselecting TRACYL), the actual total frame (work offsets) is recalculated.

Data set for the 1st transformation in the channel

MD24100 \$MC_TRAFO_TYPE_1	Definition of transformation 1 in the channel.
= 512	Transformer type (512 = cylinder surface transformation without groove side compensation)

MD24110 \$MC_TRAFO_AXES_IN_1		Axis assignment for the 1st transformation in the channel
[0] = 3	Channel axis: Infeed axis (tool axis) perpendicular (radial) to the rotary axis	Z
[1] = 4	Channel axis: Rotary axis	A
[2] = 1	Channel axis: 1st axis of the machining plane parallel to the rotary axis	X
[3] = 2	Channel axis: 2nd axis of the machining plane	Y

MD24120 \$MC_TRAFO_GEOAX_ASSIGN_TAB_1		Assignment of the geometry axes to channel axes for transformation 1.
[0] = 1	Channel axis: 1st geometry axis	X
[1] = 4	Channel axis: 2nd geometry axis	A
[2] = 3	Channel axis: 3rd geometry axis	Z

MD24800 \$MC_TRACYL_ROT_AX_OFFSET_1	
= 0	Offset of rotary axis for the 1st TRACYL transformation.

MD24805 \$MC_TRACYL_ROT_AX_FRAME_1	
= 1	Axial offset of rotary axis for the 1st TRACYL transformation.

MD24810 \$MC_TRACYL_ROT_SIGN_IS_PLUS_1	
= 1	Sign of the rotary axis for the 1st TRACYL transformation.

MD24820 \$MC_TRACYL_BASE_TOOL_1[]	
[0] = 0	Vector of the base tool for the 1st TRACYL transformation in XYZ
[1] = 0	
[2] = 0	

Data set for the 2nd transformation in the channel

MD24200 \$MC_TRAFO_TYPE_2	
= 513	Transformer type (513 = cylinder surface transformation with groove side compensation)

MD24210 \$MC_TRAFO_AXES_IN_2		
[0] = 3	Channel axis: Infeed axis perpendicular (radial) to rotary axis	Z
[1] = 4	Channel axis: Rotary axis	A
[2] = 1	Channel axis: 1st axis of the machining plane parallel to the rotary axis	X
[3] = 2	Channel axis: 2nd axis of the machining plane	Y

MD24220 \$MC_TRAFO_GEOAX_ASSIGN_TAB_2		
[0] = 1	Channel axis: 1st geometry axis	X
[1] = 4	Channel axis: 2nd geometry axis	A
[2] = 3	Channel axis: 3rd geometry axis	Z

MD24850 \$MC_TRACYL_ROT_AX_OFFSET_2	
= 0	Offset of the rotary axis for the 2nd TRACYL transformation

MD24855 \$MC_TRACYL_ROT_SIGN_IS_FRAME_2	
= 1	Axial offset for the 2nd TRACYL transformation

MD24860 \$MC_TRACYL_ROT_SIGN_IS_PLUS_2	
= 1	Sign of the rotary axis for the 2nd TRACYL transformation

MD24870 \$MC_TRACYL_BASE_TOOL[]		
[0] = 0	Vector of the base tool for the 2nd TRACYL transformation in XYZ	
[1] = 0		
[2] = 0		

Note

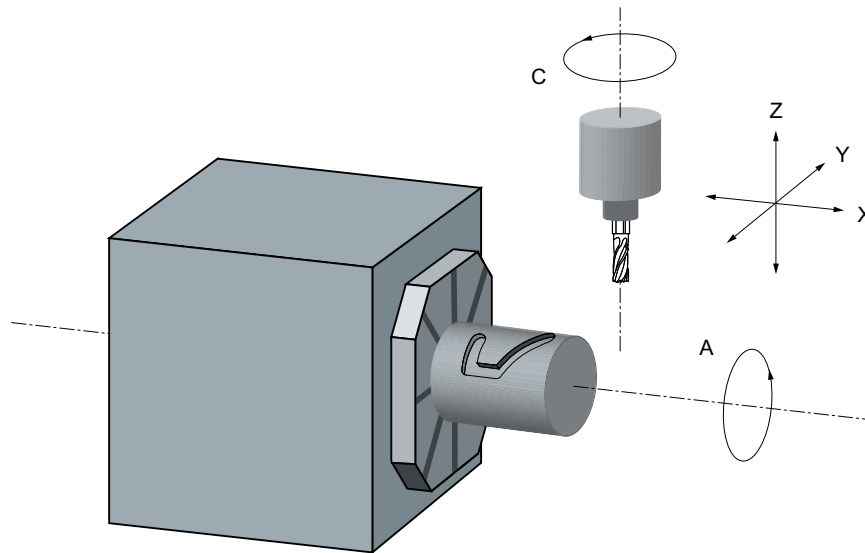
Data sets for transformations

For both data sets, you can use any transformations from all available transformations (MD24100 \$MC_TRAFO_TYPE_1, MD24200 \$MC_TRAFO_TYPE_2, etc.). The two data sets need not be directly next to each other.

However, the 1st data set must always be used for "Cylinder surface transformation **without** groove side compensation" (= 512) and the 2nd data set for "Cylinder surface transformation **with** groove side offset" (=513).

Example 1b: Milling machine with axis configuration XYZ-AC on the basis of a kinematic chain

Example of an axis configuration on the following machine:

Axis configuration

- X Longitudinal axis - 1st axis of the machining plane parallel to the rotary axis
- Y Groove side compensation - 2nd axis of the machining plane
- Z Infeed axis (tool axis) perpendicular (radial) to the rotary axis
- A Rotary axis
- C Main spindle

Figure 20-3 Machining grooves on a cylinder surface with X-C-Z kinematics

General settings for the transformation

MD10602 \$MN_FRAME_GEOAX_CHANGE_MODE		Frames when switching over geometry screen forms
= 1	When switching over geometry axes (selecting - deselecting TRACYL), the actual total frame (work offsets) is recalculated.	

MD28082 \$MC_MM_SYSTEMFRAME_MASK		System frames (SRAM)
= 21H	Default setting	
Bit 0 = 1	System frame for actual value setting and scratching	
Bit 5 = 1	System frame for cycles	
Bit 6 = 1	System frame for transformations	

If a kinematic chain has to be set up for the machine shown, then you can set up the TRACYL as transformation in operating area "Setup > NC > Transformations". Select TRACYL_K in dialog "New transformation".

Name	TRACYL_1			
Alternative call	Yes			
	TRACYL	1		
Assignment to chain				
Tool chain				
Tool reference point				
End of tool chain	SP1_AXIS			
Axis of rotation offset △\$MC_TRACYL_ROT_AX_OFFSET_1		0.000		
End of workpiece chain	END_PART_CHAIN			
Linear axes				
Infeed axis	Z_AXIS			
Groove side compensation	optional	Default=no		
Groove side compensation axis	Y_AXIS			
Longitudinal axis	X_AXIS			
Properties (transformation)				
Direction of rotation of the axis of rotation △\$MC_TRACYL_ROT_SIGN_IS_PLUS_1		Standard		
Sequence of the geometry axes		ZYX		
		X	Y	Z
Basic offset △\$MC_TRACYL_BASE_TOOL_1		0.00000	0.00000	0.00000
Tool direction from tool spindle		No		

Note

Sequence of the geometry axes

With the sequence of the geometry axes, you assign the linear axes (infeed axis X, groove side compensation axis Y and longitudinal axis Z) to the geometry axes. In this example, if you program X with cylinder transformation active, then the longitudinal axis moves. If you program Y, then the groove side compensation moves, and in Z, the infeed axis.

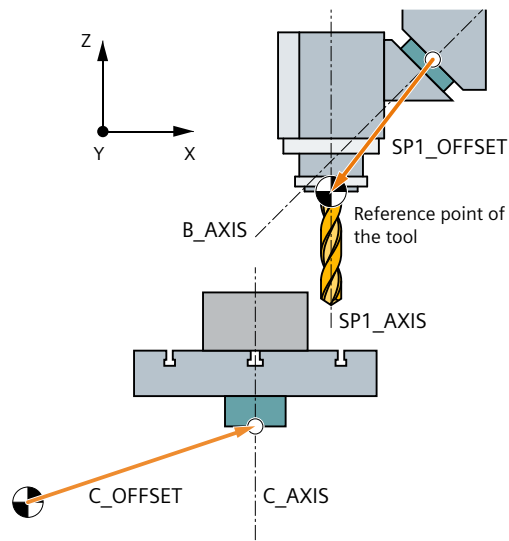
More information

More information is provided in the
Function Manual Transformations.

Example 2: Milling machine with axis configuration XYZ-BC

Example of an axis configuration on the following machine:

Axis configuration



- Z Longitudinal axis - parallel to the rotary axis
- X Infeed axis - perpendicular to the rotary axis
- Y Groove side compensation
- C Rotary axis
- SP1 Main spindle

Figure 20-4 Vertical milling machine with rotary indexing table and rotary axis in the head

Name	TRACYL_1	
Alternative call	Yes	
	TRACYL	1
Assignment to chain		
Tool chain		
Tool reference point		
End of tool chain	SP1_AXIS	
Workpiece chain		
Axis of rotation	C_AXIS	
Axis of rotation offset △\$MC_TRACYL_ROT_AX_OFFSET_1		0.000
End of workpiece chain	END_PART_CHAIN	
Linear axes		
Infeed axis	X_AXIS	
Groove side compensation	optional	Default=no
Groove side compensation axis	Y_AXIS	
Longitudinal axis	Z_AXIS	
Properties (transformation)		
Direction of rotation of the axis of rotation △\$MC_TRACYL_ROT_SIGN_IS_PLUS_1		Standard
Sequence of the geometry axes		XYZ

	X	Y	Z
Basic offset △\$MC_TRACYL_BASE_TOOL_1	0.00000	0.00000	0.00000
Tool direction from tool spindle	No		

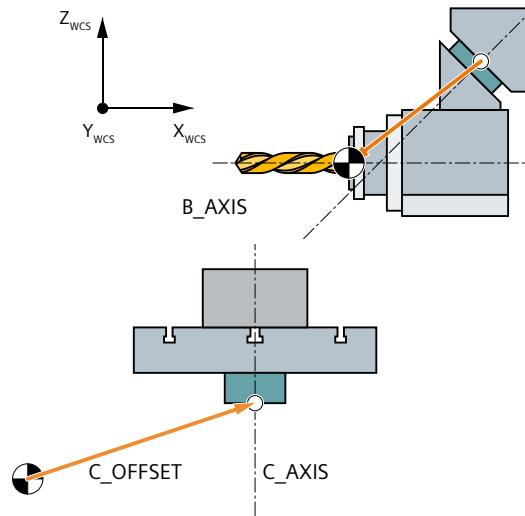


Figure 20-5 Machine after swiveling plane Z 180° and Y -90°, tool is perpendicular to the cylinder surface

Note

Swivel plane and cylinder surface transformation

In order that you can activate the transformation for this machine example, first swivel the tool vertical to the cylinder surface. Function "Swivel plane" also swivels the TRACYL coordinate system.

20.4.5 ShopMill cycles for multiple clamping



Software options

You require the following software option to use this function:

"ShopMill/ShopTurn"

Function

The Multiple clamping function provides optimized tool change over several workpiece clampings. On the one hand, this reduces downtimes and, on the other, eliminates tool change times because a tool performs as many machining operations as possible in all clampings before the next tool change is initiated.

You can either execute the same program several times for the clampings or you can select different programs. If you are using large-area fixture plates on your machine, you do not have to set up anything else.

In the case of rotating clamping devices, on the other hand, you must adapt a cycle to match the features of the clamping device so as to ensure that the next workpiece can be turned to the machining position after machining of the previous one (or for multiple clamping devices even while the current workpiece is being machined).

Procedure for setting up

1. Change the CLAMP.SPF cycle which is stored in the cycle/sc/prog/templates_deu or cycle/sc/prog/templates_eng directory.
2. Copy the cycle into the user or manufacturer directory.

Example

A rotating clamping device (reversible clamping device) is used with 4 clampings. The respective clampings can be machined by positioning rotary axis A:

Clamping 1:	$A = 0^\circ$
Clamping 2:	$A = 90^\circ$
Clamping 3:	$A = 180^\circ$
Clamping 4:	$A = 270^\circ$

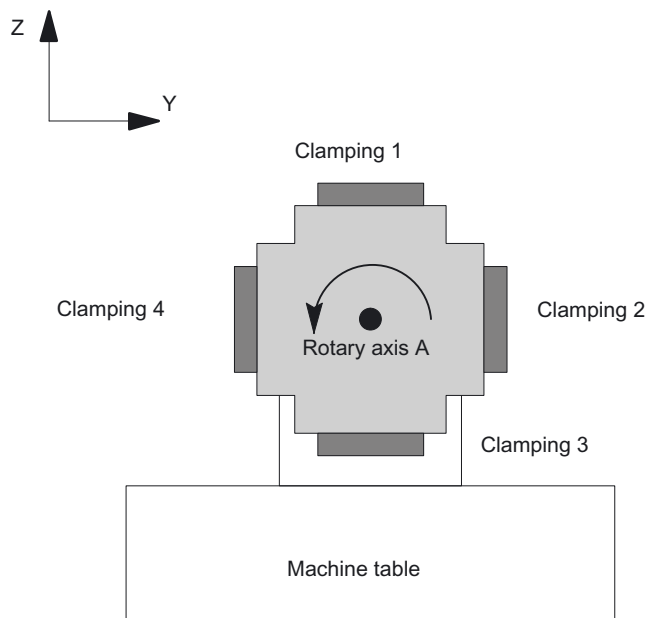


Figure 20-6 Rotating clamping device (reversible clamping device)

The cycle CLAMP.SPF must be adapted as follows:

```
...
DEF INT _NV ; Auxiliary variable
;-----
;Adaptation
```

```
;
IF _ACT==1
G0 A=DC (0)
ENDIF

;
IF _ACT==2
G0 A=DC (90)
ENDIF

;
IF _ACT==3
G0 A=DC (180)
ENDIF

;
IF _ACT==4
G0 A=DC (270)
ENDIF

;
;-----
_NV=_NPV+_ACT ; Calculate current work offset
N10 G[8]=_NV ; There must not be a calculation here
RET
```

20.5 Turning

20.5.1 General

All settings for machine and setting data of the standard cycles are also applicable for milling under ShopMill and turning under ShopTurn.

20.5.2 Setting up cycles for turning

Setting the coordinate system

MD52000 \$MCS_DISP_COORDINATE_SYSTEM	Position of the coordinate system
= 0	Default setting

Examples:

0: Vertical turning machine (carousel-type turning machine)

19: Horizontal turning machine, machining in front of the turning center

34: Horizontal turning machine, machining behind the turning center (inclined bed turning machine)

A detailed description of MD52000 is given in Section: "Activating turning/milling/drilling/grinding technologies (Page 413)."

Turning function screen

Enable various functions under the Turning function screen in the following channel-specific configuration machine data.

MD52218 \$MCS_FUNCTION_MASK_TURN	Turning function screen
Bit 0	Enable zoom under manual for tool measurement
Bit 1	Enable part catcher for cut-off
Bit 2	Enable tailstock
Bit 3	Enable spindle control of main spindle via user interface
Bit 4	Enable spindle control of the counterspindle control via user interface
Bit 5	Enable spindle control of the tool spindle via user interface
Bit 6	Enable balance cutting for two-channel stock removal
Bit 7	Retraction when cutting along the contour with G1
Bit 8	Enter the spindle chuck data in the program
Bit 9	Additional input of the tailstock data in the program
Bit 10	Enable crowned thread
Bit 12	Deactivate thread synchronization
Bit 13	Cutting along the contour with CYCLE95 (828D programGUIDE without Advanced Technology)

Meaning of the axes

You set the meaning of the axes in machine data MD52206 \$MCS_AXIS_USAGE[n].

MD52206 \$MCS_AXIS_USAGE[n]	Meaning of the axes in the channel [n] channel axis number
-----------------------------	---

A detailed description of MD52206 is provided in Chapter "Activating turning/milling/drilling/grinding technologies (Page 413)

Traversing direction

In order that the user interface and cycles know in which direction the spindles and rotary axes rotate, the following settings must be made.

You set the direction of rotation of an NC rotary axis via MD32100 \$MA_AX_MOTION_DIR.

MD32100 \$MA_AX_MOTION_DIR	Traversing direction
-1	Direction reversal
0, 1	No direction reversal

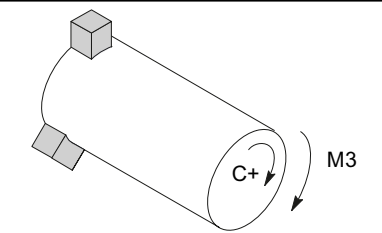
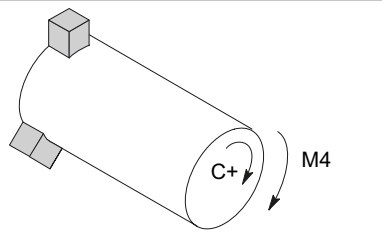
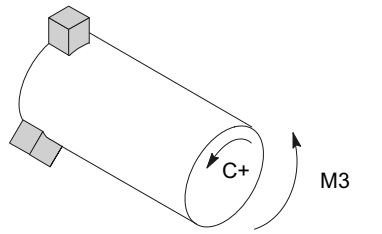
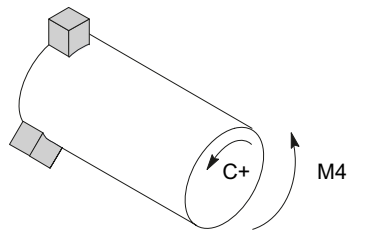
Defining the direction of rotation

In order to ensure that the direction of rotation of the spindle and C axis is correctly displayed on the user interface and when programming, the correct direction of rotation is executed, you must make several settings that are coordinated with one another. You must base these settings on the actual direction of rotation of the spindle/C axis on the machine.

You specify the settings in the following machine data:

MD52207 \$MCS_AXIS_USAGE_ATTRIB[n]	Attributes of the axes [n] channel axis number
Bit 3	Displayed positive direction of rotation is counter-clockwise (for rotary axes) The view must be from the inside of the machine (operator's view) to the axis of rotation.
Bit 4	Displayed direction of rotation for M3 is counter-clockwise (for spindles) This bit can be set from the operator's view or according to DIN 66025.
Bit 5	Direction of rotation for M3 corresponds to minus rotary axis (for spindles) This bit must be set analogous to PLC bit DB31, ... DBX17.6!

As a result, the following setting options are obtained for the main spindle:

Main spindle direction of rotation	52207[n] bit 3 =	52207[n] bit 4 = *)	52207[n] bit 5 =	DB31, ... DBX17.6
	0	0	0	0
	0	1	1	1
	1	1	0	0
	1	0	1	1

Note

MD52207[n] bit 4 = *)

Bit 4 can be set from the operator's view (values as specified) or according to DIN ("0" and "1" are then interchanged).

Dimensions

To define the reference point for moving the counterspindle, you must first communicate the dimensions of the counterspindle. You can either enter the dimensions in the following axis-specific cycle machine data or in menu "Parameter" → "Setting data" → "Spindle chuck data". Changes to the machine data are automatically accepted in the menu and vice versa.

MD53240 \$MAS_SPINDLE_PARAMETER[]	Spindle chuck data
[0]	Chuck dimensions

[1]	Stop dimensions
[2]	Jaw dimensions

MD53241 \$MAS_SPINDLE_CHUCK_TYPE[]	Spindle jaw type
= 0	Clamping, outer
= 1	Clamping, inner

Additional settings

The M code, e.g. M34 or M1 = 34 for the spindle chuck is defined in the following machine data. The manufacturer cycle CUST_TCHCYC.SPF also takes the M functions from the following machine data:

MD52250 \$MCS_M_CODE_CHUCK_OPEN[]	M code for open chuck with stationary spindle
[0]	Main spindle
[1]	Counterspindle

MD52251 \$MCS_M_CODE_CHUCK_CLOSE_OPEN_ROT[]	M code for open chuck with spindle rotating
[0]	Main spindle
[1]	Counterspindle

MD52252 \$MCS_M_CODE_CHUCK_CLOSE[]	M code for close chuck
[0]	Main spindle
[1]	Counterspindle

MD52253 \$MCS_M_CODE_TAILSTOCK_FORWARD[]	M code for quill forward
[0]	Quill opposite the main spindle
[1]	

MD52254 \$MCS_M_TAILSTOCK_BACKWARD[]	M code for quill back
[0]	Quill opposite the main spindle
[1]	Quill opposite the main spindle

Contour turning (CYCLE952)

SD55212 \$SCS_FUNCTION_MASK_TECH_SET	General function screen for all technologies
= 6	
Bit 3	Delete programs generated by contour cycles (CYCLE63, CYCLE64, CYCLE952)
= 0	Generated programs are not deleted (compatibility as before)
= 1	Generated programs are deleted as soon as they have been executed by the calling cycle.

Rounding the contour

SD55582 \$SCS_TURN_CONT_TRACE_ANGLE	Contour turning: Minimum angle for rounding the contour
= 5	Specifies the angle between the cutting edge and contour, above which for contour turning, the contour is rounded in order to remove residual material (default value).

SD 55218 \$SCCS_FUNCTION_MASK_TURN_SET	Turning function screen
Bit 3	Chamfer in CYCLE930 as chamfer length (CHF)
Bit 4	Retraction from internal machining (CYCLE951)
= 0	Compatibility as before If, during the cycle, the necessity for tightening is detected at the corner, the tool is retracted from the internal machining, otherwise it is not.
= 1	Retraction from internal machining is generally in the cutting axis.

20.5.3 Setting-up ShopTurn cycles for turning

MD52210 \$MCS_FUNCTION_MASK_DISP	Function mask for display
Bit 0 = 1	Measuring system for programs always in the base system (default)
Bit 1 = 1	Face view when turning (default setting)
Bit 4 = 1	Show follow-on tool in T, F, S window

MD52212 \$MCS_FUNCTION_MASK_TECH	General function screen for all technologies
Bit 2	Approach logic for step drill
Bit 3	Block search cycle for ShopMill / ShopTurn
= 0	The E__ASUB or F__ASUB cycles are not called in the block search cycle PROG_EVENT.SPF
= 1	The E__ASUP (under ShopMill) or F__ASUP (under ShopTurn) cycles are called in the block search cycle PROG_EVENT.SPF
Bit 4	Approach logic using the cycle
Bit 5	The cycle for SERUPRO (CYCLE207) is called in the block search cycle PROG_EVENT.SPF. Bit 3 has no effect when bit 5 is set.
Bit 6	Work offset value WO cannot be entered
Bit 7	Identification of the end of tool lives in the program (ShopMill / ShopTurn)
Bit 8	Manual machine (ShopMill / ShopTurn)
Bit 9	Selection/deselection of work offset via softkey
Bit 11	Deactivate position check for drilling and milling tools

MD52214 \$MCS_FUNCTION_MASK_MILL	Function mask for milling
Bit 3	"Inner/rear" machining is enabled in the ShopTurn masks which themselves define the machining plane.

Bit 4	If you have implemented the "Clamp/release spindle" function using the manufacturer cycle CUST_TECHCYC.SPF, then using this machine data, you can activate the "Clamp/release spindle" parameter in the drilling and milling masks.
= 0	The "Clamp/release spindle" parameter is not displayed in the drilling and milling screens. ShopTurn automatically clamps the spindle if it makes sense for the particular machining operation.
= 1	The "Clamp/release spindle" parameter is displayed in the drilling and milling masks. You decide for which machining operation the spindle should be clamped.
Bit 8	Release damping brake (C axis)
= 0	"Damping brake on/off" parameter is not displayed in the milling masks.
= 1	The "Damping brake on/off" parameter is displayed in the milling masks. You decide for which machining operation (Face C/Per.surf.C) the C axis is braked. If you have implemented the "Damping brake" function by means of the machine manufacturer cycle CUST_TECHCYC.SPF, you can activate the "Damping brake on/off" parameter in the milling masks with this machine data.

MD52216 \$MCS_FUNCTION_MASK_DRILL	Function mask for drilling
Bit 3	Constant cutting speed referred to the diameter of the centering
= 0	Constant cutting speed referred to the diameter of the tool
= 1	Constant cutting speed referred to the diameter of the centering

MD52218 \$MCS_FUNCTION_MASK_TURN	Function mask for turning
Bit 2	Enable tailstock
Bit 5	Enable spindle control of tool spindle via surface
Bit 6	Enable balance cutting for dual-channel stock removal

MD52229 \$MCS_ENABLE_QUICK_M_CODES	Enable fast M commands
= 0	
Bit 0	Coolant OFF
Bit 1	Coolant 1 ON
Bit 2	Coolant 2 ON
Bit 3	Coolants 1 and 2 ON

MD52230 \$MCS_M_CODE_ALL_COOLANTS_OFF	M code for all coolants Off
= 9	This machine data is used to define the M function for switching off the coolant; which is output when the tool is changed.

MD52231 \$MCS_M_CODE_COOLANT_1_ON	M code for coolant 1 On
= 8	This machine data is used to define the M function for coolant 1, which is output when the tool is changed.

MD52232 \$MCS_M_CODE_COOLANT_2_ON	M code for coolant 2 On
= 7	This machine data is used to define the M function for coolant 2, which is output when the tool is changed.

MD52233 \$MCS_M_CODE_COOLANT_1_AND_2_ON	M code for both coolants On
= -1	This machine data is used to define the M function for coolant 1 and 2, which is output when the tool is changed.

SD55505 \$SCS_TURN_ROUGH_O_RELEASE_DIST	Return distance stock removal for external machining
= 1	Specifies the distance by which the tool is retracted from the contour when removing stock from an outer corner. This does not apply to stock removal at a contour (default value).
= -1	The distance is internally defined.

SD55506 \$SCS_TURN_ROUGH_I_RELEASE_DIST	Return distance stock removal for internal machining
= 0.5	Specifies the distance by which the tool is retracted from the contour when removing stock from an internal corner. This does not apply to stock removal at a contour (default value).
= -1	The distance is internally defined.

20.5.4 Setting up a counterspindle



Software option

You require the following software option in order to use the counterspindle on your machine:

"Generic coupling 'CP-STATIC'" or higher

Function

If your turning machine has a counterspindle, you can machine workpieces using turning, drilling and milling functions on the front and rear faces without reclamping the workpiece manually.

Before machining the rear face, the counterspindle must grip the workpiece, pull it out of the main spindle, and position it at the new machining position.

Meaning of the axes

MD52206 \$MCS_AXIS_USAGE[n]	Meaning of the axes in the channel [n] channel axis number
-----------------------------	---

A detailed description of MD52006 is provided in Chapter "Activating turning/milling/drilling/grinding technologies (Page 413)".

Traversing direction

In order that the user interface and cycles know in which direction the spindles and rotary axes rotate, the following settings must be made.

You set the direction of rotation of an NC rotary axis via MD32100 \$MA_AX_MOTION_DIR.

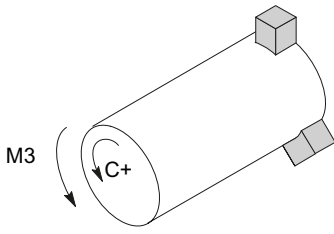
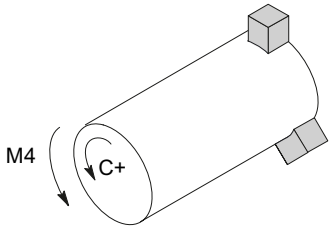
MD32100 \$MA_AX_MOTION_DIR		Traversing direction (not control direction)
-1	Direction reversal	
0, 1	No direction reversal	

Defining the direction of rotation

You set the directions of rotation for the user interface in the following machine data:

MD52207 \$MCS_AXIS_USAGE_ATTRIB[n]		Attributes of the axes in the channel [n] channel axis number
Bit 3	Displayed positive direction of rotation is counter-clockwise (for rotary axes) The view must be from the inside of the machine (operator's view) to the axis of rotation.	
Bit 4	Displayed direction of rotation for M3 is counter-clockwise (for spindles) This bit can be set from the operator's view or according to DIN.	
Bit 5	Direction of rotation for M3 corresponds to minus rotary axis (for spindles) This bit must be set analogous to PLC bit DB31, ... DBX17.6!	

As a result, the following setting options are obtained for the counterspindle:

Counterspindle direction of rotation	52207[n] bit 3 =	52207[n] bit 4 = *)	52207[n] bit 5 =	DB31, ... DBX17.6
	1	1	0	0
	1	0	1	1

Counterspindle direction of rotation	52207[n] bit 3 =	52207[n] bit 4 = *)	52207[n] bit 5 =	DB31, ... DBX17.6
	0	0	0	0
	0	1	1	1

Note**MD52207[n] bit 4 = *)**

Bit 4 can be set from the operator's view (values as specified) or according to DIN ("0" and "1" are then interchanged).

The display must be the same for the main spindle and the counterspindle ("from operator's view" or "according to DIN").

Dimensions

To define the reference point for moving the counterspindle, you must first announce the dimensions of the counterspindle. You can either enter the dimensions in the following axis-specific cycle machine data or in menu "Parameter" → "Setting data" → "Spindle chuck data". Changes to the machine data are automatically accepted in the menu and vice versa.

MD53240 \$MAS_SPINDLE_PARAMETER[]		Spindle chuck data
[0]	Chuck dimensions	
[1]	Stop dimensions	
[2]	Jaw dimensions	

MD52241 \$MCS_SPINDLE_CHUCK_TYPE		Spindle jaw type
= 0	Clamping, outer	
= 1	Clamping, inner	

20.5.5 Setting up the counterspindle under ShopTurn



Software option

You require the following software option in order to use the counterspindle on your machine:

"Generic coupling 'CP-STATIC'" or higher

The position to which the counterspindle travels when the program starts is defined in the following channel-specific cycle setting data:

SD55232 \$SCS_SUB_SPINDLE_REL_POS	Retraction position Z for counterspindle
-----------------------------------	--

The following channel-specific setting data becomes effective when traveling to the fixed stop:

SD55550 \$SCS_TURN_FIXED_STOP_DIST	Distance for travel to fixed stop.
SD55551 \$SCS_TURN_FIXED_STOP_FEED	Feedrate for travel to fixed stop.
SD55552 \$SCS_TURN_FIXED_STOP_FORCE	Force for travel to fixed stop in %.

Between traveling to the fixed stop and gripping, the counterspindle can retract a short distance to counteract compressive stress in the workpiece.

SD55553 \$SCS_TURN_FIXED_STOP_RETRACTION	Retraction distance before clamping after fixed stop.
--	---

After gripping you can cut off the workpiece. Before doing so, the counterspindle can retract a short distance with the workpiece to exert tensile stress on the workpiece. This relieves pressure on the tool when cutting off.

SD55543 \$SCS_TURN_PART_OFF_RETRACTION	Retraction distance before cut-off.
--	-------------------------------------

After cut-off, you can carry out a cut-off check and for turning, use the "Travel to fixed stop" function. You can activate/deactivate the cut-off check using the channel-specific cycle setting data:

SD55540 \$SCS_TURN_PART_OFF_CTRL_DIST	Distance for cut-off check.
SD55541 \$SCS_TURN_PART_OFF_CTRL_FEED	Feedrate for cut-off check.
SD55542 \$SCS_TURN_PART_OFF_CTRL_FORCE	Force for cut-off check in %.

The cut-off is successful when travel to fixed stop fails. The following alarms are output:

Alarm	Alarm text
20091	Axis %1 has not reached the fixed stop.
20094	Axis %1 endstop has been aborted.

You can switch off the alarm display using the following machine data:

MD37050 \$MA_FIXED_STOP_ALARM_MASK	Enabling the fixed stop alarms.
= 2	Suppressing alarms 20091 and 20094.

You set this machine data in window "Machine data" in operating area "Tool zero" on an axis-for-axis basis.

If, however, the specified force is reached during the cut-off check (i.e. travel to fixed stop is successful), alarm 61255 "Error during cut-off: Tool break?" is issued.

Note

The "Travel to fixed stop" function can also be used when gripping the spindle (see above). If travel to fixed stop does not succeed when gripping, an alarm will of course still be issued. Instead of alarms 20091 and 20094, the alarm 61254 "Error during travel to fixed stop" will be issued.

Note

MD37050 can also contain values not equal to 2, e.g. $10 = 2 + 8$. Ensure that the value 2 is always contained logically so that the monitoring for travel to fixed stop can be hidden. If MD37050 does not contain the value 2, the cut-off check is not active.

Machine manufacturer cycle

If you perform one of the following actions, you must adapt the machine manufacturer cycle CUST_TECHCYC.SPF.

- Switch between spindle and C axis mode for the main spindle or counterspindle.
- Open, close, flush chuck (main spindle / counterspindle).
- Change default settings for the coupling of the main spindle and counterspindle.

Please refer to the following section for the procedure:

"Setting-up ShopTurn cycles for turning (Page 448)"

20.5.6 Technology cycles for turning

Thread-cutting (CYCLE99)

To correctly machine the thread, it is necessary to set the machine data MD52207 \$MCS_AXIS_USAGE_ATTRIB[n] with bit 3.

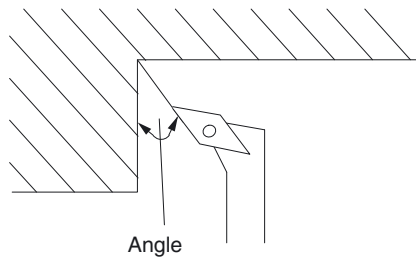
You can find **more information** in Chapter "Setting up a counterspindle (Page 450)".

Contour grooving CYCLE930, contour turning CYCLE950, stock removal at corner CYCLE951, contour turning CYCLE952

SD55500 \$SCS_TURN_FIN_FEED_PERCENT	Enter the finishing feedrate for complete machining, roughing and finishing. The percentage of the value corresponds to that entered under parameter F (feedrate).
= 100	100% finishing feedrate

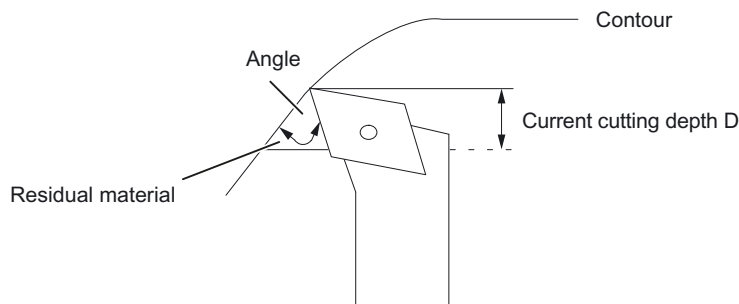
SD55510 \$SCS_TURN_GROOVE_DWELL_TIME	Dwell time, which is necessary between grooving and retracting for grooving technology. Tool clearance time when grooving at the base.
= > 0	Dwell time in seconds
= < 0	Dwell time in spindle revolutions

SD55580 \$SCS_TURN_CONT_RELEASE_ANGLE	Angle, through which the tool is lifted from the contour for contour turning, roughing.
= 45	Retraction angle of 45 degrees



SD55581 \$SCS_TURN_CONT_RELEASE_DIST	Amount, by which the tool is lifted when roughing a contour taking into account the retraction angle SD55580 \$SCS_TURN_CONT_RELEASE_ANGLE. This also applies to stock removal, grooving and plunge turning.
= 1	1 mm or 1 inch retraction distance

SD55582 \$SCS_TURN_CONT_TRACE_ANGLE	The angle between cutting edge and contour from which rounding is performed on the contour during contour turning in order to remove residual material. If the angle of the residual material is greater than that specified in the setting data, the tool will round the contour.
= 5	5 degree angle



SD55583 \$SCS_TURN_CONT_VARIABLE_DEPTH	Percentage of the changing cutting depth when turning a contour You can select changing the cutting depth for stock removal and for removing residual material.
= 20	20% variable cutting depth

SD55584 \$SCS_TURN_CONT_BLANK_OFFSET	Safety clearance when avoiding obstacles, to avoid collisions during approach or retraction from the machining. This also applies to stock removal, grooving and plunge turning.
= 1	1 mm or 1 inch blank allowance

SD55585 \$SCS_TURN_CONT_INTERRUPT_TIME	Time for the feedrate interruption for contour turning. This also applies to stock removal, grooving and plunge turning.
= > 0	Interruption time in seconds
= < 0	Interruption time in revolutions
= 0	No interruption

Note

The channel-specific cycle setting data SD55585 is only evaluated if SD55586 \$SCS_TURN_CONT_INTER_RETRACTION = 0.

SD55586 \$SCS_TURN_CONT_INTER_RETRACTION	Retraction distance for contour turning for feedrate interruption. This also applies to stock removal, grooving and plunge turning.
= > 0	Retraction distance at feed interruption SD55585 \$SCS_TURN_CONT_INTERRUPT_TIME has no effect.
= 0	No retraction distance

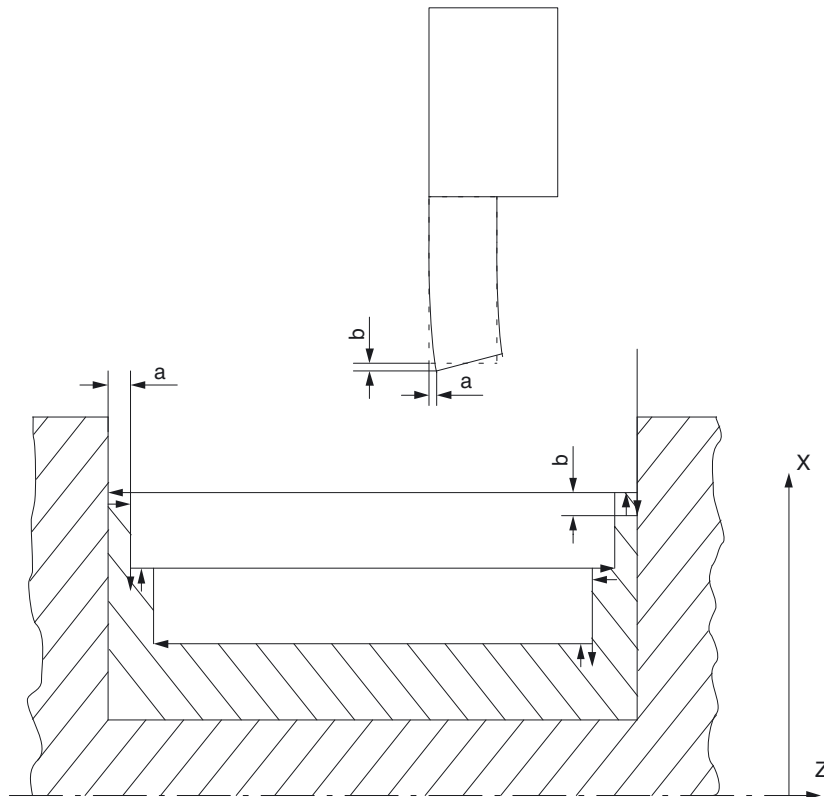
SD55587	\$SCS_TURN_CONT_MIN_REST_MAT_AX1	Limit value during contour turning for removal of residual material in the direction of axis 1 (for G18 Z). This also applies to residual machining – stock removal, grooving and plunge turning.
50	The roughing step for residual machining is not executed, if the material to be removed is less than 50% of the finishing allowance. The material is only removed when finishing.	

Example: If the SD is set to 50% and the final machining allowance is 0.5 mm, any residual material less than 0.25 mm is not removed during residual machining – but is removed during finishing. If during a machining step, less residual material is present than defined in the SD, the error message "No material present" is issued. This means that this residual material roughing step can be omitted because no machining is performed.

SD55588	\$SCS_TURN_CONT_MIN_REST_MAT_AX2	Limit value during contour turning for removal of residual material in the direction of axis 2 (for G18 X). This also applies to residual machining – stock removal, grooving and plunge turning.
50	The roughing step for residual machining is not executed, if the material to be removed is less than 50% of the finishing allowance. The material is only removed when finishing.	

As the tool bends during plunge turning, the tool cannot travel right up to the contour during stock removal. The lateral distance to the last cut by which the next cut is shortened is specified in the following channel-specific cycle setting data.

SD55595	\$SCS_TURN_CONT_TOOL_BEND_RETR	Retraction distance because of tool bending
0.1	0.1 mm or 0.1 inch retraction distance	



a Distance to the last cut, SD55595

b Retraction between plunge-cutting and stock removal, SD55596

As the tool bends during plunge turning, the tool would make an excessively deep cut during stock removal. The retraction distance of the tool between plunge-cutting and stock removal is specified in the following channel-specific cycle setting data:

SD55596 \$SCS_TURN_CONT_TURN_RETRACTION	Retraction depth before turning
= 0.1	0.1 mm or 0.1 inch retraction depth

20.5.7 Axis configuration of a lathe

General configuration

If driven milling tools are available on a lathe, then the following functions can also be set-up on this machine:

- Cylinder surface transformation (TRACYL_K/TRACYL) (Page 459)
- End face machining (TRANSMIT_K/TRANSMIT) (Page 461)

Lathe with X and Z axes, main and tool spindle

For example, for a lathe with X and Z axes, main spindle (C1) and tool spindle (WZ), you can configure the following channel-specific machine data:

MD20080 \$MC_AXCONF_CHANAX_NAME_TAB[]		Channel axis name in the channel
[0] = XC	Channel axis XC	
[1] = ZC	Channel axis ZC	
[2] = C1	Main spindle C1	
[3] = WZ	Tool spindle WZ	

Lathe with X and Z axes, main and tool spindle and counterspindle

For example, for a lathe with X and Z axes, main spindle (C1), tool spindle (WZ) and counterspindle (C2), you can configure the following machine data:

MD20080 \$MC_AXCONF_CHANAX_NAME_TAB[]		Channel axis name in the channel
[0] = XC	Channel axis XC	
[1] = ZC	Channel axis ZC	
[2] = C1	Main spindle C1	
[3] = WZ	Tool spindle WZ	
[5] = C2	Counterspindle C2	

Lathe with X and Z axes, main and tool spindle and Y axis

For example, for a lathe with X, Z and Y axes, main spindle (C1) and tool spindle (WZ), you can configure the following machine data:

MD20080 \$MC_AXCONF_CHANAX_NAME_TAB[]		Channel axis name in the channel
[0] = XC	Channel axis XC	
[1] = ZC	Channel axis ZC	
[2] = C1	Main spindle C1	
[3] = WZ	Tool spindle WZ	
[5] = YC	Channel axis YC	

20.5.8 Cylinder surface transformation (TRACYL_K/TRACYL)



Software option

You require the following software option to use this function:

"Transmit and peripheral surface transformation"

Function

Using the cylinder surface transformation function (TRACYL), you can machine the peripheral surface of a turned part.

Setting up

General settings for cylinder transformation:

MD10602 \$MN_FRAME_GEOAX_CHANGE_MODE	Frames when switching over geometry axes.
= 1	When switching over geometry axes (selecting - deselecting TRACYL), the actual total frame (work offsets) is recalculated.

MD24040 \$MC_FRAME_ADAPT_MODE	Adapting the active frames.
Bit 0 = 1	Rotations in active frames that rotate coordinate axes for which there are no geometry axes, are deleted from the active frames.
Bit 1 = 1	Shearing angles in active frames are made orthogonal.
Bit 2 = 1	Scaling factors of all geometry axes in the active frames are set to 1.

MD28082 \$MC_MM_SYSTEM_FRAME_MASK	
Bit 6 = 1	Configuration of the transformation frame for the compensation.

A cylinder surface transformation can be set up as TRACYL_K (transformation based on a kinematic chain) or as TRACYL (conventional transformation parameterized using machine data). A distinction can be made as to whether the work is done with a groove side compensation (a third linear axis is available) or without.

More information

A detailed description and corresponding examples are provided in the Function Manual Transformations.

Setting up cylinder surface transformation under ShopTurn

In addition, set the following channel-specific configuration machine data:

MD52214 \$MCS_FUNCTION_MASK_MILL	Function screen forms milling
Bit 3	Enable "internal / rear" machining in ShopTurn screen forms that define the machining plane themselves.
Bit 4	If you have implemented the "Clamp/release spindle" function using the machine manufacturer cycle CUST_TECHCYC.SPF, then using this machine data, you can activate the "Clamp/release spindle" parameter in the drilling and milling screen forms.
= 0	The "Clamp/release spindle" parameter is not displayed in the drilling and milling screen forms. ShopTurn automatically clamps the spindle if it makes sense for the particular machining operation.
= 1	The "Clamp/release spindle" parameter is displayed in the drilling and milling screen forms. The operator decides for which machining operation the spindle should be clamped.
Bit 8	Release damping brake (C axis)

= 0	"Damping brake on/off" parameter is not displayed in the milling screen forms.
= 1	The "Damping brake on/off" parameter is displayed in the milling screen forms. You decide for which machining operation (Face C/Per.surf.C) the C axis is braked. If you have implemented the "Damping brake" function by means of the machine manufacturer cycle CUST_TECHCYC.SPF, you can activate the "Damping brake on/off" parameter in the milling screen forms with this machine data.

20.5.9 End face machining (TRANSMIT_K/TRANSMIT)



Software option

You require the following software option to use this function:

"Transmit and peripheral surface transformation"

Function

Using the end face machining function (TRANSMIT), you can machine the end face of a turned part.

Setting up

For general settings for transformations, please refer to Chapter "Cylinder surface transformation (TRACYL_K/TRACYL) (Page 459)".

End face machining can be set up as TRANSMIT_K or as TRANSMIT.

Using TRANSMIT_K, end face machining can be defined via a kinematic chain that has been set up; such a transformation can be set up in the operating area "Setup > NC > Transformations".

A TRANSMIT is conventionally parameterized using machine data. For end face machining, a distinction is made as to whether a Y axis is available or not.

More information

A detailed description and examples is provided in the Function Manual Transformations.

Face machining under ShopTurn

If you wish to use the face machining function under ShopTurn function, set the following additional channel-specific configuration machine data:

MD52214 \$MCS_FUNCTION_MASK_MILL	Function screen forms ShopTurn.
Bit 3	Enable "internal / rear" machining in ShopTurn screen forms that define the machining plane themselves.

Bit 4	If you have implemented the "Clamp/release spindle" function using the machine manufacturer cycle CUST_TECHCYC.SPF, then using this machine data, you can activate the "Clamp/release spindle" parameter in the drilling and milling screen forms.
= 0	The "Clamp/release spindle" parameter is not displayed in the drilling and milling screen forms. ShopTurn automatically clamps the spindle if it makes sense for the particular machining operation.
= 1	The "Clamp/release spindle" parameter is displayed in the drilling and milling screen forms. The operator decides for which machining operation the spindle should be clamped.

Note

The face end machining is automatically integrated in the cycles, with the exception of the straight line and circle.

You can select the functions for these two cycles in the "Program" operating area at "Straight line" and "Circle".

See also

Clamping a blank (Page 198)

20.5.10 Inclined Y axis (TRAANG_K/TRAANG)**Software option**

You require the following software option in order to use the inclined Y axis function on your machine:

"Inclined axis"

Function

If your turning machine has an inclined Y axis (i.e. this axis is not perpendicular to axes X and Z), you can still completely program machining operations in Cartesian coordinates. The control uses the inclined axis function (TRAANG) to transform the Cartesian coordinates to the motion of the inclined axis.

Setting up

An inclined axis can either be conventionally set up via machine data or parameterized via the kinematic chain.

More information

A detailed description and examples is provided in the Function Manual Transformations.

Inclined axis under ShopTurn

Please also note the following:

Note

In the user interface, the inclined axis function is automatically integrated in the cycles after setting up. For machining with inclined axis, in the screen forms of the machining plane, you can select "Face Y" or "Peripheral surface Y" and enter the Cartesian coordinates.

Concatenating (TRACON) of end face machining on a main spindle (TRANSMIT) and inclined axis (TRAANG)

In transformations with kinematic chains, non-orthogonal axes can be defined via the kinematic chain. This means that transformations no longer have to be concatenated with TRACON to map non-orthogonal axes.

For conventional parameterization via machine data, two transformations can be connected one after the other via TRACON.

20.5.11 Spindle speed limitation for current program

Speed limits are programmed in the part program. If the part program is applied, the spindle speed limits are entered in the setting data and saved there after the end of program.

However, if the modified speed limits must not apply after the end of the program, you can change the property with the following commands in the GUD block of the machine manufacturer:

Changing spindle speed limits for the current program only

```
REDEF $SA_SPIND_MAX_VELO_LIMS PRLOC ; maximum spindle speed limit for V
                                     constant (G96)
REDEF $SA_SPIND_MAX_VELO_G26 PRLOC  ; maximum spindle speed limit for rpm
                                     (G26)
```

Additional information

You can find additional information about speed limiting in the NC Programming Programming Manual.

20.6 Grinding

General

Grinding tools are identified by tool type 400, 410; dressing tools are identified by tool type 490. The "New tool" function offers these types for selection. The tool list shows the "Grinding disk" and "Dressing tool" tool types listed according to their tool type. To generate the grinding disk correction, a tool setter creates a dressing program. Depending on the complexity, the tool setter makes use of external or internal code generators. This program will be assigned later to a grinding disk.

Oscillation cycles

These grinding cycles permit the machining of workpieces with grinding machines using two geometry axes.

The machines type does not exist because the cycles create only an oscillating movement that can be used as required on every machine.

This requires a SINUMERIK control as well as fast inputs/outputs for the program processing.

The cycles package provides the following cycles:

- CYCLE4071: Longitudinal grinding with infeed at the reversal point
- CYCLE4072: Longitudinal grinding with infeed at the reversal point and measurement control
- CYCLE4073: Longitudinal grinding with continuous infeed
- CYCLE4074: Longitudinal grinding with continuous infeed and measurement control
- CYCLE4075: Surface grinding with infeed at the reversal point
- CYCLE4077: Surface grinding, plunge grinding with measurement control
- CYCLE4078: Surface grinding with continuous infeed
- CYCLE4079: Surface grinding with intermittent infeed

Oscillation cycles: Activate GUD variables for synchronized actions

MD18661 \$MN_MM_NUM_SYNACT_GUD_INT[n]	Number of configurable integer-type GUD variables
> 0	With the machine data, the individual GUD blocks can be extended by additional channel-specific parameter areas of the type integer. [n] is equivalent to the access rights data block

Additional information

You can find additional information about oscillating cycles and GUD variables for synchronized actions in the:

- NC Programming Programming Manual
- Synchronized Actions Function Manual

Grinding function screen

MD51840 \$MNS_GRIND_FUNCTION_MASK		Grinding cycles function screen
Bit 0	Reference point for measuring the dresser/wheel is a work offset	
= 0	Deselection of the work offset as reference point	
= 1	Selection of the work offset as reference point	

MD52840 \$MCS_FUNCTION_MASK		Grinding cycles function screen
Bit 7	Retraction when form-truing with G1	
= 0	Retraction when form-truing with rapid traverse (G0)	
= 1	Retraction when form-truing with feedrate (G1)	

Activate and display fit-dependent corrections

Activate fit-dependent corrections

MD18603 \$MN_MM_NUM_GLOBAL_G_FRAMES		Number of global grinding frames (SRAM)
The value corresponds to the number of field elements for the pre-defined field \$P_GFR[]. If the value of the data is > 0, then all settable frames are only global. MD28079 is then ignored.		

MD28079 \$MC_MM_NUM_G_FRAMES		Number of grinding frames (SRAM)
Defines the number of predefined grinding frames.		

Display fit-dependent corrections in the operating area "Parameters" → "Work offsets" window:

MD52211 \$MCS_FUNCTION_MASK_DISP_ZOA		Function screen Display overview of work offsets
Bit 22	Display fit-dependent corrections (\$P_GFRAME)	

Details of disk size

MD52842 \$MCS_GRIND_DIAMETER_LENGTH		Number of the tool length for the disk diameter
= 1	Length 1 is disk diameter	
= 2	Length 2 is disk diameter	

MD52843 \$MCS_GRIND_WIDTH_LENGTH	Number of the tool length for the disk width
= 1	Length 1 is disk width
= 2	Length 2 is disk width

Form-truing (CYCLE495)

SD55880 \$SCS_GRIND_CONT_RELEASE_ANGLE	Angle of retraction
	This setting data is used to specify the angle of retraction from the contour during form-truing.

SD55881 \$SCS_GRIND_CONT_RELEASE_DIST	Retraction distance
	This setting data is used to specify the distance retracted in both axes during form-truing.

SD55884 \$SCS_GRIND_CONT_BLANK_OFFSET	Blank allowance
	This setting data is used to specify the distance to the grinding wheel as of which the switch-over is made from G0 to G1 during form-truing.

20.7 Swiveling

20.7.1 Technology cycles for swiveling

Precondition

The commissioning of the machine kinematics is a mandatory requirement for correct swiveling functionality (CYCLE800). The vectors of the machine kinematics are stored in the tool parameters \$TC_CARR1 to \$TC_CARR65. The machine kinematics are stored in the kinematic chain and be accessed via the \$TC_CARR_KIN... tool parameters. The vectors of the machine kinematics can also be stored in the tool parameters \$TC_CARR1 to \$TC_CARR65 without the kinematic chain.

Note

The vectors of the machine kinematics can be corrected with the "Measurement of machine kinematic" measuring function (CYCLE9960).

To activate the swivel function, there must be at least one tool carrier that can be oriented (swivel data set) in the NCK, and the workpiece, tool and rotary table reference system frames must be activated:

MD18088 \$MN_MM_NUM_TOOL_CARRIER	Maximum number of definable tool carriers
> 0	

MD28082 \$MC_MM_SYSTEM_FRAME_MASK	System frames (SRAM)
= 7DH	
Bit 2 = 1	TCARR and PAROT
Bit 3 = 1	TOROT and TOFRAME
Bit 4 = 1	Workpiece reference points
Bit 5 = 1	System frame for cycles
Bit 6 = 1	Transformations

Note

Changing machine data MD18088 and MD28082 causes the buffered memory to be reorganized.

After changing the machine data, a series setup file must be generated and downloaded, otherwise, it can be assumed that data will be lost.

To change machine data, you require the following authorization: Access level 1 (manufacturer).

More information

More information can be found in:

- Function Manual Tools
- Programming Manual Measuring Cycles

Activating the swivel function

The swivel function is enabled on the user interface via the following channel-machine data:

MD52212 \$MCS_FUNCTION_MASK_TECH	General function screen form for all technologies
Bit 0 = 1	Enable swivel

Configuring input screen forms

You can configure the input screen forms for swiveling using the following channel-specific cycle setting data. The setting data is effective for all of the declared swivel data sets.

SD55221 \$SCS_FUNKTION_MASK_SWIVEL_SET	Function screen forms swiveling CYCLE800
Bit 0	Input field "No swiveling"
= 0	Hide
= 1	Display
Bit 1	Select text when retracting "Z, ZY" or "Fixed position 1/2"
= 0	Display text Z = "Z", display text Z, XY = "Z,XY"
= 1	Display text Z = "Fixed point 1", Display text Z, XY = "Fixed point 2". If you wish to modify the retraction version "Z" or "Z, XY" via the manufacturer cycle CUST_800.SPF, the neutral text "Fixed point 1" and "Fixed point 2" can be displayed.
Bit 2	Select, permit "deselection" of the swivel data set
= 0	If deselection is not permitted, the "Swivel data set" (TC) selection field is not displayed in the "Swivel" input screen form.
= 1	Deselection permitted see also swivel data set parameter \$TC_CARR37 HUNDRED MILLIONS position
Bit 3	Displays the active swivel plane under swivel in JOG. The setting in the swivel function screen form acts on all swivel data sets.
Bit 4	Positioning in the basic position (pole position) of the kinematics
= 0	Evaluation of the input values in pole position of the machine kinematics
= 1	Compatibility
Bit 5	Tool alignment absolute or via frame calculation
= 0	Tool alignment via frame calculation (TCOFRY for G18)
= 1	Tool alignment absolute (TCOABS) For B axis kinematics of a turning machine, the tool spindle can be set in the basic position of the kinematics, either parallel to Z or to X. Therefore, the function "Align milling tool" is required for rotary milling machine bit 5 = 1.
Bit 6	Do not list swivel mode "direct" under swivel in JOG
Bit 7	Swivel plane: Direction selection in basic position of the kinematic
= 0	With direction selection + or -, both calculated solutions for the rotary axes are approached

	= 1	With direction selection + or -, only one of the calculated solutions for the rotary axes is approached
Bit 8		Traverse the work offset for the rotary axes of the swivel data set as offset
	= 0	Only take the work offset for the rotary axes of the swivel data set into account in the WCS (compatibility)
	= 1	Traverse the work offset for the rotary axes of the swivel data set as offset Bit 8 is set in conjunction with MD21186.
Bit 9		Swivel data set TC permanently assigned to the tool
	= 0	Show number of the swivel data set TC
	= 1	Do not show number of the swivel data set TC The swivel data set is assigned to the tool with parameter SGUD_TC_GNO if technology MD52200 = 3 is set for cylindrical grinding. Example: The machine manufacturer can write the current tool _TC_GNO = \$P_TOOLNO into parameter _TC_GNO in the tool change program L6. As a result, the tool carrier will be updated whenever a tool is changed.
Bit 10		Swivel plane: Show input field "Positioning direction"
	= 0	Input field "Positioning direction" is not displayed
	= 1	Input field "Positioning direction" is displayed with swivel table and swivel head/table combinations The selected positioning direction is stored in GUD_TC_POS_DIR and can be evaluated in CUST_800: _TC_POS_DIR = 0: Automatic (shortest path) _TC_POS_DIR = -1: Direction - _TC_POS_DIR = +1: Direction + The function must be implemented by the manufacturer.
Bit 11		Positioning both solutions of AB kinematics
	= 0	Positions only one solution of some swivel angles (compatibility)
	= 1	Positions both solutions calculated by the NC Bit 11 should be set for kinematics = 1 where, in the kinematics basic setting, neither of the two rotary axes rotates about the tool axis (AB kinematics in tool axis in the Z direction)
Bit 12		Swivel plane, align tool: Reset behavior takes account of rotary axis positions
	= 0	Reset condition refers to the final position of the rotary axes of the swivel data set (compatibility) Linear axis identifiers are written into parameters \$TC_CARR21/22. On reset (TCOABS), the tool carrier is initialized with the final positions of the rotary axes (\$TC_CARR13/14).
	= 1	Reset condition refers to the current position of the rotary axes of the swivel data set The rotary axis names of the swivel data set are written into parameters \$TC_CARR21/22. On reset (TCOABS), the tool carrier is initialized with the actual values of the rotary axes.
Bit 13		Activates the extended evaluation of rotations for axis-by-axis swiveling in the pole position
	= 0	The rotations when swiveling in the pole position (compatibility) are not evaluated, the settings of bits 4 and 11 apply
	= 1	Extended evaluation of rotations when swiveling in the pole position

20.7 Swiveling

Using the following channel-specific setting data, you can set the status of the "Swivel plane" input screen form when actuating the "Basic Position" softkey:

SD55410 \$SCS_MILL_SWIVEL_ALARM_MASK	Hide and unhide cycle alarms
	Displaying CYCLE800, CYCLE996, CYCLE9960 cycle alarms
Bit 0	Display alarm 62186: Active work offset G54 and following and base (base reference) contain rotations
Bit 1	Display alarm 62187: Active base and base reference (G500) contain rotations
Bit 2	Display alarm 61148: Swiveling of plane with active turning tool not possible

SD55420 \$SCS_MILL_SWIVEL_RESET_RETRACT	Swivel initial setting: Retraction
	This setting information can be used to set the status of the "Retract" toggle switch on the "Swivel Plane" screen form when the "Basic Position" softkey is pressed
	No change
= 1	No
= 2	Z
= 3	Z XY
= 4	Tool direction, max.
= 5	Tool direction, inc.

SD55421 \$SCS_MILL_SWIVEL_RESET_TRACK	Swivel initial setting: Track tool
	This setting information can be used to set the status of the "Track tool" toggle switch on the "Swivel Plane" screen form when the "Basic Position" softkey is pressed
= 0	No change
= 1	Do not track
= 2	Track

SD55422 \$SCS_MILL_SWIVEL_RESET_MODE	Swivel initial setting: Swivel mode
	This setting information can be used to set the status of the "Swivel Mode" toggle switch on the "Swivel Plane" screen form when the "Basic Position" softkey is pressed
= 0	Axis-by-axis
= 1	directly

SD55423 \$SCS_MILL_SWIVEL_RESET_SEQ_AXIS	Swivel initial setting: Axis sequence
	This setting information can be used to set the status of the "Axis sequence" toggle switch on the "Swivel Plane" screen form when the "Basic Position" softkey is pressed
= 0	XYZ
= 1	XZY
= 2	YXZ
= 3	YZX
= 4	ZXY
= 5	ZYX

Additional settings

For the swivel function, set the following machine data as a minimum to the following - although this deviates from the default value:

MD10602 \$MN_FRAME_GEOAX_CHANGE_MODE	
= 1	The actual total frame (work offsets) is recalculated when switching over geometry axes (selecting/deselecting TRAORI).

MD10760 \$MN_G53_TOOLCORR		Method of operation with G53, G153 and SUPA
Bit 0 = 1	If the machine axis/axes are to be retracted before swiveling, see Chapter "Manufacturer cycle CUST_800.SPF (Page 515)"	

MD11450 \$MN_SEARCH_RUN_MODE		Settings, block search
Bit 1 = 1	Activate PROG_EVENT.SPF after block search. This means that for a block search, the rotary axes of the active swivel data set are pre-positioned.	

Declare swivel data sets

For the swivel function, swivel data sets must be created in the NCK and declared in the machine data MD18088 \$MN_MM_NUM_TOOL_CARRIER.

If several channels are declared in the NCU, the number of swivel data sets is split up, taking MD28085 \$MC_MM_LINK_TOA_UNIT into account.

MD28085 \$MC_MM_LINK_TOA_UNIT		Assigning a TO unit to a channel (SRAM)
If several channels are set-up, then the following can be set in the machine data: Assignment of the TO units (tools and orientable tool carriers) to the NC channel. One TO unit can be assigned to several channels. - OR - Each NC channel is assigned one TO unit.		

Example 1:

Machine has two channels with different TO units.

Channel 1: MD28085 \$MC_MM_LINK_TOA_UNIT= 1

Channel 2: MD28085 \$MC_MM_LINK_TOA_UNIT= 2

Three swivel data sets (SDS) are required for each TO unit.

MD18088 = (number of TO units) x (number of SDS per TO unit) = 2 x 3 = 6

Example 2:

Machine has three channels with two different TO units.

Channel 1: MD28085 \$MC_MM_LINK_TOA_UNIT= 1

Channel 2: MD28085 \$MC_MM_LINK_TOA_UNIT= 2

Channel 3: MD28085 \$MC_MM_LINK_TOA_UNIT= 1

One swivel data set (SDS) is required for each TO unit.

$$\text{MD18088} = (\text{number of TO units}) \times (\text{number of SDS per TO unit}) = 2 \times 1 = 2$$

Using angular tools

Angular tools are created and managed in the NC with tool type 130. The tool lengths are entered in the tool of tool type 130. If an angular tool is also used on a swiveled machining plane (CYCLE800), the basic tool orientation must be enabled with

MD18114 \$MM_ENABLE_TOOL_ORIENT = 2. This enables a direction vector to be transferred to the tool in the tool parameters \$TC_DPV3[n] to \$TC_DPV5[n]. The TOROT (G17), TOROTY (G18), and TOROTX (G19) commands must be programmed for the tool change so that the basic tool orientation is updated.

n = internal tool number

MD18114 \$MM_ENABLE_TOOL_ORIENT		Assign orientation to cutting edges. Basic tool orientation
= 0	No basic tool orientation active	
= 2	Basic tool orientation active Used for angular tools and swiveling	

MD20110 \$MC_RESET_MODE_MASK		Initial control setting for RESET and end of part program
Bit 14 = 1	Calculation of the basic and system frames, example: 4041H.	

MD20112 \$MC_START_MODE_MASK		Basic control setting for START and part program.
400H		

MD20126 \$MC_TOOL_CARRIER_RESET_VALUE		Active tool carrier at RESET.
= 0	No active tool carrier at RESET.	
= > 0 (n)	Tool carrier with number n active at RESET. MD20126 is written to in CYCLE800. CYCLE800() corresponds to deselect tool carrier (MD20126 = 0).	

MD20150 \$MC_GCODE_RESET_VALUES[]		Delete position, G group.
[41] = 1	Delete position, G group 42 on TCOABS	
[51] = 2	Initial setting of G group 52 on PAROT	
[52] = 1	Delete position, G group 53 on TOROTOF	
[52] = > 1	Delete position, G group 53 on TOROT, TOROTY or TOROTX Used for machine kinematics, types "T" and "M". See parameter \$TC_CARR34	

Note

If, after a RESET from the NC, a frame must be calculated in the tool direction, then MD20150 \$MC_GCODE_RESET_VALUES[52] can be set to a value > 1.

Applications:

- Machine kinematics with Hirth teeth
- Angular tool with basic tool orientation

Note on kinematics (swivel head / mixed kinematics) with Hirth teeth:

Depending on the active plane (G17, G18, G19), the TOROT command (or TOROTX, TOROTY) is programmed in the NCU (G group 53) to calculate the compensating frame for the Hirth teeth in CYCLE800. If the Hirth teeth cause the programmed rotation to deviate from the possible positions of the rotary axes, a \$P_TOOLFRAME compensating frame is created for swivel head and mixed kinematics (see HMI active WO / details tool reference).

If the compensating frame must be retained after RESET or end of part program, enter the following value in the channel-specific machine data:

MD20150 \$MC_GCODE_RESET_VALUES[52]		Reset behavior of the G groups
= 2	For G17 (TOROT)	
= 3		
= 4	For G18 (TOROTY)	
= 5	For G19 (TOROTX)	

MD20196 \$MC_TOCARR_ROTAX_MODE		Rotary axis mode for oriented tool carriers
Bit 0 = 1	Swivel data set with a rotary axis used for a rotary table with C axis	
Bit 1 = 1	Swivel data set with two rotary axes used for standard swiveling	
Bit 2		
= 1	In a singular position, for which there is an unambiguous solution due to the alignment of the coordinate axes that are vertical to the orientation, the value 1 is displayed in the system variable \$P_TCSOL as the number of solutions.	
= 0	This version is required to ensure compatibility with older software versions. Two solutions are displayed; the angles about the orientation axis differ by 180 degrees.	

MD20360 \$MC_TOOL_PARAMETER_DEF_MASK		Tool parameter setting
Bit 10 = 1	The tool portion of an active orientable tool carrier is retained at T0 or D0 (no tool). Used for machine kinematics, types "T" and "M". See parameter \$TC_CARR34	
Bit 19 = 1	A tool's change in orientation caused by an oriented tool carrier remains at T0 or D0 (no tool). Bit 19 acts only with bit 10 = 1.	

MD21186 \$MC_TOCARR_ROT_OFFSET_FROM_FR		Offset of the rotary axes for an oriented tool carrier from the work offset of the rotary axis.
= 0	In CYCLE800, the WCS is recalculated when there is a value in the work offset (WO) of the rotary axes. If values are entered in the work offset of the rotary axes of the active swivel data set, the basic position of the swivel data set and therefore also the basic position of the WCS can change.	
= 1	A value in the WO of the rotary axes acts as offset of the oriented tool carrier. The WCS remains unchanged.	

MD21186 may not be rewritten in a program with call CYCLE800.

The setting MD21186 = 0 is only suitable for a swivel data set in which one of the available rotary axes rotates exactly around the tool axis. In this way, a useful rotation of the WCS can be calculated in CYCLE800 when values are entered in the work offset of the rotary axes. For example, for a swivel table with rotary axis A around X and rotary axis C around Z for a basic position of the kinematics in G17.

If several swivel data sets are declared per channel, and if machine functions need to be activated on changeover between swivel heads or tables, an M command can be issued in the PLC program on switchover to another swivel data set.

MD22530 \$MC_TOCARR_CHANGE_M_CODE		M code for swivel data set change
= 0	No swivel data set change	
< 0	M code + number of the swivel data set for the swivel data set change	

Example

Number of swivel data sets in channel 1	= 2
MD22530 \$MC_TOCARR_CHANGE_M_CODE	= -800
Programming swivel data set 1 (TCARR=1)	= M801
Programming swivel data set 2 (TCARR=2)	= M802

With the output of the M commands, the PLC can limit or invert the spindle speed or clamp or release the rotary axes, for example.

Setting the workpiece, tool and rotary table reference

Using the following machine data, you can set the workpiece, tool and rotary table reference system frames or you can influence the behavior of the system frames.

Application: System frames can be active after Reset or Power On, in order to retract a drill from a swiveled position without causing a collision, for example.

MD24006 \$MC_CHSFRAME_RESET_MASK		Active system frames after RESET
Bit 4	System frame workpiece reference	
= 0	Not active	
= 1	Remains active	

MD24007 \$MC_CHSFRAME_RESET_CLEAR_MASK		Clear system frames after RESET
Bit 4	System frame workpiece reference	
= 0	Do not delete	
= 1	Delete	

When used for measuring or swiveling in JOG, the workpiece reference must be active at RESET and not cleared (cascaded measuring).

MD24006 \$MC_CHSFRAME_RESET_MASK		Active system frames after RESET
Bit 4 = 1	System frame for workpiece reference remains active after RESET	

MD24007 \$MC_CHSFRAME_RESET_CLEAR_MASK		Clear system frames after RESET
Bit 2 = 0	Reserved, do not delete TCARR and PAROT	
Bit 3 = 0	Reserved, do not delete TOROT and TOFRAME	
Bit 4 = 0	Do not clear system frame workpiece reference after RESET	

MD24008 \$MC_CHSFRAME_POWERON_MASK		Reset system frames after power on.
Bit 2	System frame rotary table reference (PAROT)	
= 0	Do not reset	
= 1	Reset	
Bit 3	System frame tool reference (TOROT,...)	
= 0	Do not reset	
= 1	Reset	
Bit 4	System frame workpiece reference	
= 0	Do not reset	
= 1	Reset	

MD24080 \$MC_USER_FRAME_POWERON_MASK		Settings for settable frames.
Bit 0		
= 0	Settable work offset via power on not active.	
= 1	Last active settable work offset remains active after power on if MD20152 \$MC_GCODE_RESET_MODE[7] = 1.	

Application: Work offset G5xx, including all rotations, should remain active after Power On.

MD28082 \$MC_MM_SYSTEM_FRAME_MASK		Setting-up system frames (SRAM)
Bit 2 = 1	Rotary table reference (\$P_PARTFRAME)	
Bit 3 = 1	Tool reference (\$P_TOOLFRAME)	
Bit 4 = 1	Workpiece reference (\$P_WPFRAME)	

MD28083 \$MC_MM_SYSTEM_DATAFRAME_MASK		Setting-up data management, system frames (SRAM)
Bit 2 = 1	Rotary table reference (\$P_PARTFRAME)	

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Bit 3 = 1	Tool reference (\$P_TOOLFRAME)
Bit 4 = 1	Workpiece reference (\$P_WPFRAME)

Axial machine data for the modulo rotary axes of the swivel data set

MD30455 \$MA_MISC_FUNCTION_MASK	Axis functions
Bit 0	Modulo rotary axis programming
= 0	Programmed positions must be in the modulo range, otherwise an alarm is triggered (e.g. 0 to 359.999 degrees).
= 1	When positions are programmed outside of the modulo range, no alarms are signaled. The position is modulo converted internally (e.g. -180 to +180 degrees).
Bit 2	Positioning, rotary axis
= 0	As programmed
= 1	Along the shortest path Application: With the setting bit 2 = 1, the rotary axis C travels along the shortest path for G90 with DC. For more information, refer to Chapter "Manufacturer cycle CUST_800.SPF (Page 515)".

MD32010 \$MA_JOG_VELO_RAPID[AX] AX = axis name	Rapid traverse in JOG Rotary and machine axes that should travel for swiveling in JOG.
= 10000	Rapid traverse in JOG mode for swiveling in JOG

SD42980 \$SC_TOFRAME_MODE	Setting, frame definition for TOROT, PAROT
= 2000	Swivel (default value)

SD42974 \$SC_TOCARR_FINE_CORRECTION	Fine offset TCARR (swivel data set)
= 0	No fine offset of the swivel data set vectors.
= 1	Fine offset of the swivel data set vectors. The parameters of the swivel data set from \$TC_CARR41[n] n...number of the swivel data set and higher apply.

Swiveling in the JOG mode

Cycle alarms 62186 and 62187 can be hidden or displayed using the following cycle machine data:

MD55410 \$MC_MILL_SWIVEL_ALARM_MASK	Activate fault evaluation CYCLE800
Bit 0	Activates fault 61186
= 0	Hide fault 61186 "Active work offset G%4 and base (base reference) contains rotations" (default setting).
= 1	Display fault 61186
Bit 1	Activate fault 61187
= 0	Hide fault 61187 "Active base and base reference (G500) contain rotations" (default setting).
= 1	Display fault 61187

20.7.2 CYCLE800 checklist for the identification of the machine kinematics

Note

Identification of the machine kinematics according to DIN 66217 or ISO 841-2001

This checklist does not claim to be complete.

- **Do the 3 linear axes of the machine that are active for the transformation form an orthogonal coordinate system?** Geometry axes XYZ
- **How many swivel kinematics does the machine have?**
Combinations of two (or one) rotary axis and the three linear axes are always formed.
- **Which machine components are concerned?**
Swivel head, swivel table or swivel head and rotary table.
- **What are the names of the rotary axes of the kinematics?**
Manual rotary axes are permitted and do not have to be declared in the NC.
- **What is the 1st or 2nd d rotary axis of a swivel data set?**
- **Is the traversing direction of the linear axes and the rotary axes correct?** Right-hand rule
Rule: If the linear axis or the rotary axis moves the workpiece, the direction of motion of the axis and also the sign of the rotary axis vector change.
- **What is the initial setting of the kinematics?**
This defines the tool orientation and the plane G17, G18, G19.
- **Which rotary axis rotates around which axis of the coordinate system or the machine axis (axes)?**
This defines the rotary axis vectors of the kinematics.
Example 1:
Head kinematics. Rotary axis 2 rotates around axis Y → rotary axis vector $V2_{xyz} = 0,1,0$
Example 2:
Table kinematics. Rotary axis 1 rotates around axis X → rotary axis vector $V1_{xyz} = -1,0,0$

20.7.3 Setting up a tool carrier/swivel data set

Defining a tool carrier/swivel data set

You must create a tool carrier (tool holder) for every swivel head, swivel table or each swivel head/swivel table combination.

Tool carriers can be declared in several channels. A tool carrier can be defined as classic or via the kinematic chain.



A classic tool carrier comprises the parameters \$TC_CARR1[n] to \$TC_CARR65[n]
n = number of the tool carrier.

The geometry of the tool carrier based on the kinematic chain comes from the chain. There are also other descriptive parameters \$TC_CARR_KIN...[n] and \$TC_CARRxx[n].

If all preconditions from Chapter "Technology cycles for swiveling (Page 467)" are met, you can assign the tool carrier parameters via the input screen form in the "Setup" > "NC" > "Transformation" operating area.

When you create a new tool carrier here, you can choose if the parameters should be assigned as classic or via the chain.

Programming with appropriate value assignment is also possible in an NC program. The parameters of the tool carrier are immediately effective after the program has started.

The following softkeys are assigned to the Swivel function in the "Program" > "Various" operating area:

Milling	Turning	
"Swivel plane"	"Swivel plane"	
"Advance milling tool"	"Swivel tool"	→ "Align turning tool"
		→ "Align milling tool"
		→ "Advance milling tool"

The "Align turning tool" and "Align milling tool" softkeys are only displayed if the "B-axis kinematics" function has been activated via \$TC_CARR37[n].

More information

More information on setting up the kinematic chain can be found in the Function Manual Basic Functions.

Setting the rotary axis direction using ideal vectors

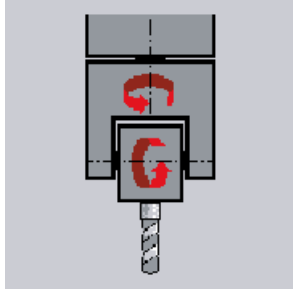
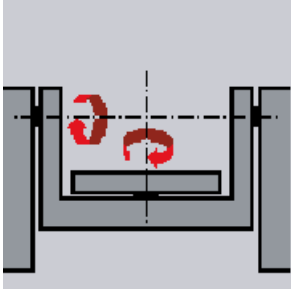
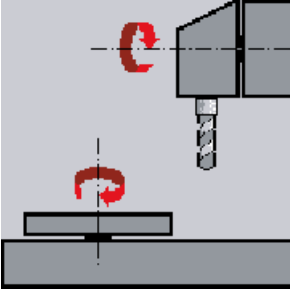
Note

Note that ideal vectors must be used for the direction of the rotary axes.

For example, if the rotary axis rotates around X, then the orientation (1,0,0) must be specified. Otherwise, when swiveling to 0°, then it is possible that the rotary axis is not positioned to this value.

It is recommended that the deviation is corrected using compensation if the rotary axis direction mechanically deviates from the ideal vector.

Kinematic types \$TC_CARR23[n]

Swivel head (type T)	Swivel table (type P)	Swivel head + Swivel table (type M)
		
Offset vector I1	Offset vector I2	Offset vector I1
Rotary axis vector V1	Rotary axis vector V1	Rotary axis vector V1
Offset vector I2	Offset vector I3	Offset vector I2
Rotary axis vector V2	Rotary axis vector V2	Offset vector I3
Offset vector I3	Offset vector I4	Rotary axis vector V2
		Offset vector I4

Name of swivel data set

If several swivel data sets are declared in each NC channel, then a name is assigned to each swivel data set: \$TC_CARR34[n]

The name of the swivel data set may only contain characters that are permissible for NC programming: A...Z, 0...9 and _ !

If multiple NC channels have been set up, note the settings in MD28085. If a TO unit is assigned to several NC channels, the channel display in the dialog corresponds to the TO unit.

You can find **more information** in Chapter "Technology cycles for swiveling (Page 467)".

System variable \$TC_CARR37[n]

In order that a value can be displayed in the input/selection boxes of the dialog for swiveling, the following display versions can be set:

Meaning of the decimal positions

\$TC_CARR37[n]	Display variants of the input masks for CYCLE800	
Decimal place	Meaning	
ONES	Select swivel mode	
	0 =	Axis-by-axis
	1 =	Axis-by-axis + projection angle
	2 =	Axis-by-axis + projection angle + solid angle
	3 =	Axis-by-axis + direct
	4 =	Axis-by-axis + projection angle + direct

\$TC_CARR37[n]	Display variants of the input masks for CYCLE800	
Decimal place	Meaning	
	5 =	Axis-by-axis + projection angle + solid angle + direct
TENS	Rotary axis 1	
	0 =	Automatic
	1 =	Manual
	2 =	Semiautomatic
HUNDREDS	Rotary axis 2	
	0 =	Automatic
	1 =	Manual
	2 =	Semiautomatic
THOUSANDS	Selection field direction: Direction selection of the rotary axes	
	0 =	No display of the direction reference for kinematics that only have one solution. Direction selection (_DIR) Minus is generated in the cycle call CYCLE800.
	3 =	Direction reference, rotary axis 1, direction selection Minus in the basic setting of the kinematics.
	4 =	Direction reference, rotary axis 2, direction selection Minus in the basic setting of the kinematics.
	5 =	No display of the direction reference for kinematics that only have one solution. Direction selection (_DIR) Plus is generated in the cycle call CYCLE800.
	8 =	Direction reference, rotary axis 1, direction selection Plus in the basic setting of the kinematics.
	9 =	Direction reference, rotary axis 2, direction selection Plus in the basic setting of the kinematics.
		The values 1, 2, 6 and 7 are not permitted.
TEN THOUSANDS	Selection field, tracking of the tool tip or B axis kinematics	
	0 =	No display of the tracking of the tool tip input field.
	1 =	Tracking of tool tip by means of TRAORI.
	2 =	No tracking of tool tip + B axis kinematics turning technology.
HUNDRED THOUSAND	Basic position of the kinematics ¹⁾	
	0 =	Corresponding to the working plane G17, G18 or G19 (compatibility)
	1 =	Tool axis in the Z direction
	3 =	Tool axis in the X direction
ONE MILLION TEN MILLION	Selection field, retraction	
	00 =	No retraction
	01 =	Retraction Z
	02 =	Retraction Z, XY
	03 =	Retraction Z or Z, XY
	04 =	Maximum retraction in tool direction
	...	
	08 =	Incremental retraction in tool direction
	...	

\$TC_CARR37[n]	Display variants of the input masks for CYCLE800		
Decimal place	Meaning		
	15 =	Retraction Z or Z, XY or in maximum tool direction or in incremental tool direction	
		\$TC_CARR38[n]	Retraction position X
		\$TC_CARR39[n]	Retraction position Y
		\$TC_CARR40[n]	Retraction position Z
HUNDRED MILLION	Swivel data set enabled Setting swivel data set change Automatic or manual tool change is only necessary under ShopMill or Shop-Turn (→ see also: CUST_800.spf, marks _M2 to _M13). A swivel data set must be "enabled" in every case (value ≥ 4).		
	0 =	Tool carrier not enabled	
	4 =	Tool carrier enabled Automatic swivel data set and tool change	
	5 =	Tool carrier enabled Automatic swivel data set change and manual tool change	
	6 =	Tool carrier enabled Manual swivel data set change and automatic tool change	
	7 =	Tool carrier enabled Manual swivel data set and tool change	

Notes on the setting Basic position of the kinematics ¹⁾

For turning machines (1st technology is turning) with a B axis, you can set whether the tool is oriented toward "-Z" or toward "-X" in the basic position of the kinematics. This setting is taken into account for "Align tool" and for "Swivel plane".

Align tool

- For "Align tool", the programming of beta and gamma is machine-independent.
- With the basic position setting "Working plane" or "-Z", beta = 0 also corresponds to this basic position (compatibility).
- With the basic position setting "-X", the B axis is re-oriented through 90° for beta = 0.

Swivel plane (new swivel plane)

- With the basic position setting "Working plane" or "-Z" and active working plane G17, there is no new tool orientation for swivel plane to basic position (compatibility).
- With the basic position setting "-X" and active working plane G17, the tool orientation is rotated 90° around Y for swivel plane to basic position.

Therefore, with the basic position setting "-X", milling is possible in a swiveled plane in different working planes (G17 or G19).

The following settings and programming is not permitted and results in error messages:

- Swivel plane, basic position -Z and G18 or G19 active
- Swivel plane, basic position -X and G18 active

Retracting the geometry axes before swiveling

TOOLCARR - tool carrier (classic)

Offset I4: 0.000000, 0.000000, 0.000000

Fine offset I4: 100.000000, 200.000000, 500.000000

Properties (input screen)

Select retract

- Incremental in tool direction: Yes
- Maximal in tool direction: Yes
- Machine axis Z: Yes
- Machine axis Z and then XY: No
- Retract position Z: 300.000

Select swivel mode

- Axis by axis: Yes
- Projection angle: No
- Solid angle: No
- Rotary axes direct: Yes

Select prefer. direction: Yes default=+

Reference axis pref. direction: Rotation axis 1

Select tracking: No

Buttons: Cancel, OK

Bottom bar: NC memory, PROFIBUS, Machine model, Transformations

Figure 20-7 Dialog to select the type of retraction for classic tool carrier

Select the retraction variant in the input field: This is defined in the ONE MILLION and TEN MILLION position of the system variable `$TC_CARR37[n]`:

- Retract axis Z
- Retract axes Z, XY
- Retract in the tool direction, maximum or incremental

NOTICE**Collision avoidance**

Make sure that the tool and the workpiece cannot collide during swiveling when the tool axes move.

Retraction of the axis Z or retraction of the axes Z, XY is implemented as an absolute machine position to the values of parameters `$TC_CARR38[n]` to `$TC_CARR40[n]`.

<code>\$TC_CARR38[n]</code>	Retraction position X
<code>\$TC_CARR39[n]</code>	Retraction position Y
<code>\$TC_CARR40[n]</code>	Retraction position Z

The type of retraction is modified in the Manufacturer cycle CUST_800.SPF (Page 515).

Note

Retraction in the tool direction is useful for swivel data sets in which the tool is re-oriented (swivel head or mixed kinematics). This applies particularly for turning machines with a B axis. During retraction in "maximum tool direction", traversing is performed until one of the relevant linear axes reaches the software limit switch.

20.7.4 Setting up the tool carrier based on kinematic chain

You must create a tool carrier for every swivel head, swivel table or each swivel head/swivel table combination.

Precondition

A kinematic chain is already available or must be created for the machine.

More information

More information is provided in the
Function Manual Tools.

Creating the tool carrier

Create the tool carrier using the input screen form in the operating area
"Setup" > "NC" > "Transformation".

In the "New tool holder" dialog you can select the tool carrier on the basis of the chain or using the classic method.

More information on selection is provided in Chapter: "Setting up a tool carrier/swivel data set (Page 477)".

TOOLCARR - tool carrier (chain)

Name: **TABLE_CC**

Enable: **Yes**

Type: **Swivel plane**

Kinematic

Workpiece chain

Start of workpiece chain: **OFFSET_TABLE**

Correct. element: **B-OFFSET-CORR**

Rotation axis: **B-AXIS**

Angle area: **-90.000** **90.000** °

Hirth teeth: **No**

Correct. element: **C-OFFSET-CORR**

Rotation axis: **C-AXIS**

Angle area: **0.000** **360.000** °

Hirth teeth: **No**

End of workp. chain: **CLAMPING**

Close workpiece chain: **No**

Tool direction in initial setting: **- 2**

Properties (input screen)

Select retract: **Incremental in tool direction**

Yes

Buttons: **NC memory**, **PROFIBUS**, **Machine model**, **Transformations**, **Cancel**, **OK**

Figure 20-8 Tool carrier dialog based on the chain

The following tool data is set using the input screen form for tool carrier setup:

Variable name	Meaning
\$TC_CARR_KIN_CNTRL[n]	Controls the acceptance of tool carrier geometry data from kinematic chain elements Bit 0: Tool carrier using kinematic chain Bit 1: Close part chain (calculation I4) Bit 2: Close tool chain (calculation I1)
\$TC_CARR_KIN_TOOL_START[n]	Name of the kinematic chain element that forms the starting point of the tool chain
\$TC_CARR_KIN_TOOL_END[n]	Name of the kinematic chain element that forms the end point of the tool chain
\$TC_CARR_KIN_PART_START[n]	Name of the kinematic chain element that forms the starting point of the tool chain
\$TC_CARR_KIN_PART_END[n]	Name of the kinematic chain element that forms the end point of the part chain
\$TC_CARR_CORRELEM[n, m] n = number of the tool carrier data set 0 ≤ m ≤ 3	Name of the kinematic chain element to which correction can be performed with CYCLE9960
\$TC_CARR_KIN_ROTAX_NAME[n, m]	String name of the kinematic chain element that contains the rotary axis
\$TC_CARR23[n]	Kinematic head (T), Table (P), Mixed (M)
\$TC_CARR26[n]	Offset Hirth teeth of the rotary axes
\$TC_CARR27[n]	

Variable name	Meaning
\$TC_CARR28[n] \$TC_CARR29[n]	Increment Hirth teeth of the rotary axes
\$TC_CARR30[n] \$TC_CARR31[n]	Software limit for minimum position of the rotary axes
\$TC_CARR32[n] \$TC_CARR33[n]	Software limits for maximum position of the rotary axes
\$TC_CARR34[n]	Name of the tool carrier
\$TC_CARR37[n]	
\$TC_CARR38[n] \$TC_CARR39[n] \$TC_CARR40[n]	Position for retraction

Rotary axes (axes of rotation)

The input screen form of the machine image is opened via the "Select element" softkey, and you can select the chain element that corresponds to the rotary axis.

The name for the chain element with rotary axis included is contained in the variable \$TC_CARR_KIN_ROTAX_NAME[n, m].

Correction element

The variable \$TC_CARR_CORRELEM[n, m] makes reference to the chain element that contains the kinematic correction if kinematics are measured and corrected via CYCLE9960.

20.7.5 Setting up classic tool carrier swivel data

Name of swivel data set

TOOLCARR - tool carrier (classic)

Name: **TABLE_TC1**

Enable: **Yes**

Type: **Swivel plane**

Kinematic

Table

Offset I2	-300.030000	-200.040000	-500.000000
Fine offset I2	0.000000	0.000000	0.000000
Rotation axis 1	A1		
Mode	automatically		
Direction v1	-1.000000	0.000000	0.000000
Offset	0.000	0.000 °	
Angle area	0.000	0.000 °	
Hirth teeth	No		
Offset I3	120.030000	0.040000	0.000000
Fine offset I3	0.000000	0.000000	0.000000
Rotation axis 2	C1		
Mode	automatically		
Direction v2	0.000000	0.000000	-1.000000
Offset	0.000	0.000 °	
Angle area	0.000	0.000 °	

NC memory PROFIBUS Machine model Transformations

Cancel OK

Figure 20-9 Dialog to input parameters for the swivel data set

Offsets I1 to I4 \$TC_CARR1[n] ... \$TC_CARR20[n]

The vectors always contain three components, which are the reference to the machine axes (X, Y, Z). The positions in the kinematic chain are measured by the machine manufacturer; they are always relevant with respect to a swivel head/swivel table (tool carrier).

Offsets I1 to I4 refer to the non-swiveled state of the rotary axes (basic setting: machine kinematics). However, be aware that the traversing range in the swivel planes may be restricted. If machine kinematics are to be implemented with just one rotary axis, this must always be declared as the 1st rotary axis.

Manually adjustable rotary axes (manual mode) are possible with and without measuring systems and can be used with "simple machines".

Rotary axes that are positioned by an additional mechanical system, can be declared in the "Semi-automatic" mode.

\$TC_CARR1[n]	\$TC_CARR2[n]	\$TC_CARR3[n]	Offset I1 xyz
\$TC_CARR4[n]	\$TC_CARR5[n]	\$TC_CARR6[n]	Offset I2 xyz

\$TC_CARR15[n]	\$TC_CARR16[n]	\$TC_CARR17[n]	Offset I3 xyz
\$TC_CARR18[n]	\$TC_CARR19[n]	\$TC_CARR20[n]	Offset I4 xyz

Example

In a boring mill, the swivel head is positioned by coupling the spindle. In this case, the rotary axes of the swivel head must be declared as "Semi-automatic". The appropriate machine-specific cycles are called in CUST_800.SPF.



Machine manufacturer

Follow the machine manufacturer's instructions.

Swivel head

- I3 distance from the tool adapter to the pivot point/intersection of the 2nd rotary axis
- I2 distance from the pivot point/intersection of the 2nd rotary axis to the pivot point/intersection of the 1st rotary axis
- I1 closure of the $I1 = -(I2 + I3)$ vector chain, if the swivel head cannot be changed

Note

Use I2 as a kinematic-describing vector if a head kinematic only has one rotary axis. As closing vector, for the head kinematics, I1 remains - and for the table kinematics, I4 remains.

Swivel table

- I2 distance from the machine reference point to the pivot point/intersection of the 1st rotary axis
- I3 distance from the pivot point/intersection of the 1st rotary axis to the pivot point/intersection of the 2nd rotary axis (or to the reference point of the tool adapter)
- I4 closure of the $I4 = -(I2 + I3)$ vector chain, if the swivel table cannot be changed

Swivel head/swivel table (mixed kinematics)

- I2 distance from the tool adapter to the pivot point/intersection of the 1st rotary axis
- I1 closure of the $I1 = -I2$ vector chain, if the swivel head cannot be changed.
- I3 distance from the machine reference point to the pivot point/intersection of the 2nd rotary axis (or to the reference point of the tool adapter)
- I4 closure of the $I4 = -I3$ vector chain, if the swivel table cannot be changed.

The offset vectors do not have to point to the pivot point of the rotary axes. The important thing is that they point to a point on the direction of rotation (intersection).

The sign of the offset vectors (I1 to I4) and the rotary axis vectors (V1, V2) result from the specifications of the axis directions according to **ISO 841-2001** or **DIN 66217** (right-hand rule). In the case of machine kinematics that move the workpiece (rotary table), the axis direction is reversed.

Direction V1 and V2

\$TC_CARR7[n]	\$TC_CARR8[n]	\$TC_CARR9[n]	Direction vector of the 1st rotary axis
\$TC_CARR10[n]	\$TC_CARR11[n]	\$TC_CARR12[n]	Direction vector of the 2nd rotary axis

More information

More information on tool offsets or on multiple transformations can be found in:

- Function Manual Tools
- Function Manual Transformations

Setting offsets

Note

Interrelation of TOOLCARRIER $\Leftrightarrow$ 5-axis transformation (transformer type 24, 40, 56):

For 5-axis transformation, transformer type 72 in MD24100: \$MC_TRAFO_TYPE_1 can be used.

In the case of transformer type 72, the vectors of the tool carrier in MD24582: \$MC_TRAFO5_TCARR_NO_1 are used.

Swivel head (swivel-mounted tool)			
\$TC_CARR23[n]="T"			MD24100: \$MC_TRAFO_TYPE_1=24
I1	\$TC_CARR1...3[n]		MD24500: \$MC_TRAFO5_PART_OFFSET_1[0...2]
I2	\$TC_CARR4...6[n]		MD24560: \$MC_TRAFO5_JOINT_OFFSET_1[0...2]
I3	\$TC_CARR15...17[n]		MD24550: \$MC_TRAFO5_BASE_TOOL_1 [0...2]
Closure of the I1=-(I2+I3) vector chain; for fixed-mounted machine kinematics			

Swivel table (swivel-mounted workpiece)			
\$TC_CARR23[n]="P"			MD24100: \$MC_TRAFO_TYPE_1=40
I2	\$TC_CARR4...6[n]		MD24550: \$MC_TRAFO5_BASE_TOOL_1 [0..2]
I3	\$TC_CARR15...17[n]		MD24558: \$MC_TRAFO5_JOINT_OFFSET_1 [0...2]
I4	\$TC_CARR18...20[n]		MD24500: \$MC_TRAFO5_PART_OFFSET_1 [0...2]
Closure of the I4=-(I2+I3) vector chain; for fixed-mounted machine kinematics			

Swivel head + swivel table (swivel-mounted tool + workpiece)			
\$TC_CARR23[n]="M"			MD24100: \$MC_TRAFO_TYPE_1=56
I1	\$TC_CARR1...3[n]		MD24560: \$MC_TRAFO5_JOINT_OFFSET_1 [0...2]
I2	\$TC_CARR4...6[n]		MD24550: \$MC_TRAFO5_BASE_TOOL_1 [0...2]
I3	\$TC_CARR15...17[n]		MD24558: \$MC_TRAFO5_JOINT_OFFSET_PART_1[0...2]
I4	\$TC_CARR18...20[n]		MD24500: \$MC_TRAFO5_PART_OFFSET_1 [0...2]
Closure of the I1=-I2 I4=-I3 vector chain; for fixed-mounted machine kinematics			

Rotary axis vectors V1, V2			
V1	\$TC_CARR7..9[n]		MD24570: \$MC_TRAFO5_AXIS1_1[0..2]
V2	\$TC_CARR10..12[n]		MD24572: \$MC_TRAFO5_AXIS2_1[0..2]

Fine offsets of offset vectors

Fine offset of the offset vectors is described in the parameters \$TC_CARR41[n] to \$TC_CARR60[n].

Assignment of base vectors to the fine offset vectors:

I1 \$TC_CARR1..3[n]	to	\$TC_CARR41..43[n]
I2 \$TC_CARR4..6[n]	to	\$TC_CARR44..46[n]
I3 \$TC_CARR15..17[n]	to	\$TC_CARR55..57[n]
I4 \$TC_CARR18..20[n]	to	\$TC_CARR58..60[n]

The fine offsets are activated by the following setting data:

SD42974 \$SC_TOCARR_FINE_CORRECTION = 1		Fine offset TCARR on/off
= 0	When activating a tool carrier that can be oriented, the fine offset values are not taken into account.	
= 1	When activating a tool carrier that can be oriented, the fine offset values are taken into account.	

The fine offsets act in addition to the corresponding base vectors when the Swivel function CYCLE800 or the NC function TCARR=n is called.

Name of the rotation axes (rotary axes)

TOOLCARR - tool carrier (classic)

Name: TABLE_TC1

Enable: Yes

Type: Swivel plane

Kinematic

Table

Offset I2: -300.030000, -200.040000, -500.000000

Fine offset I2: 0.000000, 0.000000, 0.000000

Rotation axis 1: **A1**

Mode: automatically

Direction v1: -1.000000, 0.000000, 0.000000

Offset: 0.000, 0.000 °, 0.000 °

Angle area: 0.000, 0.000 °, 0.000 °

Hirth teeth: No

Offset I3: 120.030000, 0.040000, 0.000000

Fine offset I3: 0.000000, 0.000000, 0.000000

Rotation axis 2: **C1**

Mode: automatically

Direction v2: 0.000000, 0.000000, -1.000000

Offset: 0.000, 0.000 °, 0.000 °

Angle area: 0.000, 0.000 °, 0.000 °

Buttons: Cancel, OK

Bottom bar: NC memory, PROFIBUS, Machine model, Transformations

Figure 20-10 Dialog to input parameters for the rotary axis

The following identifiers should be preferably chosen for the names of the rotary axes:

- Rotary axis rotates around machine axis X → A
- Rotary axis rotates around machine axis Y → B
- Rotary axis rotates around machine axis Z → C

For automatic rotary axes, the channel names of the corresponding NC rotary axes must be entered (see \$TC_CARR37[n] TENS and HUNDREDS position: Automatic mode). For manual (manually adjustable) and semiautomatic rotary axes, you can use any axis identifier (up to six letters or digits).

Manual and semiautomatic rotary axes are not defined in the NC. With manual rotary axes, the value for the angular range is entered in the dialog box. Semiautomatic rotary axes are moved mechanically on the machine, e.g. through a coupled spindle. The adaptations for this can be made in the CUST_800 manufacturer cycle. The value for the angular range must not be specified, the rotary axis positioning is performed automatically.

**Machine manufacturer**

Follow the machine manufacturer's instructions.

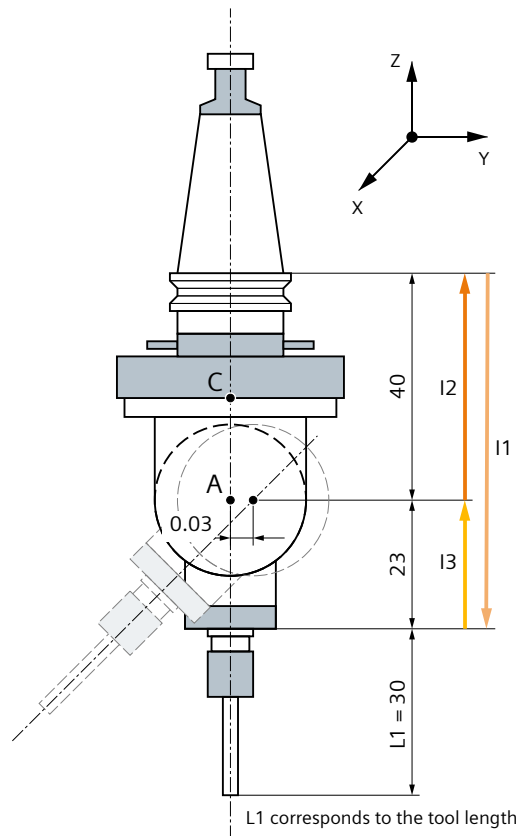
\$TC_CARR35[n]	Name of rotary axis 1
\$TC_CARR36[n]	Name of rotary axis 2

20.7.6 Examples of machine kinematics for commissioning the tool carrier

The following examples are for a classic tool carrier. If the tool carrier is based on a kinematic chain, the kinematic chain must be set up accordingly:

Example 1: Swivel head 1 "HEAD_1"

The vectors in the drawing refer to the initial setting of the kinematics. The drawing is not true to scale. The swivel head is exchangeable and manually adjustable.



C Rotary axis 1 (manual) rotates about Z.

A Rotary axis 2 (manual) rotates about X.

Figure 20-11 Exchangeable swivel head with steep taper to hold the spindle

TOOLCARR – tool carrier (classic)	
Kinematic type	Inclinable head
Number of rotary axes in the head	2
Number of rotary axes in the table	0

Figure 20-12 Selection of kinematic type

20.7 Swiveling

Name	HEAD_1		
Enable	Yes		
Type	Swivel plane		
Offset I1	0.000000	0.030000	-63.000000
Fine offset	0.000000	0.000000	0.000000
Axis of rotation 1	C		
Mode	Manual		
Direction v1	0.000000	0.000000	1.000000
Offset	0.000°		
Angle range	0.000°	360.000°	
Hirth teeth	No		
Offset I2	0.000000	0.000000	40.000000
Fine offset	0.000000	0.000000	0.000000
Axis of rotation 2	A		
Mode	Manual		
Direction v2	1.000000	0.000000	0.000000
Offset	0.000°		
Angle range	-15.000°	100.000°	
Hirth teeth	No		
Offset I3	0.000000	-0.030000	-23.000000
Fine offset	0.000000	0.000000	0.000000
Properties			
Select retract			
• Machine axis Z			Yes
• Retract position			200
Select swivel mode			
• Axis-by-axis			Yes
Reference axis pref. direction			Axis of rotation 2
Select tracking			No

Example 2a: Swivel head 2 "HEAD_2" tool carrier based on kinematic chain

In order to map the kinematics in the machine, we recommend mapping the kinematics as they actually are with regard to the kinematic chain. The drawing on the left shows how the vectors are specified to map the kinematics in such a way that reflects how the machine actually is. The tool carrier starts at the pivot point of the B axis followed by the C_OFFSET up to the actual pivot point of the C axis with an orientation of (0,1,1). The offset then connects to the reference point of the tool. However, the tool carrier can also start at the pivot point of the C axis (as is usual with classic). If the swivel head is firmly attached to the machine and the kinematics are closed, the result of the description is the same. If there are multiple swivel heads on the machine and the kinematics are open, the first kinematics description is recommended.

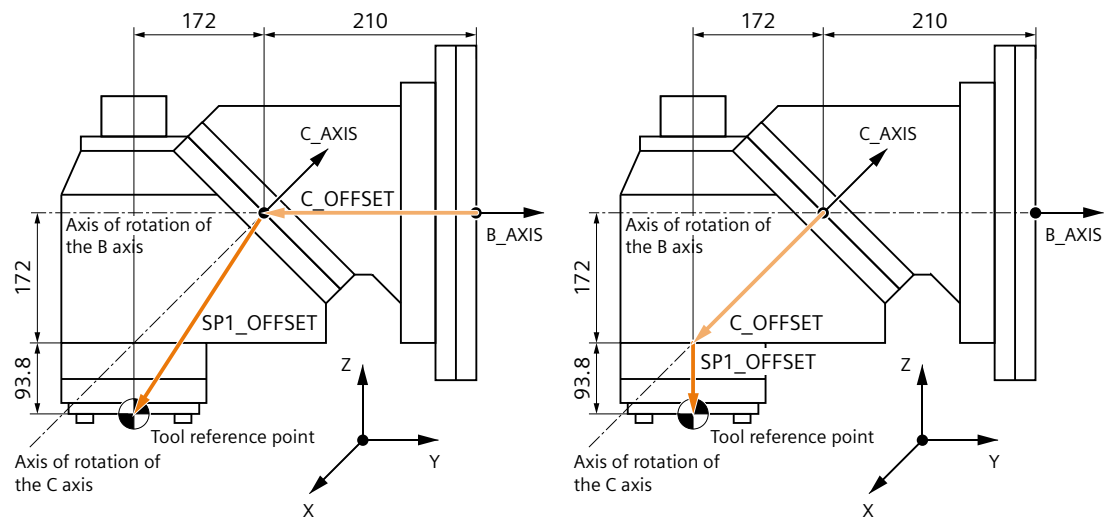
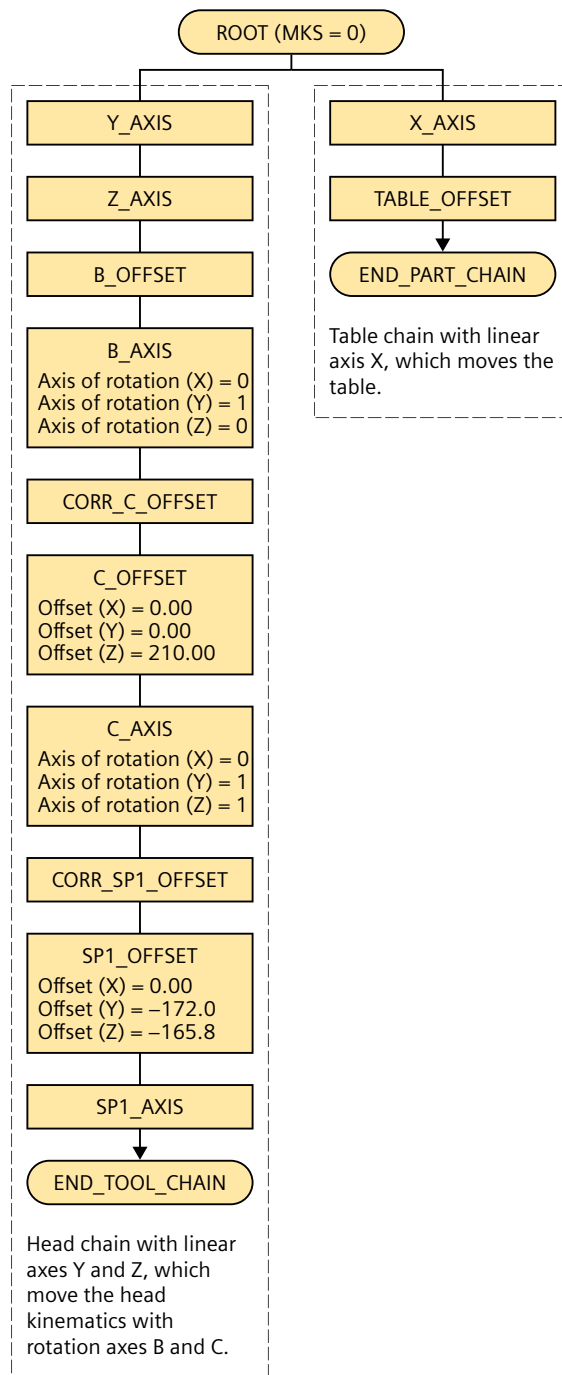


Figure 20-13 Swivel head with actual and offset kinematics description

Schematic representation of the chain:

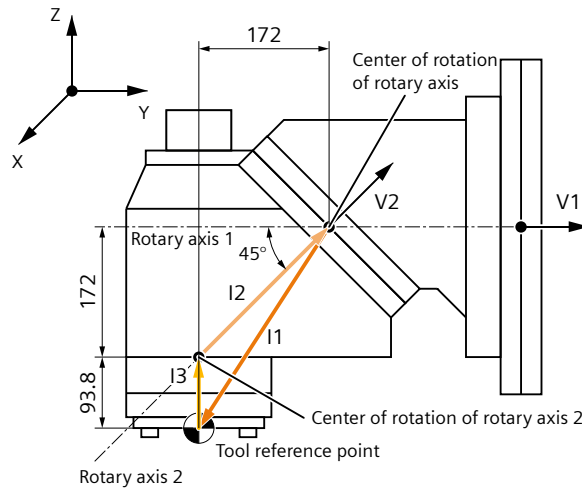


Name	HEAD_2		
Enable	Yes		
Type	Swivel plane		
Kinematics			
Tool chain			
Start of tool chain	Z_AXIS		
Axis of rotation	B_AXIS		

Angle range		0.000°	360.000°
Hirth teeth	No		
Correction element	CORR_C_OFFSET		
Axis of rotation	C_AXIS		
Angle range		-15.000°	100.000°
Hirth teeth	No		
Correction element	CORR_SP1_OFFSET		
End of tool chain	SP1_OFFSET		
Close tool chain	Yes		
Properties			
Select retract			
• Machine axis Z			Yes
• Retract position			200
Select swivel mode			
• Axis-by-axis			Yes
Reference axis pref. direction			Axis of rotation 2
Select tracking			No

Example 2b: Swivel head 2 "HEAD_2" classic tool carrier

The vectors in the drawing refer to the initial setting of the kinematics. If the swivel head is fixed-mounted, the vector chain is closed. The reference point of the center of rotation of rotary axes 1 and 2 can be offset on the line of rotation and does not have to coincide with the mechanical center of rotation.



Direction v1	Rotary axis 1 rotates about Y.
Direction v2	Rotary axis 2 rotates about Y and about Z.
Offset I1	Closure of vector chain with fixed-mounted swivel head, $I1 = -(I2 + I3)$.
Offset I2	The distance between the center of rotation of rotary axis 1 and center of rotation of rotary axis 2.
Offset I3	The distance between the reference point of the tool and the center of rotation of rotary axis 2.

Figure 20-14 Cardanic swivel head with Hirth joint, manually adjustable

Name	HEAD_2		
Enable	Yes		
Type	Swivel plane		
Offset I1	0.000000	-172.000000	265.800000
Fine offset I1	0.000000	0.000000	0.000000
Axis of rotation 1	B		
Mode	Automatic		
Direction v1	0.000000	1.000000	0.000000
Offset	0.000°		
Angle range	0.000°	360.000°	
Hirth teeth	No		
Offset I2	0.000000	172.000000	172.000000
Fine offset	0.000000	0.000000	0.000000
Axis of rotation 2	C		
Mode	Automatic		
Direction v2	0.000000	-1.000000 ¹⁾	1.000000 ¹⁾

Offset	0.000°		
Angle range	0.000°	180.000°	
Hirth teeth	Yes	1°	
Offset I3	0.000000	-0.030000	93.800000
Fine offset	0.000000	0.000000	0.000000
Properties			
Select retract			
• In tool direction, inc.			Yes
• In tool direction, max.			Yes
• Machine axis Z			
• Retract position Z			200
Select swivel mode			
• Axis-by-axis			Yes
Reference axis pref. direction			Axis of rotation 2
Select tracking			No

1) Calculation of rotary axis vector:

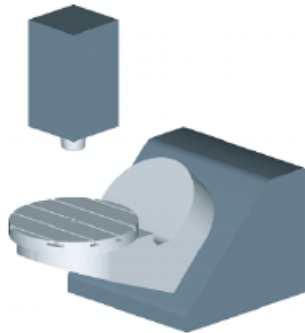
V2: 45 degree angle

$V2Y = \sin(-45) = -0.7071$

$V2Z = \cos(-45) = 0.7071$

V2Y and V2Z can be normalized to 1.

Example 3a: Cardanic table "TABLE_45" TCARR based on kinematic chain



The vectors in the drawing refer to the initial setting of the kinematics. The A_OFFSET vector can be offset anywhere on the axis of rotation of the A axis.

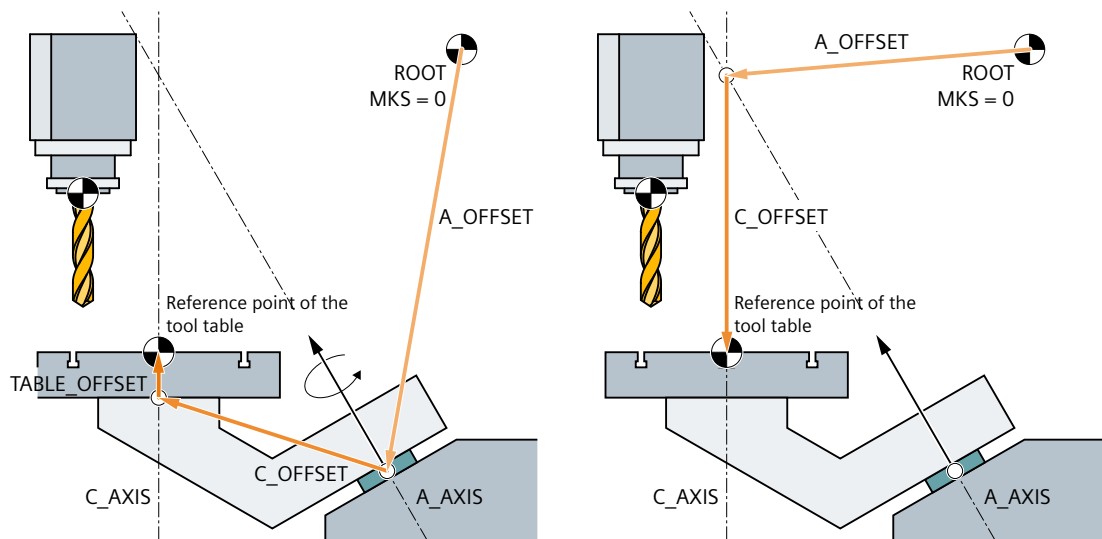
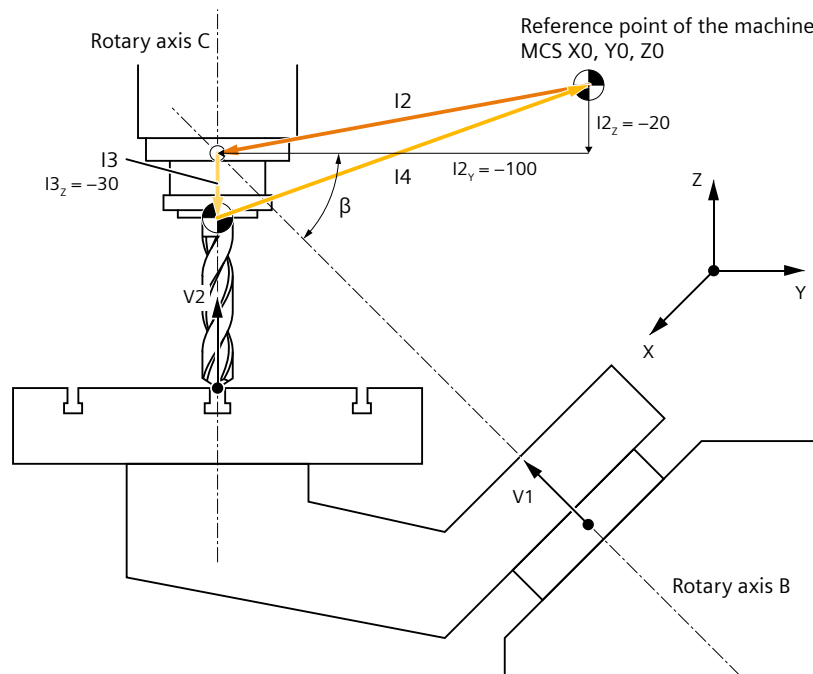


Figure 20-15 Vector offset A_OFFSET

Name	TABLE_45		
Enable	Yes		
Type	Swivel plane		
Kinematics			
Tool chain			
Start of tool chain	Z_AXIS		
	CORR_A_OFFSET		
Axis of rotation	A_AXIS		
Angle range		0.000°	360.000°
Hirth teeth	No		
Correction element	CORR_C_OFFSET		
Axis of rotation	C_AXIS		
Angle range		0.000°	360.000°
Hirth teeth	No		
End of tool chain	OFFSET_TABLE		
Close tool chain	Yes		
Properties			
Select retract			
• Machine axis Z			Yes
• Retract position			200
Select swivel mode			
• Axis-by-axis			Yes
Reference axis pref. direction			Axis of rotation 1
Select tracking			No

Example 3b: Cardanic table "TABLE_45" classic TCARR

The vectors in the drawing refer to the initial setting of the kinematics. The spindle (tool adapter) is positioned on a gage block above the top edge of the table/center of the table (rotary axis C). A measuring rod in the spindle is used to determine the turning center of rotary table C.



Direction v1

Rotary axis B rotates around Y **and** around Z.

Direction v2

Rotary axis C rotates about Z.

Offset I2

The distance from the reference point of the machine to the center of rotation/intersection of rotary axis 1.

Offset I3

The distance from the center of rotation/intersection of rotary axis 1 to the center of rotation/intersection of rotary axis 2.

Offset I4

Closure of vector chain, $I4 = -(I2 + I3)$.

Figure 20-16 Side view of the machine

Name	TABLE_45		
Enable	Yes		
Type	Swivel plane		
Kinematics			
Table			
Offset I2	0.000000	-100.000000	-20.000000
Fine offset I2	0.000000	0.000000	0.000000
Axis of rotation 1	B		
Mode	Automatic		
Direction v1	0.000000	-1.000000 ¹⁾	1.000000 ¹⁾
Offset	0.000°		
Angle range	0.000°	180.000°	
Hirth teeth	No		

Offset I3	0.000000	0.000000	-30.000000
Fine offset I3	0.000000	0.000000	0.000000
Axis of rotation 2	C		
Mode	Automatic		
Direction v2	0.000000	0.000000	-1.000000
Offset	0.000°		
Angle range	0.000°	360.000°	
Hirth teeth	No		
Offset I4	-300.000000	100.000000	50.000000
Fine offset I4	0.000000	0.000000	0.000000
Properties			
Select swivel mode			
• Axis-by-axis			Yes
Reference axis pref. direction			Axis of rotation 1
Select tracking			No

1) Calculation of rotary axis vector:

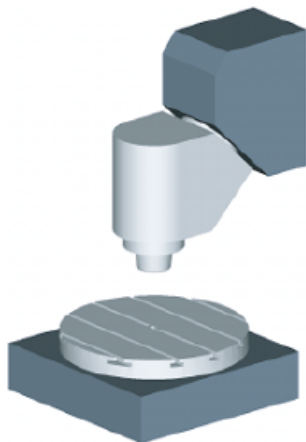
V1: $\beta = -45$ degrees

V1Y = $\sin(-45) = -0.7071$

V1Z = $\cos(-45) = 0.7071$

V1Y and V1Z can be normalized to -1 and 1.

Example 4a: Swivel head/rotary table "MIXED_45" based on kinematic chain



The vectors in the drawing refer to the initial setting of the kinematics. The vector SP1_OFFSET of the B axis to the reference point of the tool can be offset anywhere on the axis of rotation of the B axis.

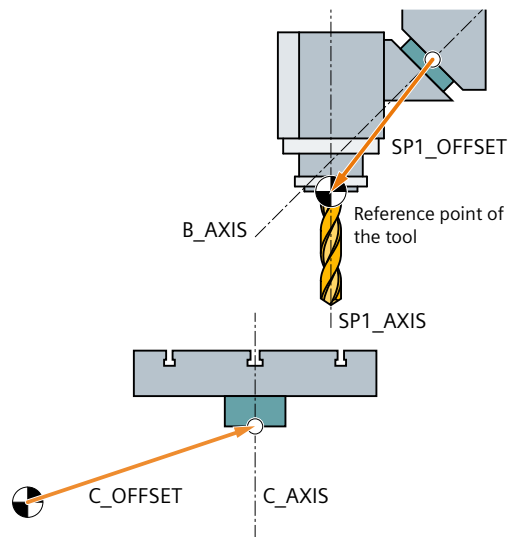
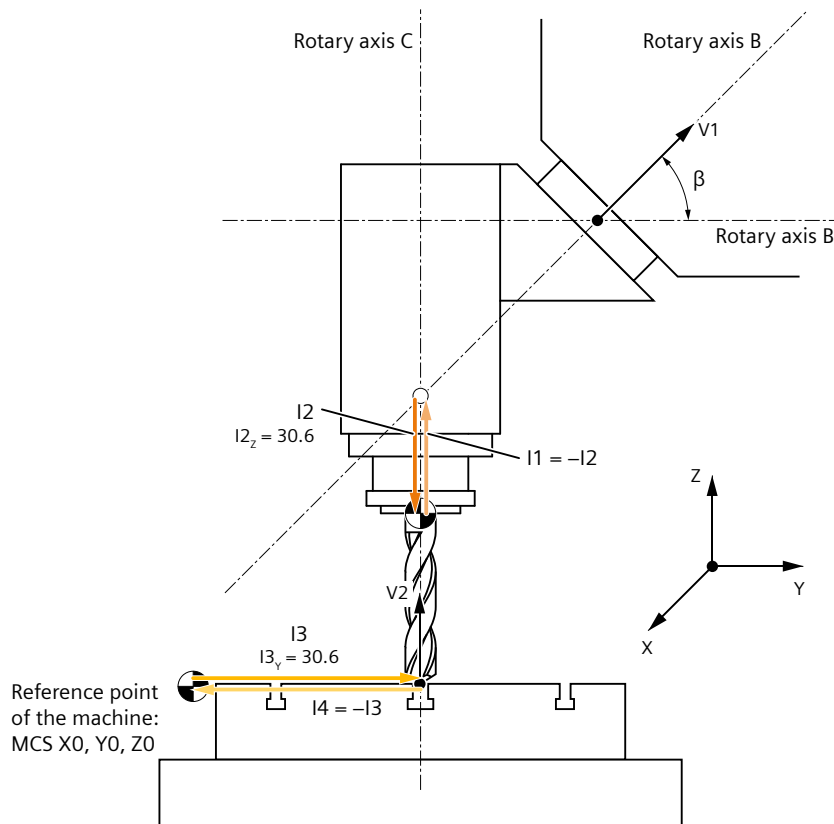


Figure 20-17 Vector offset SP1_OFFSET

Name	MIXED_45		
Enable	Yes		
Type	Swivel plane		
Kinematics			
Tool chain			
Start of tool chain	Z_AXIS		
Axis of rotation	B_AXIS		
Angle range		0.000°	180.000°
Hirth teeth	No		
Correction element	CORR_SP1_OFFSET		
End of tool chain	SP1_AXIS		
Close tool chain	Yes		
Workpiece chain			
Start of workpiece chain			
Correction element	CORR_C1_OFFSET		
Axis of rotation	C_AXIS		
Angle range		0.000°	360.000°
Hirth teeth	No		
End of workpiece chain	C_AXIS		
Close tool chain	Yes		
Properties			
Select retract			
• Machine axis Z			No
Select swivel mode			
• Axis-by-axis			Yes
Select prefer. direction			Yes, default=+
Reference axis pref. direction			Axis of rotation 1
Select tracking			No

Example 4b: Swivel head/rotary table "MIXED_45" with classic tool carrier

The vectors in the drawing refer to the initial setting of the kinematics. The spindle (tool adapter) is positioned on a gage block above the top edge of the table/center of the table (rotary axis C). A measuring rod in the spindle is used to determine the turning center of rotary table C.



Direction v1

Rotary axis B rotates around Y **and** around Z.

Direction v2

Rotary axis C rotates about Z.

Offset I2

The distance from the reference point of the tool adapter to the center of rotation/intersection of rotary axis 1.

Offset I1

Closure of vector chain, $I1 = -I2$.

Offset I3

The distance from the reference point of the machine to the center of rotation/intersection of rotary axis 2.

Offset I4

Closure of vector chain, $I4 = -I3$.

Figure 20-18 Side view of the machine

Name	MIXED_45		
Enable	Yes		
Type	Swivel plane		
Kinematics			
Head			
Offset I1	0.000000	0.000000	-30.000000
Fine offset I1	0.000000	0.000000	0.000000
Axis of rotation 1	B		

Mode	Automatic		
Direction v1	0.000000	1.000000 ¹⁾	1.000000 ¹⁾
Offset	0.000°		
Angle range	0.000°	180.000°	
Hirth teeth	No		
Offset I2	0.000000	0.000000	30.000000
Fine offset I2	0.000000	0.000000	0.000000
Table			
Offset I3	300.000000	150.000000	0.000000
Fine offset I3	0.000000	0.000000	0.000000
Axis of rotation 2	C		
Mode	Automatic		
Direction v2	0.000000	0.000000	-1.000000
Offset	0.000°		
Angle range	0.000°	360.000°	
Hirth teeth	No		
Offset I4	-300.000000	-150.000000	0.000000
Fine offset I4	0.000000	0.000000	0.000000

1) Calculation of rotary axis vector:

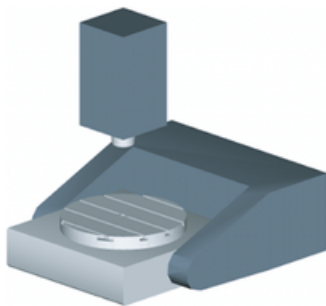
V1: $\beta = 45$ degrees

V1Y = $\sin(-45) = -0.7071$

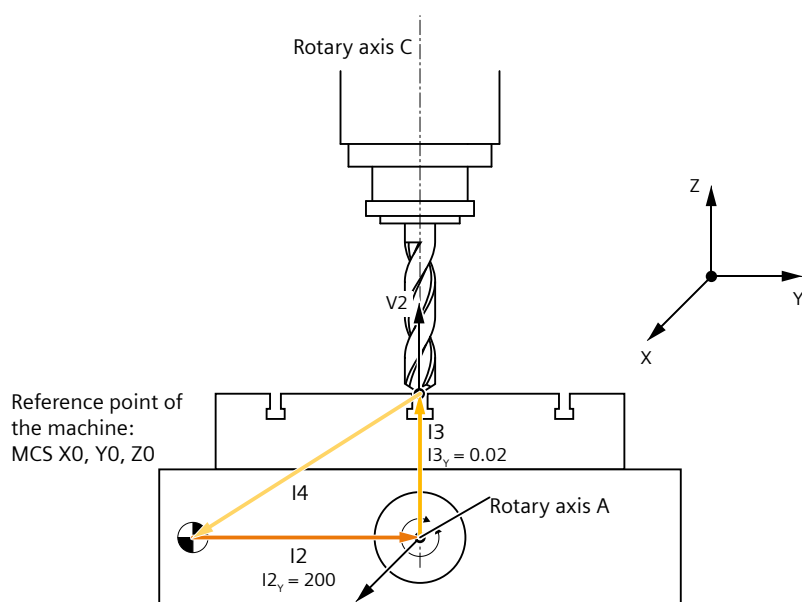
V1Z = $\cos(-45) = 0.7071$

V1Y and V1Z can be normalized to 1.

Example 5: Swivel table "Table_5" with classic tool carrier



The vectors in the drawing refer to the initial setting of the kinematics. The spindle (tool adapter) is positioned on a gage block above the top edge of the table/center of the table (rotary axis C). A measuring rod in the spindle is used to determine the turning center of rotary table C.



Direction v2

Rotary axis C rotates about Z.

Offset I2

The distance from the reference point of the machine to the center of rotation/intersection of rotary axis 1.

Offset I3

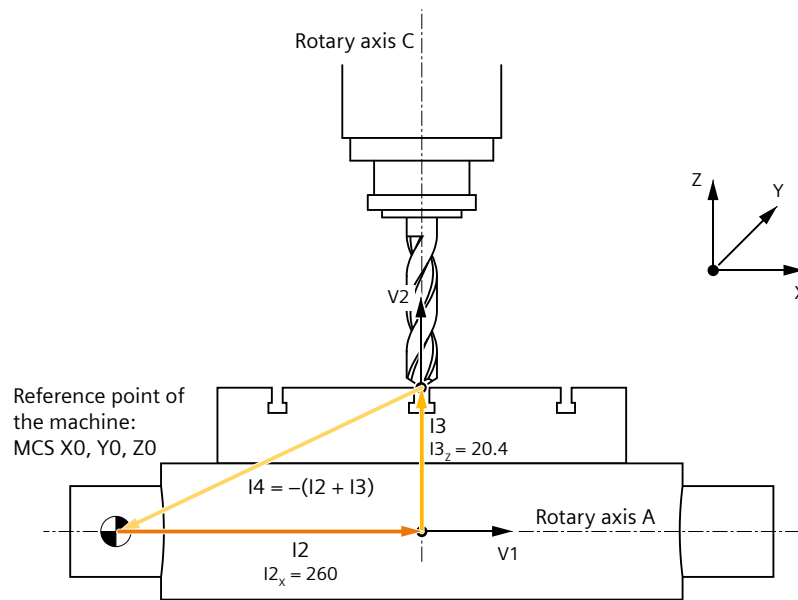
The distance from the center of rotation of rotary axis 1 to the center of rotation/intersection of rotary axis 2.

Offset I4

Closure of vector chain, $I4 = -(I2 + I3)$.

Figure 20-19

Side view of the machine from the X direction



Direction v1	The rotary axis A rotates about X.
Direction v2	Rotary axis C rotates about Z.
Offset I2	The distance from the reference point of the machine to the center of rotation/intersection of rotary axis 1.
Offset I3	The distance from the center of rotation of rotary axis 1 to the center of rotation/intersection of rotary axis 2.
Offset I4	Closure of vector chain, $I4 = -(I2 + I3)$.

Figure 20-20 Front view of the machine from the Y direction

Name	TABLE_5		
Enable	Yes		
Type	Swivel plane		
Kinematics			
Table			
Offset I2	260.000000	200.000000	0.000000
Fine offset I2	0.000000	0.000000	0.000000
Axis of rotation 1	A		
Mode	Automatic		
Direction v1	-1.000000	0.000000	0.000000
Offset	0.000°		
Angle range	-90.000°	-90.000°	
Hirth teeth	No		
Offset I3	0.000000	0.020000	20.400000
Fine offset I3	0.000000	0.000000	0.000000
Axis of rotation 2	C		
Mode	Automatic		
Direction v2	0.000000	0.000000	-1.000000
Offset	0.000°		

Angle range	0.000°	360.000°	
Hirth teeth	No		
Offset I4	-260.000000	-200.020000	-20.400000
Fine offset I4	0.000000	0.000000	0.000000

Example 6a: Setting up a turning machine with B axis (chain)

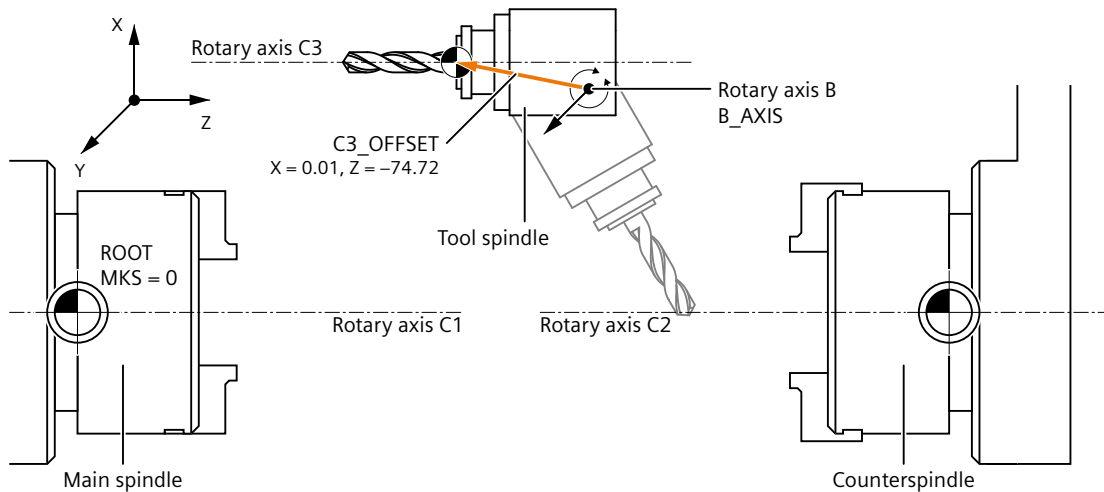


Figure 20-21 Turning machine with B axis

The example below relates to a turning machine with main spindle and counterspindle as well as B axis in the head.

The first step is to create the kinematic chain for this machine.

Schematic representation of the kinematic chain:

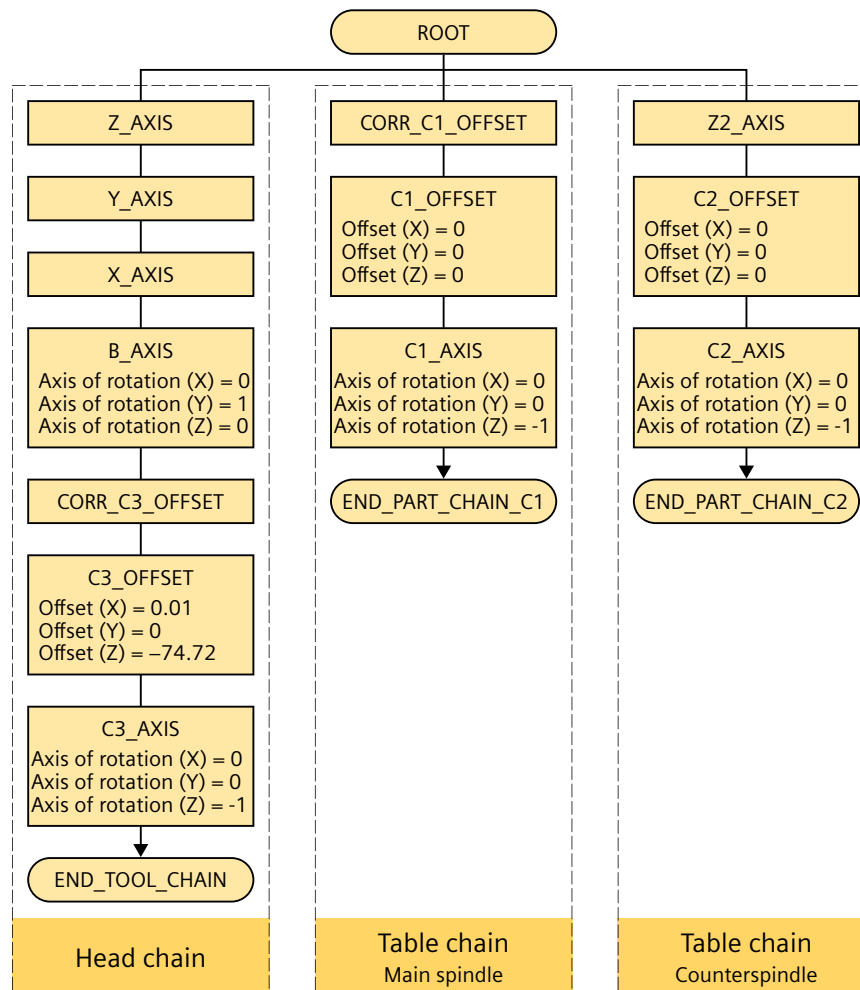


Figure 20-22 Schematic representation of the chain

Once the machine's kinematic chain has been created, various tool carriers can be created on this basis.

For turning machines with an additional rotary axis B, the tool can be aligned or swiveled on the X/Z plane. If the machine has a counterspindle, you can, for example, work with a tool alternating between the main spindle and counterspindle.

You can create the following tool carriers to use the "Align tool" and "Swivel plane" functions:

Tool carrier 1

For aligning and swiveling tools on the main spindle and counterspindle (Turning, Face Y/C, Surface Y/C):

Name			
Enable	Yes		
Type	Align turning tool		
Kinematics			
Tool chain			
Start of tool chain	Z_AXIS		

20.7 Swiveling

Axis of rotation	B_AXIS		
Angle range		-15.000°	195.000°
Hirth teeth	No		
Correction element			
Axis of rotation	C3_AXIS		
Angle range		0.000°	360.000°
Hirth teeth	No		
Correction element			
End of tool chain	SP1_OFFSET		
Close tool chain	Yes		
Properties			
Select retract			
• Machine axis Z			No
Select swivel mode			
• Axis-by-axis			Yes
Select prefer. direction			Yes, default=+
Reference axis pref. direction			Axis of rotation 1
Select tracking			No

When commissioning the "Align turning tool", the TEN THOUSANDS position in parameter \$TC_CARR37[n] must be set to 2 or 3 in swivel data set 1. This is the reason why in the program editor "Swivel tool → Align turning tool or milling tool" is listed for tool carrier 1.

For more information, see Chapter "Setting up a tool carrier/swivel data set (Page 477)"

Tool carrier 2

For machining inclined surfaces when milling on the main spindle (face B):

Name	TC_MAIN_SPINDEL		
Enable	Yes		
Type	Swivel plane		
Kinematics			
Tool chain			
Start of tool chain	Z_AXIS		
Axis of rotation	B_AXIS		
Angle range		-15.000°	195.000°
Hirth teeth	No		
Correction element	CORR_C3_OFFSET		
End of tool chain	C3_AXIS		
Close tool chain	Yes		
Workpiece chain			
Start of workpiece chain	CORR_C1_OFFSET		
Correction element	CORR_C1_OFFSET		
Axis of rotation	C1_AXIS		
Angle range		0.000°	360.000°
Hirth teeth	No		

End of workpiece chain	C1_AXIS		
Close workpiece chain	Yes		
Properties			
Select retract			
• Machine axis Z			No
Select swivel mode			
• Axis-by-axis			Yes
Select prefer. direction			Yes, default=+
Reference axis pref. direction			Axis of rotation 1
Select tracking			No

Tool carrier 3

For machining inclined surfaces when milling on the counterspindle (face B):

Name	TC_SUB_SPINDEL		
Enable	Yes		
Type	Swivel plane		
Kinematics			
Tool chain			
Start of tool chain	Z_AXIS		
Axis of rotation	B_AXIS		
Angle range		-15.000°	195.000°
Hirth teeth	No		
Correction element	CORR_C3_OFFSET		
End of tool chain	C3_AXIS		
Close tool chain	Yes		
Workpiece chain			
Start of workpiece chain	CORR_C2_OFFSET		
Correction element	CORR_C2_OFFSET		
Axis of rotation	C2_AXIS		
Angle range		0.000°	360.000°
Hirth teeth	No		
End of workpiece chain	C2_AXIS		
Close workpiece chain	Yes		
Properties			
Select retract			
• Machine axis Z			No
Select swivel mode			
• Axis-by-axis			Yes
Select prefer. direction			Yes, default=+
Reference axis pref. direction			Axis of rotation 1
Select tracking			No

The kinematic chain is created once and all requested tool carriers refer to the corresponding chain elements. If a value in the chain described in kinematic terms has to be changed, this is immediately effective for all tool carriers.

Example 6b: Setting up a turning machine with B axis (classic)

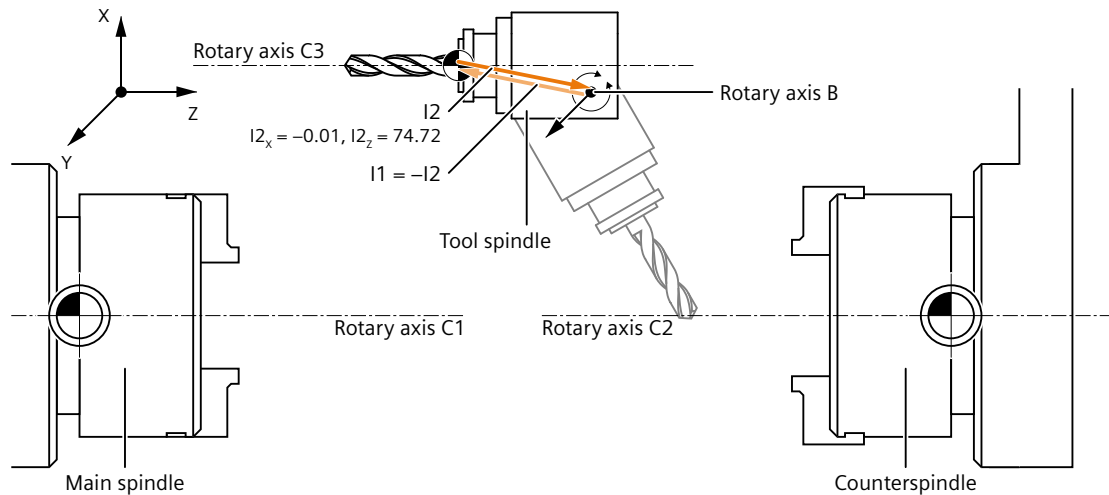


Figure 20-23 Turning machine with B axis

You can also create the following classic tool carriers to use the "Align tool" and "Swivel plane" functions:

Tool carrier 1

For aligning and swiveling tools on the main spindle and counterspindle (Turning, Face Y/C, Surface Y/C):

Name	TC_1		
Enable	Yes		
Type	Align turning tool		
Head			
Offset I1	-0.010000	0.000000	-75.070000
Fine offset I1	0.000000	0.000000	0.000000
Axis of rotation 1	B		
Mode	Automatic		
Direction v1	0.000000	1.000000	0.000000
Offset	0.000°		
Angle range	-15.000°	195.000°	
Hirth teeth	No		
Offset I2	0.010000	0.000000	75.070000
Fine offset I2	0.000000	0.000000	0.000000
Axis of rotation 2	C3		
Mode	Automatic		
Direction v2	0.000000	0.000000	1.000000

Offset	0.000°		
Angle range	0.000°	360.000°	
Hirth teeth	No		
Offset I3	0.000000	0.000000	0.000000
Fine offset I3	0.000000	0.000000	0.000000
Tool direction in initial setting			- Z
Properties			
Select retract			
• In tool direction, inc.			Yes
• In tool direction, max.			Yes
• Machine axis Z			
• Retract position Z			200
Select swivel mode			
• Axis-by-axis			Yes
Reference axis pref. direction			Axis of rotation 2
Select tracking			No

When commissioning the "B-axis kinematics turning", the TEN THOUSANDS position in parameter \$TC_CARR37[n] must be set to 2 or 3 in tool carrier 1. This is the reason why in the program editor "Swivel tool → Align turning tool or milling tool" is listed for tool carrier 1.

More information is provided in Chapter "Setting up a tool carrier/swivel data set (Page 477)"

Tool carrier 2

For machining inclined surfaces when milling on the main spindle (face B):

Name	TC_2		
Enable	Yes		
Type	Swivel plane		
Kinematics			
Head			
Fine offset I1	0.000000	0.000000	0.000000
Axis of rotation 1	B		
Mode	Automatic		
Direction v1	0.000000	1.000000	1.000000
Offset	0.000°		
Angle range	-15.000°	195.000°	
Hirth teeth	No		
Offset I2	0.010000	0.000000	75.070000
Fine offset I2	0.000000	0.000000	0.000000
Table			
Offset I3	0.000000	0.000000	0.000000
Fine offset I3	0.000000	0.000000	0.000000
Axis of rotation 2	C1		
Mode	Automatic		
Direction v2	0.000000	0.000000	-1.000000

20.7 Swiveling

Offset	0.000°		
Angle range	0.000°	360.000°	
Hirth teeth	No		
Offset I4	0.000000	0.000000	0.000000
Fine offset I4	0.000000	0.000000	0.000000
Tool direction in initial setting			- Z

Tool carrier 3

For machining inclined surfaces when milling on the counterspindle (face B):

Name	TC_3		
Enable	Yes		
Type	Swivel plane		
Kinematics			
Head			
Offset I1	-0.010000	0.000000	-75.070000
Fine offset I1	0.000000	0.000000	0.000000
Axis of rotation 1	B		
Mode	Automatic		
Direction v1	0.000000	1.000000	1.000000
Offset	0.000°		
Angle range	-15.000°	195.000°	
Hirth teeth	No		
Offset I2	0.010000	0.000000	75.070000
Fine offset I2	0.000000	0.000000	0.000000
Table			
Offset I3	0.000000	0.000000	0.000000
Fine offset I3	0.000000	0.000000	0.000000
Axis of rotation 2	C2		
Mode	Automatic		
Direction v2	0.000000	0.000000	-1.000000
Offset	0.000°		
Angle range	0.000°	360.000°	
Hirth teeth	No		
Offset I4	0.000000	0.000000	0.000000
Fine offset I4	0.000000	0.000000	0.000000
Tool direction in initial setting			- Z

Example 7: Configuring a milling machine with B axis for turning

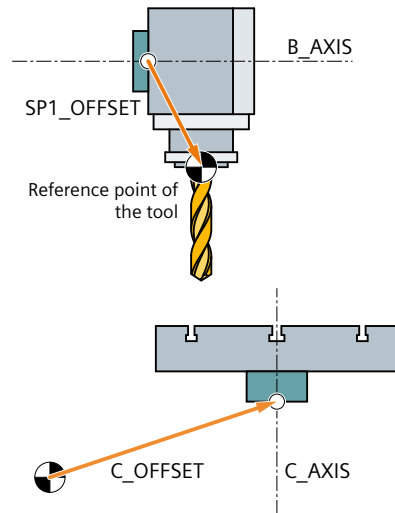


Figure 20-24 Milling machine with B axis for turning

You can configure a milling machine with a B axis (rotation around Y) so that turning is possible. To do so, turning is set up as an extended technology.

More information is provided in Chapter "Turning on milling machines (Page 526)"

The following example refers to a milling machine with a rotary axis around Y (B), a rotary axis around Z (C) and a main spindle (SP) in the tool direction Z (G17).

The following static transformation is created to use the "Align tool" functions.

A new transformation with 2 axes of rotation in the head and one in the table is created in the "Transformations" operating area:

TRAORI_STAT – static orientation transf. (turning)	
Number of rotary axes in tool chain	2
Number of rotary axes in workpiece chain	1

Figure 20-25 TRAORI_STAT dialog

Name	TURN_TRAFO		
Assignment to chain			
Tool chain			
Axis of rotation	B_AXIS		
Axis of rotation offset			0.000°
Correction element	CORR_SP1_OFFSET		
Axis of rotation	SP_AXIS		
Axis of rotation offset			0.000°
End of tool chain	SP_AXIS		
Close tool chain	Auto		

20.7 Swiveling

Workpiece chain			
Correction element	CORR_C2_OFFSET		
Axis of rotation	C_AXIS		
Axis of rotation offset			0.000°
Hirth teeth	No		
End of workpiece chain	C2_AXIS		
Close workpiece chain	Auto		
Linear axes			
Machine axis X	X_AXIS_LIN		
Machine axis Y	Y_AXIS_LIN		
Machine axis Z	Z_AXIS_LIN		
Properties (input screen form)			
Select retract			
• Machine axis Z			No
Select swivel mode			
• Axis-by-axis			Yes
Select prefer. direction			Yes, default=+
Reference axis pref. direction			Axis of rotation 1
Select tracking			No
Properties (transformation)			
Basic tool orientation			
Direction vector	0.000	0.000	1.000
Normal vector	0.000	1.000	0.000

The tool carrier can be created as follows for "Swivel plane" on the basis of the kinematic chain that has been created:

Name	MIX_BC		
Enable	Yes		
Type	Swivel plane		
Kinematics			
Tool chain			
Start of tool chain	Z_AXIS		
Axis of rotation	B_AXIS		
Angle range		-90.000°	90.000°
Hirth teeth	No		
Correction element	CORR_SP_OFFSET		
End of tool chain	SP_AXIS		
Close tool chain	Yes		
Workpiece chain			
Start of workpiece chain	CORR_C_OFFSET		
Correction element	CORR_C_OFFSET		
Axis of rotation	C_AXIS		

Angle range		0.000°	360.000°
Hirth teeth	No		
End of workpiece chain	C_AXIS		
Close workpiece chain	Yes		
Properties			
Select retract			
• Machine axis Z			No
Select swivel mode			
• Axis-by-axis			Yes
Select prefer. direction			Yes, default=+
Reference axis pref. direction			Axis of rotation 1
Select tracking			Yes

Parameter CUTMOD in CYCLE800

Distinction between calls:

- The CUTMOD NC function is activated when data set 2 is called in the NC program (CYCLE800 align turning tool). This means that the cutting edge position or the tool reference point is updated corresponding to the tool orientation:
- When calling a swivel data set for rotational operation in the NC program (CYCLE800 align tool), the CUTMOD NC function is activated. The cutting edge position, tool angle, cut direction and tool reference point are thus calculated in accordance with the current tool orientation following the "Align tool" function.

More information

A more detailed description of parameter CUTMOD is provided in the Function Manual Tools.

20.7.7 Manufacturer cycle CUST_800.SPF

Function

During swiveling, all axis positions are approached using the CUST_800.SPF cycle. The call is exclusively made from the swivel cycle CYCLE800 or from the cycles E_TCARR (ShopMill) or F_TCARR (ShopTurn).

In cycle CUST_800.SPF, the function marks (_M2: to _M59) are prepared and documented. Also refer to the following "Structogram CYCLE800".

There are extensions in the CUST_800.SPF cycle for the "Turning on milling machine" function, see Chapter "Adaptations for CUST_800 (Page 536)".

Note

If you modify the CUST_800, ensure that the G commands of the G groups used are restored at the end of the CUST_800 (versions S_G_1 to S_G_5!).

Parameter

CUST_800 (INT _MODE, INT _TC1, REAL _A1, REAL _A2, INT _TC2, REAL _T_POS)

_MODE	A jump is made to marks _M2 to _M59
_TC1	Number of the swivel head/table
_A1	Angle of rotary axis 1
_A2	Angle of rotary axis 2
_TC2	Feed evaluation in percent (%) for swiveling in JOG mode and number of the new swivel head/table when replaced in ShopMill
_T_POS	Incremental position during retraction in the incremental tool direction (see mark _M44, _M45)

Retract prior to swiveling

If the CUST_800.SPF cycle is not modified, the Z axis (mark _M41) or the Z axis followed by the X, Y axes (mark _M42) are first traversed in the Machine to the positions when retracting prior to swiveling. The freely available position values are specified in the system variables \$TC_CARR38[n] to \$TC_CARR40[n]. When retracting, the active tool cutting edge is deselected (D0) and is reselected after retraction.

If retraction in the tool direction has been declared, the tool axis is retracted to the software end position (maximum in tool direction) or by an incremental distance away from the tool in the tool direction. The tool lengths are taken into account accordingly.

Structure (coarse) of swivel cycles

Input screen form under ShopMill (ShopTurn)

Swivel plane	
TC	TC1
T	200
Retract	Z 1
Swivel	Yes
Swivel plane	New
X0	0.000
Y0	0.000
Z0	0.000
Swivel mode	Axis by axis
Sequence of axes	Z XY
Z	0.000
X	0.000
Y	0.000
X1	0.000
Y1	0.000
Z1	0.000
Direction	-
Tool	Do not track

Input screen form for CYCLE800 standard cycle

Swivel plane	
PL	G17 (XY)
TC	TC1
Retract	No
Swivel	Yes
Swivel plane	New
X0	0.000
Y0	0.000
Z0	0.000
Swivel mode	Axis by axis
Sequence of axes	Z XY
Z	0.000
X	0.000
Y	0.000
X1	0.000
Y1	0.000
Z1	0.000
Direction	-
Tool	Do not track

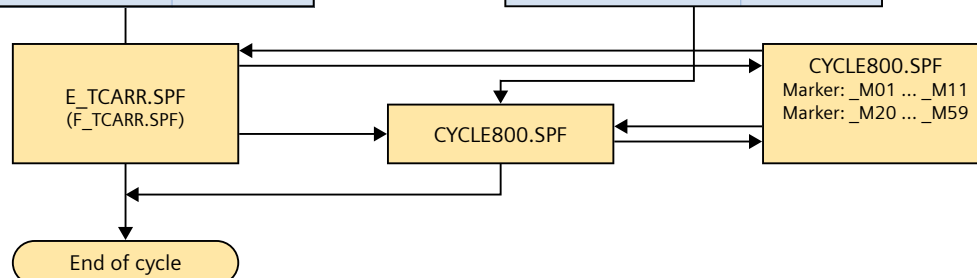


Figure 20-26 Structure (coarse) of swivel cycles

CYCLE800 structured chart

Sequence in AUTOMATIC mode

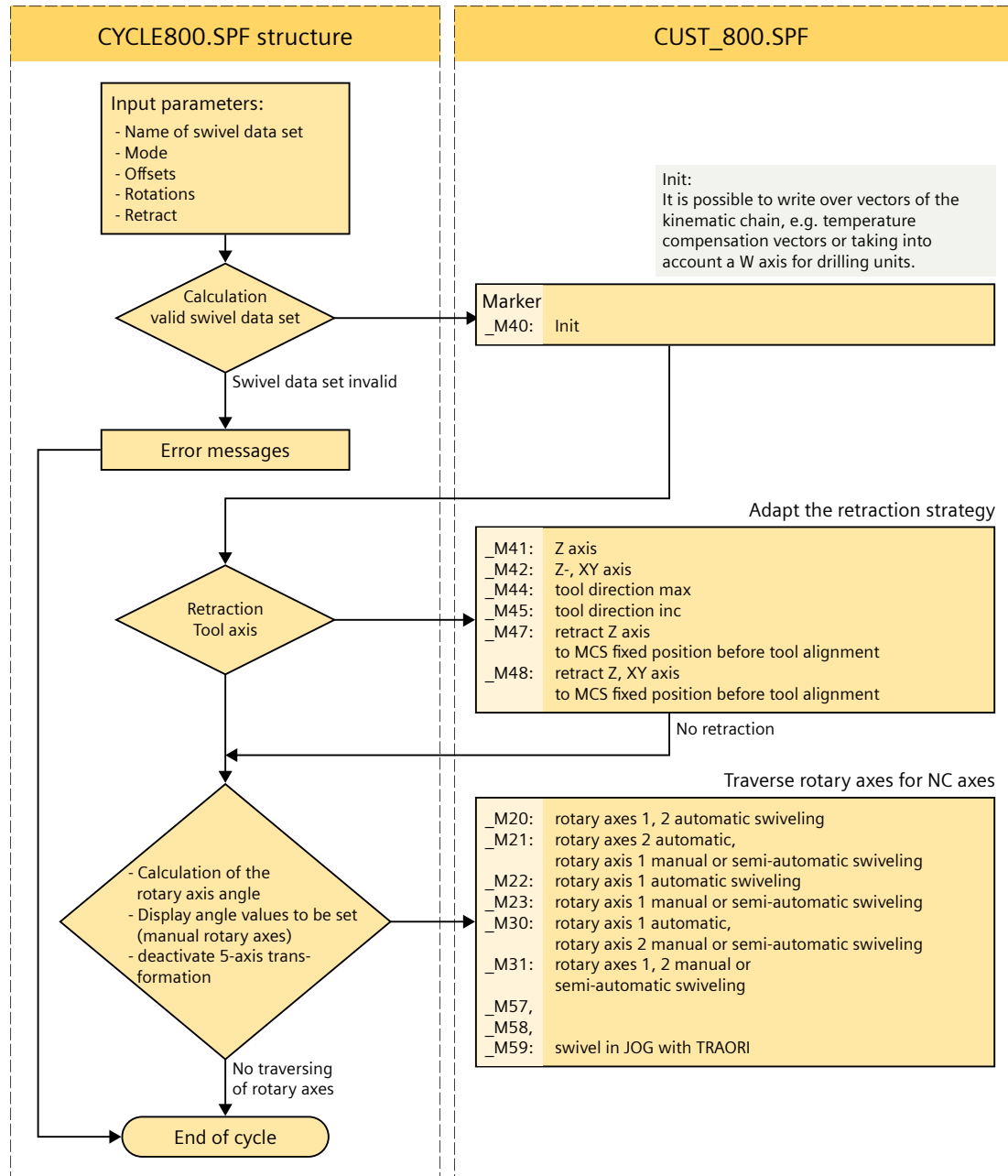


Figure 20-27 Structure: CYCLE800.SP / CUST_800.SP

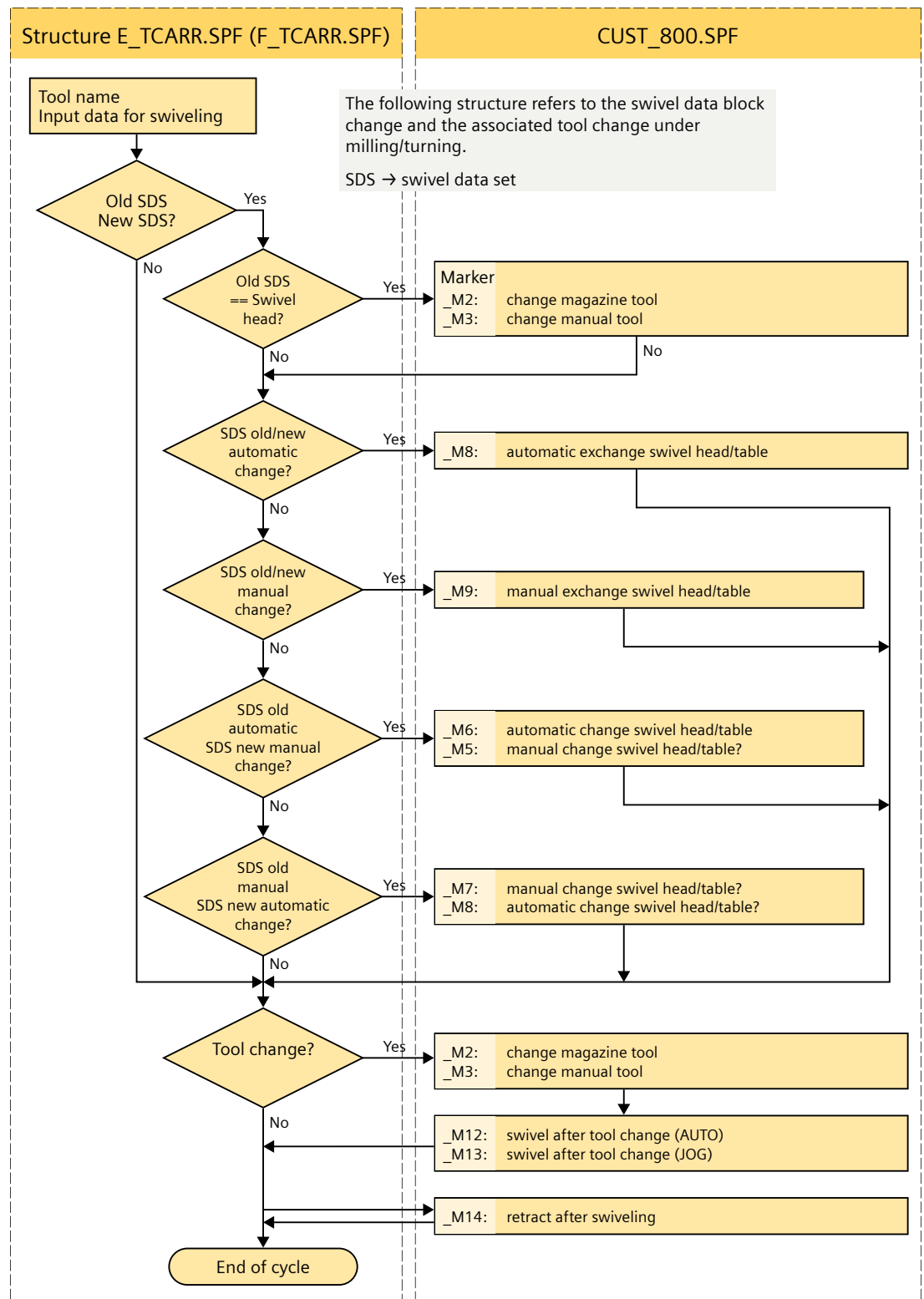


Figure 20-28 Structure: E_TCARR.SPF (F_TCARR.SPF) / CUST_800.SPF

Note on marks _M2 to _M13

When the swivel data set (SDS) or tool is changed, the linear axes are recovered using the last retraction mode (modal).

If this behavior is not desired in milling/turning, the corresponding calls must be commented out with a semicolon (;). The E_SWIV_H or F_SWIV_H cycle is called in milling/turning (see marks _M2 to _M9) in the CUST_800.SPF manufacturer cycle.

Parameter E_SWIV_H (Par1, Par2, Par3)

- Par1: Number of swivel data set (_TC1)
- Par2: Angle 1st rotary axis
- Par3: Angle 2nd rotary axis

Modification examples

If the rotary axes (swivel head/table) are not to be positioned during swivel data change/tool change, the call of the E_SWIV_H cycle can be commented out at the relevant marks. If the rotary axes are to move to a certain position, an angle value can be transferred to parameters Par 2, Par 3.

Note on marks _M14, _M15

Depending on the values of the retraction plane and the programmed swivel plane, it is possible that the linear axes now also travel the swiveled retraction plane while running up from the current position to the software limit switches after a block search. To avoid this problem, mark _M14 in the CUST_800.SPF is called after swiveling. The E_SP_RP(30) cycle preset there runs up to the milling retraction plane, whereby travel may be along the software limit switches. An appropriate retraction after block search can be set at mark _M15.

Note on the mark _M16

If for a swivel data set change or when de-selecting the swivel data set, you wish to traverse the rotary axes to zero, the syntax of the _M16 mark can be modified accordingly, e.g. activate block N8006 E_SWIV_H(_TC1,0,0).

Note on marks _M20 to _M31

Marks _M20 to _M31 are distinguished by machine kinematics with two rotary axes or one rotary axis. A distinction is also made between automatic rotary axes (known to the NCU) and manual (semi-automatic) rotary axes. There is only ever one valid mark for swiveling with the active swivel data set.

Note on mark _M35

Run through _M35 for block search and a swivel data set with manual rotary axes.

Note on mark _M40

This mark is called before the calculation and activation of the tool holder function as user initialization. This makes it possible for special kinematics, to calculate or rewrite the current vectors of the active swivel data set.

Boring mill application example: For parallel axes, the vector in the Z direction can be updated with the actual value of the W axis.

A STOPRE is integrated for this mark.

Manufacturers can test as to whether this STOPRE for mark M40 in CUST_800.spf complies with their functional requirements. In this case, one must weigh up between velocity (without STOPRE) and functionality for interrupt conditions (RESET) for a swivel plane. This also depends on the type of machine kinematics.

Note on marks _M41 to _M45 and _M47, _M48

At marks _M41 to _M45, the retraction strategy can be modified before the swiveling of the rotary axes and at marks _M47 and _M48 before the alignment of the tool.

The retraction to the MCS positions Z or Z, XY is made considering the tool length components without tool cutter deselection.

Note on marks _M41 and _M42

When retracting in Z or Z, XY with mixed swivel head kinematics, the NC takes account of the kinematics reference point. If the head is tilted, positions are approached that might deviate from the values of the retraction position \$TC_CARR38 to \$TC_CARR40.

If you do not wish to have such behavior, you can deactivate the tool carrier for the marks M41 and M42 when calculating the tool components.

Note

Reactivate the marks M41 and M42 when you have finished.

Example:

```
IF (_MODE==41) OR (_MODE==42) OR (_MODE==47) OR (_MODE==48)
```

```
  TCARR=0 ; deactivate tool carrier
```

```
  TRAFOOF
```

```
  ...
```

```
ENDIF
```

```
...
```

```
_M41; Retract axis Z to MCS fixed position
```

```
...
```

```
TCARR=_TC1 ; reactivate tool holder
```

```
GOTOF _MEND
```

```
_M42; Retract axis Z and then the XY axes to MCS fixed position
```

```
...
```

```
TCARR=_TC1 ; reactivate tool holder
```

```
GOTOF _MEND
```

Note on mark _M46

Retraction before swiveling after a block search can be set at mark _M46. Variable _E_VER is 1 if it is a milling technology program.

Note on marks _M57 to _M59

Marks _M57 to _M59 are used for swiveling in JOG mode and active 5-axis transformation (TRAORI).

Note on "Track tool"

"Track tool" requires that a 5-axis transformation is set up which is equivalent to the corresponding swivel data set. The programming section for "Track tool" is integrated in the marks _M20, _M21, _M22 and _M30. The first 5-axis transformation is called with TRAORI(1).

Note on tool change + swivel

In general, the swivel (CYCLE800) and tool change functions for a machine are independent of each other. Thus, the swiveled work plane can be retained in a technological sequence with multiple tools, e.g. centering, drilling, tapping.

If the rotary axes of the active swivel data set are involved in the mechanical sequence of the tool change or have to be retracted, this must be taken into account in the tool change program. After the tool change, the rotary axis positions are approached as prior to the tool change. If linear axes (geometry axes) are also involved in the tool change, the rotations in the NC (swivel frame) must not be deleted. Rather, the linear axes can be positioned as machine axes using the G153 or SUPA commands.

Note on swiveling without active tool compensation

If swiveling the rotary axes without active tool cutting edge (D0) is not possible, then you can adapt this in cycle CUST_800.SPF:

```
_M40:
IF ((NOT $P_TOOL) AND _TC1)
  LOOP
  MSG ("No tool cutting edge active")
  M0
  STOPRE
  ENDLOOP
ENDIF
GOTOF _MEND
```

20.7.8 Indirectly programming the name of the swivel data set

Function

The **_TC_CHANGE** GUD variable defined in the channel is a string with a length of 32. Using this variable, the user can determine before the **CYCLE800** call which swivel data set is called in the **CYCLE800**, irrespective of what is programmed in the call itself.

The **_TC_CHANGE** GUD variable is re-initialized with each **RESET**. At the end of the **CYCLE800**, the variable is also deleted. This means that the variable must be re-described before each new **CYCLE800** call.

The swivel data set is changed in the **CYCLE800** following the **CUST_800** jump to the **_M40** marker. This means that the variable can also be described in the **CUST_800**.

Programming example

```

N10 _TC_CHANGE="HEAD_2"
N20 CYCLE800(0,"HEAD_1",100000,57,0,0,0,0,0,0,0,0,0,0,-1,100,1)
N30 M0 ;* HEAD_2 is active

N40 _TC_CHANGE="HEAD_3"
N50 CYCLE800(0,"HEAD_1",100000,57,0,0,0,0,0,0,0,0,0,0,-1,100,1)
N60 M0 ;* HEAD_3 is active

N70 CYCLE800(0,"HEAD_1",100000,57,0,0,0,0,0,0,0,0,0,0,-1,100,1)
N80 M0 ;* HEAD_1 is active

N90 _TC_CHANGE="TABLE_2"
N100 CYCLE800(0,"TABLE_1",100000,57,0,0,0,0,0,0,0,0,0,0,-1,100,1)
N110 M0 ;* TABLE_2 is active
N120 M2

```

Note

The **_TC_CHANGE** variable must be re-described before each new **CYCLE800** call.

Programmed restrictions in the **CYCLE800**

The swivel data set named in **_TC_CHANGE** is checked for the following properties:

- The swivel data set to be activated must be enabled.
- The following parameters must match the swivel data set selected on the screen:
 - \$TC_CARR23 (swivel data set type)
 - \$TC_CARR37 (swivel mode, units digit)
 - \$TC_CARR37 (selection of follow-up, ten-thousands digit)
 - The mode set (Bit 6, 7) on the screen
(axis-by-axis/solid angle/projection angle/direct) to **TC_CARR37**

20.7.9 CYCLE9960 workpiece - Measurement of machine kinematic

Function

With the Measure kinematics function, it is possible to calculate the geometric vectors used to define the 5-axis transformation (TRAORI and TCARR) by measuring the position of the ball in space.

Measurement essentially involves scanning three to twelve positions of a measuring ball for each rotary axis with a workpiece probe. The ball positions can be defined in accordance with user specifications so that they correspond to the geometric ratios on the machine. The only way of setting the ball positions is to reposition the rotary axis that is to be measured in each case.

Application

The function Measurement of machine kinematic (CYCLE9960) allows the transformation-related data for kinematics transformations to be determined with included rotary axes TRAORI and TCARR.

Options:

- Redefinition of swivel data sets or kinematic chain
 - Commissioning the machine
 - Use of swivel-mounted workholders as TCARR
- Checking of swivel data sets or kinematic chain
 - Service following collisions
 - Checking the kinematics during the machining process

Kinematics with manual axes (manually adjustable rotary tables, swivel-mounted workholders) can be measured in the same way as kinematics with NC-controlled rotary axes.

When CYCLE9960 is started, a swivel data set with basic data (for kinematics type) must be parameterized.

If, in the setting data SD55740 \$MNS_MEA_FUNCTION_MASK bit 7 is set, then depending on the setting, the kinematics can be measured based on the calculated or based on the rotary axis vectors saved in the swivel data set.

Preconditions

The following preconditions must be met in order to use CYCLE9960 (measure kinematics):

- SIEMENS measuring cycles package is installed
- Workpiece probe is calibrated
- Calibration ball is mounted
- Tool carrier with orientation capability (MD18088 \$MN_MM_NUM_TOOL_CARRIER > 0) or kinematic chain is set up

- The basic geometry of the machine (X, Y, Z) is rectangular and referenced
The right angle refers to the workpiece spindle and should be preferably checked using a test mandrel.
- Defined position of the rotary axes involved in the transformation
- Defined traverse directions in compliance with the standard of all axes involved in the transformation according to ISO 841-2001 and/or DIN 66217 (righthand rule)
- Defined size of the log (protocol) file (MD11420 \$MN_LEN_PROTOCOL_FILE $\geq$ 20)

More information

The precise procedure when measuring and programming CYCLE9960, including examples, is provided in the

Programming Manual Measuring Cycles.

20.8 Turning on milling machines

You can set up the turning technology as an extended technology on milling machines. The operating software has all the setting options of a milling machine and a turning machine. For example, the rotary table can be set at a high speed for the turning of the workpiece. The turning tool is then clamped in the milling spindle and can be used in various positions.



Machine manufacturer

Please refer to the machine manufacturer's specifications.

20.8.1 Setting up machine data and setting data

Setting up parameters

Machine data

Set the following machine data to set up the technology:

MD10602 \$MN_FRAME_GEOAX_CHANGE_MODE	Frames when switching over geometry axes
= 1	The current complete frame is calculated again when the geometry axes are switched over, and the translations, scalings and mirrorings of the new geometry axes are effective. The rotations of the old geometry axes are retained.

MD18114 \$MN_MM_ENABLE_TOOL_ORIENT	Assign orientation to cutting edges
= 0	The tool orientation function is not active.
	- OR -
= 3	Each tool cutting edge D = m of tool T = n is assigned to the following system parameters: \$TC_DPV[n, m] and \$TC_DPV3 - \$TC_DPV5 \$TC_DPVN3[n, m], \$TC_DPVN4[n, m] and \$TC_DPVN5[n, m]

Note

If you use angular tools (type 130) with variable tool orientation, you require the setting MD18114 = 3.

MD51226 \$MNS_FUNCTION_MASK_SIM	Simulation function screen
Bit 5 = 1	Turning tool in tool spindle rotatable (for simulation)

MD51781 \$MNS_MEA_T_PROBE_THICKNESS	Tool probe thickness for the automatic approach of turning tools to the probe on milling/turning machines
= 0	Default value

MD20100 \$MC_DIAMETER_AX_DEF	Geometry axis with transverse axis function
=X	The machine data defines a geometry axis as transverse axis.

MD20110 \$MC_RESET_MODE_MASK	Definition of control initial setting after reset / end of part program
Bit 0 = 1	Default value for system

MD20112 \$MC_START_MODE_MASK	Definition of the basic control setting after part program start
Bit 7 = 0	The current setting for the active transformation is retained.

MD20124 \$MC_TOOL_MANAGEMENT_TOOLHOLDER	Tool holder number
= 1	Variable

MD20125 \$MC_CUTMOD_ERR	Alarm display for CUTMOD errors
= CFFFH	Display alarms for CUTMOD errors

MD20150 \$MC_GCODE_RESET_VALUES[21]	Initial setting of the G groups
= 2	Initial setting of G group 22 on CUT2DF

MD20150 \$MC_GCODE_RESET_VALUES[55]	Initial setting of the G groups
= 3	Initial setting of G group 56 TOWWCS

MD20152 \$MC_GCODE_RESET_MODE[21]	Reset behavior of the G groups
= 0	Reset behavior of G group 22

MD20152 \$MC_GCODE_RESET_MODE[55]	Reset behavior of the G groups
= 3	Reset behavior of G group 56 TOWWCS

MD20360 \$MC_TOOL_PARAMETER_DEF_MASK	Definition of the tool parameters
Bit 17 = 0	With CUTMOD for turning and grinding tools, the cutting edge for the calculation of the compensation values is not configured in the machining plane.
Bit 18 = 1	With CUTMOD for turning and grinding tools, always use the active plane for turning and grinding tools.
Bit 22 = 1	Consider tool wear with active kinematic transformation in real time.

MD21203 \$MC_LIFTFAST_MODE_MASK	Settings for fast lifting
Bit 0 = 1	This bit activates the monitoring of the direction for LIFTFAST for thread turning.

MD24030 \$MC_FRAME_ACS_SET	SZS coordinate system setting
= 1	SZS results from the WCS transformed with the \$P_CYCFRAME

MD35040 \$MA_SPIND_ACTIVE_AFTER_RESET[]	Reset behavior of the spindle
[Tool spindle] = 2	Do not stop tool spindle during jog → spindle is listed in the T,S,M screen
[Turning spindle] = 2	Do not stop turning spindle during jog → spindle is listed in the T,S,M screen

MD52001 \$MCS_DISP_COORDINATE_SYSTEM_2	Definition of the displayed directions in the user interface for turning operations (variable)
= 0	

MD52200 \$MCS_TECHNOLOGY	Technology
= 2	Milling

MD52201 \$MCS_TECHNOLOGY_EXTENSION	Extended technology
= 1	Turning

MD52206 \$MCS_AXIS_USAGE[]	Meaning of the axes in the channel
[Tool spindle] = 1	Tool spindle
[Turning spindle] = 3	Turning spindle

MD52207 \$MCS_AXIS_USAGE_ATTRIB[turning spindle]	Attributes of the axes
Bit 8 = 1	Offer rotary axis for blank clamping

MD52212 \$MCS_FUNCTION_MASK_Tech	General function screen for all technologies
Bit 10 = 1	Align the turning tool via kinematics transformation

MD52214 \$MCS_FUNCTION_MASK_MILL	Milling function screen
Bit 1 = 1	Offer fixed table for blank clamping

Note

Only set bit 1 in MD52214 when a fixed table is used in addition to a rotary table.

MD52780 \$MCS_J_MEA_T_PROBE_APPR_MODE	Approach mode for measuring a tool in JOG
= 0	Technology-dependent approaching of the tool probe (default value) Turning technology: Manual approach Milling technology: Automatic approach
= 1	Technology-independent approaching of the tool probe Manual approaching of the tool probe
= 2	Technology-independent approaching of the tool probe Automatic approaching of the tool probe

MD52242 \$MCS_TURN_TOOL_FIXING	Tool adapter for turning tools
= 0	Turning tools in tool spindle
= 1	Turning tools fixed on the tool headstock
= 2	Turning tools in the tool spindle or fixed on the tool headstock

Note

Depending on the set mounting alignment in MD52242, different parameters are available in the "Align Turning Tool" dialog.

Setting data

The following setting data is recommended. Set the setting data to set up the technology:

NOTICE	
Risk of collision	
Value changes of SD42940, SD42942 and SD42950 during the program execution can cause collisions. Only set the setting data during the commissioning.	

SD42935 \$SC_WEAR_TRANSFORM	Transformations for tool components
= 1	Orientation for milling tools: Standard G group 56: Observe or set TOWWCS

SD42940 \$SC_TOOL_LENGTH_CONST	Change of tool length components at change of plane
= 17	L1 = Z, L2 = Y, L3 = X

SD42942 \$SC_TOOL_LENGTH_CONST_T	Change of tool length components for turning tools at change of plane
= 19	L1 = Z, L2 = Y, L3 = X

Note

SD42942 is only evaluated after setting SD42950.

SD42950 \$SC_TOOL_LENGTH_TYPE	Assignment of the tool length offset independent of tool type
= 3	The assignment of the tool length components is performed separately for the turning and grinding tools (tool types 400 to 599) on the one hand and all other tools (milling tools) on the other hand.

SD42954 \$SC_TOOL_ORI_CONST_M	Change of tool orientation components for milling tools at change of plane
= 0	Orientation for milling tools: Standard

SD42956 \$SC_TOOL_ORI_CONST_T	Change of tool orientation components for turning tools at change of plane
= 18	Orientation for turning tools: G18

SD42998 \$SC_CUTMOD_PLANE_TOL	Difference between tool tip plane and machining plane
= 5	Maximum permissible difference for gamma of 0° to 180°

SD42999 \$SC_ORISOLH_INCLINE_TOL	Difference between tool tip plane and machining plane for ORISOLH
= 1	Maximum permissible inclination of the tool tip compared to the G18 plane for "Align tool directly"

In the following setting data, index [k] stands for the number of the current data field (probe number -1) of the probe.

SD54633 \$SNS_MEA_TP_TYPE[k]	Probe type, cube/disk
= 0	Compatibility (measuring cycles: cube, turning surface shows probe, milling surface shows disk)
= 3	Cube

SD54648 \$SNS_MEA_TPW_TYPE[k]	Probe version
= 0	Compatibility (measuring cycles: cube, turning surface shows probe, milling surface shows disk)
= 3	Cube

Additional settings

- Set the current zero point in the center point of the turning tool, e.g. via a settable zero offset.
- Change the tool before the "Align turning tool" cycle call.
- Program the tool in the part program for the simulation.

Note

No tool is active after the start of the simulation.

- After the "Align turning tool" cycle call, traverse the tool to $Y = 0$.
- Limit the maximum speed of the tool spindle, e.g. with the tool change cycle, in order to avoid too high a speed of the turning tool.
- The turning tools in the tool management are automatically set up by the system. You can make your own modifications in file sltmmillturnlistconfig.xml, for example, for the OEM tool list.

20.8.2 Setting up a kinematics transformation

In order to be able to use the turning on milling machines technology, at least one kinematics transformation must be set up for turning.

Precondition

A kinematic chain is already available for the machine.

More information

More information on kinematic elements is provided in the
Operating Manual Universal/Turning/Milling/Grinding.

Setting up parameters

Set the following machine data to set up the kinematics transformation technology:

MD18866 \$MN_MM_NUM_KIN_TRAFOS	Maximum number of NC transformation objects
≥ 1	This machine data specifies the maximum number of NC transformations that can be defined with kinematic chains (variable).

Setting up system variables

Use the following system variables to set up the kinematics transformation:

System variable	Meaning
\$NT_NAME[n]	Name of the transformation that appears on the user interface
\$NT_TRAFO_TYPE[n]	Transformation type for turning and milling machines: TRAORI_STAT
\$NT_T_CHAIN_LAST_ELEM[n]	Name of the chain element that describes the end of the chain in the direction of the tool
\$NT_P_CHAIN_LAST_ELEM[n]	Name of the chain element that describes the end of the chain in the direction of the workpiece
\$NT_GEO_AX_NAME[n, 0 - 2]	Names of the chain elements that describe the 1st to 3rd GEO axis (X, Y, Z)
\$NT_ROT_AX_NAME[n, 0 - 2]	Name of the chain element that describes the 1st to 3rd rotary axes (rotary indexing table, swivel axis, tool spindle)
\$NT_IDENT[n, 0 - 2]	Settings to adapt the screen form
\$NT_AUX_POS[n, 0 - 2]	Values for retraction in the direction of 1st to 3rd GEO axis (X, Y, Z) ¹⁾
\$NT_CNTRL[n]	Settings to adapt to the machine

n: Number of the transformation data set with n = 1, 2, 3, ... (MD18866 \$MN_MM_NUM_KIN_TRAFOS)

¹⁾ See manufacturer cycle CUST_800.SPF markers _M47 and _M48

Meaning of the decimal places of \$NT_IDENT[n, 0 - 2]

You can set the following display variants of the input screens for turning on milling machines:

Decimal place	Meaning
ONES	Selection of the alignment
	0 = Beta/gamma
	1 = Beta/gamma + direct alignment (B/SP)
THOUSANDS	Selection field: +/- direction reference of the swivel axis
	0 = No selection on the user interface, always minus
	4 = +/- selection via user interface, default: Minus
	5 = No selection on the user interface, always plus
	9 = +/- selection via user interface, default: Plus
TEN THOUSANDS	Selection box: Correct tool tip when swiveling
	2 = Do not list toggle
	3 = List toggle
ONE MILLION	Selection box: Retraction mode 0X and
TEN MILLION	Selection box: Retraction mode X0 (the permissible retraction modes result from the sum of the individual values: 0 ... 15)
	0 = No retraction
	1 = Retraction Z ²⁾
	2 = Retraction Z, XY ²⁾
	4 = Maximum retraction in tool direction
	8 = Incremental retraction in tool direction

Decimal place	Meaning
HUNDRED MILLION	Enable data set
	4 = Kinematics active (fixed value)

²⁾ See system variables \$NT_AUX_POS[n,0] to \$NT_AUX_POS[n,2]

Meaning of the bits of \$NT_CNTRL[n]

You can make the following settings for the machine adaptation:

Bit 0 = 1	Fixed sequence of axes For easier handling of the data, the sequence of the axes is fixed: 1. Rotary table 2. Swivel axis 3. Tool spindle
Bit 1 = 1	Rotary table is spindle
Bit 2 = 0	Swivel axis is not a spindle
Bit 3 = 0	Tool spindle is not a spindle (during turning)
Bit 4 = 0	1st rotary axis has no Hirth joint (rotary table) ³⁾
Bit 5 = 0	2nd rotary axis has no Hirth joint (swivel axis) ³⁾
Bit 6 = 0	3rd rotary axis has no Hirth joint (tool spindle) ³⁾

³⁾ It is not permissible that either the 2nd or the 3rd rotary axis has a Hirth joint.

20.8.3 Behavior at reset and power on

Behavior at reset

Make the following settings so that the kinematics transformation is retained after reset and the turning tool can be used in JOG mode:

MD20110 \$MC_RESET_MODE_MASK	Definition of the basic control setting after reset / part program end
Bit 7 = 1	The current setting for active transformation is retained after reset / part program end.
Bit 16 = 1	The current setting of the master spindle is retained.

MD20112 \$MC_START_MODE_MASK	Definition of the basic control setting after part program start
Bit 7 = 0	Start behavior, "active kinematics transformation"

MD20152 \$MC_GCODE_RESET_MODE[]	Reset behavior of G groups
[5] = 1	The current setting of the 6th G group is also retained after reset / part program end (G17, ...).

[14] = 1	The current setting of the 15th G group is also retained after reset / part program end (G94, ...).
[28] = 1	The current setting of the 29th G group is also retained after reset / part program end (DIAMxxx).

Behavior at power on

In order to retain the kinematics transformation after a power on, you must also make the following additional settings:

MD20144 \$MC_TRAFO_MODE_MASK	Selection of the kinematics transformation function
Bit 1 = 1	Reselection of the transformation after power-up

MD24008 \$MC_CHSFRAME_POWERON_MASK	Reset system frames after power on
Bit 4 = 0	Do not delete workpiece reference points after power on

Note

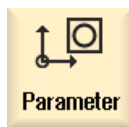
The CUTMODK function cannot be retained after power on.

20.8.4 Setting the tool clamping angle

If the clamped turning tool is not in the G18 plane at the spindle zero position, the clamping angle must be set.

For this, the position of the tool spindle must be entered as a clamping angle at which the tool is mechanically in the desired position.

Procedure



1. Select the "Parameter" operating area.
2. Press the "Tool list" softkey.
The "Tool List" window opens.
3. Select a suitable turning tool in the list.
4. Press the "Additional data" softkey.
The "Additional Data - ..." window opens.
The "Additional data" softkey is only active if a turning tool for which the "Additional Data" window is configured is selected.
5. Enter the required angle in the "Angle" input field.

Note

The clamping angle is stored in the \$TC_DPROT cutting edge parameter.

20.8.5 Setting up the Hirth joint

If the tool spindle or the swivel axis has a Hirth joint with, for example, incrementing of 2.5° (360°/2.5° = 144 division), you can set up the following:

Settings

MD30505 \$MA_HIRTH_IS_ACTIVE	Axis is indexing axis with Hirth joint
= 0	Tool spindle / swivel axis is not a real Hirth axis

MD30330 \$MA_MODULO_RANGE	Size of the modulo range
= 360°	Effective for modulo axis

MD30340 \$MA_MODULO_RANGE_START	Start position of the modulo range.
= 0°	

MD30501 \$MA_INDEX_AX_NUMERATOR	Indexing axis, numerator for equidistant positions
= 360°	Effective for non-modulo axis

MD30502 \$MA_INDEX_AX_DENOMINATOR	Indexing axis, denominator for equidistant positions
= 144	Defines the value of the denominator for calculation of the distances between two indexing positions for equidistant positions. For modulo axes, this is therefore the number of indexing positions.

Swivel axis has Hirth joint

\$NT_CNTRL[n]	
Bit 5 = 1	Swivel axis has a Hirth joint [n] transformation name

Tool spindle has Hirth joint

\$NT_CNTRL[n]	
Bit 6 = 1	Tool spindle has a Hirth joint [n] transformation name

20.8.6 Different coordinate systems for milling and turning

In boring mills, the rotary table usually rotates around the Y axis (B axis). During turning, the workpiece must rotate around the Z axis (C axis) in the G18 plane. Therefore, different coordinate systems must be used on this machine for milling and turning.

Settings

Set the appropriate coordinate system via the following channel-specific machine data (values, for example, for boring mills):

MD52000 \$MCS_DISP_COORDINATE_SYSTEM		Position of the coordinate system (variable)
= 16	Y up, Z to the right	

MD52001 DISP_COORDINATE_SYSTEM_2		Coordinate system for turning on milling machines (variable)
= 0	Z up, X to the right	

Describe the rotation of the coordinate system as follows at the _M70 marker in the CUST_800.SPF cycle:

```
_M70:                ; Rotation of the coordinate system for turning
N800703 $P_WPFRAME=$P_WPFRAME:CROT(Y,-90):CROT(X,-90)
```

20.8.7 Adaptations for CUST_800

Adapt these markers in the CUST_800.SPF cycle for turning on milling machines:

Function markers

```
_M40:                ; User Init
N800400 SETMS(1)      ; Sets tool spindle as main spindle
N800401 DIAMOF        ; No transverse axis defined as diameter
                     ; programming for milling

GOTOF _MEND

_M47:                ; Retract axis Z to MCS fixed position
                     ; before tool alignment
```

```

GOTOF _MEND

_M48:                                ; Retract axis Z and then the XY axes to
                                      MCS fixed position before tool alignment
GOTOF _MEND

_M70:                                ; Alignment tool: Prepare
IF($P_SMODE[1]==1)                  ; Spindle mode of tool spindle
N800700 SPOS[1]=0                    ; Tool spindle as rotary axis C
ENDIF
N800701 SETMS(2)                     ; Sets table as main spindle
N800702 DIAM90                       ; Transverse axis defined as diameter
                                      programming for turning
GOTO _MEND

_M71:                                ; Alignment tool: Swivel rotary axis
_AX1=$PC_TRAFO_ROT_CHAN_AX_IN[1]    ; Rotary axis B
_AX2=$PC_TRAFO_ROT_CHAN_AX_IN[2]    ; Tool spindle
IF(_TC_N_WZ==0)                     ; No tooltip tracking
N800710 TRAFOOF
ENDIF
SBLON
N800711 G0 G40 G60 G90 AX[_AX1]=_A1 AX[_AX2]=_A2
SBLOF
GOTOF _MEND

_M72:                                ; Alignment tool: End
GOTOF _MEND

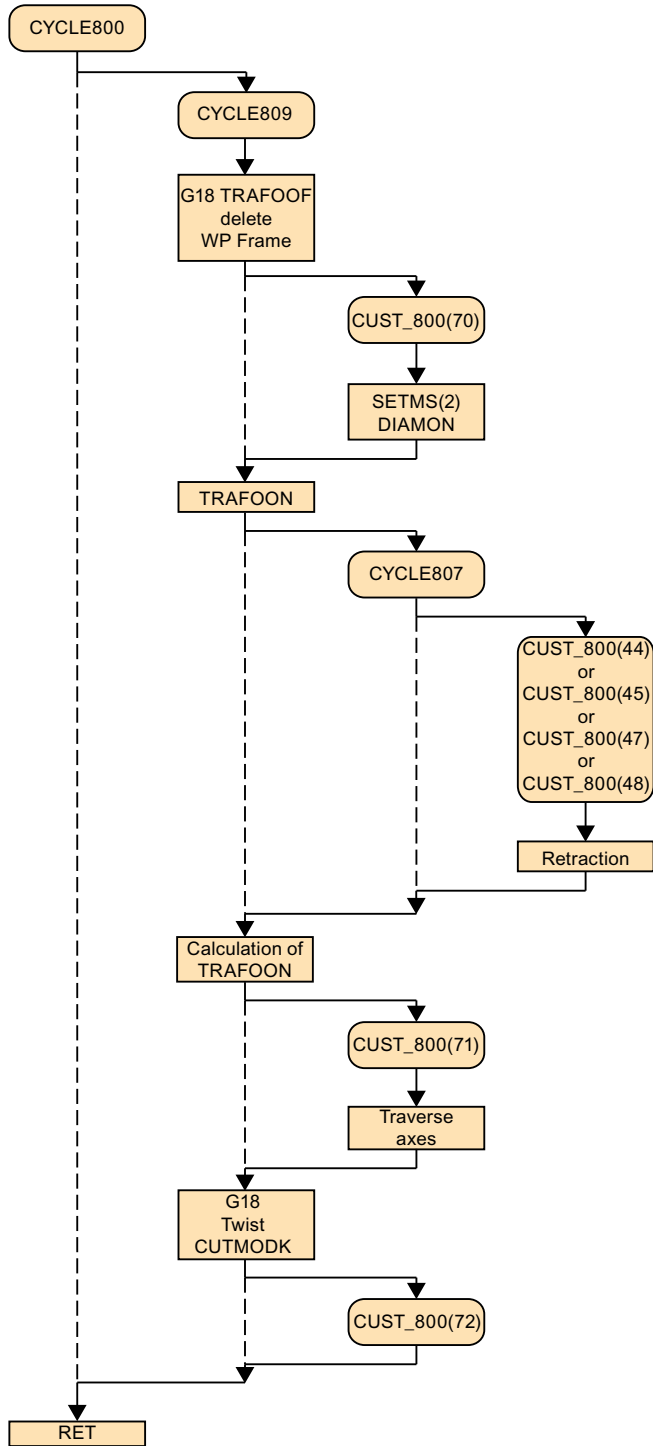
_M75:                                ; Alignment tool: Deselection
N800750 G17                          ; Standard plane for milling
N800751 SETMS(1)                     ; Sets tool spindle as main spindle
N800752 DIAMOF                       ; No transverse axis defined as diameter
                                      programming for milling
GOTOF _MEND

```

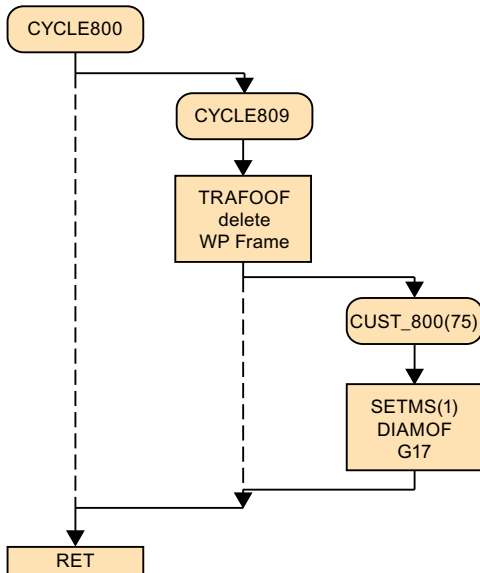
Simplified flow diagrams

During tool retraction, the markers _M44 to _M48 are run through before the rotary axis positioning in accordance with the retraction variant.

Align turning tool



Deselect turning



More information for swiveling with retraction to MCS fixed position is provided in Chapter "Manufacturer cycle CUST_800.SPF (Page 515)".

20.8.8 Rotary axis positioning during block search

After a block search, you must position the rotary axis as follows (refer to swivel plane). Generally, there are two rotary axes (swivel axis and tool spindle):

Procedure

Read out the position value of the rotary axis via the following system variable:

System variable	Meaning
\$AC_RETPOINT[axis]	Repositioning point in the ASUB

You position the rotary axis in the CYCPE_MA.SPF user cycle.

Note

So that the old rotary axis position is not swiveled in, start the block search in the G code program after the block for the turning tool alignment.

More information on CYCPE_MA.SPF is provided in Chapter "Extending the PROG_EVENT standard cycle (Page 423)".

If you have switched off the kinematics transformation, e.g. for a tool change, you can switch the transformation on again with the following program extension:

```
DEF STRING[32] U_TRAFO_NAME
U_TRAFO_NAME=$AC_TRAFO_NAME
TRAFOOF
...
TRAFOON (U_TRAFO_NAME)
```

20.8.9 Follow-up for rotary axis positioning after block search

The rotary axes must be positioned after a block search. If the positioning is done with follow-up, it is possible that the linear axes will reach the software limit switch. To prevent this, the positioning of the rotary axes is always done without follow-up by default.

Supplement for CYCPE1MA.SPF

If you nevertheless want to position the rotary axes with follow-up, you can supplement the following in the user cycle CYCPE1MA.SPF for example:

```
; Position rotary axes "with follow-up":
IF($P_PROG_EVENT==5) ; Block search
```

20.8 Turning on milling machines

```
IF($PC_TRAFO_TYPE_NAME=="TRAORI_STAT")
  IF(($NT_IDENT[$P_TRAFO_PARSET MOD 1000],0] _DEC5)>=2)
    _TC_N_WZ=1 ; Correct tool
    CUST_800(71,, $AC_RETPOINT[$PC_TRAFO_ROT_CHAN_AX_IN[1]],
      $AC_RETPOINT[$PC_TRAFO_ROT_CHAN_AX_IN[2]])
  ENDIF
ENDIF
ENDIF
```

20.9 Load-dependent controller setting

20.9.1 Adapt to load CYCLE782

Function

The workpiece and the clamping influence the dynamic response of the machine due to their moment of inertia. During axis movements, inaccuracies in workpiece machining can arise. Using cycle CYCLE782, you can automatically adapt the controller settings of the drive or the dynamic response parameters of the axes to a specific situation. In this way, you achieve faster and more accurate machining on the workpiece.



Software option

To use this function, you need the software option:
"Intelligent load adjustment"

Note

If the option "Intelligent load adjustment" is set, bit 20 is activated for MD19321 \$ON_TECHNO_FUNCTION_MASK_1 and the softkeys "Adapt to load" and "Adaptation" are displayed on the input mask.

Configuring the input mask form

Set the load response when opening the input mask using the following channel-specific machine data:

MD52212 \$MCS_FUNCTION_MASK_Tech		General function mask for all technologies
Bit 18	Enable determining the complete load: Axis empty + workpiece	
= 0	The selection separately determine load is enabled in cycle CYCLE782. The determined load value then only refers to the current workpiece. (default)	
= 1	The total load is determined in cycle CYCLE782. The determined load value corresponds to the sum of: Axis empty + workpiece.	

Further setting

MD53350 \$MAS_ILC_BASE_VALUE		Basic inertia of the axis
= 0	(default)	The result for ascertaining loading of the axis without workpiece is stored in this machine data. This value must be determined only once when commissioning the machine. It is required for support of the function Ascertain loading separately with CYCLE782.

Value output for linear axes

Loading can be determined or specified for linear and also for rotary axes. For linear axes, a mass, and for rotary axes, a moment of inertia is normally displayed in the measurement result display. For linear axes, however, the value display may differ depending on the drive type, e.g:

Drive of the linear axis	Value	Unit
Spindles or rotary axes	Moment of inertia	kgm ²
Rotary via ball screw, linear motor or gear	Loading	kg

Additional information

Additional information on using CYCLE782 and its program structure is provided under:

- Universal/Turning/Milling/Grinding Operating Manual
- NC Programming Programming Manual

20.9.2 CYCLE782: Help screens

For support, help screens are integrated in the input mask for cycle CYCLE782.

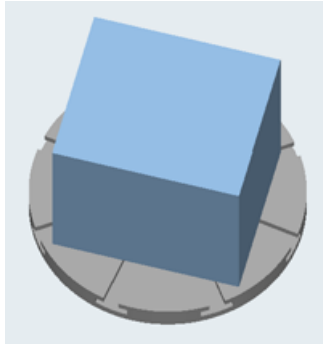
The help screens are correctly displayed in the input form if the following channel-specific machine data are set as appropriate for the machine configuration:

MD52206 \$MCS_AXIS_USAGE[n]	Meaning of the axes in the channel
MD52207 \$MCS_AXIS_USAGE_ATTRIB[n]	Attributes of the axes

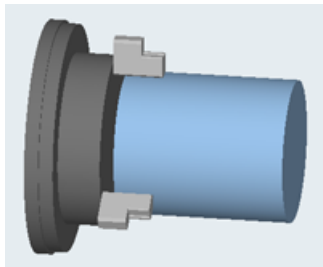
You will find a detailed description of MD52206 and MD52207 in Chapters "Setting the technology for simulation (Page 193)" and "Activating turning/milling/drilling/grinding technologies (Page 413)".

Auxiliary screens for axes

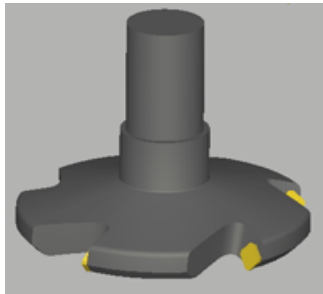
Depending on the type of axis, the following help screens are displayed, for example:



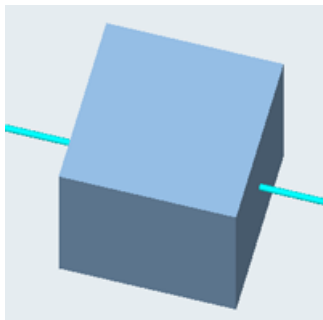
C axis



Main spindle



Tool spindle around Z



Linear axis

20.9.3 Manufacturer cycle CUST_782.SPF

Function

Cycle CUST_782 is called internally by CYCLE782 (determine the load). It is used to execute the required traverse distances and traverse conditions for determining the load. These are specific to the machine and must be set accordingly by the machine manufacturer.

Adapting manufacturer cycle CUST_782.SPF

You can execute the following actions with the aid of the _MODE parameter:

Marker	Action
_M1	Call at the start of CYCLE782
_M10	Go to starting position
_M11	Traverse movements for determining the load
_M12	Traverse movements for determining the friction
_M19	Go to end position
_M99	Call at the end of CYCLE782

Resetting value for the moment of inertia

Before each determination of the load, the moment of inertia last determined can be reset to a defined value in the CUST_782 movement profile by writing the following variables.

\$VA_RESET_INERTIA_TOTAL[ax]		Resetting the moment of inertia estimator
= -1	Reset moment of inertia and load	
= 0	No action (default when reading)	
= 1	Reset moment of inertia	
ax = axes in the system		

To ensure that the old moment of inertia does not have any influence on the new result, reset the last estimated moment of inertia prior to each new traversing with the parameterization = 1. This will allow the estimation results determined to be reproduced.

Should you wish to reset the estimated load torque at the same time (e.g. the friction force), use the parameterization = -1.

Note

System variable \$VA_RESET_INERTIA_TOTAL is only available for SINAMICS drives. It describes the SINAMICS parameter p1565.

Additional information

Additional information regarding the set parameters, commissioning and the boundary conditions for the axis functions is provided in:

- Function Manual SINAMICS S120 Drive Functions
- SINAMICS S120/S150 List Manual

20.10 High-speed machining free-form surfaces

20.10.1 High speed settings: Configuring CYCLE832

Function

The High Speed Settings function (CYCLE832) is used to preset data for the machining of freeform surfaces so that optimum machining is possible. The call of CYCLE832 contains three parameters:

- Tolerance
- Machining type (technology)
- Input of the orientation tolerance
The 3rd parameter is significant only for machines with multi-axis orientation transformation (TRAORI).

The High Speed Settings function (CYCLE832) offers, in addition to Advanced Surface, the extension Top Surface. Top Surface can be used to improve the quality of freeform surfaces. If set actively, the continuous-path control is optimized within contour tolerances. The CYCLE832 call also contains the smoothing parameter.



Software option

To use this function, you need the software option:
"Top Surface"

Setting up parameters

Set the following machine and setting data to set up the Top Surface extension:

SD55220 \$SCS_FUNCTION_MASK_MILL_TOL_SET		Function screen form High Speed Settings CYCLE832
Bit 2	Mold making function can be selected in High Speed Settings screen form	
= 0	The best available mold making function is automatically used: • Top Surface not active → Advanced Surface • Top Surface active → Top Surface	
= 1	The mold making function (Advanced Surface or Top Surface) can be selected in the input screen form.	
Bit 4	Display selection "Smoothing"	
= 0	Do not display selection "Smoothing" in the screen form (corresponds to smoothing = yes)	
= 1	Display selection "Smoothing" in the screen form	

MD52441 \$MCS_LIMIT_RES_PATH_SPEED		Limitation of the resulting velocity of the path motion
mm/min		

MD52441 \$MCS_LIMIT_RES_PATH_SPEED can be used to limit or reduce the speed of the path movement resulting from the axial limitation values in critical program sections.

The resulting path velocity is limited to the value specified in the machine data. No limitation takes effect with the value 0.

Furthermore, limitation is deactivated upon deselection of CYCLE832 or upon reset or end of part program.

Axis/contour tolerance

The distinguishing feature between "Advanced Surface" and "Top Surface" functions is as follows:

For "Advanced Surface", the axis tolerance for the linear axes (geometry axes) is transferred to the CNC with the NC command CTOL.

$CTOL = \sqrt{3} * \text{Axis tolerance}$

For "Top Surface", the contour tolerance is transferred to the CNC with the NC command CTOL.

Tolerance value = 0: Tolerance value (CTOL) is loaded from the following setting data:

Example: CYCLE832(0,_ROUGH,1) → tolerance value from SD55446 is used.

SD55446 \$SCS_MILL_TOL_VALUE_ROUGH	Tolerance value for roughing CYCLE832
SD55447 \$SCS_MILL_TOL_VALUE_SEMIFIN	Tolerance value for semi-finishing CYCLE832
SD55448 \$SCS_MILL_TOL_VALUE_FINISH	Tolerance value for finishing CYCLE832
SD55449 \$SCS_MILL_TOL_VALUE_PRECISION	Tolerance value for smooth-finishing CYCLE832



Software option

To use the contour tolerance, you require the software option:

"Top Surface"

Orientation tolerance

If rotary axes are involved in the machining (multi-axis transformation), the orientation tolerance value is transferred to the CNC with the NC command OTOL.

There are 2 options available for this:

1. Direct entry of the orientation tolerance OTOL

Machining types: _ORI_ROUGH, _ORI_SEMIFIN, _ORI_FINISH _ORI_PRECISION

To enter the orientation tolerance in the input screen form for CYCLE832,

SD55220 \$SCS_FUNCTION_MASK_MILL_TOL_SET Bit 1=1 must be set in the setting data.

The standard values for the orientation tolerance are stored in the following setting data:

SD55451 \$SCS_MILL_ORI_TOL_ROUGH	Orientation tolerance value for roughing CYCLE832
SD55452 \$SCS_MILL_ORI_TOL_SEMIFIN	Orientation tolerance value for rough-finishing CYCLE832
SD55453 \$SCS_MILL_ORI_TOL_FINISH	Orientation tolerance value for finishing CYCLE832
SD55454 \$SCS_MILL_ORI_TOL_PRECISION	Orientation tolerance value for smooth-finishing CYCLE832

2. Tolerance is transferred with a factor on the NC command OTOL.

$OTOL = \text{Tolerance} * \text{Factor} * \sqrt{2}$

Machining types: _ROUGH, _SEMIFIN, _FINISH, _PRECISION

This factor can be set in the following channel-specific setting data for each machining type:

SD55441 \$SCS_MILL_TOL_FACTOR_ROUGH	Factor, tolerance of the rotary axes for roughing of the G group 59.
SD55442 \$SCS_MILL_TOL_FACTOR_SEMIFIN	Factor, tolerance of the rotary axes for semi-finishing of the G group 59.
SD55443 \$SCS_MILL_TOL_FACTOR_FINISH	Factor, tolerance of the rotary axes for finishing of the G group 59.
SD55444 \$SCS_MILL_TOL_FACTOR_PRECISION	Factor, tolerance of the rotary axes for smooth-finishing of the G group 59.
= 10	

Example: Multi-axis transformation, SCS_MILL_TOL_FACTOR...=10

	CTOL	OTOL
CYCLE832(0.1,_ROUGH,1)	$0.1 * \sqrt{3}$ = 0.173	$0.1 * \sqrt{2} * \text{Factor}$ = 1.414
CYCLE832(0.05, TOP_SURFACE_SMOOTH_ON+_SEMIFIN,1)	0.05	$0.05 * \sqrt{2}$ * Factor = 1.414
CYCLE832(0.05, TOP_SURFACE_SMOOTH_ON+_ORI_SEMIFIN,0.3)	0.05	0.3

Smoothing

For the "Top Surface" function, smoothing can be switched off via CYCLE832. The setting data SD55220 \$SCS_FUNCTION_MASK_MILL_TOL_SET Bit 4=1 must be set for this purpose.

Mold-making function	Plain text
Top Surface without smoothing	TOP_SURFACE_SMOOTH_OFF+
Top Surface with smoothing	TOP_SURFACE_SMOOTH_ON+

Machining type and technology G group 59

The machining types of the technology G group 59 are permanently assigned in CYCLE832 or in CUST_832.SPF:

Machining type	Plain text	Technology G group 59	Array index
Deselection	_OFF	DYNNORM	0
Roughing	_ROUGH	DYNROUGH	2
Semi-finishing	_SEMIFIN	DYNSEMIFIN	3
Finishing/speed	_FINISH	DYNFINISH	4
Smooth-finishing/Precision	_PRECISION	DYNPREC	5
Roughing *)	_ORI_ROUGH	DYNROUGH	2
Semi-finishing *)	_ORI_SEMIFIN	DYNSEMIFIN	3
Finishing/speed *)	_ORI_FINISH	DYNFINISH	4
Smooth-finishing/Precision *)	_ORI_PRECISION	DYNPREC	5

*) With entry of an orientation tolerance

Dynamic parameters can be adapted to the respective machining operation with the technology G groups. Using the commands of technology G group 59, the value of channel and axis-specific machine data of the dynamic path response is activated using the corresponding **array index**.

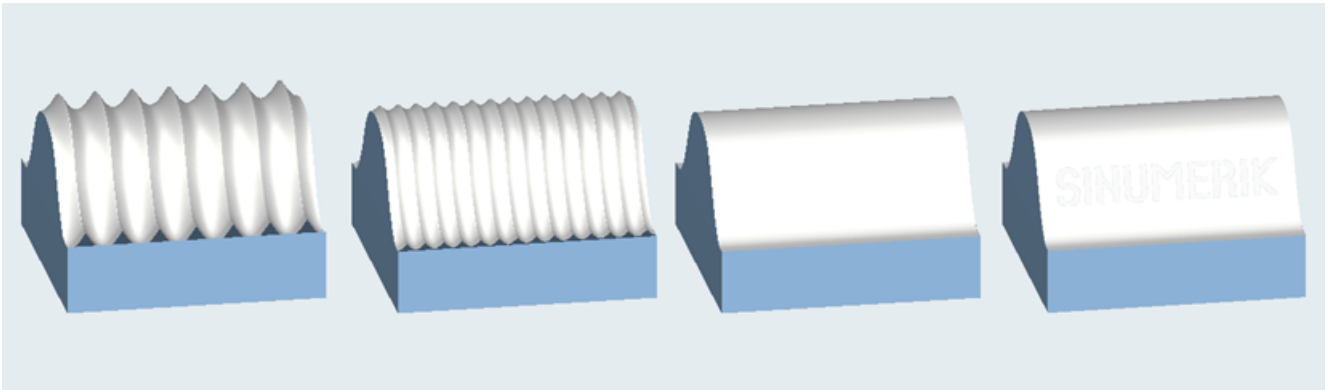


Figure 20-29 Roughing, rough-finishing, finishing or smooth-finishing

More information

More information regarding the dynamic response mode for path interpolation is provided in the Function Manual Basic Functions.

The setting instructions for Advanced Surface/Top Surface are available at the following address (<https://support.industry.siemens.com/cs/document/109738423/sinumerik-828d-840d-sl-check-programs-for-advanced-surface-top-surface-settings?dti=0&lc=en-WW>).

Machining type, deselection

When CYCLE832 is deselected, the G groups are programmed for the settings during the program run time; these settings are declared in machine data MD20150 \$MC_GCODE_RESET_VALUES[]. This involves the G groups 1, 4, 10, 12, 21, 24, 30, 45, 59, 61.

The contour and orientation tolerance is deactivated (CTOL=-1, OTOL=-1).

20.10.2 Manufacturer cycle CUST_832.SPF**Function**

In contrast to the settings (G functions) by CYCLE832.SPF, these settings can be modified in the manufacturer cycle CUST_832.SPF.

The following markers are prepared in CUST_832.SPF:

<code>_M_INIT:</code>	Initialization _FGREF
<code>_M_NORM:</code>	For deselection _OFF CYCLE832
<code>_M_TOP_SURFACE_PRECISION:</code>	Processing precision finishing _PRECISION and _ORI_PRECISION with COMPSURF
<code>_M_TOP_SURFACE_FINISH:</code>	Processing finishing _FINISH and _ORI_FINISH with COMPSURF
<code>_M_TOP_SURFACE_SEMIFINISH:</code>	Processing semi-finishing _SEMIFIN and _ORI_SEMIFIN with COMPSURF
<code>_M_TOP_SURFACE_ROUGH:</code>	Processing roughing _ROUGH and _ORI_ROUGH with COMPSURF
<code>_M_FINISH:</code>	For finishing _FINISH and _ORI_FINISH with COMPCAD
<code>_M_SEMIFINISH:</code>	For semi-finishing _SEMIFIN and _ORI_SEMIFIN with COMPCAD
<code>_M_ROUGH:</code>	For roughing _ROUGH and _ORI_ROUGH with COMPCAD

The following G functions are programmed in CUST_832.SPF:

```
SOFT
COMPCAD / COMPSURF
G645
FIFOCTRL
UPATH
;FFWON
```

The calculation of the FIR lowpass jerk filter is explicitly activated using the CALCFIR instruction:
;CALCFIR

Depending on the machining type used, the following G commands of G group 59 are programmed:

```
DYNNORM
DYNPREC
DYNFINISH
DYNSEMIFIN
DYNROUGH
```

The programming of FGREF () is useful when machining with active multi-axis transformation (e.g. TRAORI). In this case, in CUST_832.SPF, variable _FGREF is pre-assigned a value of 10 mm. This value can also be modified. In CYCLE832.SPF, the value of variable _FGREF is written to the rotary axes involved in the machining, which are declared as orientation axis of a 5-axis transformation, using the FGREF (rotary axis) command. When G70/G700 is active, the value from _FGREF is converted into inches before writing to the command FGREF.

More information

More information about the CALCFIR instruction is provided in the:

- Programming Manual NC Programming
- Function Manual Axes and Spindles

Including fewer than three rotary axes (geometry axes) in CYCLE832

With Advanced Surface, the CYCLE832 converts an axis tolerance internally into a contour tolerance because the NC can only work with a contour tolerance CTOL, e.g.:

$\text{CYCLE832}(0.01, \text{_Rough}, 1) \rightarrow \text{CTOL} = 0.01 * \sqrt{3} = 0.0173$

The NC is always set so that a contour is created with CTOL and three geometry axes. If fewer than three geometry axes are configured in the channel, CUST_832 CTOL must be adjusted so that a correct contour is also produced with two geometry axes. The value is displayed on the user interface.

Including more than two rotary axes (orientation axes) in CYCLE832

In CYCLE832, a maximum of two rotary axes of the orientation transformation (TRAORI) are taken into account for FGREF. If more than two rotary axes are declared per channel for the orientation transformation, you can write the value to FGREF using the following syntax in the CUST_832:

`FGREF[AA]=$AA_FGREF[C]`

C = rotary axis 1 (axis is taken into account by CYCLE832)

AA = rotary axis 4

In the manufacturer cycle CUST_832.SPF, parameter _MOTOL is available for the evaluation of the "Multi-axis programming yes/no".

`_MOTOL=0`

No multi-axis programming

`_MOTOL=1`

Multi-axis programming where the orientation tolerance is entered

With the following setting data, additional G functions can be programmed in CUST_832.SPF for using multi-axis programming:

SD55220 \$SCS_FUNCTION_MASK_MILL_TOL_SET		Function screen form High Speed Settings CYCLE832
Bit 1	Orientation tolerance (OTOL) as a factor of the tolerance (CTOL) or directly entered	

Example

Using `_MOTOL` in `CUST_832.SPF` for the marker for finishing:

```
_M_FINISH:
IF _MOTOL==1           ; if multi-axis programming
    ORISON
ELSE                   ; no multi-axis programming
    ORISOF
ENDIF
...
```

Including more than one transformation in CYCLE832

The following evaluation of the machine data and system variables is possible with `CYCLE832` to determine the transformation of the `TRAORI` type used and its rotary axes:

- No transformation configuration with `$MC_TRAFO_TYPE`, none with `$NT_NAME` ⇒ unique
- One transformation configuration with `$MC_TRAFO_TYPE`, none, one or more with `$NT_NAME` ⇒ the transformation with `$MC_TRAFO_TYPE`
- Two transformation configurations with `$MC_TRAFO_TYPE`, none, one or more with `$NT_NAME` ⇒ the second transformation with `$MC_TRAFO_TYPE`
- No transformation configuration with `$MC_TRAFO_TYPE`, one with `$NT_NAME` ⇒ unique
- No transformation configuration with `$MC_TRAFO_TYPE`, several with `$NT_NAME` ⇒ the last (highest index) transformation with `$NT_NAME`

Note

If an active transformation is to be performed in mold making, for example, this transformation must be activated prior to the `CYCLE832`.

20.11 Measuring cycles and measurement functions

20.11.1 Measuring cycles and measurement functions, general

Precondition

Two types of electronic probes are used for measuring:

- Probe to measure the workpiece
- Probe to measure the tool

The electronic probe must be connected to the NCU 7x0.

More information

More information about the digital inputs and outputs of the measuring probe is provided in the NCU Equipment Manual.

Note

In the NCU Equipment Manual, the electronic measuring probe is just called measuring probe.

Setting the switching behavior

You set the electrical polarity of the connected probe using the following general machine data:

MD13200 \$MN_MEAS_PROBE_LOW_ACTIVE		Polarity change of the probe
= 0	Probe in the non-deflected state, 0 V default value Probe in the deflected state, 24 V	
= 1	Probe in the non-deflected state, 24 V Probe in the deflected state, 0 V	

MD13210 \$MN_MEAS_TYPE		Measuring type for distributed drives
= 0	Default value	

Testing the probe function

You can test the switching function of the probe by manually deflecting it and checking the following PLC interface signals:

DB 10								
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
DDB107							Probe actuated	
							Probe 2	Probe 1

20.11 Measuring cycles and measurement functions

To test the switching behavior and the measured value transfer, use an NC test program with, for example, the following NC commands:

MEAS	Measurement with deletion of distance-to-go
\$AC_MEA[n]	Check the switching operation, n = measurement input number
\$AA_MW[axis name]	Measured value of the axes in workpiece coordinates
\$AA_MM[axis name]	Measured value of the axes in machine coordinates

Example of a test program

Program code	Comment
% _N_PRUEF_MESSTASTER_MPF	
\$PATH=/_N_MPF_DIR	;Testing program probe connection
N00 DEF INT MTSIGNAL	;Bit memory to check the switching state
N05 G17 G54 T="3D_Taster" D1	;Select tool geometry for probe
N10 M06	;Activate tool
N15 G0 G90 X0 F150	;Starting position and meas. velocity
N20 MEAS=1 G1 X100	;Measurement at measuring input 1 in the X axis
N30 MTSIGNAL=\$AC_MEA[1]	;Switching operation at the 1st measuring input completed, ;YES / NO
N35 IF MTSIGNAL == 0 GOTO _FEHL1	;Evaluation of the signal
N40 R1=\$AA_MM[X]	;Save measured value in machine coordinates at R1
N45 R2=\$AA_MW[X]	;Save measured value in workpiece coordinates at R2
N50 M0	;Check measured value in R1/R2
N55 M30	
N60 _FEHL1: MSG ("Probe does not switch!")	
N65 M0	
N70 M30	

General function settings for measuring cycles

MD51740 \$MNS_MEA_FUNCTION_MASK		Function screen form measuring cycles
Bit 0	Workpiece, monitoring the calibration status	
Bit 1	Workpiece, length reference of the probe in the infeed axis with relation to the sphere circumference	
= 0	Tool length L1, referred to the center of the probe sphere	
= 1	Tool length L1, referred to the sphere circumference of the probe sphere	
Bit 2	Workpiece, offset into tool, tool carrier taken into account	
Bit 4	Workpiece, probe permanently affixed to the machine (not in a spindle)	
Bit 5	Workpiece, coarse offset in WO if no fine WO has been set up	
Bit 6	Measuring blocks in the measuring cycles with feed override 100%	
Bit 7	Workpiece, accept active into inactive WO, JOG mode only, set edge	

Bit 14	Workpiece, simultaneous measurement function active
Bit 15	Workpiece, traverse measuring block with path behavior G60
Bit 16	Tool, turning technology, consideration of tool carriers

Note

After changing this machine data, the probe must be re-calibrated.

MD52740 \$MCS_MEA_FUNCTION_MASK	Function screen form measuring cycles
Bit 0	Workpiece probe connected to measurement sensing input 2
= 0	Workpiece probe at the CNC measuring input 1, active - default
= 1	Workpiece probe at the CNC measuring input 2, active
Bit 1	Workpiece, turning technology, measuring in the third geometry axis (Y)
Bit 2	Calculation of the correction angle with/without active orientation transformation
Bit 16	Tool probe connected to measurement sensing input 2
= 0	Tool probe at the CNC measuring input 1, active
= 1	Workpiece probe at the CNC measuring input 2, active - default
Bit 17	Tool measurement turning, recoding of cutting edge position

SD54740 \$SNS_MEA_FUNCTION_MASK	Function screen form measuring cycles
Bit 0	Workpiece, repeat measurement if TSA, TDIF exceeded
Bit 1	Workpiece, repeat measurement with M0 if TSA, TDIF exceeded
Bit 2	Workpiece, stop at M0 if TUL, TLL exceeded
Bit 3	Workpiece, accept calibrated probe sphere radius in tool data
Bit 4	Workpiece, plane can vary between calibration and measurement
Bit 16	Tool, repeat measurement if TDIF, TSA exceeded
Bit 17	Tool, repeat measurement with stop at M0 if TDIF, TSA exceeded
Bit 19	Tool, milling, reduction of spindle speed during last probing

SD55740 \$SCS_MEA_FUNCTION_MASK	Function screen form measuring cycles
Bit 0	Workpiece, collision monitoring for intermediate positioning
Bit 1	Workpiece, coupling of spindle position with coordinate rotation around the infeed axis
Bit 2	Workpiece, reverse positioning direction if spindle position is coupled
Bit 3	Workpiece, no repetition if probe does not switch
Bit 4	Workpiece, 1st probing for every measurement with rapid measuring feedrate
Bit 5	Workpiece, rapid retraction following measurement
Bit 6	Workpiece, deactivate probe during spindle positioning
Bit 7	Kinematics, scaling on the basis of the input values of the rotary axis vectors
Bit 8	Kinematics, measuring with swiveling (TCARR) or active TRAORI
Bit 9	Kinematics, user-specific scaling of the rotary axis vectors
Bit 10	Kinematics, measure completely with reference
Bit 11	Kinematics, number of measurement points when measuring calibration sphere

Bit 12	Kinematics, change cancel alarms for tolerance monitoring to reset alarms
Bit 13	Kinematics, scaling/set fixed value to closing vector
Bit 15	Workpiece, calibrating radius with starting point in center of ring, JOG mode only
Bit 16	Tool, collision monitoring for intermediate positioning
Bit 17	Tool, no repetition if probe does not switch
Bit 19	Tool, rapid retraction following measurement
Bit 28	Continuous measuring standard log in JOG (attach)
Bit 29	Table format for measuring standard log in JOG

20.11.2 Manufacturer and user cycle CUST_MEACYC.SPF

Function

The CUST_MEACYC.SPF is part of the measuring cycle functionality. It is called in every measuring cycle before and after executing the measurement task. The CUST_MEACYC.SPF acts in the same way when measuring in the JOG mode and measuring in the AUTOMATIC mode.

You can use the CUST_MEACYC.SPF to program and execute sequences that are necessary before and/or after a measurement (e.g. activating/deactivating a probe).

Note

Copy the CUST_MEACYC cycle before performing the changes from the directory NC data/Cycles/Standard cycles to the directory NC data/Cycles/Manufacture cycles or NC data/Cycles/User cycles. Changes for CUST_MEACYC only take effect in these directories.

CUST_MEACYC structogram

Sequence in the AUTOMATIC mode, using measure bore as example, CYCLE977 with probe type 712.

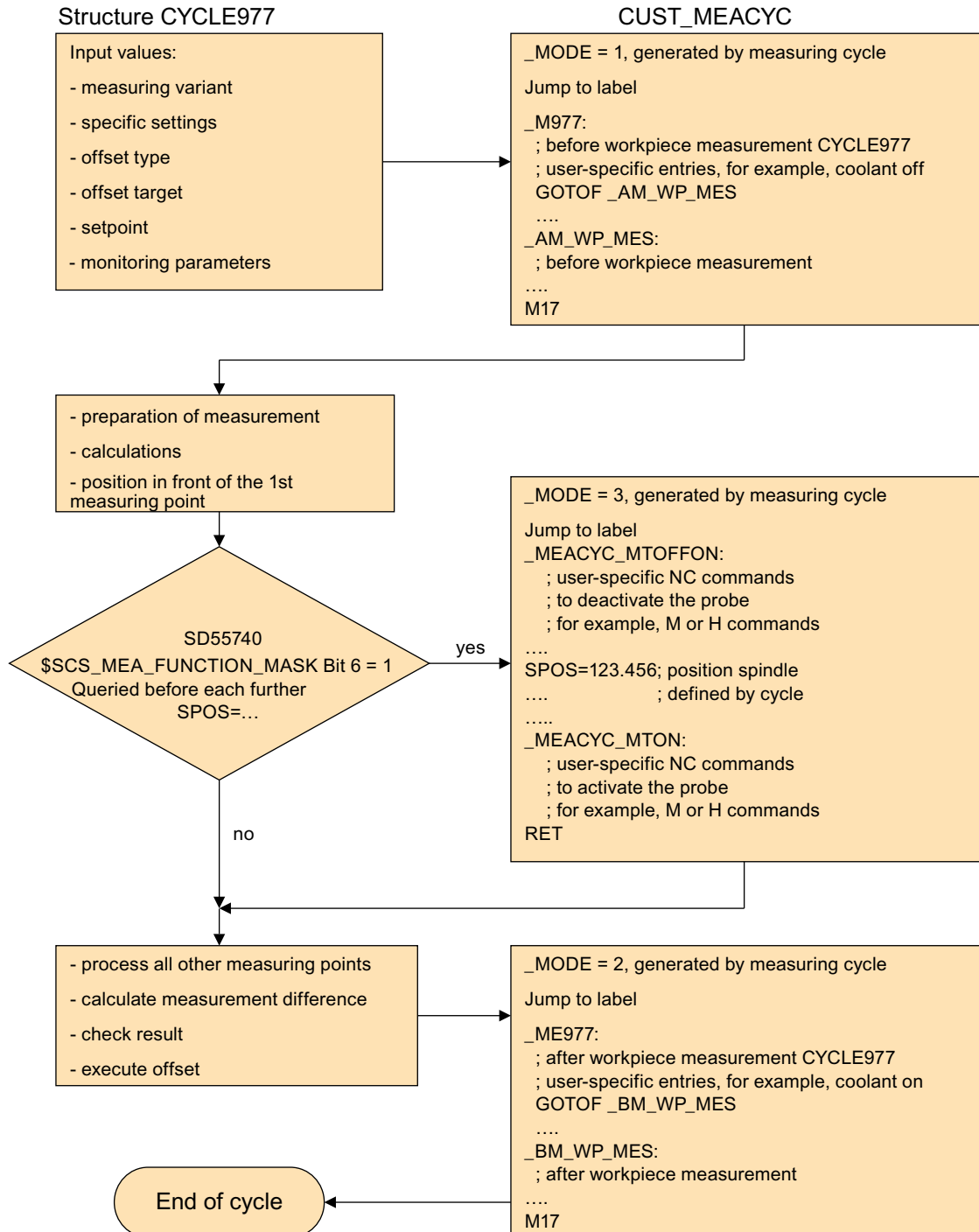


Figure 20-30 Structure: CYCLE977 / CUST_MEACYC

Note**Commenting out spindle SPOS commands**

If the spindle SPOS command is to be commented out in the CUST_MEACYC.SPF cycle, set the cycle setting in SD55740 \$SCS_MEA_FUNCTION_MASK to active with Bit 1 = 1.

You can see how to comment out a spindle SPOS command in the CUST_MEACYC.SPF cycle in the following example:

Example

```
;
;##1 Example application for spindle pre-positioning if there is no coupling
;##1 between spindle and the coordinate system active!
;##1 This example can be removed if necessary!
;##2 User example for spindle positioning, if you do not have a coupling
;##2 between the spindle and the coordinate system!
;##2 If this lines are not necessary, the user can delete this example!
;
; cycle is calling from the AUTOMATIC-mode AND the spindle is positionable
IF NOT(_OVI[14]) AND NOT(_SPOS_MOD)
    ; no coupling between the spindle and the coordinate system!
    ; SD55740, Bit 1 = 0
    IF ($SCS_MEA_FUNCTION_MASK B_AND 'B10')==0
        ; SPOS=0 ; <===== commented out
    ENDIF
ENDIF
M17
;
```

20.11.3 Measuring in JOG mode**Preconditions**

You have already made the settings from the Chapter "Measuring cycles and measurement functions, general (Page 553)".

Workpiece measurement

For milling:

- The probe has been inserted in the tool spindle.
- The probe has been selected in the tool list as type 7xx (probe).
- The probe is activated as tool in the current NC channel.

Tool measurement

To measure tools, an appropriate probe must be located in the machine space so that this can be reliably and safely reached with a tool in the spindle.

The following tool types are supported with measure tool:

- Milling: Tool types 1xx and 2xx
- Turning: Tool types 5xx, 1xx and 2xx

For the specified tool types, the tool lengths and the tool radii can be measured.

Setting general data

SD54782 \$SNS_J_MEA_FUNCTION_MASK_TOOL		Settings for the input screen form, measuring in JOG, tool measurement.
Bit 2 = 1	Activates the "Enable automatic tool measuring" function.	
Bit 3 = 1	Selects the tool probe calibration data field, enable	
Bit 10 = 1	Selects the individual cutting edge measurement	
Bit 11 = 1	Selects the spindle reversal when calibrating in the plane	

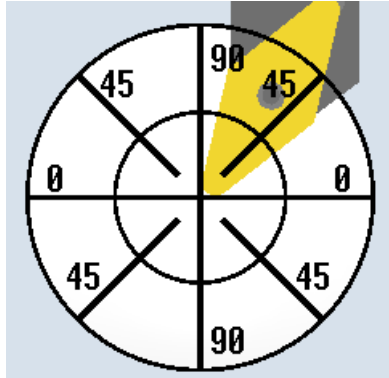
MD51784 \$MNS_J_MEA_T_PROBE_APPR_AX_DIR [i]	
Measuring in JOG: Approach direction in the plane to the tool probe	
-2	Negative direction 2nd measuring axis
-1	Negative direction 1st measuring axis (default)
0	
1	Positive direction 1st measuring axis
2	Positive direction 2nd measuring axis

MD52750 \$MCS_J_MEA_FIXPOINT		Z value for measurement with respect to a fixed point
mm		

The Z position for "Measure: Fixed point" is saved with MD52750. In milling, the fixed point serves as the reference point for manual tool measurement in JOG. The value can be set via the input screen form "Calibration: Fixed point".

MD52751 \$MCS_J_MEA_MAGN_GLAS_POS		Zoom-in position for tool measurement
mm		

[0]	Position in the 1st axis
[1]	Position in the 2nd axis



If there is a magnifying glass on the machine, it can be used to determine the tool geometry. In this case, SINUMERIK Operate calculates the tool offset data from the known positions of the tool carrier reference point and the cross-hairs of the magnifying glass.

Checking and setting the general machine data

MD11450 \$MN_SEARCH_RUN_MODE	"Search run" programming.
Bit 1 = 1	Automatic ASUB start after output of the action blocks (see also MD11620 \$MN_PROG_EVENT_NAME). Alarm 10208 is not output until the ASUB is completed.

MD11604 \$MN_ASUP_START_PRIO_LEVEL	Priorities from which ASUP_START_MASK is effective.
= 1 - 64	Priorities for ASUP_START_MASK.

Setting channel-specific machine data

MD20050 \$MC_AXCONF_GEOAX_ASSIGN_TAB[]	Assignment, geometry axis to channel axis.
[0]	For measuring in JOG mode, all of the geometry axes must be available. Preferably XYZ.
[1]	
[2]	

MD20110 \$MC_RESET_MODE_MASK	Defines the basic control settings after reset / TP end.
= 4045H	Minimum value
Bit 0 = 1	Basic control setting after power on and reset.
Bit 2 = 1	
Bit 6 = 1	
Bit 14 = 1	

MD20112 \$MC_START_MODE_MASK	Definition of the basic control setting after part program start.
= 400H	Minimum value
Bit 6 = 0	Definition of the basic control setting after NC start.

MD20310 \$MC_TOOL_MANAGEMENT_MASK	Activates tool management functions.
= 4002H	Minimum value
Bit 1 = 1	Tool management and monitoring functions active.
Bit 14 = 1	Automatic tool change for RESET and Start.

MD28082 \$MC_SYSTEM_FRAME_MASK	System frames (SRAM).
Bit 0 = 0	Do not setup system frames for actual value setting and scratching.
Bit 0 = 1	Setup system frames for actual value setting and scratching.

The following channel-specific machine data is only effective if the system frame actual value setting and scratching is set up using the above mentioned machine data MD28082 \$MC_SYSTEM_FRAME_MASK, bit 0 = 0.

MD24006 \$MC_CHSFRAME_RESET_MASK	Active system frames after reset.
Bit 0 = 1	Reset response of the system frames or actual value setting.

MD24007 \$MC_CHSFRAME_RESET_CLEAR_MASK	Clear system frames at reset.
Bit 0 = 0	Clear response of the system frames on reset.

Note

If you create the conditions described in this section and you have set and checked the machine setting data, then in JOG mode, you can measure a workpiece using a workpiece probe at a milling machine!

In JOG mode, you can measure a tool using a tool probe at a milling machine or turning machine!

A description is provided in the following chapters as to which settings you can make in order to adapt measuring to the specific requirements of your particular machine.

20.11.3.1 Measuring workpieces at the milling machines

Measuring in the "Machine" operating area can be appropriately adapted to the specific requirements using the following channel-specific general machine data and channel-specific cycle setting data.

General configuration machine data

SD55630 \$SCS_MEA_FEED_MEASURE		Measuring feedrate for workpiece measurement in JOG and AUTOMATIC
300	Default value	

Note**Measuring feedrate for workpiece measuring**

All measuring cycles use the value saved in SD54611 as the measuring feedrate value following calibration of the workpiece probe. A different measuring feedrate can be assigned for each calibration field [n].

When calibrating the probe, either the measuring feedrate from SD55630 \$SCS_MEA_FEED_MEASURE is used, or the measuring feedrate can be overwritten in the input screen form when calibrating. Bit 4 = 1 must be set in the SD54760 \$SNS_MEA_FUNCTION_MASK_PIECE for this purpose.

MD52207 \$MCS_AXIS_USAGE_ATTRIB[n]		Attributes of the axes [n] channel axis number
Bit 6	Request axis of rotation as offset target for measuring	
= 0	Default value	
= 1	Axis of rotation is displayed as offset target in the "Measuring in JOG" window	
Bit 9	SPOS behavior of main spindle influenced in connection with measuring cycles	
= 0	The positioning behavior of the tool spindle is not influenced	
= 1	The measuring cycles do not position the tool spindle (no SPOS)	

Note

If the tool spindle is never SPOS-capable, Bit 9 = 1 must be set.

MD51740 \$MS_MEA_FUNCTION_MASK		Function screen form measuring cycles, workpiece- tool measurement
Bit 7	Workpiece, accept active into inactive WO, JOG mode only, set edge	

= 0	In JOG mode, "Set edge" function with correction of the measuring result to an inactive work offset (target frame), of the geometry axes in the target frame, only the measuring axis is specified with the result No values are adopted from the active work offset (source frame) for geometry axes which have not been measured. (compatibility) From all non-geometric axes (rotary and auxiliary axes), mirroring, rotations and translations are adopted from the active work offset (source frame) into the selected inactive work offset (target frame). (compatibility)
= 1	In JOG mode, "Set edge" function with correction of the measuring result to an inactive work offset (target frame), the measuring axis is specified in the target frame with the measurement result For all other axes (geometry axes, rotary axes and auxiliary axes), mirroring, rotations and translations are also adopted from the active work offset (source frame) into the selected inactive work offset (target frame)

This description applies for automatic measuring using an electronic probe, and in the same way for the "scratching" function using a machining tool.

More information is provided in Chapter "Measuring without electronic probe in JOG (Page 571)".

MD51751 \$MNS_J_MEA_M_DIST_MANUELL	Measurement path in mm, in front of and behind the measurement point
= 10	Default value

MD51757 \$MNS_J_MEA_COLL_MONIT_FEED	Position feedrate in mm/min, in the working plane for active collision monitoring
= 1000	Default value

MD51758 \$MNS_J_MEA_COLL_MONIT_POS_FEED	Position feedrate in mm/min, in the infeed axis for active collision monitoring
= 1000	Default value

MD51770 \$MNS_J_MEA_CAL_RING_DIAM[n]	Pre-assignment of the calibration ring diameter in mm specifically for the calibration data sets
= -1	Default value

MD51772 \$MNS_J_MEA_CAL_HEIGHT_FEEDAX[n]	Pre-assignment of the calibration height in mm in the infeed axis, specifically for the calibration data sets
= -99999	Default value

General cycle setting data

SD54780 \$SNS_J_MEA_FUNCTION_MASK_PIECE	Configuration of the input screen forms for measuring in the "Machine" operating area in the JOG operating mode
= 512	Default value
Bit 2 = 1	Activates measurements with an electronic probe
Bit 3 = 1	Selects the probe calibration data, enable
Bit 6 = 1	Selects WO correction in the basis reference (SETFRAME), enable
Bit 7 = 1	Selects WO correction in channel-specific basic frames, enable
Bit 8 = 1	Selects WO correction in the global basic frame, enable
Bit 9 = 1	Selects WO correction in adjustable frames, enable
Bit 16 = 1	Selects workpiece measurement with spindle reversal
Bit 17 = 1	Selects align workpiece probe in the switching direction
Bit 28 = 1	Selects adjust workpiece length, enable

20.11.3.2 Measuring tools at the milling machines**Measuring feed for tool measurement in JOG and AUTOMATIC**

SD55628 \$SCS_MEA_TP_FEED_MEASURE	Calibrate measuring feed for tool probe and measure tool with stationary spindle.
= 300	Default value

Note**Measuring feed for tool measuring**

All measuring cycles use the value saved in SD54636 or SD54651 as the measuring feed after the tool probe has been calibrated. A different measuring feed can be assigned for each calibration field [n].

When calibrating the probe, either the measuring feed from SD55628 SCS_MEA_TP_FEED_MEASURE is used, or the measuring feed can be overwritten in the input mask when calibrating. To do this, SD54762 \$SNS_MEA_FUNCTION_MASK_TOOL bit 4 must be set to 1.

MD51757 \$MNS_J_MEA_COLL_MONIT_FEED	Position feedrate in mm/min, in the working plane for active collision monitoring
= 1000	Default value

MD51758 \$MNS_J_MEA_COLL_MONIT_POS_FEED	Position feedrate in mm/min, in the infeed axis for active collision monitoring
= 1000	Default value

In the following setting data, index [k] stands for the number of the current data field (probe number -1) of the probe.

SD54633 \$SNS_MEA_TP_TYPE[k]		Probe type, cube/disk
= 0	Compatibility (measuring cycles: cube, turning surface shows probe, milling surface shows disk)	
= 101	Disk in XY, working plane G17	
= 201	Disk in ZX, working plane G18	
= 301	Disk in YZ, working plane G19	
= 2	Probe head	
= 3	Cube	

The following setting data is used to define in which axes and directions it is possible to calibrate a tool probe.

SD54632 \$SNS_MEA_T_PROBE_ALLOW_AX_DIR[k]		Axes and directions for "calibration"
= 133	Default value	

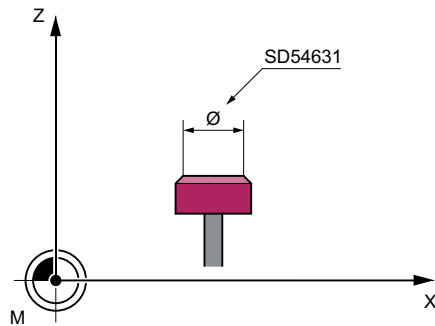
Decimal place		
ONES		1st axis
	= 0	axis not possible
	= 1	only minus direction
	= 2	only plus direction
	= 3	both directions
TENS		2nd axis
	= 0	axis not possible
	= 1	only minus direction
	= 2	only plus direction
	= 3	both directions
HUNDREDS		3rd axis
	= 0	axis not possible
	= 1	only minus direction
	= 2	only plus direction
	= 3	both directions

Example

If the general setting data SD54632 \$SNS_MEA_T_PROBE_ALLOW_AX_DIR[k] has the value 123, the tool probe is calibrated as follows in the G17 plane:

- X in both directions
- Y only in plus direction
- Z only in minus direction

SD54631 \$SNS_MEA_TP_EDGE_DISK_SIZE[k]	Effective diameter of the tool probe for length measurement.
= 0	Default value



General cycle machine/setting data for tool probe

MD51780 \$MNS_J_MEA_T_PROBE_DIAM_RAD[k]	Effective diameter of the tool probe for radius measurement.
= 0	Default value

SD54634 \$SNS_MEA_TP_CAL_MEASURE_DEPTH[n]	Distance between the tool probe upper edge and the milling tool lower edge.
= 2	Default value

MD51752 \$MNS_J_MEA_M_DIST_TOOL_LENGTH	Measurement path for tool length measurement with rotating spindle for the JOG mode.
= 2	Default value

MD51753 \$MNS_J_MEA_M_DIST_TOOL_RADIUS	Measurement path for tool radius measurement with rotating spindle for JOG mode.
= 1	Default value

MD51786 \$MNS_J_MEA_T_PROBE_MEASURE_DIST	Measurement path to calibrate the probe or for measurements with stationary spindle for JOB mode.
= 10	Default value

General cycle setting data when measuring with rotating spindle

SD54670 \$SNS_MEA_CM_MAX_PERI_SPEED[0]	Maximum permissible peripheral speed of the tool to be measured.
= 100	Default value

SD54671 \$SNS_MEA_CM_MAX_REVOLUTIONS[0]	Maximum permissible tool speed of the tool to be measured. The speed is automatically reduced when exceeded.
= 1000	Default value

SD54672 \$SNS_MEA_CM_MAX_FEEDRATE[0]	Maximum permissible feedrate to probe the tool to be measured at the probe.
= 20	Default value

SD54673 \$SNS_MEA_CM_MIN_FEEDRATE[0]	Minimum feedrate for the first probing of the tool to be measured at the probe. This avoids excessively small feedrates for large tool radii.
= 1	Default value

SD54674 \$SNS_MEA_CM_SPIND_ROT_DIR[0]	Spindle direction of rotation to measure tools.
= 4	Spindle rotation the same as M4 (default value)

Note

If the spindle is already rotating when the measuring cycle is called, this direction of rotation remains independent of the setting of this data.

SD54675 \$SNS_MEA_CM_FEEDFACTOR_1[0]	Feedrate factor 1
= 10	Default value
= 0	Only single probing with the feedrate calculated by the cycle. However, as a minimum, the value from SD54673[0] \$SNS_MEA_CM_MIN_FEEDRATE.
>= 1	First probing with feedrate. However, as a minimum with the value from SD54673[0] \$SNS_MEA_CM_MIN_FEEDRATE) SD54675[0] \$SNS_MEA_CM_FEEDFACTOR_1

SD54676 \$SNS_MEA_CM_FEEDFACTOR_2[0]	Feedrate factor 2
= 0	Second probing with the feedrate calculated by the measuring cycle. This is only effective for SD54673[0] \$SNS_MEA_CM_FEEDFACTOR_1 > 0, default value
>= 1	Second probing with the calculated feedrate from SD54673[0] \$SNS_MEA_CM_MIN_FEE-DRATE feedrate factor 2. Third probing with the calculated feedrate.

Note

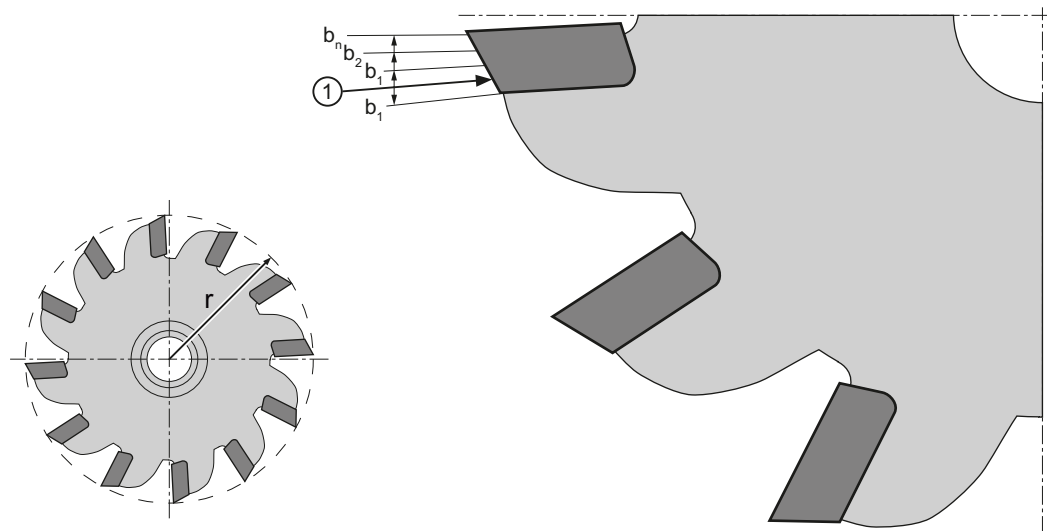
Feedrate factor 2 should be less than feedrate factor 1.

SD54677 \$SNS_MEA_CM_MEASURING_ACCURACY[0]	Specified measuring accuracy. The value of this parameter always refers to the last probing of the tool at the probe!
= 0.005	Default value

SD54692 \$SNS_MEA_T_CIRCULAR_ARC_DIST	Arc distance for the single cutting edge measurement of the radius.
= 0.25 *)	Default value

SD54693 \$SNS_MEA_T_MAX_STEPS	Maximum number of probe contacts for single cutting edge measurement of the radius.
= 10 *)	Default value

*) If the value = 0, then the "highest point on the longest cutting edge" is not sought, but the measured value of the contact with the rotating spindle taken.



- r Effective radius of the tool
 b Arc distance = SD54692
 n Maximum number of probe contacts = SD54693
 ① 1st measuring point.

Figure 20-31 Single cutting edge measurement

General cycle setting data for correction using the correction tables when forming measurements with rotating spindle.

SD54691 \$SNS_MEA_T_PROBE_OFFSET		Activate the measuring result compensation
= 0	No data, default value	
= 1	Correction in the cycle. This is only effective if SD54689 \$SNS_MEA_T_PROBE_MANUFACTURER>0.	
= 2	Correction using user-defined correction table	

SD54689 \$SNS_MEA_T_PROBE_MANUFACTURER		Activates pre-configured compensation tables for several tool probe models (customer-specific)
= 0	No data, default value	
= 1	TT130 (Heidenhain)	
= 2	TS27R (Renishaw)	

20.11.3.3 Measuring tools at the turning machines

Measuring feed for tool measurement in turning operation

SD55628 \$SCS_MEA_TP_FEED_MEASURE	Calibrate measuring feed for tool probe and measure tool with stationary spindle.
= 300	Default value

Note

Measuring feed for tool measuring

All measuring cycles use the value saved in SD54636 or SD54651 as the measuring feed after the tool probe has been calibrated. A different measuring feed can be assigned for each calibration field [n].

When calibrating the probe, either the measuring feed from SD55628 is used, or the measuring feed can be overwritten in the input mask when calibrating. To do this, SD54762 \$SNS_MEA_FUNCTION_MASK_TOOL bit 4 must be set to 1.

General cycle machine/setting data for measurement path/feed

SD42950 \$SC_TOOL_LENGTH_TYPE	Assignment of the tool length offset independent of tool type.
= 2	The assignment of the tool length components is, independent of the actual tool type, always the same as for turning and grinding tools. This setting is recommended for measuring milling tools and drill bits.

MD51786 \$MNS_J_MEA_T_PROBE_MEASURE_DIST	Measurement path to calibrate the probe or for measurements with stationary spindle.
= 10	Default value

SD55628 \$SCS_MEA_TP_FEED_MEASURE	Feedrate for the calibration of a tool probe with stationary spindle.
= 300	Default value

Calibrating tool probes

Use the following general cycle machine data to set the access level as of which the "Calibrate probe" softkey is displayed. This requires that the automatic tool measurement is enabled using the setting data SD54782 (bit 2 = 1).

MD51070 \$MNS_ACCESS_CAL_TOOL_PROBE	Calibrate tool probe access level.
= 7	Access rights: Access level 7 (keyswitch 0)

= 4	Read access rights: Access level 4 (keyswitch 3), default value
= 3	Write access: Access level 3 (user)

20.11.3.4 Measuring without electronic probe in JOG

Measure workpiece

For manual measuring functions in the JOG operating mode, for which a rotating spindle is required, the following applies:

- The channel state must be reset at the instant in time that the measured value is transferred.
- The spindle can be moved or positioned either using the T,S,M menu or using the bits in DB3x.DBB30.
- The following preconditions apply when using the DB3x.DBB30 technology functions with fixed speed:

Setting the machine data			
MD10709 \$MN_PROG_SD_POWERON_INIT_TAB [0] = 0			Setting data to be initialized
MD35035 \$MA_SPIND_FUNCTION_MASK	Bit 4 = 0		Spindle functions
	Bit 5 = 1		
SD43200 \$SA_SPIND_S			Speed setting value

Note

The entry in SD43200 \$SA_SPIND_S is kept at power on.

With these settings, the spindle velocity for manual operation, which is set in SD41200 \$SN_JOG_SPIND_SET_VELO, is no longer effective.

20.11.4 Measuring in the AUTOMATIC mode

Requirement



Software option

In order to use the "Measuring in AUTOMATIC" function, you require the software option: "Measuring cycles"

You have already made the settings from Chapter "Measuring cycles and measurement functions, general (Page 553)".

Workpiece measurement

Sequence in milling technology:

1. The probe has been selected in the tool list as type 7xx (probe).
2. The probe has been inserted in the tool spindle.
3. The probe is activated in the actual NC channel.

Sequence in turning technology:

1. Tool type 580 (3D probe, turning) is selected.
2. Tool is activated in the actual NC channel.

Tool measurement

To measure tools, an appropriate probe must be located in the machine space so that this can be reliably and safely reached with a tool in the spindle.

The following tool types are supported with tool measurement:

- Milling technology: Tool types 1xx and 2xx
- Turning technology: Tool types 5xx, 1xx and 2xx

For the specified tool types, the tool lengths and the tool radii can be measured.

Channel-specific cycle setting data

Using the following channel-specific cycle setting data, you can adapt the **workpiece and tool measuring** in the "Program" operating area to specific requirements. As a general rule, no changes are required.

SD55613 \$SCS_MEA_RESULT_DISPLAY		Selects the screen display of the measuring result
= 0	No screen display of the measuring result (default value).	
= 1	Screen display of the measuring result is displayed for 8 seconds.	
= 3	The measuring cycle stops an internal machine data, the measuring result is statically displayed on the screen! Continue with NC start, the measuring result screen is deselected.	
= 4	The measuring result is only displayed on the screen for cycle alarms 61303, 61304, 61305, 61306. Continue with NC start, the measuring result display on the screen is deselected.	

SD55614 \$SCS_MEA_RESULT_MRD		Setting of the program control of the measurement result display MRD
= 0	Switch off the measurement result display	
= 1	Switch on the measurement result display	

SD55623 \$SCS_MEA_EMPIRIC_VALUE[n]	Empirical values
= 0	Default value

SD55618 \$SCS_MEA_SIM_ENABLE	Measuring cycle simulation
= 0	When calling measuring cycles in conjunction with SINUMERIK Operate, ShopMill or ShopTurn simulation, the measuring cycles are skipped, default value.
= 1	Default setting: When calling measuring cycles in conjunction with SINUMERIK Operate, ShopMill or ShopTurn simulation, the measuring cycles are run through. However, no corrections are performed and there is no logging. There is no screen display of the measuring result.

Additional information

Additional information on SD55618 is provided in the
Measuring Cycles Programming Manual.

Configuring input screens for measuring cycles in the program editor

Using the following setting data, you configure the display screen and the correction options when making measurements in the AUTOMATIC mode:

- SD54760 \$SNS_MEA_FUNCTION_MASK_PIECE measure workpiece: Measuring cycles in the milling area, Chapter "Measuring workpieces, general (Page 573)"
- SD54762 \$SNS_MEA_FUNCTION_MASK_TOOL measure tool: Measuring cycles in the milling area, Chapter "Measuring tools at the milling machines (Page 577)"

Note

If you have created the prerequisites described in this chapter and you have set and checked the machine/setting data, you can perform measurements at the machine with a workpiece or tool probe in the AUTOMATIC mode!

If you wish to set up workpiece measurement on a turning machine, then additional settings are required. Refer to Chapter "Measuring workpieces at the turning machines (Page 583)" for the settings.

If you wish to set-up tool measurement using a tool probe, then you must also make additional settings. Please refer to Chapters "Measuring tools at the turning machines (Page 584)" or "Measuring tools at the milling machines (Page 577)" for the settings.

A description is provided in the following chapters as to which settings you can make in order to adapt measuring to the specific requirements of your particular machine.

20.11.4.1 Measuring workpieces, general

Using the following general and channel-specific cycle setting data, you can appropriately adapt workpiece measurement to the specific requirements in the "Program" operating area.

Requirement

You have already made the settings from the Chapter "Measuring cycles and measurement functions, general (Page 553)".

Settings

General cycle setting data

SD54760 \$SNS_MEA_FUNCTION_MASK_PIECE		Settings for the input screen, measuring cycles in AUTOMATIC, workpiece measurement.
Bit 1	Display select softkey 3D measurement	
Bit 3	Enable probe calibration field to be selected	
Bit 4	Select calibration input measuring feed ¹⁾	
Bit 6	Enable NP correction in the basis reference (SETFRAME) to be selected	
Bit 7	Enable NP correction in channel-specific basic frame to be selected	
Bit 8	Enable NP correction in global basic frame to be selected	
Bit 9	Enable NP correction in adjustable frame to be selected	
Bit 10	Enable NP correction coarse and fine to be selected	
Bit 11	Select tool offset, geometry and wear	
Bit 12	Select tool offset, not inverted and inverted	
Bit 13	Select tool offset L1, R or L1, L2, L3 R	
Bit 14	Select tool offset, zero offset (_TZL)	
Bit 15	Select tool offset, dimensional difference monitoring (_TDIF)	
Bit 16	Select workpiece measurement with spindle reversal	
Bit 17	Selects align workpiece probe in the switching direction	
Bit 18	Select number of measurements (_NMSP)	
Bit 19	Select offset with mean value generation (_TMV) ¹⁾	
Bit 20	Select experience values (_EVNUM)	
Bit 21	Select total setting-up offset	
Bit 22	Select calibration to unknown or to known center point	
Bit 24	Select calibration with/without position deviation	
Bit 25	Select zero offset when measuring the angulation of the spindle	
Bit 26	Selects tool offset, do not enable	
Bit 27	Selects measure tolerance of the linear vector for kinematics, do not enable	
Bit 28	Enable tool offset adjust length to be selected	

Channel-specific cycle setting data

SD55630 \$SCS_MEA_FEED_MEASURE		Measuring feedrate [mm/rev]
= 300	Measuring feedrate when calibrating the workpiece probe	

Note**Measuring feedrate for workpiece measuring**

All measuring cycles use the value saved in SD54611 \$SNS_MEA_WP_FEED[n] as measuring feedrate after the tool probe has been calibrated.

A different measuring feedrate can be assigned for each calibration field [n].

When calibrating the probe, either the measuring feedrate from SD55630 \$SCS_MEA_FEED__MEASURE is used, or the measuring feedrate can be overwritten in the input screen when calibrating. To do this, SD54760 MEA_FUNCTION_MASK_PIECE bit 4 must be set to 1.

SD55632 \$SCS_MEA_FEED_RAPID_IN_PERCENT	Percentage reduction
= 50	Default value of the percentage reduction of the rapid traverse velocity for internal cycle intermediate positioning without collision monitoring. The setting of the channel-specific cycle setting data SD55600 SCS_MEA_COLLISION_MONITORING must be = 0.

SD55634 \$SCS_MEA_FEED_PLANE_VALUE	Feedrate of the intermediate positioning in the working plane with active collision monitoring.
= 1000	Default value

SD55636 \$SCS_MEA_FEED_FEEDAX_VALUE	Feedrate of the intermediate positioning in the infeed axis with active collision monitoring.
= 1000	Default value

SD55638 \$SCS_MEA_FEED_FAST_MEASURE	Fast measuring feedrate
= 900	Default value

SD55640 \$SCS_MEA_FEED_CIRCLE	Feedrate with circle programming
= 1000	Default value

SD55642 \$SCS_MEA_EDGE_SAVE_ANG	Safety angle when measuring a corner (CYCLE961)
= 0	Degrees

This angle is added to the angle that the user entered between the workpiece reference edge and the 1st axis of the active coordinate system in a positive direction, and refers to the corner measurement in the automatic mode (CYCLE961).

The angle of the user specifications is designated "α0" in the parameterization screen corner measurement. For compatibility programs, the designation is _STA1.

Notice:

For compatibility programs, \$SCS_MEA_EDGE_SAVE_ANG should be set = 10.

20.11.4.2 Measuring workpieces at the milling machines

Measuring in the "Program" operating area can be adapted corresponding to the specific requirements using the channel-specific cycle setting data.

Settings

SD55625 \$SCS_MEA_AVERAGE_VALUE[n]	Number of mean values.
= 0	Default value

The following cycle setting data are written to by the measuring cycles with the "Calibrate probe" measuring function. User parameterization is not necessary here. However, after the probe has been calibrated, you can check these values and if required, evaluate the probe quality, e.g. for position deviations, no values > 0.1 mm should be reached. Otherwise, the probe must be mechanically readjusted.

The measuring feedrate at the time of calibration is used for all subsequent applications of the measuring cycles.

Note

Observe the manufacturer's instructions for the probe.

SD54600 \$SNS_MEA_WP_BALL_DIAM[n]	Effective diameter of the probe ball of the workpiece probe.
SD54601 \$SNS_MEA_WP_TRIG_MINUS_DIR_AX1[n]	Trigger point, minus direction, 1st measuring axis in the plane.
SD54602 \$SNS_MEA_WP_TRIG_PLUS_DIR_AX1[n]	Trigger point, plus direction, 1st measuring axis in the plane.
SD54603 \$SNS_MEA_WP_TRIG_MINUS_DIR_AX2[n]	Trigger point, minus direction, 2nd measuring axis in the plane.
SD54604 \$SNS_MEA_WP_TRIG_PLUS_DIR_AX2[n]	Trigger point, plus direction, 2nd measuring axis in the plane.
SD54605 \$SNS_MEA_WP_TRIG_MINUS_DIR_AX3[n]	Trigger point, minus direction, 3rd measuring axis in the tool direction.

SD54606 \$SNS_MEA_WP_TRIG_PLUS_DIR_AX3[n]	Trigger point, plus direction, 3rd measuring axis opposite to the tool direction. In the default case = 0.
SD54607 \$SNS_MEA_WP_POS_DEV_AX1[n]	Position deviation, 1st measuring axis in the plane.
SD54608 \$SNS_MEA_WP_POS_DEV_AX2[n]	Position deviation, 2nd measuring axis in the plane.
SD54609 \$SNS_MEA_WP_STATUS_RT	Calibration status of the axis positions
SD54610 \$SNS_MEA_WP_STATUS_GEN[n]	Calibration status
SD54611 \$SNS_MEA_WP_FEED[n]	Measuring feedrate when calibrating

20.11.4.3 Measuring tools at the milling machines

Settings

SD54762 \$SNS_MEA_FUNCTION_MASK_TOOL	Setting for the input screen, measuring cycles in the automatic mode, tool measurement
Bit 3	Setting for the input screen, measuring cycles in the automatic mode, tool measurement, enable tool probe calibration data field to be selected
Bit 4	Select calibration input measuring feed (VMS) ¹⁾
Bit 5	Select input feedrate and spindle speeds when probing
Bit 7	Select measurement in MCS and WCS
Bit 8	Select measurement, absolute and incremental
Bit 9	Select tool offset, geometry and wear
Bit 10	Select individual cutting edge measurement
Bit 11	Selects spindle reversal when calibrating in the plane
Bit 12	Select number of measurements (_NMSP)
Bit 13	Select experience values (_EVNUM)

¹⁾ Input, measurement feedrate is valid for AUTOMATIC and JOG

SD55634 \$SCS_MEA_FEED_PLANE_VALUE	Feedrate of the intermediate positioning in the working plane with active collision monitoring.
= 1000	Default value

SD55636 \$SCS_MEA_FEED_FEEDAX_VALUE	Feedrate of the intermediate positioning in the infeed axis with active collision monitoring.
= 1000	Default value

Calibration data of the tool probe, referred to the machine coordinate system

Before calibration is started, the position of the tool probe in the machine coordinate system (MCS) must be entered into the following general cycle setting data. In this case, the reference point is the outer diameter or the tool length of the active tool in the spindle. If there is no tool in the spindle, the reference points are the spindle center point and the tool reference point at the spindle.

Note

Calibrate probe

If you have calibrated the tool probe in JOG mode, then the calibration data has already been correctly entered in: SD54632 \$SNS_MEA_TP_AX_DIR_AUTO_CAL[k]

You do not need to recalibrate the tool probe in the AUTOMATIC mode.

Index [k] stands for the number of the actual data field (probe number -1).

SD54625 \$SNS_MEA_TP_TRIG_MINUS_DIR_AX1[k]	Trigger point of the 1st measuring axis in the negative direction.
SD54626 \$SNS_MEA_TP_TRIG_PLUS_DIR_AX1[k]	Trigger point of the 1st measuring axis in the positive direction.
SD54627 \$SNS_MEA_TP_TRIG_MINUS_DIR_AX2[k]	Trigger point of the 2nd measuring axis in the negative direction.
SD54628 \$SNS_MEA_TP_TRIG_PLUS_DIR_AX2[k]	Trigger point of the 2nd measuring axis in the positive direction.
SD54629 \$SNS_MEA_TP_TRIG_MINUS_DIR_AX3[k]	Trigger point of the 3rd measuring axis in the negative direction.
SD54630 \$SNS_MEA_TP_TRIG_PLUS_DIR_AX3[k]	Trigger point of the 3rd measuring axis in the positive direction.
SD54631 \$SNS_MEA_TP_EDGE_DISK_SIZE[k]	Tool probe, edge length / disk diameter.
SD54632 \$SNS_MEA_TP_AX_DIR_AUTO_CAL[k]	Axes and directions for calibrating in AUTOMATIC mode.
SD54634 \$SNS_MEA_TP_CAL_MEASURE_DEPTH[k]	Distance between the upper edge of the tool probe and lower edge of the tool (calibration depth, measuring depth for milling radius).
SD54635 \$SNS_MEA_TPW_STATUS_GEN[k]	Calibration status
SD54636 \$SNS_MEA_TPW_FEED[k]	Measuring feedrate when calibrating

The general cycle setting data SD54632 \$SNS_MEA_TP_AX_DIR_AUTO_CAL, is used to define in which axes and directions it is possible to calibrate the tool probe.

Decimal place		
ONES		1st axis
	= 0	axis not possible
	= 1	only minus direction
	= 2	only plus direction
	= 3	both directions
TENS		2nd axis

Decimal place		
	= 0	axis not possible
	= 1	only minus direction
	= 2	only plus direction
	= 3	both directions
HUNDREDS	3rd axis	
	= 0	axis not possible
	= 1	only minus direction
	= 2	only plus direction
	= 3	both directions

Example

If the general cycle machine data SD54632 \$SNS_MEA_TP_AX_DIR_AUTO_CAL has the value 123, the tool probe is calibrated as follows in the G17 plane:

- X in both directions
- Y only in plus direction
- Z only in minus direction

SD54633 \$SNS_MEA_TP_TYPE[k]		Probe version
= 0	Compatibility (measuring cycles: cube, turning surface shows probe, milling surface shows disk)	
= 101	Disk in XY, working plane G17.	
= 201	Disk in ZX, working plane G18.	
= 301	Disk in YZ, working plane G19.	
= 2	Probe	
= 3	Cube	

Calibration data of the tool probe referred to the workpiece coordinate system

Before calibration is started, the position of the tool probe in the workpiece coordinate system (WCS) must be roughly entered into the following general cycle setting data. In this case, the reference point is the outer diameter or the tool length of the active tool in the spindle. If there is no tool in the spindle, the reference points are the spindle center point and the tool reference point at the spindle.

Note

When measuring tools, ensure that the data of the adjustable work offset or the basic reference always correspond to the data when calibrating (measuring in WCS!).

Always make measurements and calibrate with the same adjustable work offset.

SD54640 \$SNS_MEA_TPW_TRIG_MINUS_DIR_AX1[k]	Trigger point of the 1st measuring axis in the negative direction.
SD54641 \$SNS_MEA_TPW_TRIG_PLUS_DIR_AX1[k]	Trigger point of the 1st measuring axis in the positive direction.
SD54642 \$SNS_MEA_TPW_TRIG_MINUS_DIR_AX2[k]	Trigger point of the 2nd measuring axis in the negative direction.
SD54643 \$SNS_MEA_TPW_TRIG_PLUS_DIR_AX2[k]	Trigger point of the 2nd measuring axis in the positive direction.
SD54644 \$SNS_MEA_TPW_TRIG_MINUS_DIR_AX3[k]	Trigger point of the 3rd measuring axis in the negative direction.
SD54645 \$SNS_MEA_TPW_TRIG_PLUS_DIR_AX3[k]	Trigger point of the 3rd measuring axis in the positive direction.
SD54646 \$SNS_MEA_TPW_EDGE_DISK_SIZE[k]	Tool probe, edge length / disk diameter.
SD54647 \$SNS_MEA_TPW_AX_DIR_AUTO_CAL[k]	Automatic calibration of tool probe, enable axes/directions
SD54648 \$SNS_MEA_TPW_TYPE[k]	Probe version
= 0	Compatibility (measuring cycles: cube, turning surface shows probe, milling surface shows disk)
= 101	Disk in XY, working plane G17.
= 201	Disk in ZX, working plane G18.
= 301	Disk in YZ, working plane G19.
= 2	Probe
= 3	Cube
SD54649 \$SNS_MEA_TPW_CAL_MEASURE_DEPTH[k]	Distance between the upper edge of the tool probe and lower edge of the tool (calibration depth, measuring depth for milling radius).
SD54650 \$SNS_MEA_TPW_STATUS_GEN[k]	Calibration status
SD54651 \$SNS_MEA_TPW_FEED[k]	Measuring feedrate when calibrating

The following general cycle setting data SD54647 \$SNS_MEA_TPW_AX_DIR_AUTO_CAL is used to define in which axes and directions it is possible to calibrate a tool probe.

Decimal place		
ONES		1st axis
	= 0	axis not possible
	= 1	only minus direction
	= 2	only plus direction
	= 3	both directions
TENS		2nd axis
	= 0	axis not possible
	= 1	only minus direction
	= 2	only plus direction
	= 3	both directions
HUNDREDS		3rd axis
	= 0	axis not possible
	= 1	only minus direction

Decimal place		
	= 2	only plus direction
	= 3	both directions

Example

If the general cycle machine data SD54647 \$SNS_MEA_TPW_AX_DIR_AUTO_CAL has the value 123, the tool probe is calibrated as follows in the G17 plane:

- X in both directions
- Y only in plus direction
- Z only in minus direction

Monitoring when measuring with a rotating spindle

SD54670 \$SNS_MEA_CM_MAX_PERI_SPEED[0]		Maximum permissible peripheral speed of the tool to be measured.
= 100	Default value	

SD54671 \$SNS_MEA_CM_MAX_REVOLUTIONS[0]		Maximum permissible tool speed of the tool to be measured. The speed is automatically reduced when exceeded.
= 1000	Default value	

SD54672 \$SNS_MEA_CM_MAX_FEEDRATE[0]		Maximum permissible feedrate to probe the tool to be measured at the probe.
= 20	Default value	

SD54673 \$SNS_MEA_CM_MIN_FEEDRATE[0]		Minimum feedrate for the first probing of the tool to be measured at the probe. This avoids excessively small feedrates for large tool radii.
= 1	Default value	

SD54674 \$SNS_MEA_CM_SPIND_ROT_DIR[0]		Spindle direction of rotation to measure tools.
4 = M4	Default value	

Note

If the spindle is already rotating when the measuring cycle is called, this direction of rotation remains independent of the setting of this data.

SD54675 \$SNS_MEA_CM_FEEDFACTOR_1[0]	Feedrate factor 1
= 10	Default value
= 0	Only single probing with the feedrate calculated by the cycle. However, as a minimum, the value from SD54673[0] \$SNS_MEA_CM_MIN_FEEDRATE.
= ≥1	First probing with feedrate. However, as a minimum with the value from SD54673[0] \$SNS_MEA_CM_MIN_FEEDRATE) SD54675[0] \$SNS_MEA_CM_FEEDFACTOR_1

SD54676 \$SNS_MEA_CM_FEEDFACTOR_2[0]	Feedrate factor 2
= 0	Second probing with the feedrate calculated by the cycle. This is only effective for SD54673 \$SNS_MEA_CM_FEEDFACTOR_1[0] > 0, default value.
= ≥1	Second probing with the calculated feedrate from SD54673 \$SNS_MEA_CM_MIN_FEEDRATE[0] feedrate factor 2. Third probing with the calculated feedrate.

Note

Feedrate factor 2 should be less than feedrate factor 1.

SD54677 \$SNS_MEA_CM_MEASURING_ACCURACY[0]	Specified measuring accuracy. The value of this parameter always refers to the last probing of the tool at the probe.
= 0.005	Default value

Measurement with rotating spindle: Measured value correction using correction tables

SD54691 \$SNS_MEA_T_PROBE_OFFSET	Activates the measuring result correction
= 0	No data, default value
= 1	Correction in the cycle. This is only effective if SD54690 \$SNS_MEA_T_PROBE_MANUFACTURER>0.
= 2	Correction using user-defined correction table

SD54689 \$SNS_MEA_T_PROBE_MANUFACTURER	Activate pre-configured compensation tables for several tool probe models (customer-specific).
= 0	No data, default value
= 1	TT130 (Heidenhain)
= 2	TS27R (Renishaw)

Correction values for users

If the general cycle setting data SD54691 \$SNS_MEA_T_PROBE_OFFSET= 2, the following settings apply:

SD54695 to SD54700	Correction values for radius measurement.	See the subsequent general cycle setting data.
SD54705 to SD54710	Correction values for length measurement.	See the subsequent general cycle setting data.

SD54695 \$SNS_MEA_RESULT_OFFSET_TAB_RAD1[n]	Radius measurement
SD54705 \$SNS_MEA_RESULT_OFFSET_TAB_LEN1[n]	Length measurement
= 0	0
= 1	1st radius
= 2	2nd radius
= 3	3rd radius
= 4	4th radius

20.11.4.4 Measuring workpieces at the turning machines

General settings for turning

MD52740 \$MNS_MEA_FUNCTION_MASK	Measuring cycles function screen
Bit 1	Workpiece measurement, measuring in the third geometry axis (Y, when turning
= 0	The measuring cycles do not support a third geometry axis (Y axis)!
=1	Setpoint input and parameterization (SETVAL, _TUL, _TLL, SZO) refer to the third geometry axis (Y axis). The correction of the tool length or zero offset is however realized in the second geometry axis (X axis, ordinate) active components (i.e. measure in Y and correct in X). The correction target can be influenced using parameter _KNUM!
Bit 16	Measuring input, tool probe

Calibration data of the tool probe, referred to the machine coordinate system

Before calibration is started, the position of the tool probe in the machine coordinate system (MCS) must be entered into the following general cycle setting data.

SD54615 \$SNS_MEA_CAL_EDGE_BASE_AX1[n]	Calibration slot base referred to the 1st measuring axis.
SD54617 \$SNS_MEA_CAL_EDGE_PLUS_DIR_AX1[n]	Calibration slot edge in the positive direction of the 1st measuring axis.
SD54618 \$SNS_MEA_CAL_EDGE_MINUS_DIR_AX1[n]	Calibration slot edge in the negative direction of the 1st measuring axis.
SD54619 \$SNS_MEA_CAL_EDGE_BASE_AX2[n]	Calibration slot base referred to the 2nd measuring axis.
SD54620 \$SNS_MEA_CAL_EDGE_UPPERE_AX2[n]	Upper calibration slot edge referred to the 2nd measuring axis.

SD54621 \$SNS_MEA_CAL_EDGE_PLUS_DIR_AX2[n]	Calibration slot edge in the positive direction of the 2nd measuring axis.
SD54622 \$SNS_MEA_CAL_EDGE_MINUS_DIR_AX2[n]	Calibration slot edge in the negative direction of the 2nd measuring axis.

Note

For a standard lathe with axes X and Z (G18), axis Z is the 1st measuring axis and axis X is the 2nd measuring axis.

20.11.4.5 Measuring tools at the turning machines**Calibration data of the tool probe referred to the machine coordinate system**

If you wish to calibrate the tool probe in the machine coordinate system, then the position of the tool probe in the machine coordinate system must be entered into the following general cycle setting data.

SD54625 \$SNS_MEA_TP_TRIG_MINUS_DIR_AX1[k]	Trigger point in minus direction of the 1st measuring axis (for G18 Z).
SD54626 \$SNS_MEA_TP_TRIG_PLUS_DIR_AX1[k]	Trigger point in plus direction of the 1st measuring axis (for G18 Z).
SD54627 \$SNS_MEA_TP_TRIG_MINUS_DIR_AX2[k]	Trigger point in minus direction of the 2nd measuring axis (for G18 X).
SD54628 \$SNS_MEA_TP_TRIG_PLUS_DIR_AX2[k]	Trigger point in plus direction of the 2nd measuring axis (for G18 X).

Calibration data of the tool probe referred to the workpiece coordinate system

If you wish to calibrate the tool probe in the workpiece coordinate system, then the position of the tool probe in the workpiece coordinate system must be entered into the following general cycle setting data. In this case, the reference point is the outer diameter or the tool length of the active tool in the spindle.

Index [k] stands for the number of the actual data field (probe number -1).

SD54640 \$SNS_MEA_TPW_TRIG_MINUS_DIR_AX1[k]	Trigger point in minus direction of the 1st measuring axis (for G18 Z).
SD54641 \$SNS_MEA_TPW_TRIG_PLUS_DIR_AX1[k]	Trigger point in plus direction of the 1st measuring axis (for G18 Z).
SD54642 \$SNS_MEA_TPW_TRIG_MINUS_DIR_AX2[k]	Trigger point in minus direction of the 2nd measuring axis (for G18 X).
SD54643 \$SNS_MEA_TPW_TRIG_PLUS_DIR_AX2[k]	Trigger point in plus direction of the 2nd measuring axis (for G18 X).

Tool measurement using the "Orientable tool holder" or "Swivel tool" function

If the general cycle machine data MD52740 \$MNS_MEA_FUNCTION_MASK, bit 16 = 1, then the following setting applies:

MD51618 \$MNS_MEA_CM_ROT_AX_POS_TOL	Tolerance parameter for rotary axis settings
= 0.5	Default value

The real angular position of rotary axes can deviate from that programmed (exact stop fine window) This deviation depends on the position control properties of the axis. The maximum deviation that can be expected at a specific axis should be entered into the parameter. When the tolerance is exceeded, Alarm 61442 is output - "Tool holder not parallel to the geometry axes".

20.11.4.6 Simultaneous measurement on double spindles

Requirement



Software option

To use the "Simultaneous measurement", you require the software option: "Measurement level 2"

Checking and setting the general machine data

MD51740 \$MNS_MEA_FUNCTION_MASK	Measuring cycles function screen
Bit 14	Workpiece, simultaneous measurement function active
= 0	Simultaneous measurement function for double-spindle machine not active
= 1	Simultaneous measurement function for double-spindle machine active

MD18660 \$MN_MM_NUM_SYNACT_GUD_REAL[0]	Number of configurable real-type GUD variables
= 2	Minimum value

General cycle setting data

SD54740 \$SNS_MEA_FUNCTION_MASK	Measuring cycles function screen
Bit 3 = 0	Do not take the calibrated radius of the workpiece probe over into the tool data

SD54760 \$SNS_MEA_FUNCTION_MASK_PIECE	Setting for the input screen, measuring cycles in automatic mode, workpiece measurement.
Bit 3 = 1	Enable probe calibration data field to be selected
Bit 6 = 0	Enable selection of WO correction in the basis reference
Bit 7 = 0	Enable selection of WO correction in the channel-specific basic WO

Bit 8 = 0	Enable selection of WO correction in the global basic WO
Bit 9 = 0	Enable selection of WO correction in the work offset
Bit 26 = 0	Do not enable selection of the tool offset
Bit 28 = 1	Enable selection of adapt tool length

SD54780 \$SNS_J_MEA_FUNCTION_MASK_PIECE	Setting for the workpiece measurement in JOG input screen.
Bit 3 = 1	Enable probe calibration data field to be selected
Bit 28 = 1	Enable selection of adapt tool length

20.11.5 Logging

20.11.5.1 Logging the measuring, general

General logging can be performed without special settings:

- In the passive file system of the NC
- On the local drive of the CF card

If you want to use a logical drive for the logging, you require the Execution from External Storage (EES) function.

More information

A detailed description of the EES function is provided in the Function Manual Basic Functions.

General machine data

Logging can be controlled via the following machine data settings:

MD11420 \$MN_LEN_PROTOCOL_FILE	File size for log files (KB)
≥ 20	recommended value

Increase the value of machine data MD11420 if larger log files have to be stored in the file system of the NC.

MD11422 \$MN_PROTOCOL_FILE_MODE	Setting the behavior of the WRITE command
Bit 0	Persistence behavior
= 0	time-delayed WRITE command (immediately persistent)
= 1	= fast WRITE command (time-delayed persistent)

Note

Set MD11422 bit 0 = 1 so that the program runtimes are not lengthened significantly.

20.11.5.2 Logging while measuring in the JOG mode

You can set the following setting data in the "Settings for Measurement Log" window for the JOG mode.

More information

More information about the setting procedure is provided in the Operating Manual Turning/Milling/Grinding.

Cycle channel setting data

SD55774 \$SCS_J_MEA_PROTOCOL_FILE	Name and path for the log file for measuring in JOG
//NC:/WKS.DIR/TEMP.WPD/J_MEAPROT.TXT	Default setting

SD55740 \$SCS_MEA_FUNCTION_MASK	Function screen form measuring cycles, workpiece/ tool measurement
Bit 28	Select new log or continuous log for measuring standard log in JOG
= 0	New log (default value)
= 1	Continuous, i.e. always attach to the existing log
Bit 29	Select file format for measuring standard log in JOG
= 0	Text format (default value)
= 1	Tabular format

20.11.5.3 Logging while measuring in the AUTOMATIC mode**Cycle channel setting data**

SD55730 \$SCS_MEA_PROTOCOL_USER_EXT	File extension for user log
TXT	Default setting

SD55614 \$SCS_MEA_RESULT_MRD	Setting of the program control of the measurement result display MRD
= 0	Switch off the measurement result display
= 1	Switch on the measurement result display (default value)

Definition file: User GUD block

Data for user logs are generally logged from the S_PROTTXT[10] GUD array (PGUD).

If the data array is not sufficient, you can create a second array with the predefined name S_USERTXT[n] in a separate GUD block (e.g. MGUD or UGUD):

```
DEF NCK STRING[200] S_USERTXT[n] ; n = number of field elements
```

Note

The logging operation checks whether the S_USERTXT array is available. If S_USERTXT is available, the content of the array is logged. If S_USERTXT is not available, the content of the S_PROTTXT array is logged.

20.11.5.4 Manufacturer and user cycle CUST_MEAPROT.SPF**Function**

You can make individual adaptations to the log form and content in the CUST_MEAPROT cycle.

Procedure

1. Open the CUST_MEAPROT.SPF cycle file.
2. Select the program lines in the _MARK1 block.
3. Copy the contents from the _MARK1 block to the _MARK2 block.
4. Adapt the parameters individually in the _MARK2 block.
5. Save the changed cycle file.
The original default values are retained and can be activated/deactivated at any time (setting of comment characters).

Parameter

In the CUST_MEAPROT cycle, all the possible parameter changes are described in detail in the _MARK2_1 block.

You can adapt the following parameters:

Parameter	Default value	Input area
Characters per line	66	> 66 possible ⁽¹⁾
Characters per column 2 to 4	14	Min. 12, max. 14
Workpiece counter	""	Identifier
Column space	" "	Blank string (≥ 2 * blanks)
Identifier for tolerance specification	"#"	1 character

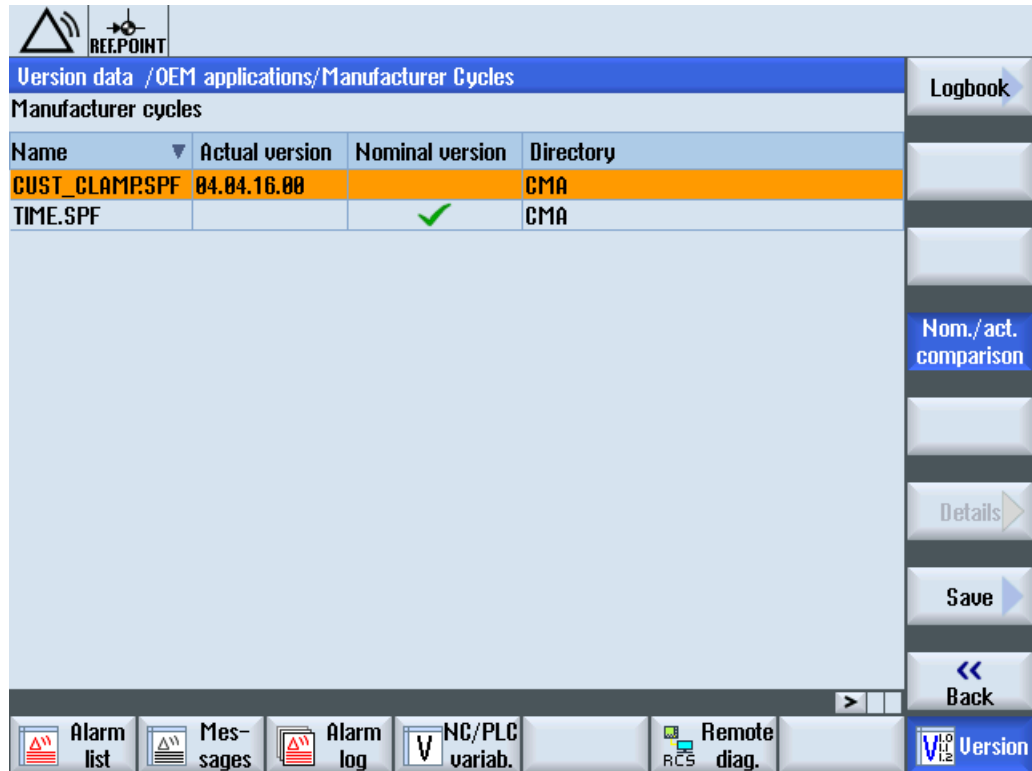
Parameter	Default value	Input area
Identifier for tolerance violation	!"	1 character
Log header lines 5 to 7	""	Any text

- ¹⁾ 66 characters per line correspond to the screen width in the default setting. A log line is therefore displayed completely on the screen. If logging is mainly performed in the file system of the NC, this setting should be retained because of the better readability. If you perform logging mainly in external files, you can increase the line width accordingly. In this case, the width of column 1 is increased automatically (with the same width for columns 2, 3 and 4 and the same column space).

20.12 Compare cycles version

20.12.1 Display cycles version

If cycles have version details, you can display them in the version screen.



Precondition

The version details are included in the cycles files in the following form:

```
;VERSION: <Version> ;DATE: <YYYY-MM-DD>
```

Example:

```
;VERSION: 05.05.05.00 ;DATE: 2012-11-30
```

Procedure



1. Select the "Diagnostics" operating area.



2. Press the "Version" softkey.
It takes some time to call the version display. While the version data is being determined a progress message box and the appropriate text are displayed in the dialog line.



3. Select the "OEM applications /manufacturer cycles" areas and press the "Details" softkey.
The "Manufacturer Cycles" window opens.
The "Planned-actual comparison" softkey is selected by default.

See also

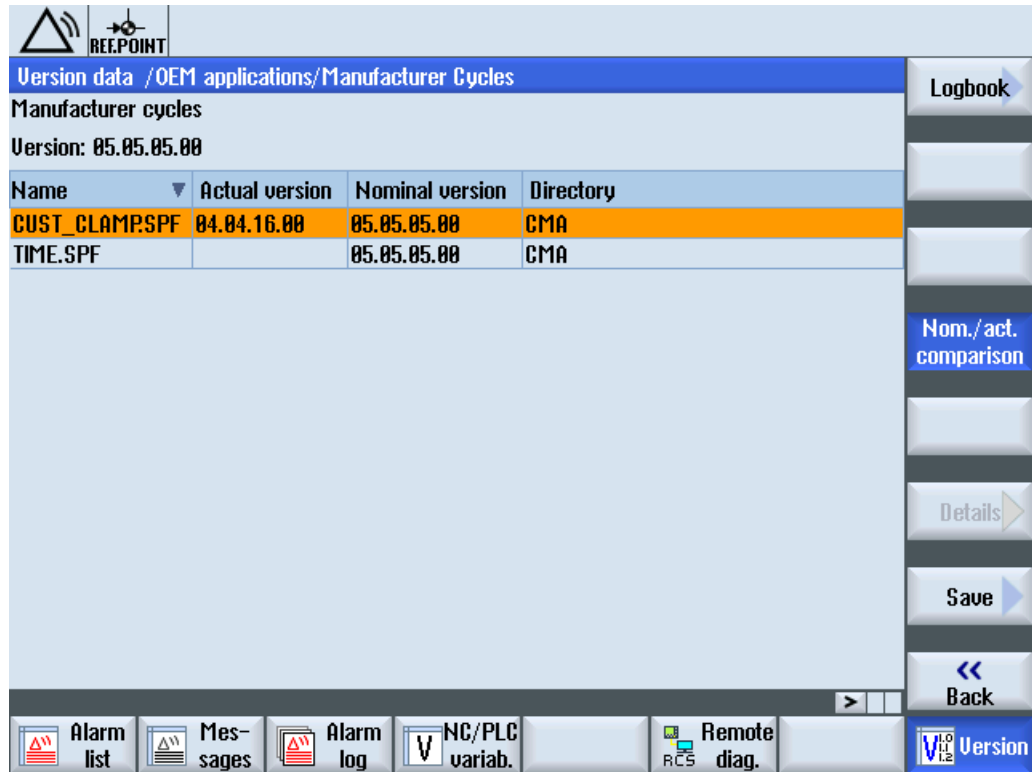
Save information (Page 338)

Logbook (Page 342)

20.12.2 Specify cycles version

General

You have the possibility to compare a required cycles version with the existing cycles version in the version view.



File overview

The following files are required:

Name	Path	Meaning
versions.xml	/siemens/sinumerik/hmi/data/version/oem/cma	Version file
versions.xml	/oem/	Version path file

Adapting the version file

The cycles version specification requires a manual adaptation of the version file.

1. Copy the "versions.xml" sample file from the following directory:
/siemens/sinumerik/hmi/data/version/oem/cma
2. Save the sample file in its own directory under /oem.
The standard directory for this purpose is /oem/sinumerik/hmi/data/version/oem/cma.
3. Open the file.

4. Enter the planned version for the cycles files in the <info> tag with "defaultFileVersion" and the details for the complete version in the <Version> tag.
5. Close the file to save the changes.

Example:

```
<info defaultFileType=" *.spf *.cpf" defaultFileVersion="05.05.00.00"  
linkname="CMA" linkpath="//NC/CMA.DIR" EffDirOrder="CUS CMA">  
<Name>Manufacturer cycles</Name>  
<Version>5.5.0.0</Version>  
<Link>  
<Name>CUS</Name>  
<Path>//NC/CUS.DIR</Path>  
</Link>  
</info>
```

Adapting the version path file

If the version file is saved in the standard directory, and a current oem\versions.xml is available, no changes are required. In all other cases, the path data can be manually changed:

1. Open the versions.xml file under /oem
2. Replace the standard path in the <Path> tag for the "Manufacturers Cycles" with your own path for the version file.
3. Close the file to save the changes.

Standard:

```
<Component>  
<Name>Manufacturer Cycles</Name>  
<Path>/siemens/sinumerik/hmi/data/version/oem/cma</Path>  
</Component>
```

Example:

```
<Component>  
<Name>Manufacturer Cycles</Name>  
<Path>/oem/sinumerik/hmi/data/version/oem/cma</Path>  
</Component>
```


Additional language

21.1 Installing additional languages

Additional languages

In addition to the already existing standard languages, additional user interface languages are available on a separate DVD.

The integrated online help is either displayed in the relevant language of the country or in English.

Refer to Section "Supported languages (Page 597)" to view the languages in which this interface is available.

Requirement



Software option

You require the following software option in order to use this function:
"Additional languages"

- After the installation, approx. 256 MB memory must be available on the CompactFlash Card.
- Language extension software "hmi_sl_language_xxx_02.06.00.00y.arc".
xxx = language code, y = internal version ID
Is supplied on the language extension DVD.

Installing a language

Install the language the same as for a commissioning archive (ARC). For the procedure, please refer to Section "Reading-in a start-up archive (Page 258)".

Note

Language extensions software of the previous version is compatible with the current operating software.

21.2 Uninstalling languages

If you no longer require a language interface, then you can uninstall this.

Note

Standard languages and the currently active language for the operating software cannot be uninstalled.

Procedure



1. Select the "Startup" operating area.



2. Press the "Change language" softkey.

The "Language selection" window opens. The language most recently set is highlighted.



3. Switch the cursor to the required language.

4. Press the "Delete language" softkey.

The "Delete language" window opens.



5. Press the "OK" softkey.

The operating software uninstalls the selected language.

21.3 Supported languages

Table 21-1 Supported languages

Language	Language code	Standard languages
Chinese simplified	chs	X
Chinese (traditional)	cht	
Danish	dan	
German	eng	X
English	eng	X
Finnish	fin	
French	fra	X
Indonesian	ind	
Italian	ita	X
Japanese	jpn	
Korean	kor	
Malay	msl	
Dutch	nld	
Polish	plk	
Portuguese	ptb	
Romanian	rom	
Russian	rus	
Swedish	sve	
Slovenian	slv	
Slovakian	sky	
Spanish	esp	X
Thai	tha	
Czech	csy	
Turkish	trk	
Hungarian	hun	
Vietnamese	vit	

SINUMERIK Operate on PCU/IPC

22.1 Link OEMFrame application

Integrating an OEM application

The following files should be adapted and created in order to integrate an OEMFrame application into the operating software:

- Configuration file "systemconfiguration.ini"
The operating software is started and controlled from the system manager; the system manager also controls the OEMFrame applications. The system manager is configured using the "systemconfiguration.ini" configuration file.
- Configuring the start softkey
In order to start an OEMFrame application from the operating software, configure a softkey on the expansion bar of the operating area.
- Configuration file "slamconfig.ini"
In order to configure the softkey position with text and/or symbol for the OEMFrame application, generate the "slamconfig.ini" file.
- Save the language-dependent text for a softkey in the file mytext_<lng>.ts.

"systemconfiguration.ini" file

In order to integrate an OEMFrame application into the operating software, copy the "systemconfiguration.ini" configuration file and place it in one of the two directories:

<Installation path>/**user**/sinumerik/hmi/cfg

<Installation path>/**oem**/sinumerik/hmi/cfg

All of the processes to be managed by the system manager, as well as the applications that are to be integrated as OEMFrame applications are in the **[processes]** section.

Value	Meaning
process	Symbolic name of the OEMFrame application. This is required to configure the operating areas.
cmdline	Command line which is transferred to the "oemframe.exe" process when starting.
oemframe	For OEMFrame applications, always set to "true".
windowname	Window name of the OEMFrame application - determined with "findwindow.exe".
classname	Class name of the OEMFrame application - determined with "findwindow.exe".
deferred	true: OEMFrame application is not started when SINUMERIK Operate powers up, but only when selected for the first time.

22.1 Link OEMFrame application

Value	Meaning
startupTime	The linked process starts as follows: immediately: immediately (default) afterServices: after all services have started afterGuis: after all GUI components have started If SINUMERIK Operate is shut down, the process goes in reverse: immediately: immediately (default) afterServices: after all services have shut down afterGuis: after all GUI components have shut down
gimmekeys	Release mask for system configuration keys that are to be handled by the OEMFrame application. The parameterization is performed in the form of a bit mask.
disablekeys	Parameterization for the keyboard filter behavior. The parameterization is performed in the form of a bit mask.
menuselectkey	The value is used for changing the key that calls the operating area menu (default F10). The value is a logically ORed combination of the modifications (Microsoft definition) Key_Shift, Key_Alt, Key_Ctrl, and the virtual key code.
timeout	Maximum duration for the search for the OEMFrame application in milliseconds. If the OEMFrame application was not found within this time, it is not managed by the System Manager. Default setting in the "systemconfiguration.ini" file: [miscellaneous] startTimeoutDefault
shutdowntime	Maximum duration for downloading the OEMFrame application in milliseconds. If the OEMFrame application was not found after this period of time, the process is canceled. Default setting in the "systemconfiguration.ini" file: [miscellaneous] shutdownTimeoutDefault

Bit mask "gimmekeys"

The bit mask for an OEMFrame application is set to the binary value 0xF by default. All of the key combinations from F1 to F8 are fed to the OEMFrame application. The OEMFrame application itself can handle a specific key/key combination by setting additional bits. Otherwise, the system configuration will evaluate the key/key combination and it will not even reach the OEMFrame application.

You can parameterize the bit mask "gimmekeys" as follows:

Bit	Keys	Meaning
0	F1 - F8	Horizontal softkeys (upper bar, HU)
1	Shift+F1 - Shift+F8	Vertical softkeys (right bar, VR)
2	Ctrl+F1 - Ctrl+F8	Horizontal softkeys (lower bar, HL)
3	Shift+Ctrl+F1 - Shift+Ctrl+F8	Vertical softkeys (left bar, VL)
4	F9	Recall
5	Shift+F9	ETC switchover
6	F10	Operating area menu
7	Shift+F10	M key

Bit	Keys	Meaning
8	F11	Channel switchover key
9	Shift+F11	M key (hard key)
10	F12	Info/help
11	Shift+F12	Custom key (hard key)
12	ESC	Alarm cancel
13	HOME	Window switchover key
14	END	PROGRAM (hard key)
15	PAGE UP	ALARM (hard key)
16	PAGE DOWN	TOOL OFFSET (hard key)
17	HOME (NUMPAD)	PROGRAM MANAGER (hard key)
18	F13 - F20	Extended, horizontal softkeys (upper bar, HU)
19	Shift+F13 - Shift+F20	Extended, vertical softkeys (right bar, VR) and right direct keys HT8
20	Ctrl+F13 - Ctrl+F20	Extended, horizontal softkeys (lower bar, HL)
21	Shift+Ctrl+F13 - Shift+Ctrl+F20	Extended, vertical softkeys (left bar, VL) and left direct keys HT8

Bit mask "disablekeys"

The bit mask for an OEMFrame application is set to the binary value 0x3FFFF by default. Thus, all of the keyboard sequences are filtered out and not forwarded to the OEMFrame application. If a bit is set to 0, the keyboard filter for the corresponding sequence is deactivated and the OEMFrame application is able to receive the keyboard sequence.

If, for example, an OEMFrame application is to receive all of the softkeys of left and bottom softkey bar, set the "disablekeys" bit mask to the binary value 0x300FF.

You can parameterize the bit mask "disablekeys" as follows:

Bit	Keys	Meaning
0 - 7	Reserved	
8	(Shift)+Ctrl+F1	Lower and left-hand softkey bar (HL, VL)
9	(Shift)+Ctrl+F2	Lower and left-hand softkey bar (HL, VL)
10	(Shift)+Ctrl+F3	Lower and left-hand softkey bar (HL, VL)
11	(Shift)+Ctrl+F4	Lower and left-hand softkey bar (HL, VL)
12	(Shift)+Ctrl+F5	Lower and left-hand softkey bar (HL, VL)
13	(Shift)+Ctrl+F6	Lower and left-hand softkey bar (HL, VL)
14	(Shift)+Ctrl+F7	Lower and left-hand softkey bar (HL, VL)
15	(Shift)+Ctrl+F8	Lower and left-hand softkey bar (HL, VL)
16	Reserved	
17	Reserved	

Bit mask "disablekeyshigh"

It may be necessary to map key sequences because the operating system already responds to Ctrl-F4 and Ctrl-F6 in certain situations.

You can parameterize the bit mask "disablekeyshigh" as follows:

Bit	Meaning
0 - 28	Reserved
29	Key sequences Ctrl-F1 to Ctrl-F8 can be mapped onto key sequences Ctrl-F13 to Ctrl-F20.
30 - 31	Reserved

Note

The "gimmekeys", "disablekeys" and "disablekeyshigh" bit masks can be specified both with a decimal code (e.g. 31) and a hexadecimal code (e.g. 0x1F).

Examples

Note

Write error

Avoid write errors. Determine the entries for the sections "processes" and "areas" only with the FindWindow program.

"notepad.exe" and "calc.exe"

In the following example, the two Windows applications "notepad.exe" and "calc.exe" are configured as OEMFrame applications:

```
[processes]
```

```
PROC500=process:=notepadOEM, cmdline:="C:\\WINDOWS\\system32\\
\notepad.exe", oemframe:=true, deferred:=true,
windowname:="Untitled - Notepad", classname:="Notepad"
```

```
PROC501=process:=calcOEM, cmdline:="C:\\WINDOWS\\system32\\
\\calc.exe", oemframe:=true, deferred:=true,
windowname:="Calculator", classname:="SciCalc"
```

```
[areas]
```

```
AREA500=name:=AreaNote, process:=notepadOEM
```

```
AREA501=name:=AreaCalc, process:=calcOEM
```

"keycatcher.exe"

The Windows application "keycatcher.exe" is integrated in the following example. In this case, all four softkey bars and the Recall key will reach the Windows application. The keyboard filter for the lower and the left-hand softkey bar is deactivated:

```
[processes]
```

```
PROC500= process:=keycatcherOEM, cmdline:="keycatcher.exe",
oemframe:=true, deferred:=true, windowname:="keycatcher",
classname:="QWidget", gimmekeys:=0x1F, disablekeys:=0x300FF
```

[areas]

```
AREA500=name:=AreaKeyCatcher, process:= keycatcherOEM
```

The Windows application "keycatcher.exe" is integrated in the following example. In this case, all four softkey bars and the F10 key will reach the Windows application. Press Ctrl+F12 to show the operating area menu when a Windows application is displaying (the system configuration no longer evaluates F10):

[processes]

```
PROC500= process:=keycatcherOEM, cmdline:="keycatcher.exe",
oemframe:=true, deferred:=true, windowname:="keycatcher",
classname:="QWidget", gimmekeys:=0x4F, disablekeys:=0x300FF,
menuselectkey:=Key_Control|0x7B
```

[areas]

```
AREA500=name:=AreaKeyCatcher, process:= keycatcherOEM
```

The Windows application "keycatcher.exe" is integrated in the following example. In this case, all four softkey bars are fed to the Windows application. Key sequences Ctrl-F1 to Ctrl-F8 can be mapped onto key sequences Ctrl-F13 to Ctrl-F20:

[processes]

```
PROC500= process:=keycatcherOEM, cmdline:="keycatcher.exe",
oemframe:=true, deferred:=true, windowname:="keycatcher",
classname:="QWidget", gimmekeys:=0xF, disablekeys:=0x300FF
```

[areas]

```
AREA500=name:=AreaKeyCatcher, process:= keycatcherOEM
```

The [areas] section

The SINUMERIK Operate operating areas are configured in this section.

Value	Meaning
name	Symbolic name for the operating area
process	Name of the OEMFrame application according to section [processes]
panel	Name of the panel (header) to be used Only "SIHdStdHeaderPanel" is currently available for OEMFrame applications.
plcid	ID to identify the operating area using the SINUMERIK Operate monitor Only values in the range of 150 to 199 are permitted.

NOTICE**Basic components are overwritten**

If you use numbers less than 500, then it is possible that Siemens basis components will be overwritten. In the "processes" and "areas" sections, the number range 500 - 999 is permissible.

Example

```
[areas]
```

```
AREA600= name:=AreaOEM, process:=notepadOEM
```

```
AREA601= name:=AreaCalc, process:=calcOEM, panel:=SlHdStdHeaderPanel
```

Note

Only OEMFrame applications are supported that use programming interfaces of SINUMERIK Operate.

The [miscellaneous] section

You can make various settings in this section. Generally, only the start operating area is changed.

Key	Value
startuparea	Name of the start operating area

Example

```
[miscellaneous]
```

```
startuparea = AreaOEM
```

Configuring the operating area menu

The operating area menu is intended for switching over the operating areas configured in the "systemconfiguration.ini" configuration file. A softkey for selecting the appropriate operating area is provided on the horizontal softkey bar for each operating area configured.

The operating area displays the names of the operating areas from the "systemconfiguration.ini" configuration file as the text on the operating area softkeys. The system automatically searches for a free softkey on the horizontal softkey bar for each operating area.

Configuring additional settings

In order to configure the following settings you require the "slamconfig.ini" configuration file:

- Assigning a softkey position to a specific operating area.
- Creating a language-dependent text for the softkey.
- Displaying a symbol for the operating area on the softkey.

Creating the "slamconfig.ini" configuration file

Copy the "slamconfig.ini" and place the file in the same directory in which the "systemconfiguration.ini" file is located:

<Installation path>/**user**/sinumerik/hmi/cfg

<Installation path>/**oem**/sinumerik/hmi/cfg

"slamconfig.ini" file

In the "slamconfig.ini" configuration file, for every operating area, you can create a section that was configured in the "systemconfiguration.ini" file. The section must bear the configured name of the appropriate operating area, e.g. AreaOEM.

Value	Meaning
TextId	Text ID for a foreign-language text which will be displayed as the softkey label.
TextContext	Context of the foreign-language text.
TextFile	Name of the text file which includes the context and the foreign-language text.
Graphic	Name of an image file which will be used as an icon for the softkey.
SoftkeyPosition	Fixed softkey position of the area softkey. In this case, softkey positions 1 to 8 are located on the 1st horizontal bar and softkey positions 9 to 16 on the 2nd horizontal bar, etc.
AccessLevel	Access level from which the softkey will be displayed. If this value is not specified, the access level 7 (keyswitch position 0) is set.

Example

The softkey for the "AreaOEM" operating area with the following properties is configured in the following example:

- The softkey displays the text which has been stored in the "mytext_<lng>.ts" text file under the context "mycontext" with the "MY_AREA" TextID.
- The "mypicture.png" icon is displayed on the softkey.
- The softkey is located at position 7 in the operating area menu.
- The softkey with access level 5 (keyswitch position 2) is displayed.

```
[AreaOEM]
; Text-ID of a language dependent text
TextId = MY_AREA
; File name of the text file which contains the Text-ID
TextFile = mytext
; Context in the text file to which the Text-ID is assigned to
TextContext = mycontext
; File name of an icon shown on the area softkey
Picture = mypicture.png
; Position of the area softkey on area menu,
```

22.1 Link OEMFrame application

```
; If no position is specified, an empty position is searched
SoftkeyPosition = 7
; Access level of the area softkey
AccessLevel = 5
```

Note

Operating area position 7 is reserved for OEM users.

Labeling text for the softkey

Storage path:

<Installation path>/**user**/sinumerik/hmi/lng

<Installation path>/**oem**/sinumerik/hmi/lng

The XML identifiers have the following meanings:

Attribute	Description
context	Context within the text file. Each file must have at least one context.
name	Name of the context.
message	Text translation. There must be at least one message per context.
source	Text identifier.
translation	Translated text.
remark	Text comment (optional).
chars	Maximum possible length of the text in characters. If nothing is specified, the text can have any length (optional).
lines	Maximum number of lines available for display. If nothing is specified, the number of lines is unlimited (optional).

Structure of the language-dependent ts file that contains the labeling text for the softkey:

```
mytext_<lng>.ts
<?xml version="1.0" encoding="utf-8" standalone="yes"?>
<!DOCTYPE TS>
```

mytext_<lng>.ts

```
<TS>
  <context>
    <name>mycontext</name>
    <message>
      <source>MY_AREA</source>
      <translation>Text, which is displayed on the softkey</translation>
      <remark>comment (optional)</remark>
      <chars>20</chars>
      <lines>2</lines>
    </message>
  </context>
</TS>
```

<lng> stands for the language code.

22.2 Parameterizing the OEMFrame application

File "oemframe.ini"

Using the "oemframe.ini" file, it is possible to further parameterize OEMFrame applications. Create the file in the following directory:

<Installation path>/compat/oem

Create a separate section with the required parameters for each OEMFrame application. Name the section according to the corresponding program file without a filename extension. Place the name in square brackets.

Example

```
[notepad]
```

Parameter overview

The following parameters can be used for OEM applications:

Parameter	Meaning	Default value
WindowStyle_On	Defines properties to be assigned to the window	0
WindowStyle_Off	Defines properties that the window must not have	0
x	Horizontal starting coordinate of the OEMFrame application (unit: pixels)	0
y	Vertical starting coordinate of the OEMFrame application (unit: pixels)	0
Width	Width of the OEMFrame application (unit: pixels)	Desktop width
Height	Height of the OEMFrame application (unit: pixels)	Desktop height
nDelayInitComplete	Delays the feedback to the System Manager	0
fSearchOnlyForTaskWindow	States whether the window specified in the "systemconfiguration.ini" file belongs to the task specified there	1
fRestoreTaskWindow	Defines the behavior when exiting an application that was started from the OEMFrame application	0
fKeepPlacement	Deactivates the size adaptation	0
fForceTaskFocus fSearchForPopUps	Define which window of the OEMFrame application will be displayed when starting.	0 1

Parameter	Meaning	Default value
nInitShowMode	State in which the window of the OEMFrame application is displayed when the application is started.	SW_SHOWMINNOACTIVE
nShowMode	State in which the window of the OEMFrame application is displayed when it is shown.	SW_SHOWNORMAL
nUnShowMode	State into which the window of the OEMFrame application is put when it is hidden.	SW_SHOWMINNOACTIVE
fWinForms	Must be set if the application is a "Windows Forms Application"	0
nSwitchToTaskAfterTermination	Controls the behavior when the OEMFrame application is exited	-1
fFindWindowWithWildcards	Used for wildcards (?, *) for the attribute Windowname	0

WindowState_On/WindowState_Off

The appearance of a Windows application is defined with the aid of the Windows API function `SetWindowLong`. When the `SetWindowLong` function is called, the appearance of the application is controlled using an 8-byte word. 2 bytes of this word can be changed using the `WindowState_On` and `WindowState_Off` parameters.

The `WindowState_On` parameter defines properties to be assigned to the window. The `WindowState_Off` defines properties that the window must not have.

The following control options are possible with `WindowsStyle` parameters (binary characteristic values):

0000	0000	xxxx	xxxx	0000	0000	0000	0000
		1010		Header			
		1000		Border			
		0100		Type of window frame on a dialog box			
		0010		Vertical scroll bar			
		0001		Horizontal scroll bar			
			1000	System menu			
			0100	Frame (Thickframe)			
			0010	Minimize box			
			0001	Maximize box			

Assign binary characteristic values to the `WindowState` parameters as decimal numbers. It is possible to do the conversion using the calculator in Windows, for example.

Example conversion

The properties of the system menu as well as the horizontal and vertical scroll bar should be defined. According to the table, these are:

0000 0000 0011 1000 0000 0000 0000 0000 binary or

0038 0000 hexadecimal

1. Select Hex on the calculator.
2. Enter the digit string 00380000 (leading zeroes can be omitted).
3. Select Dec.
Result: 3670016
4. Assign the result to the parameter as a characteristic value.

Application examples

For the Windows application Notepad, the system menu as well as the horizontal and vertical scroll bar should be activated:

```
[notepad]
```

```
WindowState_On = 3670016
```

No minimize box and no maximize box should be displayed for the Windows application Notepad:

```
[notepad]
```

```
WindowState_Off = 196608
```

x/y

The parameters *x* and *y* define the starting coordinates of the window of the Windows application to be linked, measured from an origin in the upper left corner of the screen. *x* is the horizontal coordinate, *y* is the vertical coordinate pointing downward. The unit of measurement is pixels.

The available working area depends on the screen layout being used.

Width

This parameter defines the width of the window for the Windows application, measured in pixels from the window origin according to parameter *x*.

Height

This parameter defines the height of the window for the Windows application, measured in pixels from the window origin according to parameter *y*.

nDelayInitComplete

As soon as the window of a Windows application has been initiated, the information is sent to the System Manager. The Windows application can then be selected using the System Manager. This information can be delayed using the `nDelayInitComplete` parameter. The unit is specified in milliseconds.

A delay is necessary, for example, if the Windows application must carry out other actions while generating its window. If the window is activated too soon by the system manager, display errors will occur in the Window.

Example

After creating its window, the Windows application "app.exe" reads additional status data from a database. The window of the Windows application may only be displayed after all status data has been read. This read operation should take approximately one second. The following parameter assignment is possible:

```
[app]
nDelayInitComplete = 2000
```

fSearchOnlyForTaskWindow

This parameter specifies whether the window specified in the file "systemconfiguration.ini" using `ClassName/WindowName` belongs to the task that is also specified there.

The following values can be used:

fSearchOnlyForTaskWindow	
= 0	The window does not belong to the specified task.
= 1	The window belongs to the specified task.

When searching, not only are the windows of the task configured in "systemconfiguration.ini" taken into account, but all of the windows that exist in the system at the time of the search.

Example

The Windows application comprises more than one process, e.g. a "startup.exe" and a "user.exe". In the "systemconfiguration.ini" file, only "startup.exe" is entered, from which "user.exe" is started. The application window belongs to "user.exe" and is therefore not found when searching is restricted to the windows of "startup.exe".

The following parameter assignment is possible:

```
[startup]
fSearchOnlyForTaskWindow = 0
```

fRestoreTaskWindow

This parameter defines the behavior when exiting a Windows application that was started from the OEMFrame application as second task level.

When the OEMFrame application is deselected, the last window that was active (`ForegroundWindow`) is saved by default. When reselecting the OEMFrame application, this window is reactivated.

If another application was started from the OEMFrame application, then the active window refers to the new Windows application.

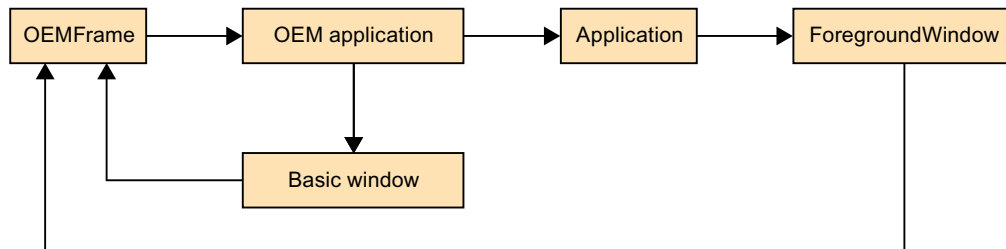
Note**Incorrect displays**

In many cases, the proxy application "oemframe.exe" cannot detect when the new Windows application ends. Display errors can occur in the second task level. Activate a basic window for the OEMFrame application.

The behavior can be influenced via the following values:

fRestoreTaskWindow	
= 0	When selecting the OEMFrame application or starting a Windows application from the OEM-Frame application, the <code>ForegroundWindow</code> is activated. When ending the second task level, the OEMFrame application is displayed.
= 1	When selecting the OEMFrame application or starting a Windows application from the OEM-Frame application, a basic window is activated before the <code>ForegroundWindow</code> is activated. When ending the second task level, the basic window of the OEMFrame application is always displayed.

Schematic



fForceTaskFocus/fSearchForPopUps

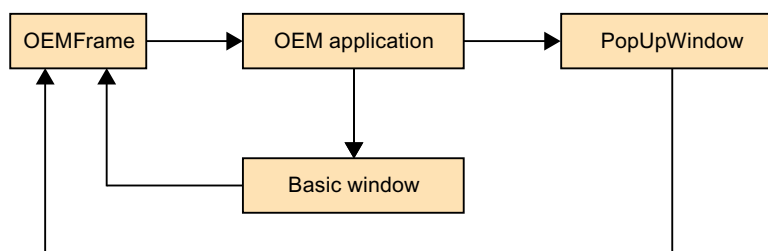
These two parameters define which window the OEMFrame application will activate after it has been deselected and reselected again.

On switching from one operating area to another, the last active window `ForegroundWindow` of the OEMFrame application is saved. When reselecting the application, the `ForegroundWindow` window is then reactivated.

The behavior can be changed via the following values:

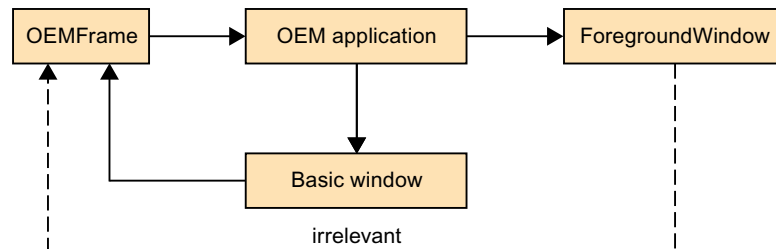
fForceTaskFocus and fSearchForPopUps	
= 1	When the OEMFrame application is deselected, an active popup window is searched for rather than the <code>ForegroundWindow</code> window. Behavior of the search: • If a popup window was found, it is displayed when the OEMFrame application is reselected. • If no popup window exists or was found, the basic window of the application is displayed when the application is reselected.

Schema fForceTaskFocus/fSearchForPopUps with value 1



With the following value change, only the basic window of the OEMFrame application is taken into consideration when an application is selected or deselected. The basic window is specified in `ClassName/WindowName` in the "systemconfiguration.ini" file:

Schema fForceTaskFocus with value 1 and fSearchForPopUps with value 0



fKeepPlacement

This parameter deactivates the resizing (zooming) for the basic window of the OEMFrame application. By default, the application is zoomed to the screen size before it is displayed. In the case of applications that do not allow their windows to be zoomed, the resizing can result in display problems. In such cases, the zoom function must be deactivated.

Example

An application "fixres.exe" should be displayed in its programmed window size. The following parameter assignment is required:

```
[fixres]
```

```
fKeepPlacement = 1
```

fSearchForPopUps	
= 0	No active pop-up window is searched for.

nInitShowMode/nShowMode/nUnShowMode

The three parameters define how the application window will be displayed when the application is started, hidden, and shown.

The parameter `nInitShowMode` starts the application. The `nShowMode` parameter refers to showing the application (area is activated). The parameter `nUnShowMode` hides the application.

The following value range exists for the parameters `nShowMode` and `nUnShowMode`:

nShowMode and nUnShowMode	
= 0	The application window is hidden (SW_HIDE).
= 1	The application window is displayed in its original form (position, size) and has the input focus (SW_SHOWNORMAL, SW_NORMAL).
= 2	The application window is minimized and has the input focus (SW_SHOWMINIMIZED).
= 3	The application window is maximized (SW_SHOWMAXIMIZED).
= 4	The application window is displayed without having the input focus (SW_SHOWNOACTIVATE).

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= 5	The application window is displayed and has the input focus (SW_SHOW).
= 6	The application window is minimized and loses the input focus (SW_MINIMIZE).
= 7	The application window is minimized without having the input focus (SW_SHOWMINNOACTIVE).
= 8	The application window is displayed without having the input focus (SW_SHOWNA).
= 9	The application window is displayed in its original form (position, size) (SW_RESTORE).
= 10	The application window is displayed in the same way as when the application was started (SW_SHOWDEFAULT).

Note

Display problems

The default settings function for most of the applications.

In exceptional cases, display problems can occur in applications with Borland-Delphi development, i.e. shifted windows, etc.

Use the following parameters in this case:

```
nUnShowMode = 0
```

```
fKeepPlacement = 1
```

or

```
nInitShowMode = 1
```

fWinForms

Windows Forms parameters provide control elements to applications which also use Windows default applications, e.g. dialog boxes, menus and buttons.

If the OEMFrame application is a Windows Forms application, then the following parameterization is required:

```
[<app-name>]
```

```
fWinForms = 1
```

Note

Deactivated size adjustment

If the parameter `fWinForms` is not set, the OEMFrame application does not open to the maximum size. The specified size adjustments (`x`, `y`, `Width` and `Height`) are deactivated.

nSwitchToTaskAfterTermination

This parameter controls the behavior when the OEMFrame application is exited. Normally in this situation, the system manager displays the operating area switchover, which can be used to switch over to another area.

The parameter `nSwitchToTaskAfterTermination` can be used to initiate an automatic switch to the previously active area:

<code>nSwitchToTaskAfterTermination</code>	
= -1	Display of the operating area switchover (default)
= -2	Switchover to the previously active area

Example

When the "closeapp.exe" Windows application is exited, a switch should be made to the previous area. The following parameter assignment is required:

```
[closeapp]
nSwitchToTaskAfterTermination = -2
```

fFindWindowWithWildcards

With this parameter, a wildcard search can be activated for the attribute `Windowname`. In this way it is possible to identify applications that do not have the same attribute `window name` at every start, e.g. access level, time-of-day under `window name`, etc.:

<code>fFindWindowWithWildcards</code>	
= 0	Wildcard search is switched off
= 1	Wildcard search is switched on
	Wildcard:
	?
	One arbitrary character
	*
	Any number of characters

Example

An application is to be integrated that contains the start time in the attribute `window name`:

oemframe.ini

```
[MyQtTest]
fFindWindowWithWildcards = 1
```

systemconfiguration.ini

```
[processes]
PROC500=process:=ProcessOEM, cmdline:="C:\\Program Files(x86)\\Siemens\\
MotionControl\\oem\\sinumerik\\hmi\\appl\\MyQtTest.exe", oemframe:=true,
windowname:="MyQtTest - ??:??:??", classname:="QWidget", deferred:=true

[areas]
AREA500=name:=Test, process:=ProcessOEM
```

22.3 Creating OEM subdirectories

If you would like to integrate several OEM applications (user interface dialogs or OEM frame applications), you can distribute them to their own OEM subdirectories. The advantage is the clear assignment of the files to a particular OEM application. This is especially true for the "systemconfiguration.ini" file as there is a risk of it being accidentally overwritten when copying, which may hide other OEM applications.

Create OEM subdirectories with any directory name under /oem/sinumerik/hmi. These subdirectories are communicated in the file "systemconfiguration.ini" in directory /oem/sinumerik/hmi/cfg. Create the following syntax in section **[oem_dirs]**:

```
OEM_<Number>=<OEM subdirectory name>
```

Example

```
[oem_dirs]
OEM_1=oem_example
OEM_2=oem_new
```

Under the two subdirectories /oem/sinumerik/hmi/oem_example and /oem/sinumerik/hmi/oem_new, create directories "appl", "cfg", "lng", "hlp", etc. again as required.

22.4 FindWindow program application

You can use the FindWindow program to determine all the parameters in the "systemconfiguration.ini" file that are relevant for integrating an OEMFrame application into SINUMERIK Operate.

Requirement

For changes to become effective in SINUMERIK Operate through the FindWindow program, you need access level 2 (Service).

Installation

FindWindow can be used on any PCU without being installed.

FindWindow (findwindow.exe) is located in the following directory:
C:\Program Files (x86)\Siemens\MotionControl\Common\FindWindow\

Application

1. Start the PCU.
2. Install the application to be integrated using OEMFrame.
3. Open the application.
4. Open the FindWindow program.
5. Left-click to drag the red cross to the title bar of the application in the FindWindow program.
6. Check the application parameters "FileName", "ClassName", etc.
7. Select the parameters "Gimmekey", "Disablekeys", etc. via the checkboxes as needed.
If the configuration file "systemconfiguration.ini" exists and you want to expand it:
8. Copy the entries to the clipboard by clicking on "Copy to Clipboard".
9. Open the existing configuration file and insert the parameters from the clipboard. To do this, right-click on the position at which the parameters are to be inserted and then click on "Insert".
10. Save the modified configuration file.
- OR -
If the configuration file "systemconfiguration.ini" does not exist and you want to create it:
8. Click on the "Create systemconfiguration.ini" button.
A new configuration file is simultaneously created in the directory for FindWindow. Any existing configuration file will be overwritten.
9. Insert a copy of the new configuration file into the provided directory.

Note

If you include a 64-bit application, no parameter data is displayed under "FileName". In this case, an information dialog opens, which allows you to manually select the application.

Note

Only use the 8.3 Notation for file names if problems occur without this parameterization.

22.5 Activating/deactivating window mode

By default, SINUMERIK Operate is displayed without window mode on PCU/IPC.

Activate the window mode for the operating software in the file "slguiconfig.ini".

Procedure

1. Copy the "slguiconfig.ini" file from the folder
/siemens/sinumerik/hmi/template/cfg.
2. Insert the copy into the folder
/oem/sinumerik/hmi/cfg or **/user/sinumerik/hmi/cfg.**
3. Open the file in the editor.
4. To activate or deactivate the window mode, make the following settings:
 - Activate window mode:
In the section [WindowMode], ActivateWindowMode = true
 - Deactivate window mode:
In the section [WindowMode], ActivateWindowMode = false
5. Restart SINUMERIK Operate.
When the system has finished booting, the operating software is displayed in the window mode.

22.6 Setting text legibility by means of font smoothing

To ensure that particularly small TrueType fonts can be read more easily, the text display is already optimized under Windows by default. The settings perform fine font smoothing of the font and provide an improved display on the screen (Windows ClearType technology).

If you want to change the text legibility for SINUMERIK Operate, you can adjust the following parameters via the "slstartup.ini" file.

Adapting the "startup.ini" file

Parameter	Description	
[FontSmoothing]	Describes the section in which all of the parameters for setting the text legibility are located	
UseSystemSettings	Defines which system settings will be used for font smoothing and optimizing the display	
	= true	Windows settings
	= false	SINUMERIK Operate settings (default)
UseFontSmoothing	Activates font smoothing of the font type used in SINUMERIK Operate (only possible with parameters UseSystemSettings switched off)	
	= true	Switch on font smoothing
	= false	Switch off font smoothing (default)
UseFontSmoothingType	Activates the Windows display optimization ClearType (only possible with switched off parameter UseSystemSettings and switched on parameter UseFontSmoothing)	
	= 1	Only use font smoothing FE_FONTSMOOTHINGSTANDARD
	= 2	Use ClearType technology FE_FONTSMOOTHINGCLEARTYPE
	= 0	Switch off function (default)

Archive

The template of the file "slstartup.ini" for SINUMERIK Operate is stored in the following directory:

<Installation path>/siemens/sinumerik/hmi/cfg/slstartup.ini

Copy the file to one of the following directories:

<Installation path>/**user**/sinumerik/hmi/cfg

<Installation path>/**oem**/sinumerik/hmi/cfg

Note

If you want to achieve a better overview of the changes you have made yourself, simply delete the unchanged parameters from the file copy "slstartup.ini". The missing parameters continue to be read by the directory /siemens/sinumerik/hmi/cfg from the template.

22.7 Using interactive or silent installation versions

General Information

If you install SINUMERIK Operate using PC/PCU, then the execution is realized using an MSI setup. The following installation versions are available, which you can use in the interactive or silent mode using the appropriate Windows command line:

- SINUMERIK Operate complete installation
- SINUMERIK Operate base installation with auxiliary files
- SINUMERIK Operate base installation without auxiliary files

Execution

You control setup execution using command line arguments. The interactive mode `/v` allows you to transfer parameter strings to setup.exe. If you wish to run setup without user interaction, then you can extend the parameter string with the silent mode `/qn`.

Place the parameter string in inverted commas. If you use several parameters in the string, separate these using spaces.

If you do not specify any arguments when calling setup.exe, then the complete installation is run in the interactive mode.

Note

Do not put any spaces between `/v` and the parameter string.

Note

If you want a progress display in the silent mode, then instead of specifying `/qn` you can also specify `/qbn`.

Interactive installation versions

<code>setup.exe</code>	Complete installation in the interactive mode
<code>setup.exe /v"BASEONLY=1"</code>	Base installation in the interactive mode with help files
<code>setup.exe /v"BASEONLY=1 HELPFILES=0"</code>	Base installation in the interactive mode without help files

Silent installation versions

<pre>setup.exe /v"/qn" setup.exe /s /v"/qn"</pre>	Complete installation in the silent mode (/s suppresses all of the setup messages)
<pre>setup.exe /v"/qn BASEONLY=1" setup.exe /s /v"/qn BASEONLY=1"</pre>	Base installation in the silent mode with help files (/s suppresses all of the setup messages)
<pre>setup.exe /v"/ qn BASEONLY=1 HELPFILES=0" setup.exe /s /v"/ qn BASEONLY=1 HELPFILES=0"</pre>	Base installation in the silent mode without help files (/s suppresses all of the setup messages)

Additional parameter assignments

Installation path

If you install the PC version of SINUMERIK Operate, then you can additionally specify the installation path:

```
setup.exe /s /v"/qn INSTALLDIR=C:\Programme\testdir"
```

For spaces in the path:

```
setup.exe /s /v"/qn INSTALLDIR=\"C:\Program Files\testdir\""
```

Exit code

You can identify a successful installation or errors based on the exit code of the setup.exe call:

Exit code == 0	No error
Exit code <> 0	Error

Log file

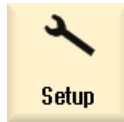
During the installation you can generate a log file with /L:

```
setup.exe /s /v"/qb! /L*vx log.txt"
```

22.8 Setting the IP address of the NCU

From the user interface of the SINUMERIK Operate, you can set the IP address of the NCU with which it should connect.

Procedure



1. Select the "Start-up" operating area.



2. Press the "HMI" softkey and the ">>" softkey.



Press the vertical softkey "NCU connection".

The "NCU Connection" window opens.

Enter the IP address of the NCU into the input field.



3. Press the "OK" softkey to confirm the data.

22.9 SINUMERIK Operate exiting

Procedure



1. Press the <MENU SELECT> key on the operator panel.

OR:

Activate the <M> symbol on the touch panel.



External keyboard: Press the <F10> key.



2. Press the menu forward key.

External keyboard: Press the <Shift> + <F9> keys.



3. Press the "EXIT" softkey.

External keyboard: Press <F8>

- on the PCU to terminate SINUMERIK Operate and the Windows system.
- If you started SINUMERIK Operate operating software on the PCU in the service mode, then only the operating software is exited.
- On the PC itself, only SINUMERIK Operate is exited.

Handheld terminals

The mobile HT 8 and HT 10 handheld terminals combined the functions of an operator panel and a machine control panel in one device. They therefore allow a machine to be completely operated and monitored.

More information

More information on operating and commissioning the handheld terminal is provided in the:

- Operating Manual Universal/Turning/Milling/Grinding
- Equipment Manual HT 8 Handheld Terminal
- Equipment Manual HT 10 Handheld Terminal

23.1 Configuring HT 8 traversing keys

The traversing keys of the HT 8 are not labeled as their type of action is not predefined. The labeling of the traversing keys should adapt dynamically to the type of action of the keys. To recognize the type of action of the traversing keys, they are shown within the display in the vertical softkey area.

The menu of the traversing keys consists of two vertical rows each with eight keys so that up to 16 texts can be configured. The top and bottom traversing key row remain empty and can be assigned other functions.

The following data can be displayed:

- Machine axis name
- Alias name for machine axis
- Any language-dependent text
- Symbol

The following user-specific files are required. You can use the sample files as template:

File	Meaning
"sljkconfig.ini" configuration file	File in which the traversing keys are configured.
Text file "oem_sljk_XXX.ts"	File for labeling traversing keys in a foreign language, XXX = language code

"sljkconfig.ini" configuration file

Entries	Meaning
[State_1]	Labeling type - changed via the PLC.
ParamText_x_y	Text of the traversing key that is made up of parameters. Two-line labeling is possible, whereby max. five characters are possible per line. x: Specifies the position of the key within the row (2 to 7). y: Specifies the key row (1 or 2).
	%m1 The machine axis name of the first axis is referenced and displayed as text. The current active axis number is read out from data block DB10. The name from the machine data is determined via this index.
	%n Defines the position in the text for the line break.
	%a1 The alias axis name of the first axis is referenced and displayed as text. The current active axis number is read out from data block DB10. The name from the "oem_sljk_eng.ts" text file is determined via this index.
TextId_x_y	Text of the traversing key that is read from the text file (target language text).
Picture_x_y	File name of the icon to be displayed. The files with the icons must be located in the following directories: /oem/sinumerik/hmi/ico and depending on the resolution, in subdirectories: /ico640 /ico800 /ico1024 /ico1280

Procedure

1. Copy the "sljkconfig.ini" configuration file from the folder **/siemens/sinumerik/hmi/template/cfg**
2. Place the copy into the folder **/oem/sinumerik/hmi/cfg** or **/user/sinumerik/hmi/cfg**
3. Open the copy in the Editor and define the traversing key labeling.

Example of a "sljkconfig.ini" configuration file

12 axes are defined in the example, with text for softkey 1 and softkey 2, as well as an image on softkey 3 and softkey 4.

```
[Settings]
```

```
FileType = INI
```

```
; A few examples for further configuration options
```

```
; Alias names of machine-axes (%a1, %a2, etc.), from oem_sljk_deu.ts  
(example)
```

```
[State_1]
```

```
TextId_1_1 = OEM_JK_TEXT_1
```

```
TextId_1_2 = OEM_JK_TEXT_2
```

```
ParamText_2_1 = %a1%n-
```

```
ParamText_2_2 = %a1%n+
```

```
ParamText_3_1 = %a2%n-
```

```
ParamText_3_2 = %a2%n+
```

```
ParamText_4_1 = %a3%n-
```

```
ParamText_4_2 = %a3%n+
```

```
ParamText_5_1 = %a4%n-
```

```
ParamText_5_2 = %a4%n+
```

```
ParamText_6_1 = %a5%n-
```

```
ParamText_6_2 = %a5%n+
```

```
ParamText_7_1 = %a6%n-
```

```
ParamText_7_2 = %a6%n+
```

```
Picture_8_1 = AlarmCancel.png
```

```
Picture_8_2 = AlarmNCReset.png
```

"oem_sljk_eng.ts" text file

Entries	Meaning
name	Freely selectable name of the text context. In the text file template, the name of the text context is "SIJkLabels" and stands for the traversing key labeling (solution line jog key labels). This identifier is already stored in the configuration file.
source	Traversing key identifier of the respective axis. This text ID is referenced in the "sljkconf.ini" configuration file with the "TextId_2_1". The text IDs for the alias names (JK_AXISNAME_2 to JK_AXISNAME_7) must not be changed.
translation	Input of the foreign language text for the axis specified in <source>.

Language code in file names "xxx"

Language	Language code
German	deu
English	eng
French	fra
Spanish	esp
Italian	ita
Chinese	chs

Procedure

1. You can copy the sample file "oem_sljk_deu.ts" from the following folder: **/siemens/sinumerik/hmi/template/lng**.
2. Store or create the file in the **/oem/sinumerik/hmi/lng** or **/user/sinumerik/hmi/lng** directory.
3. Assign the file a name, e.g. for German texts: "sljk_deu.ts".
If you wish to set-up the labeling for additional languages, a separate file must be created for each language. Save the file with the appropriate language code in the file name. To do this, use the language codes specified above.
4. Open the file and in the <message> and </message> area, define the labeling.
5. Restart the HMI.
In order that the labeling is displayed during the program runtime, the file must be converted into a binary format. This conversion is only executed when the HMI powers up.

Example of a text file "sljk_deu.ts"

12 axes are defined in the example, with text for softkey 1 (SF1) and softkey 2 (SF2):

```
<?xml version="1.0" encoding="utf-8"?>
<!DOCTYPE TS>
<TS>
    <context>
```

```
<name>SlJkLabels</name>
<!-- Alias names for machine axis (%a1, %a2, etc.) -->
<!-- Do not change the text ID (JK_AXISNAME_1, etc.) -->
<message>
    <source>JK_AXISNAME_1</source>
    <translation>X</translation>
</message>
<message>
    <source>JK_AXISNAME_2</source>
    <translation>Y</translation>
</message>
<message>
    <source>JK_AXISNAME_3</source>
    <translation>Z</translation>
</message>
<message>
    <source>JK_AXISNAME_4</source>
    <translation>A</translation>
</message>
<message>
    <source>JK_AXISNAME_5</source>
    <translation>B</translation>
</message>
<message>
    <source>JK_AXISNAME_6</source>
    <translation>C</translation>
</message>
<message>
    <source>JK_AXISNAME_7</source>
    <translation>U</translation>
</message>
<message>
    <source>JK_AXISNAME_8</source>
    <translation>V</translation>
</message>
<message>
    <source>JK_AXISNAME_9</source>
    <translation>W</translation>
</message>
<message>
    <source>JK_AXISNAME_10</source>
    <translation>UV1</translation>
```

23.1 Configuring HT 8 traversing keys

```
</message>
<message>
  <source>JK_AXISNAME_11</source>
  <translation>UV2</translation>
</message>
<message>
  <source>JK_AXISNAME_12</source>
  <translation>UV3</translation>
</message>
<!-- User defined language dependent text (example) -->
<message>
  <source>OEM_JK_TEXT_1</source>
  <translation>SF1</translation>
</message>
<message>
  <source>OEM_JK_TEXT_2</source>
  <translation>SF2</translation>
</message>
</TS>
```

23.2 HT 10 traversing keys

If an HT 10 is connected to the system, you can automatically select the axes in the operating software using checkboxes, and traverse them using the keys +/- or the handwheel.

Selecting an axis using the checkbox

To activate selection of the axis with the checkbox using Panels with touch function, set the following channel-specific machine data:

MD52210 \$MCS_FUNCTION_MASK_DISP	Function screen display
Bit 16	Selection of JOG axis via HMI

Note

A selection made at the HT 10 has no effect if you select an axis at the machine control, e.g. for switching over between MCS and WCS.

23.3 Activating/deactivating the virtual keyboard

The virtual keyboard is configured in file "slguiconfig.ini".

Procedure

1. Copy the "slguiconfig.ini" file from the folder
/siemens/sinumerik/hmi/template/cfg.
2. Insert the copy into the folder:
/oem/sinumerik/hmi/cfg or /user/sinumerik/hmi/cfg.
3. Open the file in the editor.
4. To activate or deactivate the keyboard, make the following settings:
 - Activating the virtual keyboard:
In the section [TouchPanel], EnableTouch = true
In the section [Keyboard], EnableVirtualKeyBoard = true
 - Deactivating the virtual keyboard:
In the section [TouchPanel], EnableTouch = true
In the section [Keyboard], EnableVirtualKeyBoard = false
5. Double click in the input field to display the keyboard.

23.4 Configuring user-specific key labeling

Labeling of the keys on the handheld terminal

The texts of the CPF menu (CPF: Control Panel Function) for the HT 8 or HT 10 can be labeled with your own texts in the particular language of the country.

The texts are created in the "slck_XXX.ts" file.

"XXX" = language code for the corresponding language-specific labeling.

You can create and edit this file using SINUMERIK Operate or also externally on a PC.

Note

If you wish to create or edit the file on a PC, use an editor that supports UTF-8 coding.

Language code in file names "XXX"

Language	Language code
German	deu
English	eng
French	fra
Spanish	esp
Italian	ita
Chinese	chs

Creating key labeling

Tag	Meaning
source	Designation for the user softkey. "SK_USERKEY1" to "SK_USERKEY16" are possible, whereby the names may not be changed.
comment	User-specific description of the key assignment.
translation	Text that should be shown on the key. - A maximum of 10 characters are possible per line. 2-line labeling is possible, whereby the line break is set using "%n".
remark	Remark for key assignment.
chars	Number of characters. A maximum of 10 characters per line are possible.
lines	Number of lines. 2 lines are possible.

Procedure

1. You can copy the sample file "oem_slck_deu.ts" from the following folder: **/siemens/sinumerik/hmi/template/lng**.
2. Store or create the file in the **/oem/sinumerik/hmi/lng** or **/user/sinumerik/hmi/lng** directory.

23.4 Configuring user-specific key labeling

3. Give the file a name, e.g. for German texts: "slck_deu.ts".
If you wish to create the key labeling for additional languages, then a separate file must be created for each language. Save the file with the appropriate language code in the file name. To do this, use the language codes specified above.
4. Open the file and in the <message> and </message> area, define the key labeling.
5. Restart the user interface.
In order that the key labeling is displayed during the program runtime, the file must be converted into a binary format. This conversion is only performed when the user interface runs up.

Example of a key label

```
<!DOCTYPE TS><TS>
<context>
  <name>SlCkDialog</name>
  <message>
    <source>SK_USERKEY1</source>
    <comment></comment>
    <translation>U1</translation>
    <remark>User key 1</remark>
    <chars>10</chars>
    <lines>2</lines>
    <languageIndependent>true</languageIndependent>
  </message>
  <message>
    <source>SK_USERKEY2</source>
    <comment></comment>
    <translation>U2</translation>
    <remark>User key 2</remark>
    <chars>10</chars>
    <lines>2</lines>
    <languageIndependent>true</languageIndependent>
  </message>
  <message>
    . . . . .
  </message>
</context>
</TS>
```

23.5 Configuring the function display at user-specific keys (U keys)

Function

Active functions can be displayed at the configurable user keys via the PLC. For instance, small LEDs can be emulated on the softkeys.

You configure the function in the "slckcpf.ini" file.

Interface signals

The PLC bits are in the output image of the PLC-HT 8/HT 10 interface and are analogous to those in the input image.

Signals to the MCP1 (or MCP2) Interface PLC → HT 8/HT 10								
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
AB n + 1		U4	U3		U2	U1		
AB n + 4	U9	U10	U11	U12	U13	U14	U15	U16
AB n + 5		U8	U7	U6	U5			

Adapt the display in the "slckcpf.ini" file

Section	Description	
UserKeyLEDIcon	Name of the icon file. Standard entry: led_green.png	
	OFF	Deactivates the icon display.
	PRESSED	Displays the active functions by pressing down the softkey.
UserKeyLEDIconAlignment	Specifies the position of the icon. Standard position: AlignLeft AlignTop Horizontal and vertical alignments can be combined. The two names are separated by the " " character. The following alignments are possible:	
	AlignLeft	Left
	AlignRight	Right
	AlignHCenter	Horizontal, center
	AlignTop	Top
	AlignBottom	Bottom
	AlignVCenter	Vertical, center
	UserKeyLEDMap	Specifies the start address of the output image. Entries can be made in the following form: "DBx.DBBy", "ABx", "MBx". Default setting: The start address is determined using DB7 MCP1Out (or MCP2Out).

23.5 Configuring the function display at user-specific keys (U keys)

Section	Description	
U1LED ... U16LED	Note: The offsets from the HT 8 or HT 10 output image, for one or more softkeys, are not taken into consideration.	
VarIncLED		
SBLLED		
WCSLED		
showVarIncLED	true	When the increment mode is active, the icon is also displayed on the "[VAR]" softkey.
	false	The icon is not displayed.
showSBLLED	true	When the SingleBlock mode is active, then the icon is also displayed on the "Single Block" softkey.
	false	The icon is not displayed.
showWCSLED	true	When the SingleBlock mode is active, then the icon is also displayed on the "Single Block" softkey.
	false	The icon is not displayed.

1. You can copy the sample file "slckcpf.ini" from the following folder: **/siemens/sinumerik/hmi/template/cfg**
2. Store the file in the **/oem/sinumerik/hmi/cfg** or **/user/sinumerik/hmi/cfg** directory.
3. If you use your own icon, then locate it together with the corresponding resolution for HT 8 or HT 10 in the directory: e.g. **/oem/sinumerik/hmi/ico/ico640** or **/user/sinumerik/hmi/ico/ico640**.
4. Open the file and make the appropriate settings.

Sample file "slckcpf.ini"

```

Template for the configuration of the
; HT 8/HT 10 control panel function menu
;
; To activate the settings remove the
; commentary ';' at the beginning of the line
;; Display settings of the user key softkey leds
[UserKeyLED]
; Filename of the LED icon
;UserKeyLEDIcon = led_green.png
; Alignment of the LED icon
;UserKeyLEDIconAlignment= AlignLeft | AlignTop

; Use following led map start address instead of calculating
DB7.MCP1Out
;UserKeyLEDMap = AB0

```

23.5 Configuring the function display at user-specific keys (U keys)

```
; Use the following settings to use this status bits instead of the
led map for a specific sk
;U1LED=/channel/parameter/R[U1,1]

;....

;U16LED=/channel/parameter/R[U1,16]
;VarIncLED = DB11.DBX8.5
;SBLLED = DB21.DBX0.4
;WCSLED = DB19.DBX0.7

; Show a LED for the var inc sk
;showVarIncLED = true
; Show a LED for the var single block sk
;showSBLLED = true
; Show a LED for the var wcs/mcs sk
;showWCSLED = true
```

23.5 Configuring the function display at user-specific keys (U keys)

List of abbreviations/acronyms

Abbreviation	Description
ASCII	American Standard Code for Information Interchange: American coding standard for the exchange of information
Mode group	Mode group
OPI	Operator Panel Interface
CNC	Computerized Numerical Control: Computerized numerical control
CEC	Cross Error Compensation: Sag compensation
CP	Communication Processor
DCP	Discovery and basic Configuration Protocol: ProfiNet protocol
DHCP	Dynamic Host Configuration Protocol
DIN	Deutsche Industrie Norm
DNS	Domain Name System
DIR	Directory: Directory
DRAM	Dynamic Random Access Memory
DRF	Differential Resolver Function: Differential resolver function (handwheel)
EES	Execution from External Storage
ERTEC	Enhanced Real Time Ethernet Controller
ESR	Extended stop and retract
ETC	ETC key ">"; Softkey bar extension in the same menu
FRAME	Data block (FRAME)
FIFO	First In - First Out: Method of storing/retrieving data in/from a memory.
GDIR	Global Directory: Global part program memory
GUD	Global User Data: Global user data
GUI	Graphical User Interface
MSD	Main Spindle Drive
HSC	High Speed Cutting: High-speed machining
ILC	Intelligent Load Control: Intelligent load adjustment
INC	Increment: Incremental dimension
INI	Initializing Data: Initializing data
IP	Internet Protocol
IPO	Interpolator
ISO	International Standard Organization
JOG	Jogging: Setup mode
LED	Light Emitting Diode: Light emitting diode
LLDP	Link Layer Discovery Protocol
LUD	Local User Data: Local user data
MAC	Media Access Control
MB	Megabyte
MD	Machine data

Abbreviation	Description
MDA	Manual Data Automatic: Manual input
MCS	Machine Coordinate System
MLFB	Maschinenlesbare Fabrikatbezeichnung
MPF	Main Program File: NC part program (main program)
MCP	Machine Control Panel: Machine control panel
NC	Numerical Control: Numerical control
NCK	Numerical Control Kernel: NC kernel with block preparation, traversing range, etc.
NCU	Numerical Control Unit: NCK hardware unit
NFS	Network File System
NTP	Network Time Protocol
ZO	Zero offset
OEM	Original Equipment Manufacturer
OID	Object Identifier: Information identifier
OP	Operator Panel
PCU	Programmable Control Unit
PI service	Program Invocation Services
PG	Programming device
PLC	Programmable Logic Control
RCS	Remote Control System
RFC	Request for Comments
REF	REference point approach function
REPOS	REPOSition function
ROV	Rapid Override: Input correction
RPA	R-Parameter Active: Memory area in NCK for R- NCK for R parameter numbers
SBL	Single Block: Single block
SD	Setting Data
SDB	System Data Block
SEA	Setting Data Active: Identifier (file type) for setting data
SK	Softkey
SMB	Server Message Block
SNMP	Simple Network Management Protocol
SPF	Sub Program File: Subroutines
SRAM	Static Random Access Memory: Static RAM (non-volatile)
SSH	Secure Shell: Network protocol
SW	Software
SYF	System Files: System files
TCU	Thin Client Unit
TEA	Testing Data Active: Identifier for machine data
TMA	Tool Magazine Active: Magazine data
TO	Tool Offset: Tool offset
TOA	Tool Offset Active: Identifier (file type) for tool offsets
UDP	User Datagram Protocol: Network protocol
UFR	User frame

Abbreviation	Description
VNC	Virtual Network Computing
FD	Feed Drive
WCS	Workpiece Coordinate System
TM	Tool management

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