Preface

SINUMERIK Operate (IM9)

Easy Screen (BE2)

NCU Operating System (IM7)

PCU Base Software (IM8)

Appendix

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NCU Operating System (IM7)

PCU Base Software (IM8)

Appendix

Valid for

Control:
SINUMERIK 840D sl/840DE sl

Software:
CNC software V2.7
SINUMERIK Operate V2.7

02/2011

6FC5397-1DP40-0BA0
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.

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

⚠️ CAUTION
with a safety alert symbol, indicates that minor personal injury can result if proper precautions are not taken.

⚠️ CAUTION
without a safety alert symbol, indicates that property damage can result if proper precautions are not taken.

NOTICE
indicates that an unintended result or situation can occur if the corresponding information is not taken into account.

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 for the specific task, 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 adhered to. The information in the relevant documentation must be observed.

Trademarks

All names identified by ® are registered trademarks of the Siemens AG. The remaining trademarks in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owner.

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.
Preface

SINUMERIK documentation

The SINUMERIK documentation is organized in the following categories:

- General documentation
- User documentation
- Manufacturer/service documentation

Additional information

You can find information on the following topics under the link (www.siemens.com/motioncontrol/docu):

- Ordering documentation/overview of documentation
- Additional links to download documents
- Using documentation online (find and search in manuals/information)

Please send any questions about the technical documentation (e.g. suggestions for improvement, corrections) to the following address: (mailto:docu.motioncontrol@siemens.com)

My Documentation Manager (MDM)

Under the following link you will find information to individually compile OEM-specific machine documentation based on the Siemens content: MDM (www.siemens.com/mdm)

Training

For information about the range of training courses, refer under:

- SITRAIN (www.siemens.com/sitrain) - training courses from Siemens for automation products, systems and solutions
- SinuTrain (www.siemens.com/sinutraining) - training software for SINUMERIK

FAQs


SINUMERIK

You can find information on SINUMERIK under the following link: (www.siemens.com/sinumerik)
Target group

This documentation is intended for commissioning personnel.
The plant or system is readily assembled and wired. For the following steps, e.g. configuring the individual components, the Commissioning Manual contains all necessary information or at least references.

Benefits

The intended target group can use the Commissioning Manual to test and commission the system or the plant correctly and safely.

Utilization phase: Setup and commissioning phase

Standard version

This documentation only describes the functionality of the standard version. Extensions or changes made by the machine manufacturer are documented by the machine manufacturer.

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

Further, for the sake of simplicity, this documentation does not contain all detailed information about all types of the product and cannot cover every conceivable case of installation, operation or maintenance.

Technical Support

Country-specific telephone numbers for technical support are provided in the Internet under "Contact" (www.siemens.com/automation/service&support).

EC Declaration of Conformity

The EC declaration of conformity for the EMC directive can be found in the Internet (www.siemens.com/automation/service&support).

There, as search term, enter the number 15257461 or contact your local Siemens office.
CompactFlash cards for users

- The SINUMERIK CNC supports the file systems FAT16 and FAT32 for CompactFlash cards. You may need to format the memory card if you want to use a memory card from another device or if you want to ensure the compatibility of the memory card with SINUMERIK. However, formatting the memory card will permanently delete all data on it.

- 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.

- If you cannot use a memory card with the SINUMERIK, it is probably because the memory card is not formatted for the control system (e.g. Ext3 Linux file system), the memory card file system is faulty, or it is the wrong type of 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 SINUMERIK, as system CompactFlash Card, only memory cards (8 GB) with order number 6FC5313-6AG00-0AA0 are permitted.
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System overview

NCU

The operating software SINUMERIK Operate (HMI) V2.6 is an integral component of the CNC software V2.6 and can therefore run on the NCUs 7xx0.2. The NCU's CompactFlash Card is the standard data carrier of the CNC software.

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

PCU 50.3

The SINUMERIK Operate operating software is supplied on DVD and must then be installed on the hard disk of the PCU 50.3. The operating software is automatically started when the control boots.

PC

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

The following chapters describe the possible functional expansions and adjustments that the machine manufacturer can make using the SINUMERIK Operate operating software.

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

References

Commissioning Manual, IBN CNC: NCK, PLC, Drive
Prerequisites

2.1 Hardware/Software

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.

- USB keyboard: handles text input with capital and lower-case letters.
- Storage medium, e.g. USB FlashDrive (2 GB) and/or network connection: handles data exchange with an external PC/PG.

---

Note

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

---

SINUMERIK Operate under Windows

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

- PC: Windows XP SP3 operating system.
- PCU 50.3: PCU base software WinXP V8.6

Additional programs

- TextPad text editor: handles external creation and editing of XML and ini files in Windows. The program is available on the Internet at: [http://www.textpad.com/](http://www.textpad.com/)
- WinSCP: Enables protected data transfer between different computers (NCU - PC). The program is available on the Internet at: [http://winscp.net/eng/docs/lang:de-OR-](http://winscp.net/eng/docs/lang:de-OR-)
- RCS Commander: Permits a connection to be established between SINUMERIK Operate for PCU 50.3 or PC.
- HMI Solutionline Alarm Text Converter: The alarm text converter allows you to transfer alarm texts from HMI Advanced or HMI Embedded to SINUMERIK Operate. The converter is supplied as an installation package in the directory on the following DVD: SINUMERIK 840D sl CNC-SW with SINUMERIK Operate
- System Network Center (SNC): Supports you when configuring a channel menu and is supplied with the system software.
References

A detailed description of the configuration and commissioning of the system network with control and operator components is provided in the following description:
SINUMERIK 840D sl/840Di sl Operator Components and Networking
3.1 Data structure of SINUMERIK Operate

For SINUMERIK Operate, all files are saved on the CompactFlash Card (NCU) or on the hard disk (PCU 50.3) or DVD (PC).

The file system is at the uppermost level:
- On the NCU in the “/System CF-Card/” directory
- On the PCU 50.3 in the “F:\hmisl\” directory
- On the PC, the drive can be freely selected, e.g. “C:\Programs\siemens\sinumerik

The directory structure comprises the following directories:
- addon
- compat (only PC/PCU 50.3)
- 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:

<table>
<thead>
<tr>
<th>Files</th>
<th>Directory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configuration files</td>
<td>/siemens/sinumerik/hmi/template/cfg</td>
</tr>
<tr>
<td>Text files</td>
<td>/siemens/sinumerik/hmi/template/ing</td>
</tr>
</tbody>
</table>

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:

<table>
<thead>
<tr>
<th>siemens directory</th>
</tr>
</thead>
<tbody>
<tr>
<td>/siemens/sinumerik</td>
</tr>
<tr>
<td>/hmi</td>
</tr>
<tr>
<td>/appl // Applications (operating areas)</td>
</tr>
<tr>
<td>/base // basis system components</td>
</tr>
<tr>
<td>/cfg // all configuration files</td>
</tr>
<tr>
<td>/data // version data</td>
</tr>
<tr>
<td>/hlp // online help files</td>
</tr>
<tr>
<td>/hlp // online help files, zipped and version files</td>
</tr>
<tr>
<td>/ico // symbol files</td>
</tr>
<tr>
<td>/ico640 // Icons in resolution 640x480</td>
</tr>
<tr>
<td>/ico800 // Icons in resolution 800x600</td>
</tr>
<tr>
<td>/ico1024 // Icons in resolution 1024x768</td>
</tr>
<tr>
<td>/ico1280 // Icons in resolution 1280x1024</td>
</tr>
<tr>
<td>/ico1600 // Icons in resolution 1600x1240</td>
</tr>
<tr>
<td>/lng // text files</td>
</tr>
<tr>
<td>/lngs // text files zipped and version files</td>
</tr>
<tr>
<td>/osal</td>
</tr>
<tr>
<td>/ace // ACE/TAO</td>
</tr>
<tr>
<td>/qt // Qt</td>
</tr>
<tr>
<td>/proj // EasyScreen configuring</td>
</tr>
<tr>
<td>/template // various templates</td>
</tr>
<tr>
<td>/cfg // templates for configuration files</td>
</tr>
<tr>
<td>/ing // templates for text files</td>
</tr>
<tr>
<td>/tmp // storage, temporary data</td>
</tr>
<tr>
<td>/sys_cache/hmi // various log files</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Compat directory</th>
</tr>
</thead>
<tbody>
<tr>
<td>/compat // files for integrating the OEMFrame applications</td>
</tr>
<tr>
<td>/add_on</td>
</tr>
<tr>
<td>/hmi_adv</td>
</tr>
<tr>
<td>/mmc2</td>
</tr>
<tr>
<td>/oem</td>
</tr>
<tr>
<td>/user</td>
</tr>
</tbody>
</table>
### 3.1 Data structure of SINUMERIK Operate

#### 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
      /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
```

#### 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

<table>
<thead>
<tr>
<th>Directory</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>/user/sinumerik</td>
<td></td>
</tr>
<tr>
<td>/data</td>
<td>// version data</td>
</tr>
<tr>
<td>/archive</td>
<td>// user-specific archive</td>
</tr>
<tr>
<td>/prog</td>
<td>// user-specific programs</td>
</tr>
<tr>
<td>/hmi</td>
<td></td>
</tr>
<tr>
<td>/cfg</td>
<td>// configuration files</td>
</tr>
<tr>
<td>/data</td>
<td>// version data</td>
</tr>
<tr>
<td>/hlp</td>
<td>// online help files</td>
</tr>
<tr>
<td>/ico</td>
<td>// symbol files</td>
</tr>
<tr>
<td>/ico640</td>
<td>// icons in resolution 640x480</td>
</tr>
<tr>
<td>/ico800</td>
<td>// icons in resolution 800x600</td>
</tr>
<tr>
<td>/ico1024</td>
<td>// icons in resolution 1024x768</td>
</tr>
<tr>
<td>/ico1280</td>
<td>// icons in resolution 1280x1024</td>
</tr>
<tr>
<td>/ico1600</td>
<td>// icons in resolution 1600x1240</td>
</tr>
<tr>
<td>/lng</td>
<td>// text files</td>
</tr>
<tr>
<td>/proj</td>
<td>// EasyScreen configuring</td>
</tr>
<tr>
<td>/log</td>
<td>// log files</td>
</tr>
<tr>
<td>/md</td>
<td>// machine data views</td>
</tr>
<tr>
<td>/proj</td>
<td>// EasyScreen configuring</td>
</tr>
</tbody>
</table>
3.2 Editing files

3.2.1 Editing files in HMI sl

Use 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 will require access rights: Protection level 1 (password: machine manufacturer).
- When assigning a new file name, ensure that only files with a maximum name length of 49 characters can be managed.

**Copying / inserting / 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.
3.2 Editing files

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.
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.

3.2.2   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 sequence: <!--
- A comment ends with the character string: -->
3.2 Editing files

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:

<table>
<thead>
<tr>
<th>Special characters</th>
<th>Notation</th>
</tr>
</thead>
<tbody>
<tr>
<td>&amp;</td>
<td>&amp;</td>
</tr>
<tr>
<td>'</td>
<td>'</td>
</tr>
<tr>
<td>&lt;</td>
<td>&lt;</td>
</tr>
<tr>
<td>&gt;</td>
<td>&gt;</td>
</tr>
<tr>
<td>&quot;</td>
<td>&quot;</td>
</tr>
</tbody>
</table>

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 "RCS Commander" 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.

For a detailed description, see the following sub-book:

References

NCU Operating System (IM7): Backing up and restoring data and WinSCP and PuTTY service tools

See also

Configuring alarm and message texts via alarm text files (Page 178)
Licensing

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

Precondition

If you wish to set or reset options for a machine, then you require as a minimum, the access rights: Protection level 3 (password: end user).

You can only license options for a machine from this protection level and higher.

General information

- **Serial number of the CF Card**
  - Permanently defined serial number of the CompactFlash Card
- **Hardware type**
  - Control data
- **Machine name/No.**
  - Displays the data that are saved in machine data MD17400 $MN_OEM_GLOBEL_INFO.
  - A display field only becomes an editing window from access authorization: Protection level 1 (password: Manufacturer).
- **License key**
  - Information about options that require a license

Procedure

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

2. Press the menu forward key.

3. Press the "Licenses" softkey.
   - The "Licensing" window appears and you can select the following with the vertical softkeys:
     - Determining the license requirement
       - Overview
       - All options
       - Missing licenses
     - Exporting licensing requirements
     - Entering or reading in "License Key"
License database

The licenses are purchased via the Internet. There are two ways to access the license database administered by Siemens A&D:

- Web License Manager
- Automation License Manager

For a detailed description, please refer to the following documentation:

References

CNC Commissioning Manual: NCK, PLC, drive: Licensing

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:

<table>
<thead>
<tr>
<th>Order number</th>
<th>Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>6FC5800-0AN00-0YB0</td>
<td>Additional languages</td>
</tr>
<tr>
<td>6FC5800-0AP04-0YB0</td>
<td>Machining step programming</td>
</tr>
<tr>
<td>6FC5800-0AP11-0YB0</td>
<td>Manual machine</td>
</tr>
<tr>
<td>6FC5800-0AP14-0YB0</td>
<td>Multiple clamping of various workpieces</td>
</tr>
<tr>
<td>6FC5800-0AP15-0YB0</td>
<td>ShopTurn HMI/ShopMill HMI for SINUMERIK 840Di sl incl. HMI-Advanced</td>
</tr>
<tr>
<td>6FC5800-0AP20-0YB0</td>
<td>3D simulation of the finished part</td>
</tr>
<tr>
<td>6FC5800-0AP21-0YB0</td>
<td>Simulation, milling (2D dynamic; 3D static)</td>
</tr>
<tr>
<td>6FC5800-0AP23-0YB0</td>
<td>Simultaneous recording ShopMill (real-time simulation)</td>
</tr>
<tr>
<td>6FC5800-0AP24-0YB0</td>
<td>Simultaneous recording, ShopTurn (real-time simulation)</td>
</tr>
</tbody>
</table>
4.1 Determining the license requirement

Procedure

1. Press the "All options" softkey to list all the options that can be selected for this control.
   - OR -
   Press the "Missing lic./opt." softkey.
   You receive an overview of all options that
   • are not adequately licensed
   • are licensed, but which were not set

2. Activate or deactivate the required options in the "Set" column:
   • Activate checkbox or
   • Enter the number of options
   Options shown red are activated, however, not yet licensed or not licensed in adequate number.
   - OR -
   Press the softkey "Set option according to license", 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.
Licensing

4.1 Determining the license requirement

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 periodically, indicating that the option use has not yet been assigned the required license.
4.2 Exporting the license requirement

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 small window opens listing the set-up storage locations.

2. Select "USB" for example, if you export the licenses on a USB FlashDrive.
   If you use the Automation License Manager (expansion module from V1.2 SP1 and later), it is not permissible that the data are in a subdirectory.

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.
   This file is used by the "automation license manager" as the basis for licensing.

Transferring a license requirement

The license information is transferred electronically with the "automation license manager".
A detailed description of the license management is provided in the following documentation:

References

CNC Commissioning Manual: NCK, PLC, drive: Licensing
4.3 Reading in the license key

The newly purchased license key can be loaded to the controller as follows:

- Enter license key manually
- Read in license key electronically

Procedure

1. Press the "Licenses" softkey.

   - OR -
   Press the "Overview" softkey.
   The "Licensing" window opens.

2. If you receive the license key via the "Web License Manager", enter the license key manually in the field "You can enter a new license key here".

3. Press the <INPUT> key.
   If the license key is valid, the message "License key set" is displayed.

   - OR -
   If you receive the license key via the "Automation License Manager", 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.
Creating drive connections

Set up connections

Up to 8 connections to so-called logical drives (data carriers) can be configured. These drives can be accessed in the "Program manager" and "Startup" 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 50.3, only for SINUMERIK Operate on the PCU

Software option

In order to use the CompactFlash Card as data carrier, you require the option "Additional 256 MB HMI user memory on CF card of NCU" (not for SINUMERIK Operate of PCU50 / PC).

Note

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

The "Set-up drives" window is available in the "Startup" operating area for configuration.

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

<table>
<thead>
<tr>
<th>Entry</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>No drive</td>
</tr>
<tr>
<td></td>
<td>- No drive defined.</td>
</tr>
<tr>
<td></td>
<td>USB local</td>
</tr>
<tr>
<td></td>
<td>- Access to the USB memory medium is only realized via the TCU to which it is connected.</td>
</tr>
<tr>
<td></td>
<td>- USB drives are automatically identified if the memory medium is inserted when SINUMERIK Operate powers-up.</td>
</tr>
<tr>
<td></td>
<td>USB global</td>
</tr>
<tr>
<td></td>
<td>- All of the TCUs in the plant network can access the USB memory medium.</td>
</tr>
<tr>
<td></td>
<td>- USB global is not possible under Windows!</td>
</tr>
<tr>
<td></td>
<td>NW Windows</td>
</tr>
<tr>
<td></td>
<td>- Network drive</td>
</tr>
<tr>
<td></td>
<td>Local drive</td>
</tr>
<tr>
<td></td>
<td>- Local drive</td>
</tr>
<tr>
<td></td>
<td>- Hard disk or user memory on the CompactFlash Card</td>
</tr>
<tr>
<td>Connection</td>
<td>Front</td>
</tr>
<tr>
<td></td>
<td>- USB interface that is located at the front of the operator panel.</td>
</tr>
<tr>
<td></td>
<td>X203/X204</td>
</tr>
<tr>
<td></td>
<td>- USB interface X203/X204 that is located at the rear of the operator panel.</td>
</tr>
<tr>
<td></td>
<td>X204</td>
</tr>
<tr>
<td></td>
<td>- For SIMATIC Thin Client the USB interface is X204.</td>
</tr>
<tr>
<td>Device</td>
<td>Names of the TCU to which the USB storage medium is connected, e.g. tcu1.</td>
</tr>
<tr>
<td></td>
<td>- The NCU must already know the TCU name.</td>
</tr>
<tr>
<td>Partition</td>
<td>Partition number on the USB memory medium, e.g. 1.</td>
</tr>
<tr>
<td></td>
<td>- If a USB hub is used, specify the USB port of the hub.</td>
</tr>
<tr>
<td>Path</td>
<td>- Start direct directory of the data carrier that is connected via the local drive.</td>
</tr>
<tr>
<td></td>
<td>- Network path to a directory that has been released in the network.</td>
</tr>
<tr>
<td></td>
<td>- This path must always start with &quot;/&quot;, e.g. //Server01/share3.</td>
</tr>
<tr>
<td>Access level</td>
<td>Assign access rights to the connections: From protection level 7 (key switch position 0) to protection level 1 (password: Manufacturer).</td>
</tr>
<tr>
<td></td>
<td>- The particular assigned protection level applies to all operating areas.</td>
</tr>
</tbody>
</table>
### 5.1 Setting up drives

#### Entry Meaning

<table>
<thead>
<tr>
<th>Entry</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Softkey text</td>
<td>Two lines are available as labeling text for the softkey. %\n is accepted as a line separator. If the first line is too long, then it is automatically separated into several lines. If a blank is present, then this is used as line separator.</td>
</tr>
<tr>
<td>Softkey icon</td>
<td>No icon is displayed on the softkey.</td>
</tr>
<tr>
<td>sk_usb_front.png</td>
<td>Icon file name. Is displayed on the softkey.</td>
</tr>
<tr>
<td>sk_local_drive.png</td>
<td>Icon file name. Is displayed on the softkey.</td>
</tr>
<tr>
<td>Text file</td>
<td>slpmdialog File for softkey dependent on the language. If nothing is specified in the input fields, the text appears on the softkey as was specified in the input field &quot;Softkey text&quot;. If your own text files are saved, then the text ID, which is used to search for the text file, is specified in the &quot;Softkey text&quot; input field.</td>
</tr>
<tr>
<td>Text context</td>
<td>SlPmDialog</td>
</tr>
<tr>
<td>User name Password</td>
<td>Enter the user name and the corresponding password for which the directory is enabled on the server. The password is displayed in encoded form as as string of &quot;*&quot; characters and is stored in the &quot;logdrive.ini&quot; file.</td>
</tr>
</tbody>
</table>

**Error messages**

<table>
<thead>
<tr>
<th>Error message</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Error occurred when closing a connection</td>
<td>An existing drive was not able to be deactivated.</td>
</tr>
<tr>
<td>Error occurred when establishing a connection.</td>
<td>Drive connection was not able to be established.</td>
</tr>
<tr>
<td>Error occurred while establishing a connection: Incorrect entry or no authorization.</td>
<td>Drive connection was not able to be established.</td>
</tr>
<tr>
<td>Incorrect data</td>
<td>The entered data are either incorrect or inconsistent.</td>
</tr>
<tr>
<td>Function not available</td>
<td>The function is not supported with the current software release.</td>
</tr>
<tr>
<td>Unknown error - error code:%1</td>
<td>Error was not able to be assigned.</td>
</tr>
</tbody>
</table>
Creating drive connections

5.1 Setting up drives

Procedure

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

2. Press the "HMI" and "Log. drive" softkeys.
   The "Set Up Drives" window opens.

3. Select the data for the corresponding drive or enter the necessary data.

4. Press the "Activate drive" softkey.
   The drive is activated.
   The operating system now checks the entered data and whether the
   connection is established. An OK message is output in the dialog line if
   an error is not identified.
   The drive can be accessed.
   - OR -
   If the operating system identifies an error, then you receive an error
   message.
   Press the "OK" softkey.
   You then return to the "Configure drives" window. Check and correct
   your entries and re-activate the drive.
   If you press the "OK" softkey, the modified data are accepted without
   any feedback message. You do not receive any message about a
   successful or unsuccessful connection.
   If you press the "Cancel" softkey, then all of the data that has not been
   activated is rejected.
5.2 File "logdrive.ini"

Configurations of drives in the window "logical drives" are saved in the "logdrive.ini" file.

Structure of the "logdrive.ini" file

- You define all logical drives in section [CONNECTIONS].
- You can enter the number of logical drives next to "ConnectionNum."

The following setting options are available for each logical drive:
(The "X" at the end stands for the number of drive connections respectively.)

<table>
<thead>
<tr>
<th>Setting Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ConnectionX</td>
<td>Logical path of the drive, e.g. //my computer/my path</td>
</tr>
<tr>
<td>SK_ConnectionX</td>
<td>Types of connection</td>
</tr>
<tr>
<td>SoftkeyIndexX</td>
<td>Softkey position on the horizontal softkey bar.</td>
</tr>
<tr>
<td></td>
<td>• Index 1-8 is the first ETC level,</td>
</tr>
<tr>
<td></td>
<td>• Index 9-16 second level, etc.</td>
</tr>
<tr>
<td>NetDriveTypeX</td>
<td>Network connection type, e.g. NFS, SMBFS</td>
</tr>
<tr>
<td>SoftkeyPictureX</td>
<td>File name of the icon displayed on the softkey.</td>
</tr>
<tr>
<td>UsernameX</td>
<td>User name (for network drives)</td>
</tr>
<tr>
<td>PasswordX</td>
<td>Password belonging to UsernameX</td>
</tr>
<tr>
<td>AccessProgrammX</td>
<td>Access authorizations for the program manager and system data areas.</td>
</tr>
<tr>
<td>AccessMachineX</td>
<td></td>
</tr>
<tr>
<td>AccessServicesX</td>
<td></td>
</tr>
</tbody>
</table>

Drive paths

Use the following syntax to identify the drive paths:

<table>
<thead>
<tr>
<th>Logical drive</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>//NC/&lt;nc-directory&gt;</td>
<td>Current NC</td>
</tr>
<tr>
<td>/card/user/sinumerik/data</td>
<td>Local drive on the CompactFlash Card (Linux)</td>
</tr>
<tr>
<td>//TCU/&lt;tcu-name&gt;/&lt;interface&gt;, &lt;partition-number&gt;</td>
<td>Global TCU-USB drive</td>
</tr>
<tr>
<td>&lt;interface&gt;: FRONT, X203, X204</td>
<td>Global TCU-USB drive with partition specification (default: 1st partition)</td>
</tr>
<tr>
<td>//ACTTCU/&lt;interface&gt;,&lt;partition-number&gt;</td>
<td>Local TCU-USB drive with partition specification</td>
</tr>
<tr>
<td>//&lt;computer name&gt;/&lt;share name&gt;&lt;computer name&gt;: DNS name or IP address</td>
<td>External network drives (WinXP)</td>
</tr>
<tr>
<td>//computer name/DNS name or IP address</td>
<td>Network drive</td>
</tr>
</tbody>
</table>
Creating drive connections

5.2 File "logdrive.ini"

Sample structure of the logdrive.ini

<table>
<thead>
<tr>
<th>Syntax</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>[CONNECTIONS]</td>
<td></td>
</tr>
<tr>
<td>ConnectionNum=1</td>
<td>1st connection</td>
</tr>
<tr>
<td>Connection1=//ACTTCU/Front,1</td>
<td>USB storage medium on the current TCU</td>
</tr>
<tr>
<td>SK_Connection1=SL_PM_SK_LOCAL_TCU_USB</td>
<td>Softkey labels</td>
</tr>
<tr>
<td>SoftkeyIndex1=3</td>
<td>Softkey is displayed on the horizontal bar as third softkey from the left.</td>
</tr>
<tr>
<td>SoftkeyTextContext1=slpmdialog</td>
<td>Softkey labels</td>
</tr>
<tr>
<td>SoftkeyTextFile1=slpmdialog</td>
<td>Softkey labels</td>
</tr>
<tr>
<td>SoftkeyPicture1=sk_usb_front.png</td>
<td>The icon &quot;sk_usb_front.png&quot; is displayed.</td>
</tr>
<tr>
<td>AccessProgram1=7</td>
<td>The softkey is visible as of access authorization: protection level 7 (key-operated switch position 0) in the &quot;Program manager&quot; area.</td>
</tr>
<tr>
<td>AccessMachine1=7</td>
<td></td>
</tr>
<tr>
<td>AccessServices1=7</td>
<td></td>
</tr>
</tbody>
</table>

Configuring NFS drive

<table>
<thead>
<tr>
<th>Syntax</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connection2=//ef35161c/testshare</td>
<td>Connection to release &quot;testshare&quot; on computer ef35161c.</td>
</tr>
<tr>
<td>NetDriveType2=nfs</td>
<td>with an NFS network drive</td>
</tr>
<tr>
<td>SK_Connection2=LW_NFS</td>
<td>Softkey inscription is &quot;LW_NFS&quot;</td>
</tr>
<tr>
<td>SoftkeyIndex2=4</td>
<td>Softkey is displayed on the horizontal bar as fourth softkey from the left.</td>
</tr>
</tbody>
</table>

In addition, the NFS share for the client computer must be released on the NFS server.

Configuring SMB drive

<table>
<thead>
<tr>
<th>Syntax</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connection3=//ef36557c/public</td>
<td>Connection to the computer ef36557c</td>
</tr>
<tr>
<td>NetDriveType3=smbfs</td>
<td>with an SMB network drive</td>
</tr>
<tr>
<td>Username3=test</td>
<td>User name</td>
</tr>
<tr>
<td>Password3=Passwd02</td>
<td>Password (encrypted)</td>
</tr>
<tr>
<td>SK_Connection3=LW_SMBFS</td>
<td>Softkey inscription is &quot;SMBFS&quot;</td>
</tr>
<tr>
<td>SoftkeyIndex3=9</td>
<td>Softkey is displayed on the second horizontal bar as first softkey from the left.</td>
</tr>
</tbody>
</table>

In addition, you must set up an account on the Windows computer and release the directory (/ef36557c/public) for this account:

1. Properties/Release/Authorizations/Add...
2. Properties/Security/Add...
If the network drive is to be write accessed from SINUMERIK Operate, then the specified Windows user (in the example, "test") must have write authorization for the directory released under Windows.

---

**Note**

Access to a Novell network is not allowed.

---

**Configuring USB drive**

<table>
<thead>
<tr>
<th>Syntax</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connection4=//TCU/TCU2/X203</td>
<td>USB interface X203 configured</td>
</tr>
<tr>
<td>SK_Connection4=X203</td>
<td>Softkey inscription is &quot;X203&quot;</td>
</tr>
<tr>
<td>SoftkeyIndex3=10</td>
<td>Softkey is displayed on the second horizontal bar as second softkey from the left.</td>
</tr>
</tbody>
</table>
5.2 File "logdrive.ini"
6.1 Configuring a channel menu

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

The channel menu is used to switch over the NC channel displayed in the SINUMERIK Operate or more precisely at the operating 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 operating stations.

To configure the data for the operating stations (entries in the "config.ini" files), instead of directly editing in the "config.ini" file, we recommend that you use the "System Network Center (SNC)" program.

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 on the NCU in the relevant directory:

- /user/common/tcu/< TCU name>/common/tcu/config.ini

On the PCU 50.3, the files are stored under:

- F:\user_base\common\tcu\< TCU name>\common\tcu\config.ini

For < TCU name>, the TCU name of the operating station should be used that was assigned at the system when a TCU powered-up for the first time. If you work with the "System Network Center (SNC)" tool, then these file paths are of no significance.
### Using the channel menu

- For a system comprising several operating stations and several NCUs within the framework of operator unit management, if the NC channels of several NCKs are operated from one operating station.

- For a simple system with a high number of 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, which 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 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 operating station can only be switched over across NCUs using the channel menu.
6.2 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.
- Computer names cannot be used as addresses in the project configuration. IP addresses must be used in the project configuration.
- The SINUMERIK Operate of an NCU can only operate with its own NCK and cannot be switched over to another NCU.
6.3 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.
6.3 General structure of the channel menu

Two-stage procedure

1. In the first stage, all channel groups that are used in the system are defined in the "netname.ini" file, irrespective of the actual operating stations.

2. In the second step, the version of the channel menu for the specific operating station is defined in the "config.ini" files belonging to the station.
### Defining channel groups in the "netnames.ini" file

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

A separate section [CH_GRP_x] (1 <= x <= 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 <= y <= 8).

### "netnames.ini" file

The file header is as follows:

```ini
[own] /* Channel menus for TCUs
owner = HMI_1 /*
[chan HMI_1] /*
ShowChanMenu = true /* Display channel menu
```

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

```ini
[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 = 192.168.214.3.#1 /* Computer name (host name) or the IP
 /* address of the computer on which
 /* the HMI to be selected runs (NCU or
 /* PCU). Using ".#Channel number",
 /* optionally the NC channel can be
 /* specified, which should be taken
 /* when switching over.
 /*
Member1.Text = NCU730_K1 /* Softkey text for the display in the
 /* channel menu (vertical softkey).
 /* Texts, that include a blank, should
 /* be placed in "". If, for "Target" a
 /* channel number is specified, then
 /* here, instead of a text, using the
```
6.4 Defining channel groups in the "netnames.ini" file

(* 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.

Member2.Target = /*
Member2.Text /* analog

Note

When specifying the target, only an IP address can be specified and not a computer name. The IP address or the computer name to be specified is the IP address of the computer on which the SINUMERIK Operate operating software runs.

For SINUMERIK Operate in the NCU, this is the address of the NCU.

For a SINUMERIK Operate on the PCU, this is the address of the PCU 50.3.
6.5 Configuring operating stations in the "config.ini" file

The version of the channel menu is individually defined for the operating stations in the "config.ini" files belonging to the station. In addition, data of the channel groups relevant for this station is used, as was defined in the "netnames.ini" file. 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

"System Network Center" tool (SNC)

The operating stations can be configured in a transparent way using various windows using the "SNC" tool.

Calling SNC

- For the NCU, the program is also included on the CompactFlash Card and is called with "sc start snc" using the service command.
- For the PCU 50.3, the program is on the hard disk and can be started from the user interface using an icon.

Configuring with SNC

1. The operating stations are listed via the "OPs" tab.
2. The "Set/Modify properties for "TCU"") is opened after selecting an OP and pressing the "Properties" button.
3. The softkey assignment is displayed after selecting the checkbox "Configuration of T:M:N enabled". Here, the desired channel group can be assigned to the softkey for this operating station.

**Note**

For PCU 50.3

The PCU must not change the NCK with which it is connected during the switchover: With the switchover, it can only initiate a channel switchover on this NCU.

**Note**

The section [T2M2N] can also be created at the end of the "netnames.ini" file instead of in the "config.ini" file. This means that the channel menu for all TCUs is the same.

For SINUMERIK Operate on PC, this procedure is required because here, it is not possible to access the "config.ini".
6.6 Configuration example

Configuring channel groups in the "netnames.ini" file

```
[own]
owner= HMI_1
;*************************** /* channel menu for TCUs
[chan HMI_1] /*
ShowChanMenu = true /* Display channel menus

[CH_GRP_1]
Text = Process1

Member1.Target = 192.168.214.1#1
Member1.Text = NCU730_K1

Member2.Target = 192.168.214.1#3
Member2.Text = NCU730_K3

Member3.Target = 192.168.214.1#4
Member3.Text = NCU730_K4

[CH_GRP_2]
Text = Transport

Member1.Target = 192.168.214.2#1
Member1.Text = NCU710_K1

Member2.Target = 192.168.214.2#2
Member2.Text = NCU710_K2

[CH_GRP_3]
Text = Process2

Member1.Target = 192.168.214.3#1
Member1.Text = NCU720_K1
```
```plaintext
Member2.Target = 192.168.214.3#2
Member2.Text = NCU720_K2

Member3.Target = 192.168.214.3#3
Member3.Text = NCU720_K3

Member4.Target = 192.168.214.3#4
Member4.Text = NCU720_K4

...

[CH_GRP_15]
Text = Headend

Member1.Target = 192.168.214.241.#1
Member1.Text = NCU720_K1

Member2.Target = 192.168.214.241.#2
Member2.Text = NCU720_K2

Member3.Target = 192.168.214.241.#3
Member3.Text = NCU720_K3

Member4.Target = 192.168.214.241.#4
Member4.Text = NCU720_K4

Configuring an operating station in the "config.ini" file
...

[T2M2N]
SK1=CH_GRP_1
SK2=CH_GRP_3
SK8=CH_GRP_15
```
With this example and the configuring in the "netnames.ini" file, which it is assumed has been made, it is defined that the channel menu is assigned as follows for this operating station:

```
| Process 1 | Process 2 |   |   |   |   | Head-end |
```
7.1 Changing the language

The operating software is available as standard in 6 languages.

Selecting a language

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

<table>
<thead>
<tr>
<th>MD9100 $MM_CHANGE_LANGUAGE_MODE</th>
<th>Language selection mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 1</td>
<td>The user-interface language is specified via the &quot;Language Selection&quot; window (default value).</td>
</tr>
</tbody>
</table>

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

2. Press the "Change language" softkey. The small "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

<table>
<thead>
<tr>
<th>MD9100 $MM_CHANGE_LANGUAGE_MODE</th>
<th>Language selection mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 2</td>
<td>Selection of two languages. During operation, the &quot;Change language&quot; softkey can be used to toggle between these languages.</td>
</tr>
</tbody>
</table>

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

2. Press the "HMI" softkey.

3. Press the ">>" softkey.

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.
7.2 Setting the time and date

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

<table>
<thead>
<tr>
<th>Formats</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>d.M.yy</td>
<td>3.1.09</td>
</tr>
<tr>
<td>dd.MM.yy</td>
<td>03.01.09</td>
</tr>
<tr>
<td>dd.MM.yyy</td>
<td>03.01.2009</td>
</tr>
<tr>
<td>d/M/yy</td>
<td>3/01/09</td>
</tr>
<tr>
<td>dd/MM/yy</td>
<td>03/01/09</td>
</tr>
<tr>
<td>dd/MM/yyyy</td>
<td>03/01/2009</td>
</tr>
<tr>
<td>M/d/yy</td>
<td>1/3/09</td>
</tr>
<tr>
<td>MM/dd/yy</td>
<td>01/03/09</td>
</tr>
<tr>
<td>MM/dd/yyyy</td>
<td>01/03/2009</td>
</tr>
<tr>
<td>yyyy/MM/dd</td>
<td>2009/01/03</td>
</tr>
</tbody>
</table>

The following applies:

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

Time display formats

<table>
<thead>
<tr>
<th>Formats</th>
<th>Example</th>
<th>Hour system</th>
</tr>
</thead>
<tbody>
<tr>
<td>H:m:s AP</td>
<td>1:2:4 PM</td>
<td>24 hour system, with display of &quot;AM&quot; / &quot;PM&quot;</td>
</tr>
<tr>
<td>h:m:s ap</td>
<td>1:2:8 pm</td>
<td>12 hour system, with display of &quot;am&quot; / &quot;pm&quot;</td>
</tr>
<tr>
<td>HH:mm:ss AP</td>
<td>13:02:08 PM</td>
<td>24 hour system, with display of &quot;AM&quot; / &quot;PM&quot;</td>
</tr>
<tr>
<td>hh:mm:ss ap</td>
<td>01:02:09 pm</td>
<td>12 hour system, with display of &quot;am&quot; / &quot;pm&quot;</td>
</tr>
<tr>
<td>H:mm:ss AP</td>
<td>1:02:09 PM</td>
<td>24 hour system, with display of &quot;AM&quot; / &quot;PM&quot;</td>
</tr>
<tr>
<td>h:mm:ss ap</td>
<td>1:02:09 pm</td>
<td>12 hour system, with display of &quot;am&quot; / &quot;pm&quot;</td>
</tr>
<tr>
<td>h:mm:ss</td>
<td>13:02:09</td>
<td>24 hour system</td>
</tr>
<tr>
<td>hh:mm:ss</td>
<td>13:12:04</td>
<td>24 hour system</td>
</tr>
</tbody>
</table>
The following applies:

<table>
<thead>
<tr>
<th>Time symbol</th>
<th>Description of the entry</th>
</tr>
</thead>
<tbody>
<tr>
<td>h</td>
<td>Single or double digit hour (0 - 23 or 1 - 12 for am/pm).</td>
</tr>
<tr>
<td>hh</td>
<td>Double digit hour, with leading zero (00 - 23 or 01 - 12 for am/pm).</td>
</tr>
<tr>
<td>H</td>
<td>Single or double digit hour (0 - 23 for AM/PM).</td>
</tr>
<tr>
<td>HH</td>
<td>Double digit hour, with leading zero (00 - 23 for AM/PM).</td>
</tr>
<tr>
<td>m</td>
<td>Single or double digit minute (0 - 59).</td>
</tr>
<tr>
<td>mm</td>
<td>Double digit minute, with leading zero (00 - 59).</td>
</tr>
<tr>
<td>s</td>
<td>Single or double digit second (0 - 59).</td>
</tr>
<tr>
<td>ss</td>
<td>Double digit second, with leading zero (00 - 59).</td>
</tr>
<tr>
<td>AP</td>
<td>Display of the time of day: AM or am = before midday or PM or pm = after midday</td>
</tr>
</tbody>
</table>

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".
7.3 Configuring Caps Lock

The CAPSLOCK 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**

<table>
<thead>
<tr>
<th>MD9009 $MM_KEYBOARD_STATE</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 0</td>
<td>CAPSLOCK off (default value)</td>
</tr>
<tr>
<td>= 2</td>
<td>CAPSLOCK on</td>
</tr>
<tr>
<td></td>
<td>The key sequence &quot;Ctrl&quot; and Shift is used to switch between upper and lower case.</td>
</tr>
</tbody>
</table>

If the machine data is changed, the system must be rebooted.
7.4 Defining the access rights for the "HMI restart" softkey

Displaying the machine data

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

For SINUMERIK Operate on PC or PCU 50.3, the "EXIT" softkey is displayed.

<table>
<thead>
<tr>
<th>MD9110_$MM_ACESS_HMI_EXIT</th>
<th>Protection level of the &quot;EXIT&quot; softkey</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 1</td>
<td>Access rights: Protection level 1 (password: machine manufacturer), default value</td>
</tr>
</tbody>
</table>

See also

Definition of access levels (Page 59)
7.5 Darken screen

Defining the time until the screen is darkened

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

Interface signal

The screen is darkened by setting an interface signal.

<table>
<thead>
<tr>
<th>DB 19 byte</th>
<th>Signals to the operator panel front (PLC -&gt; HMI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DBB0</td>
<td>Bit 1 Bit 0</td>
</tr>
<tr>
<td></td>
<td>Darken screen Brighten screen</td>
</tr>
</tbody>
</table>

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

- It is then 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.
7.6 Switching EXTCALL off

It is possible to access files located on network drives from a part program using the EXTCALL command.

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

Setting

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

<table>
<thead>
<tr>
<th>MD9106 $MM.Serve_EXTCALL_PROGRAMS</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Switch off call processing</td>
</tr>
<tr>
<td>1</td>
<td>Switch on call editing (default value)</td>
</tr>
</tbody>
</table>
7.7 Access levels

7.7.1 Definition of access levels
Access to programs, data and functions is user-oriented and controlled via eight hierarchical protection levels. These are divided into

- Four password levels for system, machine manufacturer, commissioning engineer and end user
- Four keyswitch positions for end user

There are protection levels 0 to 7 (see table below); where

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

Access rights

Table 7-1 Protection levels concept

<table>
<thead>
<tr>
<th>Protection level</th>
<th>Protected by</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Password</td>
<td>System</td>
</tr>
<tr>
<td>1</td>
<td>Password: SUNRISE (default value)</td>
<td>Machine manufacturer</td>
</tr>
<tr>
<td>2</td>
<td>Password: EVENING (default value)</td>
<td>Service</td>
</tr>
<tr>
<td>3</td>
<td>Password: CUSTOMER (default value)</td>
<td>End user</td>
</tr>
<tr>
<td>4</td>
<td>Keyswitch 3</td>
<td>Programmer, machine setter</td>
</tr>
<tr>
<td>5</td>
<td>Keyswitch 2</td>
<td>Qualified operator</td>
</tr>
<tr>
<td>6</td>
<td>Keyswitch 1</td>
<td>Trained operator</td>
</tr>
<tr>
<td>7</td>
<td>Keyswitch 0</td>
<td>Semi-skilled operator</td>
</tr>
</tbody>
</table>

7.7.2 Modifying the access levels password

Overview
You can activate the protection levels used with passwords via the user interface.

The following options are available for editing the passwords:

- Set new password
- Change password
- Delete password
General settings
7.7 Access levels

Password Set

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

Delete password

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

NOTICE
Access authorization is not automatically deleted at POWER ON.
When a general NCK reset is performed, the passwords are reset to the default passwords.
7.7.3 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.

With access authorization levels to files and folders, it can be defined as to which users are authorized to execute which operations on a folder 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 contents of a file (WRITE) or deleting the file.
- executing a file (EXECUTE).
- listing a file in a folder and displaying (SHOW).
- creating a file in a folder.
- displaying or reading the contents of a folder.
- creating or deleting a folder.

Description of functions
The individual allocation of access rights acts, in the passive NCK file system, on the following folders:

- part programs
- subprograms
- cycle folder, manufacturer
- cycle folder, user
- workpiece folder
- workpiece folders

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

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

- Part programs
- Subprograms
7.7 Access levels

- Workpiece folder
- Workpiece folders

**Note**

**Working via remote access**

When working via remote access (e.g. WinSCP or RCS Commander) the same access rights apply for editing or saving files and folders as directly at the control.

---

**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 as well as when settings have been made via MD51050 $MNS_ACCESS_WRITE_PROGRAM.

---

**Settings in the file slfsfileattributes.ini**

The slfsfileattributes.ini file is available as template in the following folder:

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

The values from 0 ... 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:

<table>
<thead>
<tr>
<th>Significance from the left → right: R W X S</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>R  READ</td>
<td>Reading files and folders</td>
</tr>
<tr>
<td>W  WRITE</td>
<td>Changing, deleting or creating files and folders</td>
</tr>
<tr>
<td>X  EXECUTE</td>
<td>Executes program: for files; for folders, always 7</td>
</tr>
<tr>
<td>S  SHOW</td>
<td>Outputs a list of files and folders</td>
</tr>
</tbody>
</table>

Copy the slfsfileattributes.ini file into one of the following folders:

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

The operating software must be restarted in order that the changes become effective.
Example

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

For all workpieces, 7777 is defined as 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 59)

7.7.4 Access levels for softkeys

Use

The display and operation of softkeys can be suppressed by both the OEM 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.

### 7.7.5 This is how you define new access levels for softkeys

**General sequence**

In order to assign 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, this machine data should be set 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 and press the "Original setting" softkey. This means that in the "New access level" column, the "Original setting" identifier is entered, which functions in the same way as deletion. This entry is no longer available following a system restart. "

Example

The following access levels were changed:

<table>
<thead>
<tr>
<th>Softkey</th>
<th>New access level</th>
</tr>
</thead>
<tbody>
<tr>
<td>SISuMainScreenMenuHu::0::3</td>
<td>Manufacturer</td>
</tr>
<tr>
<td>SImaJogMillMenuHU::jogHuMore::6</td>
<td>User</td>
</tr>
<tr>
<td>SISuPaUserDataMenu:::4</td>
<td>Service</td>
</tr>
</tbody>
</table>

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

7.7 Access levels

Result

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

<table>
<thead>
<tr>
<th>NOTICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Editing the file &quot;slsoftkeyaccess.xml&quot;</td>
</tr>
<tr>
<td>In order to avoid errors in the xml syntax and for the softkey identifier the &quot;slsoftkeyaccess.xml&quot; file may only be edited via the operating software as described above, and not directly in the file system under &quot;System data&quot;. It is possible that the complete file or individual entries for softkeys can no longer be interpreted.</td>
</tr>
</tbody>
</table>
Machine and setting data

8.1 Machine and setting data

Overview

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

References

You can find a detailed description of the machine and setting data in the following documentation:

- List Manual (book 1)
- Detailed machine data
8.2 Displaying/editing machine data

You can access the following machine data in the "Startup" 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 controller.

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

Read access to machine data is possible from access rights: Protection level 4 (key switch 3).

Machine data can be changed from access rights: Protection level 1 (password: machine manufacturer).

⚠️ DANGER

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 field index if applicable
- Machine data name
- Value of the machine data
- Unit of the machine data
- 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

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.
8.2 Displaying/editing machine data

- 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.
8.3 Displaying/editing display machine data

You can access the display machine data via the user interface in the "Startup" 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.
7. Press the "OK" softkey to trigger a warm restart.

- OR -

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

   ![Axis +](image)
   ![Axis -](image)
   ![Channel +](image)
   ![Channel -](image)

   - 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.
8.5 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" 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.

Precondition

Settings to drive parameters are protected with protection level 2 (password: service). The lists of the drive parameters are visible with protection level 4 (key switch 3).

Please refer to the following documentation for information about commissioning the drive parameters:

References

CNC Commissioning Manual: NCK, PLC, drives

Procedure

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

2. Press the "Mach. data" softkey. The softkeys "Control Unit MD", "Supply MD", and "Drive MD" 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 using 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 using the following softkeys:
Only the NCK is restarted.

Only the currently selected drive unit (CU) is restarted.

The NCK and the selected drive unit are restarted.

All of the control units in the system are restarted.

All of the Control Units in the system and the NCK are restarted. This
softkey corresponds to the "Reset (po)" softkey if you confirm the
prompt with "Yes".
All of the Control Units in the system, the NCK and also the HMI sl 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]
   AdvancedReset = 0.
8.6 Machine data display filter

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:

- Filter according to indices
- Filter according to display groups
- Display expert parameters

Indices from ... to

The index filter refers to the machine data fields. 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 fields 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.

References: 840D sl Parameter Manual

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 "Start-up" 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 "Display options" softkey.
   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.
8.7 Editing machine data and drive parameters

8.7.1 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.

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.
8.7 Editing machine data and drive parameters

8.7.2 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 to 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.
8.7 Editing machine data and drive parameters

8.7.3 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 [ ].
8.8 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 status bar.

Procedure

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

2. Press the "Mach. data" softkey.

3. Select an area by pressing the relevant softkey.

4. Press the "Search..." softkey and enter the required text or digit in the search screen.
   
   The cursor is positioned on the first entry that corresponds to the search term.

5. 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 Beginning" softkey to start the search at the first data.

Press the "Go to End" softkey to start the search at the last data.
8.9 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 "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".
8.9.1 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".

   "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 date" 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.
8.9 User views

**Note:**
You can navigate in the open user view with the mouse and select a line without closing the listbox.

7. Press the "Back" softkey to close the listbox 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 apply 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.

**8.9.2 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 lefthand window.

7. Press the "Back" softkey to save your changes.
## 8.9 User views

### Selecting a particular machine data item

You can use the Search dialog box to look for a particular data item.

Press the "Go to Beginning" 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.

### 8.9.3 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".

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`
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_MACHİNE_MASK.

<table>
<thead>
<tr>
<th>MD51040 $MNS_SWITCH_TO_MACHİNE_MASK</th>
<th>0 (default setting)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit 0 = 1</td>
<td>For program selection in the Program Manager, an automatic change is not made into the Machine operating area.</td>
</tr>
</tbody>
</table>
| 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. |
9.1 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.

<table>
<thead>
<tr>
<th>MD52010 $MCS_DISP_NUM_AXIS_BIG_FONT</th>
<th>Number of actual values with a large font</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 3</td>
<td>Number of actual values with a larger font (default setting)</td>
</tr>
</tbody>
</table>
9.2 Inserting a user-specific logo

The SIEMENS logo is visible in the header of the "Machine" operating area.
You can replace the SIEMENS logo with your own logo.

Procedure

1. Name your own logo "Logo.png".
2. Save your own logo depending on the bitmap size, in one of the directories:
   /oem/sinumerik/hmi/ico or
   /user/sinumerik/hmi/ico

<table>
<thead>
<tr>
<th>Folder</th>
<th>Bitmap size</th>
</tr>
</thead>
<tbody>
<tr>
<td>/ico640</td>
<td>122 x 19</td>
</tr>
<tr>
<td>/ico800</td>
<td>160 x 24</td>
</tr>
<tr>
<td>/ico1024</td>
<td>199 x 30</td>
</tr>
</tbody>
</table>
9.3 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

<table>
<thead>
<tr>
<th>Section</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Selected G groups</td>
<td>This area is intended for operation of the controller in Siemens mode.</td>
</tr>
<tr>
<td>Selected G groups ISO mode</td>
<td>This area is intended for operation of the controller in ISO mode.</td>
</tr>
</tbody>
</table>

Enter the G-code group and position as follows:

<table>
<thead>
<tr>
<th>SelectedGGroupN = M</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>M</td>
</tr>
</tbody>
</table>

### 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)
```
9.3 Configuring the display of the G-code groups

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.
9.4 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

<table>
<thead>
<tr>
<th>Section</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>CondStopIcons</td>
<td>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 &quot;DefaultIcon&quot; is displayed.</td>
</tr>
<tr>
<td>CondDelayTime</td>
<td>Specification of how long (in milliseconds) a certain message must be present before it is displayed.</td>
</tr>
<tr>
<td></td>
<td>• If no time is specified for a certain channel operational message, then the time specified at &quot;CondDelayTime&quot; is used.</td>
</tr>
<tr>
<td></td>
<td>• If the channel operational message is to be displayed immediately, &quot;0&quot; must be specified as time.</td>
</tr>
</tbody>
</table>

Procedure

1. Copy the "slmahdconfig.ini" file from the /siemens/sinumerik/hmi/template/cfg directory.
2. Place the file in the following directory: /oem/sinumerik/hmi/cfg or /user/sinumerik/hmi/cfg.
3. Open the file and make the required settings.
"slmahdconfig.ini" file

Standard configuration

[CondStopIcons]
Default icon = 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
5 = condstop.png ; M0/M1 active
6 = condstop.png ; Block in SBL mode terminated
7 = condstop.png ; NC stop active
8 = condstop.png ; Read-in enable missing
9 = condstop.png ; Feed enable missing
10 = condwait.png ; Dwell time active
11 = condwait.png ; Aux. function acknowledgment missing
12 = condstop.png ; Axis enable missing
13 = condwait.png ; Exact stop not reached
14 = condwait.png ; Waiting for positioning axis
15 = condwait.png ; Waiting for spindle
16 = condwait.png ; Waiting for other channel
17 = condstop.png ; Waiting for feedrate override
18 = condwait.png ; Error in NC block
19 = condwait.png ; Waiting for external NC blocks
20 = condwait.png ; Waiting for synchronized action
21 = condwait.png ; Block search active
22 = condstop.png ; Spindle enable missing
23 = condwait.png ; Axis feedrate override
24 = condwait.png ; Waiting for tool change acknowledgment
25 = condwait.png ; Gear step change
26 = condwait.png ; Waiting for position control
27 = condwait.png ; Waiting for thread cut
28 = condwait.png ; Reserved
29 = condwait.png ; Waiting for punching
30 = condwait.png ; Waiting for safe operation
31 = condwait.png ; No channel ready
32 = condstop.png ; Oscillation active
33 = condwait.png ; Axis replacement active
34 = condwait.png ; Axis container rotation
35 = condwait.png ; AXCT: Following axis active
36 = condwait.png ; AXCT: Leading axis active
37 = condwait.png ; AXCT: Follow-up active
38 = condwait.png ; AXCT: Internal status change
39 = condwait.png ; AXCT: Axis/spindle disable
40 = condwait.png ; AXCT: Corr. motion active
41 = condwait.png ; AXCT: Axis replacement active
42 = condwait.png ; AXCT: Axis interpolator active
43 = condwait.png ; Waiting for compile cycle
44 = condwait.png ; Access to system variable
45 = condwait.png ; Search target found
46 = condwait.png ; Rapid retraction started
47 = condwait.png ; AXCT: Wait for spindle stop
48 = condwait.png ; Machine data match
49 = condwait.png ; Axis replacement: Axis coupled
50 = condwait.png ; Axis replacement: Liftfast active
51 = condwait.png ; Axis replacement: New config active
52 = condwait.png ; Axis replacement: AXCTSW active
53 = condwait.png ; Axis replacement: Waitp active
54 = condwait.png ; Axis in another channel
55 = condwait.png ; Axis replacement: Axis is PLC axis
56 = condwait.png ; Axis replacement: Axis is oscillating axis
57 = condwait.png ; Axis replacement: Axis is Jog axis
58 = condwait.png ; Axis replacement: Command axis
Customizing the "Machine" operating area

9.4 Configuring the channel operational message

[CondDelayTime]
Default delay time = 1000

1 = 0 ; No NC ready
2 = 0 ; No mode group ready
3 = 0 ; EMERGENCY STOP active
4 = 0 ; Alarm with stop active
5 = 0 ; M0/M1 active
6 = 0 ; Block in SBL mode terminated
7 = 0 ; NC stop active
8 = 0 ; Read-in enable missing
9 = 0 ; Feed enable missing
10 = 0 ; Dwell time active
12 = 0 ; Axis enable missing
16 = 0 ; Waiting for other channel
17 = 0 ; Waiting for feedrate override
18 = 0 ; Error in NC block
19 = 0 ; Waiting for external NC blocks
22 = 0 ; Spindle enable missing
23 = 0 ; Axis feedrate override
32 = 0 ; Oscillation active
45 = 0 ; Search target found
76 = 0 ; Wait: G64 still U
9.5 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 in the "Machine" operating area, in the "Program control" window and using the "PRT" check box.

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.

<table>
<thead>
<tr>
<th>MD51039 $MNS_PROGRAM_CONTROL_MODE_MASK</th>
<th>Options for machine - program control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit 0 = 0 Function program test not available</td>
<td></td>
</tr>
</tbody>
</table>

The test option is described in the following documentation:

References

Function Manual, Basic Functions, Mode Group, Channel, Program Operation, Reset Behavior (K1)
9.6 Activating the "Teach In" function

Activate teach in

The teach in function is activated in part via the general configuration machine data.

Settings

<table>
<thead>
<tr>
<th>MD51034 $MNS_TEACH_MODE</th>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit 0 = 1</td>
<td>The &quot;Teach progr.&quot; softkey is displayed. The approached position is accepted into the program with the &quot;Accept&quot; softkey, default value.</td>
<td></td>
</tr>
<tr>
<td>Bit 1 = 1</td>
<td>The acceptance of the teach-in block can be blocked by the PLC.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>DB19.DBX13.0 = 0 Block is accepted</td>
<td></td>
</tr>
<tr>
<td></td>
<td>DB19.DBX13.0 = 1 Block is not accepted</td>
<td></td>
</tr>
</tbody>
</table>

Access to the function still depends on access rights.

<table>
<thead>
<tr>
<th>MD51045 $MNS_ACCESS_TEACH_IN</th>
<th>Protection level TEACH IN</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 7</td>
<td>The protection level for the execution of traversing movements to MDA buffer/part program for TEACH IN is specified, default value.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD51050 $MNS_ACCESS_WRITE_PROGRAM</th>
<th>Protection level write part program</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 7</td>
<td>The protection level for writing part programs is specified, default value.</td>
</tr>
</tbody>
</table>

Set the channelspecific machine data:

<table>
<thead>
<tr>
<th>MD20700 $MC_REFP_NC_START_LOCK</th>
<th>NC-Start disable without reference point</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 0</td>
<td></td>
</tr>
</tbody>
</table>

Activating teach in

1. Set the machine data and initiate a reset.
2. Now change into the "AUTO" and "MDA" operating mode.
3. Select the TEACHIN sub-operating mode.
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 you wish to accept the joint position of the machine and position of the rotary axes in the
traversing block, then click on the "STAT" and "TU" check boxes.

In order that the check boxes are displayed, set the following general configuration machine
data:

<table>
<thead>
<tr>
<th>MD51032 $MNS_STAT_DISPLAY_BASE</th>
<th>Numerical basis for display of the joint position STAT</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 1</td>
<td>Display, joint position STAT</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD51033 $MNS_TU_DISPLAY_BASE</th>
<th>Numerical basis, display of the position of the rotary axes TU</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 1</td>
<td>Display, position of the rotary axes TU</td>
</tr>
</tbody>
</table>
9.7 Block search

9.7.1 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:

<table>
<thead>
<tr>
<th>MD51028 $MNS_BLOCK_SEARCH_MODE_MASK</th>
<th>Bit mask for the available search modes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit 3 = 1 (33H to 3BH)</td>
<td></td>
</tr>
</tbody>
</table>

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.

9.7.2 Activating block search mode

The display is activated via a general configuration machine data to select from the available search versions.

Settings

<table>
<thead>
<tr>
<th>MD51028 $MNS_BLOCK_SEARCH_MODE_MASK</th>
<th>Bit mask for the available search modes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit 0 = 1</td>
<td>Activates block search with calculation, without approach, default value</td>
</tr>
<tr>
<td>Bit 1 = 1</td>
<td>Activates block search with calculation, with approach, default value</td>
</tr>
<tr>
<td>Bit 4 = 1</td>
<td>Activates block search without calculation, default value</td>
</tr>
</tbody>
</table>
9.8 Multi-channel support

In the "Machine" operating area, a dual channel view is possible for any two channels (2 from n) of a mode group.

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.

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
  - Work offset (e.g. G54)
  - Z value of the work 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:

<table>
<thead>
<tr>
<th>Bit 0</th>
<th>G code programming without multi-channel data</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 1</td>
<td>Multi-channel data are not listed for job lists that only contain G code programs. The &quot;multi-channel data&quot; softkey is not displayed.</td>
</tr>
</tbody>
</table>
Simulation and simultaneous recording

Displaying machining operations

Turning technology
• 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 on turning machines
• Milling with geometry axes: TRANSMIT, TRACYL, TRAANG

Milling technology
• Milling with 5 axes: Swivel/TRAORI
• Swivel head change

Configuring the simulation

Set the turning or milling technology and the corresponding coordinate system in the channel via the following channel-specific machine data:

Turning technology:

<table>
<thead>
<tr>
<th>MD52200 $MCS_TECHNOLOGY</th>
<th>Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 1</td>
<td>Turning technology</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD52000 $MCS_DISP_COORDINATE_SYSTEM</th>
<th>Position of the coordinate system</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 34 (example)</td>
<td></td>
</tr>
</tbody>
</table>

Milling technology:

<table>
<thead>
<tr>
<th>MD52200 $MCS_TECHNOLOGY</th>
<th>Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 2</td>
<td>Milling technology</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD52000 $MCS_DISP_COORDINATE_SYSTEM</th>
<th>Position of the coordinate system</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 0 (example)</td>
<td></td>
</tr>
</tbody>
</table>
Meaning of the axes

<table>
<thead>
<tr>
<th>MD52206 $MCS_AXIS_USAGE</th>
<th>Meaning of the axes in the channel</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 0</td>
<td>No special meaning</td>
</tr>
<tr>
<td>= 1</td>
<td>Tool spindle (driven tool)</td>
</tr>
<tr>
<td>= 2</td>
<td>Auxiliary spindle (driven tool)</td>
</tr>
<tr>
<td>= 3</td>
<td>Main spindle (turning)</td>
</tr>
<tr>
<td>= 4</td>
<td>C axis of the main spindle (turning)</td>
</tr>
<tr>
<td>= 5</td>
<td>Counterspindle (turning)</td>
</tr>
<tr>
<td>= 6</td>
<td>C axis of the counterspindle (turning)</td>
</tr>
<tr>
<td>= 7</td>
<td>Linear axis of the counterspindle (turning)</td>
</tr>
<tr>
<td>= 8</td>
<td>Tailstock (turning)</td>
</tr>
<tr>
<td>= 9</td>
<td>Back rest (turning)</td>
</tr>
</tbody>
</table>

Enter the direction of rotation for the rotary axes that are not configured in a tool carrier of 5-axis transformation via the following channel-specific machine data.

<table>
<thead>
<tr>
<th>MD52207 $MCS_AXIS_USAGE_ATTRIB</th>
<th>Attributes of the axes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit 0</td>
<td>Rotation around 1st geometry axis (for rotary axes)</td>
</tr>
<tr>
<td>Bit 1</td>
<td>Rotation around 2nd geometry axis (for rotary axes)</td>
</tr>
<tr>
<td>Bit 2</td>
<td>Rotation around 3rd geometry axis (for rotary axes)</td>
</tr>
<tr>
<td>Bit 3</td>
<td>Reversal of direction of rotation (for rotary axes)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD52290 $MCS_SIM_DISPLAY_CONFIG</th>
<th>Position of the status display of the channel in the simulation.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit 0</td>
<td>Upper left-hand corner</td>
</tr>
<tr>
<td>Bit 1</td>
<td>Upper right-hand corner</td>
</tr>
<tr>
<td>Bit 2</td>
<td>Lower left-hand corner</td>
</tr>
<tr>
<td>Bit 3</td>
<td>Lower right-hand corner</td>
</tr>
</tbody>
</table>

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.
Simulation and simultaneous recording

<table>
<thead>
<tr>
<th>MD52207 $MCS_AXIS_USAGE_ATTRIB</th>
<th>Attributes of the axes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit 0</td>
<td>Rotation around 1st geometry axis (for rotary axes)</td>
</tr>
<tr>
<td>Bit 1</td>
<td>Rotation around 2nd geometry axis (for rotary axes)</td>
</tr>
<tr>
<td>Bit 2</td>
<td>Rotation around 3rd geometry axis (for rotary axes)</td>
</tr>
<tr>
<td>Bit 3</td>
<td>Reversal of direction of rotation (for rotary axes)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD53230 $MCS_SIM_START_POSITION</th>
<th>Axis position when starting the simulation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Simulation is only possible if a value not equal to 0 has been set for at least one geometry axis.</td>
</tr>
</tbody>
</table>

Software option
You require the following option for further simulation settings:
"3D simulation 1 (finished part)".

Note
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".

Note
Alarm display in the simulation
In the simulation, for alarms with several parameters, a maximum of only 5 parameters can be displayed per alarm.

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.

Configuring the simultaneous recording

Software option
For the "Simultaneous recording" function, you require the option:
"Simultaneous recording (real-time simulation)".
Activating the tailstock display

Software option
You require the "ShopMill/ShopTurn" option to display the tailstock

Making the tailstock visible

<table>
<thead>
<tr>
<th>MD52218 $MCS_FUNCTION_MASK_TURN</th>
<th>Turning function screen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit 2 = 1</td>
<td>The tailstock becomes visible if selected in the &quot;tailstock&quot; program.</td>
</tr>
</tbody>
</table>

Specifying tailstock dimensions

- "Spindle chuck data" window

  In the operating area "Parameters" → Setting data → Spindle chuck data:
  Enter parameters "ZR" and "XR" for the tailstock length and tailstock diameter.
  The tailstock dimensions are written into the following machine data:

<table>
<thead>
<tr>
<th>MD52246 $MCS_FUNCTION_TAILSTOCK_DIAMETER</th>
<th>Tailstock diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tailstock diameter in mm</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD52247 $MCS_FUNCTION_TAILSTOCK_LENGTH</th>
<th>Tailstock length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tailstock length in mm</td>
<td></td>
</tr>
</tbody>
</table>

- Input in machine data

  You can directly enter the tailstock dimensions in machine data 52246 and 52247.

Activating the machining time display

Timers are provided as system variables in the Program runtime function. While the NCK-specific timers are always activated (for time measurements since the last control power-up), the channel-specific timers must be started via the following channel-specific machine data.

<table>
<thead>
<tr>
<th>MD27860 $MC_PROCESS TIMERMODE</th>
<th>Activating the program runtime measurement.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit 0 = 1</td>
<td>The measurement of the total runtime for all part programs is active ($AC_OPERATING_TIME).</td>
</tr>
<tr>
<td>Bit 1 = 1</td>
<td>The measurement of the actual program runtime is active ($AC_CYCLE_TIME).</td>
</tr>
<tr>
<td>Bit 4 = 1</td>
<td>Measurement also during active dry run feedrate.</td>
</tr>
<tr>
<td>Bit 5 = 1</td>
<td>Measurement during program test.</td>
</tr>
</tbody>
</table>
Deactivating simulation

Procedure:
1. Copy the "slsimconfigsettings.xml" file from the 
   siemens/sinumerik/hmi/appl/systemconfig/simulation directory
2. Store the file in the following directory: /oem/sinumerik/hmi/cfg or /user/sinumerik/hmi/cfg
   If the "slsimconfigsettings.xml" file is already available in the directory, only add the 
   entries from the "slsimconfigsettings.xml" Siemens file.
3. Restart SINUMERIK Operate.
   The softkeys for the simulation selection are no longer available.
10.1 Reset NCK data for the simulation

If an alarm, designated with the Power On symbol occurs during simulation, then you must reset the simulation and then reload again.

Procedure

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

2. Press the "HMI" softkey.

3. Press the ">>" and "Simulation general reset" softkeys.
   The "NOTICE! Power On Reset" window is opened and you receive a confirmation prompt: "Do you really want to completely initialize the simulation again?"

4. Press the "OK" softkey.
   A general reset of the simulation is initiated with a complete data alignment with the real NCK.

Note

If you read-in an archive into the NCK, the general reset is automatically initiated.
PLC functions

11.1 Program selection

11.1.1 Displaying the softkey

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

Configuring a softkey

<table>
<thead>
<tr>
<th>MD51041 $MNS_ENABLE_PROGLIST_USER</th>
<th>0</th>
<th>No softkey</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>The &quot;Prog. list&quot; softkey is displayed</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD51043 $MNS_ENABLE_PROGLIST_MANUFACT</th>
<th>0</th>
<th>No softkey</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>The &quot;MANUFACTURER&quot; softkey is displayed</td>
</tr>
</tbody>
</table>

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.

Precondition

For the program list, you require the access rights: Protection level 3 (password: end user or access rights: Protection level 1 (password: machine manufacturer).

Program lists

<table>
<thead>
<tr>
<th>Program lists</th>
<th>Directory</th>
</tr>
</thead>
<tbody>
<tr>
<td>plc_proglst_user.ppl</td>
<td>/user/sinumerik/hmi/plc/programlist</td>
</tr>
<tr>
<td>plc_proglst_manufacturer.ppl</td>
<td>/oem/sinumerik/hmi/plc/programlist</td>
</tr>
</tbody>
</table>
11.1 Program selection

Procedure

1. Select the "Start-up" operating area, if you have access rights: Protection level 1 (password: machine manufacturer).

- OR / AND -

Select the "Program Manager" operating area, if you have the access rights: Protection level 3 (password: end 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.

A syntax check is not performed.

Note:

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

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.

11.1.2 Program selection from the PLC

Function

The NC program to be executed can be specified via the PLC. The names of the NC programs are entered in program lists.

There are two types of program lists that are dependent on the protection level where NC programs are combined into different files:

1. user: Can be edited by users with the access rights: Protection level 3 (password: end user).

2. manufacturer: Can only be edited by machinery manufacturers with the access rights: Protection level 1 (password: machine manufacturer).

<table>
<thead>
<tr>
<th>Access rights</th>
<th>Index</th>
<th>Program lists</th>
<th>Directory</th>
</tr>
</thead>
<tbody>
<tr>
<td>user</td>
<td>1</td>
<td>plc_proglist_user.ppl</td>
<td>/user/sinumerik/hmi/plc/programlist</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Reserved</td>
<td></td>
</tr>
<tr>
<td>manufacturer</td>
<td>3</td>
<td>plc_proglist_manufacturer.ppl</td>
<td>/oem/sinumerik/hmi/plc/programlist</td>
</tr>
</tbody>
</table>

Changing the name of the program list

If the name of a program list is changed, a control file with the "plc_proglist_main.ppl" name must be created.

Depending on the access rights, the control file is saved in the directory /oem/sinumerik/hmi/plc/programlist or /user/sinumerik/hmi/plc/programlist. The index and the modified name must be entered into the control file.

Interface signals

The PLC issues jobs to the HMI to perform a program selection in the NC.

<table>
<thead>
<tr>
<th>DB19.DBB13 (PLC → HMI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit 7</td>
</tr>
<tr>
<td>Selection</td>
</tr>
</tbody>
</table>

"Selection"
PLC functions

11.1 Program selection

The job is specified using an index in the control file.

<table>
<thead>
<tr>
<th>DB19.DBB16 (PLC → HMI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit 7</td>
</tr>
<tr>
<td>-------------------------</td>
</tr>
<tr>
<td>Always 1= passive file system</td>
</tr>
</tbody>
</table>

An index in the specified program list refers to the NC program.

<table>
<thead>
<tr>
<th>DB19.DBB17 (PLC → HMI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit 7</td>
</tr>
<tr>
<td>-------------------------</td>
</tr>
<tr>
<td>Part program handling: Index of the file to be transferred from the program list. user = value 1 - 100 oem = value 201 - 255</td>
</tr>
</tbody>
</table>

Acknowledgment byte from the HMI for the actual data transfer status.

<table>
<thead>
<tr>
<th>DB19.DBB26 (HMI → PLC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit 7</td>
</tr>
<tr>
<td>-------------------------</td>
</tr>
<tr>
<td>Selection</td>
</tr>
</tbody>
</table>

References

Function Manual Basic Functions: Various NC/PLC interface signals and functions (A2)

Job processing

A PLC job is processed according to the following scheme:

- The PLC may only initiate a job in the job byte if the acknowledgment byte is 0.
- The HMI mirrors the job (excluding the parameter set) in the acknowledgment byte (signaling to the PLC that its job is being processed). The PLC receives a "job active" signal for an unfinished job.
- Once the operation is finished (without error or with error), the PLC must respond again and delete the job byte.
- The HMI then sets the acknowledgement byte to 0. This ensures a sequential procedure.
## Error IDs at the PLC

<table>
<thead>
<tr>
<th>DB19.DBB27 (HMI → PLC)</th>
<th>Value</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td>No error</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Invalid number for the control file (value in DB19.DBB16 &lt; 127 or invalid).</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Control file &quot;plc_proglist_main.ppl&quot; not found (value in DB19.DBB16 invalid).</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Invalid index in control file (incorrect value in DB19.DBB17).</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Job list in the selected workpiece could not be opened.</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>Error in job list (job list interpreter returns error).</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>Job list interpreter returns empty job list.</td>
</tr>
</tbody>
</table>
11.2 Activating the key lock

The operator panel keyboard and a keyboard connected to the HMI can be locked via an interface signal.

Interface signal

<table>
<thead>
<tr>
<th>DB19</th>
<th>Signals to operator panel front (PLC -&gt; HMI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit 7</td>
<td>Bit 6</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>DBB0</td>
<td>Key lock On</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DB19</th>
<th>Signals to operator panel front (PLC -&gt; 2nd HMI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit 7</td>
<td>Bit 6</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>DBB50</td>
<td>Key lock On</td>
</tr>
</tbody>
</table>
11.3 Transferring the area and screen number to the PLC

Archiving the active operating area in the PLC user interface

For the subsequently listed operating areas, the specified PLC-IDs are saved in the variable DB19.DBB21 of the PLC user interface when selecting the operating areas.

If an HMI monitor is configured, the PLC-ID is saved in byte 0 of the HMI monitor.

<table>
<thead>
<tr>
<th>Operating area</th>
<th>PLC_ID (DB19.DBB21)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Machine</td>
<td>201</td>
</tr>
<tr>
<td>Parameters</td>
<td>205</td>
</tr>
<tr>
<td>Programming</td>
<td>203</td>
</tr>
<tr>
<td>Program Manager</td>
<td>202</td>
</tr>
<tr>
<td>Diagnostics</td>
<td>204</td>
</tr>
<tr>
<td>Commissioning</td>
<td>206</td>
</tr>
</tbody>
</table>

Saving the selected window in the PLC user interface

For the windows subsequently listed, when selecting the screen, the specified PLC-IDs are saved in the variable DB19.DBW24 of the PLC user interface.

If an HMI monitor is configured, then the PLC-ID is saved in bytes 2 and 3 of the HMI monitor.

Machine operating area

<table>
<thead>
<tr>
<th>Window name</th>
<th>PLC-ID - DB19.DBW24</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUTO</td>
<td></td>
</tr>
<tr>
<td>Starting screen</td>
<td>200</td>
</tr>
<tr>
<td>Program control</td>
<td>210</td>
</tr>
<tr>
<td>Block search</td>
<td>220</td>
</tr>
<tr>
<td>Settings for manual</td>
<td>2</td>
</tr>
<tr>
<td>AUTO</td>
<td></td>
</tr>
<tr>
<td>Settings for automatic mode</td>
<td>250</td>
</tr>
<tr>
<td>MDA</td>
<td>Starting screen</td>
</tr>
<tr>
<td>JOG</td>
<td>Starting screen</td>
</tr>
<tr>
<td>Settings for manual</td>
<td>1</td>
</tr>
<tr>
<td>T.S.M</td>
<td>2</td>
</tr>
<tr>
<td>Softkey: &quot;Position&quot;</td>
<td>Target position</td>
</tr>
<tr>
<td>Softkey: &quot;Measure tool&quot;</td>
<td>Length, manual</td>
</tr>
<tr>
<td></td>
<td>Radius, manual</td>
</tr>
<tr>
<td></td>
<td>Softkey: &quot;Length, auto&quot;</td>
</tr>
<tr>
<td></td>
<td>Diameter/radius auto</td>
</tr>
<tr>
<td></td>
<td>Probe calibration</td>
</tr>
<tr>
<td>Softkey: &quot;Set WO&quot;</td>
<td>21</td>
</tr>
</tbody>
</table>
### PLC functions

#### 11.3 Transferring the area and screen number to the PLC

<table>
<thead>
<tr>
<th>Window name</th>
<th>PL C-ID - DB19.DBW24</th>
</tr>
</thead>
<tbody>
<tr>
<td>Softkey: &quot;Measure tool&quot;</td>
<td>Calibration fixed point 52</td>
</tr>
<tr>
<td></td>
<td>Length, manual 51</td>
</tr>
<tr>
<td></td>
<td>Length, auto 58</td>
</tr>
<tr>
<td></td>
<td>Probe calibration 56</td>
</tr>
<tr>
<td>Softkey: &quot;Workpiece zero&quot;</td>
<td>Setting the edge 5</td>
</tr>
<tr>
<td></td>
<td>Aligning the edge 31</td>
</tr>
<tr>
<td></td>
<td>Distance 2 edges 32</td>
</tr>
<tr>
<td></td>
<td>Right-angled corner 33</td>
</tr>
<tr>
<td></td>
<td>Any corner 8</td>
</tr>
<tr>
<td></td>
<td>1 hole 9</td>
</tr>
<tr>
<td></td>
<td>2 holes 35</td>
</tr>
<tr>
<td></td>
<td>3 holes 36</td>
</tr>
<tr>
<td></td>
<td>4 holes 37</td>
</tr>
<tr>
<td></td>
<td>Rectangular pocket 34</td>
</tr>
<tr>
<td></td>
<td>Rectangular spigot 38</td>
</tr>
<tr>
<td></td>
<td>1 circular spigot 10</td>
</tr>
<tr>
<td></td>
<td>2 circular spigots 39</td>
</tr>
<tr>
<td></td>
<td>3 circular spigots 40</td>
</tr>
<tr>
<td></td>
<td>4 circular spigots 41</td>
</tr>
<tr>
<td></td>
<td>Aligning the plane 11</td>
</tr>
<tr>
<td>Softkey: &quot;Swivel&quot;</td>
<td>Swivel plane 60</td>
</tr>
</tbody>
</table>

### Parameters operating area

<table>
<thead>
<tr>
<th>Window name</th>
<th>PL C-ID, DB19.DBW24</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tool list</td>
<td>600</td>
</tr>
<tr>
<td>Tool wear</td>
<td>610</td>
</tr>
<tr>
<td>OEM list</td>
<td>620</td>
</tr>
<tr>
<td>Magazine</td>
<td>630</td>
</tr>
<tr>
<td>Work offsets</td>
<td>640</td>
</tr>
<tr>
<td>R parameters</td>
<td>650</td>
</tr>
<tr>
<td>Global user variables</td>
<td>682</td>
</tr>
<tr>
<td>Local user variables (LUD)</td>
<td>681</td>
</tr>
<tr>
<td>Channel-specific user variables</td>
<td>683</td>
</tr>
<tr>
<td>Local user variables (LUD/PUD)</td>
<td>684</td>
</tr>
<tr>
<td>Softkey: &quot;Setting data&quot;</td>
<td>Spindles 670</td>
</tr>
</tbody>
</table>
Program Manager operating area

<table>
<thead>
<tr>
<th>Window name</th>
<th>PLC-ID, DB19.DBW24</th>
</tr>
</thead>
<tbody>
<tr>
<td>NC</td>
<td>300</td>
</tr>
<tr>
<td>Local drive</td>
<td>325</td>
</tr>
<tr>
<td>Configured drive1</td>
<td>330</td>
</tr>
<tr>
<td>Configured drive2</td>
<td>340</td>
</tr>
<tr>
<td>Configured drive3</td>
<td>350</td>
</tr>
<tr>
<td>Configured drive4</td>
<td>360</td>
</tr>
<tr>
<td>Configured drive5</td>
<td>383</td>
</tr>
<tr>
<td>Configured drive6</td>
<td>384</td>
</tr>
<tr>
<td>Configured drive7</td>
<td>385</td>
</tr>
<tr>
<td>Configured drive8</td>
<td>386</td>
</tr>
</tbody>
</table>

Diagnostics operating area

<table>
<thead>
<tr>
<th>Window name</th>
<th>PLC-ID, DB19.DBW24</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alarms</td>
<td>500</td>
</tr>
<tr>
<td>Messages</td>
<td>501</td>
</tr>
<tr>
<td>Alarm log</td>
<td>502</td>
</tr>
</tbody>
</table>
11.4 HMI monitor

The HMI monitor is a data area in a freely-selectable user-specific PLC data block.

Configuring HMI monitors

The PLC address of the HMI monitor is configured using the following display machine data:

<table>
<thead>
<tr>
<th>MD9032 $MM_HMI_MONITOR</th>
<th>Determining the PLC data for HMI monitor information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Byte 0</td>
<td>Saves the PLC-ID of the active operating area.</td>
</tr>
<tr>
<td>Byte 2</td>
<td>Saves the PLC-ID of the window that is currently selected.</td>
</tr>
<tr>
<td>Byte 3</td>
<td></td>
</tr>
</tbody>
</table>

The machine data is a string and is interpreted as a pointer to a PLC data area with specified byte offset, e.g. DB60.DBB10. The PLC data area encompasses 8 bytes of the PLC. The start address must have an even byte offset (0, 2, 4, 6, 8, etc.).

Example

DB60.DBB10 for data block 60, byte 10
Reserves the bytes 10, 11, 12, 13, 14, 15, 16, 17 as HMI monitor
DB60.DBB10: PLC-ID of the active operating area
DB60.DBW12: PLC-ID of the window that is currently selected

Note

When using the HMI monitor, the corresponding variables in the PLC user interface – DB19.DBB21 and DB19.DBW24 – are no longer supplied.

This means that either the user interface or the HMI monitor can be used – but not both simultaneously.
11.5 User status display (OEM)

Function

User symbols 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.

User symbols are displayed, controlled using PLC bits. 32 bits are available for this purpose. 16 positions are available in the header to display the user symbols. The symbols are provided in the form of PNG files and saved - depending on the resolution - in the file system (/user/hmi/ico/ico640, etc.).

Configuration

The user symbols are configured in Section [UserIcons] of file slmahdconfig.ini. The following data are required:

- The basis address of the PLC double word with the bits to control the display of the user symbols.
- for each bit used, the file name of the symbol and the position at which the symbol should be displayed.

Example

; The section UserIcons enables you to show your own icons (up to 16) in the machine header instead of the actual program name.
; The icons can be displayed dynamically by setting a plc double word.

[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

User symbols (symbols) can be output, controlled from the PLC (DB x, DBB y), which are linked to specific machine states.

Procedure:
1. Declaration of symbols and positions
2. Control of the symbol call by the PLC
Enter the name of the user icons and the associated positions in the HEADER.INI file in the [UserIcons] section under identifiers UI_0 to UI_31.

[UserIcons]
UI_0= <Icon_00.bmp> , <Position>
; UI_0: Identifiers
; Icon_00.bmp: Name of user icon (8 characters.bmp)
; Position: Display position (1 to 16)
...
UI_31= <Icon_31.bmp> , <Position>

USER_ICON_BASE = DBx.DBBy

DBx.DBBy: Double word defined by user for controlling the symbol selection. If a bit for a symbol is set, then the associated UI_x entry should exist, otherwise nothing is displayed. To display a symbol according to the above declaration, the PLC sets the corresponding bit in the double word.

Example:
UI_0 display allocated symbol → bit 0
...
UI_31 display allocated symbol → set bit 31.

If the bit is reset by the PLC, the associated symbol is deleted from the display.

Example:
UI_3=Icon_01.bmp,12.

If bit 3 is set, the "Icon_01.bmp" symbol is displayed at the 12th position, if no other symbol with a higher identifier (>UI_3) and the same position (12) is active.

Possible applications

With a unique selection, a maximum of 16 bits are set simultaneously in the 4 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)
- 2 alternative images for each of the permissible 16 positions, each position requires 2 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
Superimposition

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 2 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. Symbols can be requested by the PLC for the active HMI application only.

Configuring OEM texts

The machine manufacturer can display his own texts in the program directory and program name lines. These texts cannot include % parameters as is possible in user texts. The lines are divided into <OEM_NUMBER_TEXTFIELD> areas according to the entry in HEADER.INI.

The data are provided in a user data block. The number of the data block and the exact offset are declared in the HEADER.INI file. The following entries are available in the [OEMTextInfo] section for this purpose:

```
[OEMTextInfo]
OEM_NUMBER_TEXTFIELD = 1 ; maximum of 3 text fields per line
OEM_TEXT_BASE = DBx.DBBy
```

The interface in the user DB has the following format:

<table>
<thead>
<tr>
<th>Start-DBB byte</th>
<th>Bit0=1: there is something to do</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start-DBB +18 byte</td>
<td>All bits=1: job is acknowledged by HMI</td>
</tr>
<tr>
<td></td>
<td>All bits=0: PLC can write to interface again.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Start-DBB +1 word</th>
<th>Offset for text from alpu_xx.com to be displayed;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start-DBB +19 word</td>
<td>700 000 is the base address and is always summed internally.</td>
</tr>
<tr>
<td></td>
<td>All bits=0: Delete line</td>
</tr>
</tbody>
</table>

| Start-DBB + 3 string   | String containing a maximum of 12 characters     |
| or Start DBB +20 double Word |                                                     |

The first parameter contains an offset for a text number with a base of 700,000 (user PLC texts). If this parameter = 0, the corresponding line is deleted. The second parameter contains a maximum 12-character string. Unless empty, this text is output instead of the user PLC text.
The parameters must be written from "back to front" in the PLC, i.e., all parameters must be initialized before the first byte is set. The data for the next line are located exactly 18 bytes after the start byte. The lines are output from left to right; a maximum of 3 output fields per line are provided (i.e., a total of 6 fields are possible).

A hotlink to the first byte for each line is set up in the operating software. If a change occurs in that byte, the operating software responds. If the operating software displayed the data, it writes a –1 to the first variable. The operating software is informed about this change by means of the hotlink, whereupon it writes a 0 to this variable.

The HMI itself does not have to react to this change. The PLC can only write data to the interface again if the variable is set to 0. This mechanism ensures that the operating software knows about all parameter changes.

### Configuring OEM symbols

OEM symbols indicating the machine state can be output in the field provided for the program control display (e.g. SBL, M01, etc.). If OEM symbols are defined, the elements for the program control display are hidden.

The symbol names are identified in the HEADER.INI configuration file, similar to user symbols:

```
[OemIcons]
O1_0= <name.bmp>, <Position>
...
O1_31= <name.bmp>, <Position>
```

Here, <name> is the file name of the bit map and <Position> is the output position (from 1 to 16) in the display line. Multiple bit maps can be output at the same position. If more than one bit map is active simultaneously at the same position, the bit map with the highest screen number is displayed.

The output is controlled by means of a PLC double word. This double word is declared in the next section in the HEADER.INI file:

```
[OemIcons]
Oem_ICON_BASE = DBx.DBBy
```

Each bit in this double word represents exactly one OEM symbol corresponding to the screen number. Thus, if bit 0 is set, bit map O1_0 is displayed. If a bit is reset, the associated bit map is deleted.

A maximum of 16 symbols can be displayed, enabling a total of 16 display positions. Empty positions need not be specified.
12

Drive system

12.1 Commissioning of drives

Procedure

Once commissioning of the PLC has been completed, you can carry out commissioning of 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.

References

The procedure for commissioning the SINAMICS drives is described in the following documentation:

CNC Commissioning Manual: NCK, PLC, drive
Drive system

12.1 Commissioning of drives
13.1 Setting machine data for magazine management

Setting without magazine management

Make the following settings if you are commissioning the tool management without NC magazine management:

<table>
<thead>
<tr>
<th>MD18080 $MN_MM_TOOL_MANAGEMENT_MASK</th>
<th>Memory for the tool management is reserved step-by-step (SRAM).</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 02H</td>
<td>Bit 1 Provide monitoring data.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD20310 $MC_TOOL_MANAGEMENT_MASK</th>
<th>Activating the tool management functions.</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 02H</td>
<td>Bit 1 Monitoring functions of tool management active.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD17530 $MN_TOOL_DATA_CHANGE_COUNTER</th>
<th>Marking the changed tool data for HMI.</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 1FH</td>
<td>Bit 0 Tool status change.</td>
</tr>
<tr>
<td></td>
<td>Bit 1 Tool remaining unit quantity change.</td>
</tr>
<tr>
<td></td>
<td>Bit 2 Tool data change service.</td>
</tr>
<tr>
<td></td>
<td>Bit 3 Magazine data in the change service.</td>
</tr>
<tr>
<td></td>
<td>Bit 4 ISO data in the change service.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD28450 $MC_MM_TOOL_DATA_CHG_BUFF_SIZE</th>
<th>Buffer for changing tool data (DRAM).</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 100</td>
<td>Number of entries in the buffer for the OPI change service for tool data. Dynamic memory is used. This buffer is only created if either bit 2 or bit 3 is set in MD17530 $MN_TOOL_DATA_CHANGE_COUNTER.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD19320 $ON_TECHNO_FUNCTION_MASK</th>
<th>Enables the tool monitoring function without magazine management.</th>
</tr>
</thead>
</table>
### Setting with magazine management

Make the following settings if you are commissioning the tool management with NC magazine management:

<table>
<thead>
<tr>
<th>MD18080 $MN_MM_TOOL_MANAGEMENT_MASK</th>
<th>Memory for the tool management is reserved step-by-step (SRAM).</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 03H</td>
<td></td>
</tr>
<tr>
<td>Bit 0</td>
<td>Provide tool management data.</td>
</tr>
<tr>
<td>Bit 1</td>
<td>Provide monitoring data.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD20310 $MC_TOOL_MANAGEMENT_MASK</th>
<th>Activating the tool management functions.</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 03H</td>
<td></td>
</tr>
<tr>
<td>Bit 0</td>
<td>Magazine management active.</td>
</tr>
<tr>
<td>Bit 1</td>
<td>Monitoring functions of tool management active.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD17530 $MN_TOOL_DATA_CHANGE_COUNTER</th>
<th>Marking the changed tool data for HMI.</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 1FH</td>
<td></td>
</tr>
<tr>
<td>Bit 0</td>
<td>Tool status change.</td>
</tr>
<tr>
<td>Bit 1</td>
<td>Tool remaining unit quantity change.</td>
</tr>
<tr>
<td>Bit 2</td>
<td>Tool data change service.</td>
</tr>
<tr>
<td>Bit 3</td>
<td>Magazine data in the change service.</td>
</tr>
<tr>
<td>Bit 4</td>
<td>ISO data in the change service.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD28450 $MC_MM_TOOL_DATA_CHG_BUFF_SIZE</th>
<th>Buffer for changing tool data (DRAM).</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 100</td>
<td>Number of entries in the buffer for the OPI change service for tool data. Dynamic memory is used. This buffer is only created if either bit 2 or bit 3 is set in MD17530 $MN_TOOL_DATA_CHANGE_COUNTER.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD19320 $ON_TECHNO_FUNCTION_MASK</th>
<th>Enables the tool monitoring function with magazine management.</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 10H</td>
<td></td>
</tr>
<tr>
<td>Bit 4</td>
<td></td>
</tr>
</tbody>
</table>
Additional settings

You can enable further functions on the user interface via the following machine data/setting data:

<table>
<thead>
<tr>
<th>MD52270 $MCS_TM_FUNCTION_MASK</th>
<th>Bit 0</th>
<th>Creating tool at the magazine location is not permitted.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Bit 1</td>
<td>Load/unload lock, if the machine is not in the reset state.</td>
</tr>
<tr>
<td></td>
<td>Bit 2</td>
<td>Load/unload lock for EMERGENCY OFF</td>
</tr>
<tr>
<td></td>
<td>Bit 3</td>
<td>Tool in/out of spindle load/unload locked.</td>
</tr>
<tr>
<td></td>
<td>Bit 4</td>
<td>Tool loaded directly into spindle.</td>
</tr>
<tr>
<td></td>
<td>Bit 5</td>
<td>Using the grinding configuration file.</td>
</tr>
<tr>
<td></td>
<td>Bit 6</td>
<td>Reserved</td>
</tr>
<tr>
<td></td>
<td>Bit 7</td>
<td>Tool is created using the number.</td>
</tr>
<tr>
<td></td>
<td>Bit 8</td>
<td>Hide tool relocation.</td>
</tr>
<tr>
<td></td>
<td>Bit 9</td>
<td>Hide magazine positioning.</td>
</tr>
<tr>
<td></td>
<td>Bit 10</td>
<td>Reactivate tool with magazine positioning.</td>
</tr>
<tr>
<td></td>
<td>Bit 11</td>
<td>Reactivate tool in all monitoring types.</td>
</tr>
<tr>
<td></td>
<td>Bit 12</td>
<td>Hide reactivating tool.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SD54215 $SNS_TM_FUNCTION_MASK_SET</th>
<th>Bit 0</th>
<th>Diameter display for rotating tools, e.g. cutters and drills. For rotating tools, the diameter is displayed and not the radius.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Bit 1</td>
<td>M4 is the standard direction of rotation for all turning tools. When creating turning tools, the direction of rotation is pre-assigned with M4.</td>
</tr>
<tr>
<td></td>
<td>Bit 2</td>
<td>A name is not suggested when creating a tool.</td>
</tr>
<tr>
<td></td>
<td>Bit 3</td>
<td>Input lock, tool name and tool type for loaded tools. For loaded tools, the tool name and the tool type can no longer be changed.</td>
</tr>
<tr>
<td></td>
<td>Bit 4</td>
<td>Input lock for loaded tools if the channel is not in the reset state.</td>
</tr>
<tr>
<td></td>
<td>Bit 5</td>
<td>Tool wear entries are added: Wear data is entered in addition to the already existing wear value.</td>
</tr>
<tr>
<td></td>
<td>Bit 6</td>
<td>Only numerical entries are permitted in the &quot;Tool identifier&quot;.</td>
</tr>
<tr>
<td></td>
<td>Bit 7</td>
<td>Hide tool monitoring parameters. The tool monitoring parameters are hidden in the user interface.</td>
</tr>
<tr>
<td></td>
<td>Bit 8</td>
<td>Diameter display for face axis - geometry. The geometry value of the face axis is displayed as diameter value.</td>
</tr>
<tr>
<td></td>
<td>Bit 9</td>
<td>Diameter display for face axis - wear. The wear value of the face axis is displayed as diameter value.</td>
</tr>
<tr>
<td></td>
<td>Bit 10</td>
<td>Enable tool load/relocate to buffer storage locations. The magazine number can be entered into the load dialog box. It is therefore possible to access the buffer storage via magazine number 9998.</td>
</tr>
<tr>
<td></td>
<td>Bit 11</td>
<td>Creating new tools at gripper locations is blocked.</td>
</tr>
</tbody>
</table>
Enabling the multitool function

<table>
<thead>
<tr>
<th>MD18080 $MN_MM_TOOL_MANAGEMENT_MASK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit 10  The multitool function is available</td>
</tr>
</tbody>
</table>
13.2 Configuring the user interface of the tool management

Customizing the user interface of the TM

The following settings can be configured:

- Configure the tool lists
- Configure the list parameters
- Configure the "Additional Data" window
- Configure the "New Tool - Favorites" window
- Configure tool types
- Assigning a name for magazines and magazine locations
- Assigning magazines to channels
- General settings
- Creating OEM-specific texts

The following chapters explain how you configure these adaptations.

Configuration files for tool management

The settings for the tool management user interface are defined in technology-dependent configuration files. As a template, use the `oem_sltmlistconfig.xml` file from the folder `/siemens/sinumerik/hmi/template/cfg` and adapt the file names corresponding to the technology according to the following table:

<table>
<thead>
<tr>
<th>File name</th>
<th>Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>sltmlistconfig.xml</td>
<td>Milling technology</td>
</tr>
<tr>
<td>sltmturninglistconfig.xml</td>
<td>Turning technology</td>
</tr>
<tr>
<td>sltmpcplistconfig.xml</td>
<td>PLC tool management &quot;TRANSLINE 2000&quot;</td>
</tr>
<tr>
<td>sltmgrindinglistconfig.xml</td>
<td>Grinding technology</td>
</tr>
</tbody>
</table>

Turning/milling

Proceed as follows:

1. Open the directory: `/siemens/sinumerik/hmi/template/cfg`.
2. Copy the file "oem_sltmlistconfig.xml".
3. Copy the file into the folder `/oem/sinumerik/hmi/cfg` OR: `/user/sinumerik/hmi/cfg`
4. Change the file name according to the selected technology (refer to the table above).
5. Use the template (see below, "Configuration examples"), to create your specific configuration.
13.2 Configuring the user interface of the tool management

Grinding technology

Precondition:
Select the Universal technology and set MD52270 $MN_TM_FUNCTION_MASK bit 5 = 1. Then, only grinding tool types can be selected at the user interface.

Proceed as follows:
1. Open the directory: /siemens/sinumerik/hmi/template/cfg.
2. Copy the file "oem_sltmlistconfig.xml".
   This file can only be used for grinding applications.
3. Copy the file into the folder /oem/sinumerik/hmi/cfg
   OR: /user/sinumerik/hmi/cfg
4. Change the file name corresponding to the technology that has been selected sltmgrindinglistconfig.xml.
5. Use the template (see below, "Configuration examples"), to create your specific configuration.

Grinding on a lathe

Configuration file as template for grinding:

<table>
<thead>
<tr>
<th>File name</th>
<th>Grinding technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>sltmaddgrindinglistconfig.xml</td>
<td>This file is a template and is saved under: ../siemens/sinumerik/hmi/template/cfg</td>
</tr>
</tbody>
</table>

Note

The "sltmaddgrindinglistconfig.xml" file is used to expand a turning configuration by adding grinding tools. To do this, the "sltmaddgrindinglistconfig.xml" file must be renamed "sltmturninglistconfig.xml" and then copied into one of the following folders:

- /oem/sinumerik/hmi/cfg
- /user/sinumerik/hmi/cfg
Tool management

13.2 Configuring the user interface of the tool management

Configuration examples

Examples for all possible configurations are provided in the template oem_sltmlistconfig.xml, which are described individually in the following chapters:

```xml
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
-<CONFIGURATION>
<!-- enter your configuration behind this comment -->
<!-- enter your configuration ahead this comment -->
</CONFIGURATION>
```

Enter your configuration using the following xml identifiers:

<table>
<thead>
<tr>
<th>Identifier &lt;tag&gt;</th>
<th>for the following setting:</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>&lt;LISTCONFIGURATION&gt;</code></td>
<td>Configure the tool lists (Page 132)</td>
</tr>
<tr>
<td><code>&lt;PARAMETERCONFIGURATION&gt;</code></td>
<td>Configure the list parameters (Page 142)</td>
</tr>
<tr>
<td><code>&lt;MOREDATACONFIGURATION&gt;</code></td>
<td>Configuring the &quot;More data&quot; window (Page 148)</td>
</tr>
<tr>
<td><code>&lt;NEWTOOLFAVORITECONFIGURATION&gt;</code></td>
<td>Configure the &quot;New tool - favorites&quot; window (Page 150)</td>
</tr>
<tr>
<td><code>&lt;DETAILSCONFIGURATION&gt;</code></td>
<td>Configuring the &quot;Details&quot; window (Page 151)</td>
</tr>
<tr>
<td><code>&lt;TOOLTYPECONFIGURATION&gt;</code></td>
<td>Configure tool types (Page 152)</td>
</tr>
<tr>
<td><code>&lt;MAGAZINEPLACENAMECONFIGURATION&gt;</code></td>
<td>Assigning a name for magazines and magazine locations (Page 154)</td>
</tr>
<tr>
<td><code>&lt;CHANNELMAGAZINEASSIGNMENT&gt;</code></td>
<td>Assignment of magazines to channels (Page 157)</td>
</tr>
<tr>
<td><code>&lt;TOOLCHANGEREASON&gt;</code></td>
<td>Reason for the tool change when reactivating (Page 163)</td>
</tr>
<tr>
<td><code>&lt;SETTINGS&gt;</code></td>
<td>General settings (Page 165)</td>
</tr>
</tbody>
</table>
13.3 Example: Configuring an OEM tool list

Example

sltmconfiglist.xml file (milling) for an OEM tool list:

```xml
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<CONFIGURATION>
<LISTCONFIGURATION>
<!-- *********************************************************** -->
<!-- OEM ToolList by ABCSOFT -->
<!-- *********************************************************** -->
<SlTmTooloemForm>
    <Enabled value="true" type="bool" />
    <CAPTION>
        <Text value="TM_CAPTION_TOOLOEM" type="QString" />
    </CAPTION>
    <COLUMN1>
        <TOOLTYPE_ALL>
            <Item value="ToolInMagInPlace" type="QString" />
        </TOOLTYPE_ALL>
    </COLUMN1>
    <COLUMN2>
        <TOOLTYPE_ALL>
            <Item value="ToolType" type="QString" />
        </TOOLTYPE_ALL>
    </COLUMN2>
    <COLUMN3>
        <TOOLTYPE_ALL>
            <Item value="ToolPlaceSpec" type="QString" />
        </TOOLTYPE_ALL>
    </COLUMN3>
    <COLUMN4>
        <TOOLTYPE_ALL>
            <Item value="ToolIdent" type="QString" />
            <TOOLTYPE_9997>
                <Item value="MultiToolIdent" type="QString" />
            </TOOLTYPE_9997>
        </TOOLTYPE_ALL>
    </COLUMN4>
    <COLUMN5>
        <TOOLTYPE_ALL>
            <Item value="DuploNo" type="QString" />
            <TOOLTYPE_9997>
                <Item value="Empty" type="QString" />
            </TOOLTYPE_9997>
        </TOOLTYPE_ALL>
    </COLUMN5>
    </SlTmTooloemForm>
</LISTCONFIGURATION>
<!-- *********************************************************** -->
```
<SETTINGS>
    <MagazineSelectionDialog value="true" type="bool" />
</SETTINGS>
</CONFIGURATION>
13.4 Configure the tool lists

You can find the names for the technology-dependent configuration file in Chapter Configuring the user interface of the tool management (Page 127).

The entries used for configuring the following list views are located in the <LISTCONFIGURATION> tag:

- "Tool list" window, identifier <S1TmToollistForm>, see the 1st example.
- "Tool Wear" window, <S1TmToolwearForm> identifier
- "Magazine" window, <S1TmToolmagazinForm> identifier
- "Tool Data OEM" window, <S1TmTooloemForm> identifier
  This window is hidden in the default configuration. The window is only displayed when you enable it with <Enabled>, see the 2nd example.
- "Tool selection" window, <S1TmToolselectionForm> identifier: In order to select a tool this window can be displayed in the program input screen.

<table>
<thead>
<tr>
<th>Entry</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enabled</td>
<td>true - Window appears.</td>
</tr>
<tr>
<td></td>
<td>false - Window is hidden.</td>
</tr>
<tr>
<td>CAPTION</td>
<td>Definition of the list name.</td>
</tr>
<tr>
<td></td>
<td>See 1st example: &quot;Tool list&quot; appears on the</td>
</tr>
<tr>
<td></td>
<td>user interface for the &quot;TM_CAPTION_TOOLLIST&quot;</td>
</tr>
<tr>
<td></td>
<td>identifier.</td>
</tr>
<tr>
<td>COLUMNX</td>
<td>Column selection: X stands for the column</td>
</tr>
<tr>
<td></td>
<td>number.</td>
</tr>
<tr>
<td>TOOLTYPE_ALL</td>
<td>The column setting applies to all tool types.</td>
</tr>
<tr>
<td>TOOLTYPE_XXX</td>
<td>The column setting applies to a particular</td>
</tr>
<tr>
<td></td>
<td>tool type. XXX stands for the number of the</td>
</tr>
<tr>
<td></td>
<td>tool type.</td>
</tr>
<tr>
<td>EMPTY_MAG_PLACE</td>
<td>The column setting applies to an empty</td>
</tr>
<tr>
<td></td>
<td>magazine location. Empty magazine locations</td>
</tr>
<tr>
<td></td>
<td>appear in a list sorted according to</td>
</tr>
<tr>
<td></td>
<td>magazine.</td>
</tr>
<tr>
<td>Item</td>
<td>Identifier of the list parameter.</td>
</tr>
<tr>
<td></td>
<td>See example: The column in which the</td>
</tr>
<tr>
<td></td>
<td>magazine number and magazine location are</td>
</tr>
<tr>
<td></td>
<td>displayed is created for the &quot;ToolInMagInPlace&quot;</td>
</tr>
<tr>
<td></td>
<td>identifier.</td>
</tr>
<tr>
<td></td>
<td>Tool parameter identifiers (Page 134)</td>
</tr>
<tr>
<td></td>
<td>Cutting parameter identifiers (Page 136)</td>
</tr>
<tr>
<td></td>
<td>Monitoring parameter identifiers (Page 138)</td>
</tr>
<tr>
<td></td>
<td>Magazine location parameter identifiers (Page 139)</td>
</tr>
<tr>
<td>DELETE_COLUMN</td>
<td>Delete column.</td>
</tr>
<tr>
<td>INSERT_COLUMN</td>
<td>Insert column.</td>
</tr>
</tbody>
</table>
1st example: Configure tool list

```xml
<ListConfiguration>
  <S1TmToolListForm>
    <Enabled value="true" type="bool" />
    <Caption>
      <Text value="TM.Caption.ToolList" type="QString" />
    </Caption>
    <Column1>
      <ToolType all>
        <Item value="ToolInMagInPlace" type="QString" />
      </ToolType all>
      <Empty_Mag_Place>
        <Item value="MagNoMagPlaceNo" type="QString" />
      </Empty_Mag_Place>
    </Column1>
    <Column2>
      <ToolType all>
        <Item value="ToolType" type="QString" />
      </ToolType all>
    </Column2>
    <Column8>
      <ToolType_200>
        <Item value="NoseAngle" type="QString" />
      </ToolType_200>
      <ToolType_220>
        <Item value="NoseAngle" type="QString" />
      </ToolType_220>
      <ToolType_240>
        <Item value="GeoPitch" type="QString" />
      </ToolType_240>
      <ToolType_999>
        <Item value="NoseAngle" type="QString" />
      </ToolType_999>
    </Column8>
    <Delete_Column>
      <Column7>
      </Column7>
    </Delete_Column>
    <Insert_Column>
      <Column3>
        <ToolType all>
          <Item value="ToolIdent" type="QString" />
        </ToolType all>
      </Column3>
    </Insert_Column>
  </S1TmToolListForm>
</ListConfiguration>
```
13.4 Configure the tool lists

2nd example: Enable tool data OEM list

```xml
<SlTmTooloemForm>
  <Enabled value="true" type="bool" />
</SlTmTooloemForm>
```

13.4.1 Tool parameter identifiers

Tool parameters

For the tool parameters, the following identifiers are used in the configuration file:

<table>
<thead>
<tr>
<th>Identifier</th>
<th>Parameter or property</th>
</tr>
</thead>
<tbody>
<tr>
<td>Empty</td>
<td>Empty field</td>
</tr>
<tr>
<td>ToolNo</td>
<td>Number of the tool</td>
</tr>
<tr>
<td>AdaptNo</td>
<td>Adapter number assignment</td>
</tr>
<tr>
<td>DuploNo</td>
<td>Duplo number</td>
</tr>
<tr>
<td>NumCuttEdges</td>
<td>Number of cutting edges of tool</td>
</tr>
<tr>
<td>ToolIdent</td>
<td>Tool name</td>
</tr>
<tr>
<td>ToolIdentRO</td>
<td>Tool name, read only access</td>
</tr>
<tr>
<td>ToolInfo</td>
<td>Tool information</td>
</tr>
<tr>
<td>ToolInMag</td>
<td>Magazine in which the tool is located</td>
</tr>
<tr>
<td>ToolInPlace</td>
<td>Magazine location containing the tool</td>
</tr>
<tr>
<td>ToolInMagInPlace</td>
<td>Magazine number/Magazine location</td>
</tr>
<tr>
<td>ToolMonTCW</td>
<td>Type of tool monitoring, tool life, workpiece count and wear. If wear monitoring has not been enabled via the machine data, this parameter is handled like ToolMonTC.</td>
</tr>
<tr>
<td>ToolMonTC</td>
<td>Type of tool monitoring, tool life and workpiece count</td>
</tr>
<tr>
<td>ToolPlaceSpec</td>
<td>Location type</td>
</tr>
<tr>
<td>ToolPlaceSpecIdent</td>
<td>Location type, if it is to be displayed as text. The precondition is that the text for the location type was configured.</td>
</tr>
<tr>
<td>ToolSearch</td>
<td>Tool search type for replacement tools</td>
</tr>
<tr>
<td>ToolMyMag</td>
<td>Owner magazine of the tool</td>
</tr>
<tr>
<td>ToolMyPlace</td>
<td>Owner magazine of the tool</td>
</tr>
<tr>
<td>ToolSizeLeft</td>
<td>Tool size left in half locations</td>
</tr>
<tr>
<td>ToolSizeRight</td>
<td>Tool size right in half locations</td>
</tr>
<tr>
<td>ToolSizeUpper</td>
<td>Tool size upper in half locations</td>
</tr>
<tr>
<td>ToolSizeDown</td>
<td>Tool size lower in half locations</td>
</tr>
<tr>
<td>ToolOverSize</td>
<td>Tool size as fixed setting - two half locations left, two half locations right, one half location top, one half location bottom</td>
</tr>
</tbody>
</table>
### Tool management

#### 13.4 Configure the tool lists

<table>
<thead>
<tr>
<th>Identifier</th>
<th>Parameter or property</th>
</tr>
</thead>
<tbody>
<tr>
<td>ToolState</td>
<td>Tool status in the hexadecimal notation</td>
</tr>
<tr>
<td>ToolStateActiv</td>
<td>Tool status - tool active</td>
</tr>
<tr>
<td>ToolStateEnabled</td>
<td>Tool status - tool released</td>
</tr>
<tr>
<td>ToolStateLocked</td>
<td>Tool status - tool locked</td>
</tr>
<tr>
<td>ToolStateLockedRO</td>
<td>Tool status - tool locked, only read access</td>
</tr>
<tr>
<td>ToolStateMeasured</td>
<td>Tool status - tool measured</td>
</tr>
<tr>
<td>ToolStatePrewarn</td>
<td>Tool status - tool has reached prewarning limit</td>
</tr>
<tr>
<td>ToolStatePrewarnRO</td>
<td>Tool status - tool has reached prewarning limit, only read access</td>
</tr>
<tr>
<td>ToolStateInChange</td>
<td>Tool status - tool is being changed</td>
</tr>
<tr>
<td>ToolStateFixed</td>
<td>Tool status - tool fixed place coded</td>
</tr>
<tr>
<td>ToolStateUsed</td>
<td>Tool status - tool was in use</td>
</tr>
<tr>
<td>ToolStateAutoReturn</td>
<td>Tool status - automatic return</td>
</tr>
<tr>
<td>ToolStateIgnoreLocked</td>
<td>Tool status - do not observe locked</td>
</tr>
<tr>
<td>ToolStateMarkedToUnload</td>
<td>Tool status - tool is marked to unload</td>
</tr>
<tr>
<td>ToolStateMarkedToLoad</td>
<td>Tool status - tool is marked to load</td>
</tr>
<tr>
<td>ToolStatePermanent</td>
<td>Tool status - tool is permanent</td>
</tr>
<tr>
<td>ToolState1To1Exchange</td>
<td>Tool status - one to one replacement</td>
</tr>
<tr>
<td>ToolStateHandTool</td>
<td>Tool status - manual tool</td>
</tr>
<tr>
<td>ToolProtAreaFile</td>
<td>File name of the tool description, which is required to define the protection zone</td>
</tr>
<tr>
<td>ToolMaxVelo</td>
<td>Maximum speed</td>
</tr>
<tr>
<td>ToolMaxAcc</td>
<td>Maximum acceleration</td>
</tr>
<tr>
<td>ToolInMultiTool</td>
<td>Multitool in which the tool is located</td>
</tr>
<tr>
<td>ToolInMultiToolPlace</td>
<td>Multitool location containing the tool</td>
</tr>
<tr>
<td>ToolMyMultiTool</td>
<td>Owner multitool of the tool</td>
</tr>
<tr>
<td>ToolMyMultiToolPlace</td>
<td>Owner multitool location of the tool</td>
</tr>
<tr>
<td>ToolAlarmIsExtended</td>
<td>PLC tool status - function &quot;extended alarm&quot; active</td>
</tr>
<tr>
<td>ToolAlarmLimit</td>
<td>PLC tool status - alarm limit reached</td>
</tr>
<tr>
<td>ToolExtAlarmLimit</td>
<td>PLC tool status - limit &quot;extended alarm&quot; reached</td>
</tr>
<tr>
<td>ToolUser_1, ToolUser_2, ... ToolUser_10</td>
<td>OEM tool parameters 1 to 10</td>
</tr>
<tr>
<td>ToolAppl_1, ToolAppl_2, ... ToolAppl_10</td>
<td>Siemens application tool parameters 1 to 10</td>
</tr>
</tbody>
</table>

**NOTICE**

"ToolIdent" tool name

The maximum length of tool names is 31 ASCII characters.
The number of characters is reduced for Asian characters or Unicode characters.
The following special characters are not permitted: | # "

---

SINUMERIK Operate (IM9)
Commissioning Manual, 02/2011, 6FC5397-1DP40-0BA0
13.4.2 Cutting parameter identifiers

For the cutting parameters, the following identifiers are used in the configuration file:

<table>
<thead>
<tr>
<th>Identifier</th>
<th>Parameter or property</th>
</tr>
</thead>
<tbody>
<tr>
<td>EdgeNo</td>
<td>Cutting edge number</td>
</tr>
<tr>
<td>ToolType</td>
<td>Tool type, cutting parameter 1</td>
</tr>
<tr>
<td>CuttEdgePos</td>
<td>Cutting edge position, cutting parameter 2</td>
</tr>
<tr>
<td>GeoLength1</td>
<td>Length 1, cutting parameter 3</td>
</tr>
<tr>
<td>GeoLengthGeoAx1</td>
<td>Length of geometry axis 1, cutting parameter 3, e.g. length X</td>
</tr>
<tr>
<td>GeoLength</td>
<td>Length, cutting parameter 3</td>
</tr>
<tr>
<td>GeoLength2</td>
<td>Length 2, cutting parameter 4</td>
</tr>
<tr>
<td>GeoLengthGeoAx3</td>
<td>Length of geometry axis 3, cutting parameter 4, e.g. length Z</td>
</tr>
<tr>
<td>GeoLength3</td>
<td>Length 3, cutting parameter 5</td>
</tr>
<tr>
<td>GeoLengthGeoAx2</td>
<td>Length of geometry axis 2, cutting parameter 5, e.g. length Y</td>
</tr>
<tr>
<td>GeoRadius</td>
<td>Radius, cutting parameter 6</td>
</tr>
<tr>
<td>GeoCornerRadius</td>
<td>Corner radius, cutting parameter 7</td>
</tr>
<tr>
<td>GeoOutsideRadius</td>
<td>Outside radius, cutting parameter 7</td>
</tr>
<tr>
<td>GeoLength4</td>
<td>Length 4, cutting parameter 8</td>
</tr>
<tr>
<td>PlateLength</td>
<td>Cutting tip length, cutting parameter 8</td>
</tr>
<tr>
<td>GeoLength5</td>
<td>Length 5, cutting parameter 9</td>
</tr>
<tr>
<td>GeoWidth</td>
<td>Width, cutting parameter 9</td>
</tr>
<tr>
<td>PlateWidth</td>
<td>Cutting tip width, cutting parameter 9</td>
</tr>
<tr>
<td>GeoPitch</td>
<td>Thread pitch, cutting parameter 9</td>
</tr>
<tr>
<td>BoreRadius</td>
<td>Hole radius, cutting parameter 9</td>
</tr>
<tr>
<td>GeoAngle1</td>
<td>Angle 1, cutting parameter 10</td>
</tr>
<tr>
<td>HolderAngle</td>
<td>Holder angle, cutting parameter 10</td>
</tr>
<tr>
<td>GeoAngle2</td>
<td>Angle 2, cutting parameter 11</td>
</tr>
<tr>
<td>AngleConicalMillTool</td>
<td>Angle conical mill tools, cutting parameter 11</td>
</tr>
<tr>
<td>CuttDirection</td>
<td>Reference direction holder angle, cutting parameter 11</td>
</tr>
<tr>
<td>WearLength1</td>
<td>Wear length 1, cutting parameter 12</td>
</tr>
<tr>
<td>WearLengthGeoAx1</td>
<td>Wear length of geometry axis 1, cutting parameter 12, e.g. Δ length X</td>
</tr>
<tr>
<td>WearLength</td>
<td>Wear length, cutting parameter 12</td>
</tr>
<tr>
<td>WearLength2</td>
<td>Wear length 2, cutting parameter 13</td>
</tr>
<tr>
<td>WearLengthGeoAx3</td>
<td>Wear length of geometry axis 3, cutting parameter 13, e.g. Δ length Z</td>
</tr>
<tr>
<td>WearLength3</td>
<td>Wear length 3, cutting parameter 14</td>
</tr>
<tr>
<td>WearLengthGeoAx2</td>
<td>Wear length of geometry axis 2, cutting parameter 14, e.g. Δ length Y</td>
</tr>
<tr>
<td>WearRadius</td>
<td>Wear radius, cutting parameter 15</td>
</tr>
<tr>
<td>WearCornerRadius</td>
<td>Wear corner radius, cutting parameter 16</td>
</tr>
<tr>
<td>WearLength4</td>
<td>Wear length 4, cutting parameter 17</td>
</tr>
<tr>
<td>WearLength5</td>
<td>Wear length 5, cutting parameter 18</td>
</tr>
</tbody>
</table>
### Identifier Parameter or property

<table>
<thead>
<tr>
<th>Identifier</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>WearAngle1</td>
<td>Wear angle 1, cutting parameter 19</td>
</tr>
<tr>
<td>WearAngle2</td>
<td>Wear angle 2, cutting parameter 20</td>
</tr>
<tr>
<td>AdaptLength1</td>
<td>Adapter length 1, cutting parameter 21</td>
</tr>
<tr>
<td>AdaptLengthGeoAx1</td>
<td>Adapter length of geometry axis 1, cutting parameter 21, e.g. adapter length X</td>
</tr>
<tr>
<td>AdaptLength2</td>
<td>Adapter length 2, cutting parameter 22</td>
</tr>
<tr>
<td>AdaptLengthGeoAx3</td>
<td>Adapter length of geometry axis 3, cutting parameter 22, e.g. adapter length Z</td>
</tr>
<tr>
<td>AdaptLength3</td>
<td>Adapter length 3, cutting parameter 23</td>
</tr>
<tr>
<td>AdaptLengthGeoAx2</td>
<td>Adapter length of geometry axis 2, cutting parameter 23, e.g. adapter length Y</td>
</tr>
<tr>
<td>ReliefAngle</td>
<td>Relief angle, cutting parameter 24</td>
</tr>
<tr>
<td>PlateAngle</td>
<td>Cutting tip angle, combination of cutting parameter 24 and cutting parameter 10</td>
</tr>
<tr>
<td>NoseAngle</td>
<td>Nose angle, cutting parameter 24</td>
</tr>
<tr>
<td>CuttRate</td>
<td>Cutting rate, cutting parameter 25</td>
</tr>
<tr>
<td>SpindleDirection</td>
<td>For rotating tools, direction of rotation of the tool spindle. For turning tools, direction of rotation of the main spindle</td>
</tr>
<tr>
<td>Coolant1</td>
<td>Coolant 1</td>
</tr>
<tr>
<td>Coolant2</td>
<td>Coolant 2</td>
</tr>
<tr>
<td>MFunction1</td>
<td>M function 1</td>
</tr>
<tr>
<td>MFunction2</td>
<td>M function 2</td>
</tr>
<tr>
<td>MFunction3</td>
<td>M function 3</td>
</tr>
<tr>
<td>MFunction4</td>
<td>M function 4</td>
</tr>
<tr>
<td>IsoHNoDPH</td>
<td>ISO H number</td>
</tr>
<tr>
<td>OrientNo</td>
<td>Cutting orientation</td>
</tr>
<tr>
<td>OrientV1</td>
<td>Cutting orientation vector 1</td>
</tr>
<tr>
<td>OrientV2</td>
<td>Cutting orientation vector 2</td>
</tr>
<tr>
<td>OrientV3</td>
<td>Cutting orientation vector 3</td>
</tr>
<tr>
<td>OrientVGeoAx1</td>
<td>Cutting orientation vector of geometry axis 1, cutting orientation parameter 3, e.g. vector X</td>
</tr>
<tr>
<td>OrientVGeoAx3</td>
<td>Cutting orientation vector of geometry axis 3, cutting orientation parameter 4, e.g. vector Z</td>
</tr>
<tr>
<td>OrientVGeoAx2</td>
<td>Cutting orientation vector of geometry axis 2, cutting orientation parameter 5, e.g. vector Y</td>
</tr>
<tr>
<td>TeethCount</td>
<td>Number of teeth, cutting parameter 34</td>
</tr>
<tr>
<td>EdgeUser_1,</td>
<td>OEM cutting parameter 1, to</td>
</tr>
<tr>
<td>EdgeUser_10,</td>
<td>OEM cutting parameter 10</td>
</tr>
<tr>
<td>EdgeAppl_1,</td>
<td>Siemens application cutting parameter 1, to</td>
</tr>
<tr>
<td>EdgeAppl_10x</td>
<td>Siemens application cutting parameter 10</td>
</tr>
</tbody>
</table>
13.4 Configure the tool lists

13.4.3 Monitoring parameter identifiers

For the monitoring parameters, the following identifiers are used in the configuration file:

<table>
<thead>
<tr>
<th>Identifier</th>
<th>Parameter or property</th>
</tr>
</thead>
<tbody>
<tr>
<td>SupWarning</td>
<td>Warning limits, taking the current monitoring type into consideration</td>
</tr>
<tr>
<td>SupRemaining</td>
<td>Actual value, taking the current monitoring type into consideration</td>
</tr>
<tr>
<td>SupDesired</td>
<td>Setpoint, taking the current monitoring type into consideration</td>
</tr>
<tr>
<td>SupWarningTime</td>
<td>Tool life warning limit</td>
</tr>
<tr>
<td>SupRemainingTime</td>
<td>Tool life actual value</td>
</tr>
<tr>
<td>SupWarningPieces</td>
<td>Warning limit for count</td>
</tr>
<tr>
<td>SupRemainingPieces</td>
<td>Actual value for workpiece count</td>
</tr>
<tr>
<td>SupDesiredTime</td>
<td>Setpoint for tool life</td>
</tr>
<tr>
<td>SupDesiredPieces</td>
<td>Setpoint for workpiece count</td>
</tr>
<tr>
<td>SupWarningWear</td>
<td>Prewarning limit for wear</td>
</tr>
<tr>
<td>SupRemainingWear</td>
<td>Actual value for wear</td>
</tr>
<tr>
<td>SupDesiredWear</td>
<td>Setpoint for wear</td>
</tr>
<tr>
<td>SupExtendedAlarm</td>
<td>PLC tool management - extended alarm</td>
</tr>
<tr>
<td>SupWarningPiecesIncremental</td>
<td>PLC tool management - prewarning limit workpiece count</td>
</tr>
<tr>
<td>SupActualPieces</td>
<td>PLC tool management - actual value workpiece count</td>
</tr>
<tr>
<td>EdgeSupUser_1</td>
<td>OEM cutting monitoring parameter 1, to</td>
</tr>
<tr>
<td>EdgeSupUser_10</td>
<td>OEM cutting monitoring parameter 10</td>
</tr>
<tr>
<td>EdgeSupAppl_1</td>
<td>Siemens application cutting monitoring parameter 1, to</td>
</tr>
<tr>
<td>EdgeSupAppl_10</td>
<td>Siemens application cutting monitoring parameter 10</td>
</tr>
</tbody>
</table>

13.4.4 Grinding parameter identifiers

For grinding parameters, the following identifiers are used in the configuration file:

<table>
<thead>
<tr>
<th>Identifier/parameter</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>GrindingSpindleNo</td>
<td>Spindle number</td>
</tr>
<tr>
<td>GrindingConnectionRule</td>
<td>Chaining rule</td>
</tr>
<tr>
<td>MinimalDiscRadius</td>
<td>Minimum grinding wheel radius</td>
</tr>
<tr>
<td>ActualDiscRadius</td>
<td>Actual grinding wheel radius (read access only)</td>
</tr>
<tr>
<td>MinimalDiscWidth</td>
<td>Minimum grinding wheel width</td>
</tr>
<tr>
<td>ActualDiscWidth</td>
<td>Actual grinding wheel width</td>
</tr>
<tr>
<td>MaximalDiscSpeed</td>
<td>Maximum grinding wheel speed</td>
</tr>
<tr>
<td>MaximalDiscPeripheralVelocity</td>
<td>Maximum grinding wheel peripheral velocity</td>
</tr>
<tr>
<td>AngleBevelDisc</td>
<td>Angle of inclined wheel</td>
</tr>
<tr>
<td>ParamForRadiusCalculation</td>
<td>Parameters to calculate the radius</td>
</tr>
</tbody>
</table>
The following parameters are assigned to the cutting edges of the grinding tool:

<table>
<thead>
<tr>
<th>Identifier/parameter</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>GrindingMonitoring</td>
<td>Grinding-specific tool monitoring</td>
</tr>
<tr>
<td>GrindingUseBaseLength</td>
<td>Taking into account the basis dimension when calculating the grinding wheel radius</td>
</tr>
</tbody>
</table>

**13.4.5 Magazine location parameter identifiers**

For the magazine location parameters, the following identifiers are used in the configuration file:

<table>
<thead>
<tr>
<th>Identifier</th>
<th>Parameter or property</th>
</tr>
</thead>
<tbody>
<tr>
<td>MagPlaceKind</td>
<td>Location kind</td>
</tr>
<tr>
<td>MagPlaceType</td>
<td>Location type</td>
</tr>
<tr>
<td>MagPlaceTypeIdent</td>
<td>Location type as text</td>
</tr>
<tr>
<td>MagPlaceTNo</td>
<td>Tool number of the tool in this location</td>
</tr>
<tr>
<td>MagPlaceWatchNeighbour</td>
<td>Consider adjacent location</td>
</tr>
<tr>
<td>MagPlaceStateLocked</td>
<td>Magazine location locked</td>
</tr>
<tr>
<td>MagPlaceStateEmpty</td>
<td>Magazine location free</td>
</tr>
<tr>
<td>MagPlaceStateResInterMag</td>
<td>Reserved for tool in buffer</td>
</tr>
<tr>
<td>MagPlaceStateResLoadTool</td>
<td>Reserved for tool to be loaded</td>
</tr>
<tr>
<td>MagPlaceStateOccupiedLeft</td>
<td>Magazine location occupied, left half location</td>
</tr>
<tr>
<td>MagPlaceStateOccupiedRight</td>
<td>Magazine location occupied, right half location</td>
</tr>
<tr>
<td>MagPlaceStateOccupiedUpper</td>
<td>Magazine location occupied, upper half location</td>
</tr>
<tr>
<td>MagPlaceStateOccupiedDown</td>
<td>Magazine location occupied, lower half location</td>
</tr>
<tr>
<td>MagPlaceStateReservedLeft</td>
<td>Magazine location reserved, left half location</td>
</tr>
<tr>
<td>MagPlaceStateReservedRight</td>
<td>Magazine location reserved, right half location</td>
</tr>
<tr>
<td>MagPlaceStateReservedUpper</td>
<td>Magazine location reserved, upper half location</td>
</tr>
<tr>
<td>MagPlaceStateReservedDown</td>
<td>Magazine location reserved, lower half location</td>
</tr>
<tr>
<td>MagPlaceMagazineNo</td>
<td>Magazine number</td>
</tr>
<tr>
<td>MagPlaceTypeIdx</td>
<td>Type index</td>
</tr>
<tr>
<td>MagPlaceWearGroup</td>
<td>Wear group number</td>
</tr>
<tr>
<td>MagPlaceAdaptNo</td>
<td>Adapter number</td>
</tr>
<tr>
<td>MagPlaceNo</td>
<td>Magazine location number</td>
</tr>
<tr>
<td>MagNoMagPlaceNo</td>
<td>Magazine number/Magazine location number</td>
</tr>
<tr>
<td>MagPlaceUser_1,</td>
<td>OEM magazine location parameter 1, to</td>
</tr>
<tr>
<td>MagPlaceUser_10</td>
<td>OEM magazine location parameter 10</td>
</tr>
<tr>
<td>MagPlaceAppl_1,</td>
<td>Siemens magazine location parameter 1, to</td>
</tr>
<tr>
<td>MagPlaceAppl_10</td>
<td>Siemens magazine location parameter 10</td>
</tr>
</tbody>
</table>
### Multitool parameter identifiers

For the multitool parameters, the following identifiers are used in the configuration file:

<table>
<thead>
<tr>
<th>Identifier</th>
<th>Parameter or property</th>
</tr>
</thead>
<tbody>
<tr>
<td>MultiToolNo</td>
<td>Number of the multitool</td>
</tr>
<tr>
<td>MultiToolNumberOfPlaces</td>
<td>Number of multitool locations</td>
</tr>
<tr>
<td>MultiToolNumberOfPlacesRO</td>
<td>Number of multitool locations, only read access</td>
</tr>
<tr>
<td>MultiToolIdent</td>
<td>Name of the multitool</td>
</tr>
<tr>
<td>MultiToolInMag</td>
<td>Magazine in which the multitool is located</td>
</tr>
<tr>
<td>MultiToolInPlace</td>
<td>Magazine location containing the multitool</td>
</tr>
<tr>
<td>MultiToolMyMag</td>
<td>Owner magazine of the multitool</td>
</tr>
<tr>
<td>MultiToolMyPlace</td>
<td>Owner magazine location of the multitool</td>
</tr>
<tr>
<td>MultiToolPlaceSpec</td>
<td>Location type</td>
</tr>
<tr>
<td>MultiToolPlaceSpecIdent</td>
<td>Location type as text</td>
</tr>
<tr>
<td>MultiToolSizeLeft</td>
<td>Multitool size to the left in half locations</td>
</tr>
<tr>
<td>MultiToolSizeRight</td>
<td>Multitool size to the right in half locations</td>
</tr>
<tr>
<td>MultiToolSizeUpper</td>
<td>Multitool size to the top in half locations</td>
</tr>
<tr>
<td>MultiToolSizeDown</td>
<td>Multitool size to the bottom in half locations</td>
</tr>
<tr>
<td>MultiToolOverSize</td>
<td>Multitool size as fixed setting - two half locations left, two half locations right, one half location top, one half location bottom</td>
</tr>
<tr>
<td>MultiToolPosition</td>
<td>Multitool position</td>
</tr>
<tr>
<td>MultiToolProtAreaFile</td>
<td>File name of the multitool description, which is required to determine the protection zone</td>
</tr>
<tr>
<td>MultiToolKindOfDist</td>
<td>Type of distance input of the multitool locations</td>
</tr>
<tr>
<td>MultiToolKindOfDistRO</td>
<td>Type of distance input of the multitool locations, only read access</td>
</tr>
<tr>
<td>MultiToolState</td>
<td>Multitool status in the hexadecimal notation</td>
</tr>
<tr>
<td>MultiToolStateEnabled</td>
<td>Multitool status - multitool released</td>
</tr>
<tr>
<td>MultiToolStateLocked</td>
<td>Multitool status - multitool locked</td>
</tr>
<tr>
<td>MultiToolStateLockedRO</td>
<td>Multitool status - multitool locked, only read access</td>
</tr>
<tr>
<td>MultiToolStateInChange</td>
<td>Multitool status - multitool is being changed</td>
</tr>
<tr>
<td>MultiToolStateFixed</td>
<td>Multitool status - multitool fixed location coded</td>
</tr>
<tr>
<td>MultiToolStateUsed</td>
<td>Multitool status - multitool was in use</td>
</tr>
<tr>
<td>MultiToolStateAutoReturn</td>
<td>Multitool status - automatic return</td>
</tr>
<tr>
<td>MultiToolStateIgnoreLocked</td>
<td>Multitool status - do not observe locked status</td>
</tr>
<tr>
<td>MultiToolStateMarkedToUnload</td>
<td>Multitool status - multitool is selected to be unloaded</td>
</tr>
<tr>
<td>MultiToolStateMarkedToLoad</td>
<td>Multitool status - multitool is selected to be loaded</td>
</tr>
<tr>
<td>MultiToolStatePermanent</td>
<td>Multitool status - multitool is a master tool</td>
</tr>
<tr>
<td>MultiToolState1To1Exchange</td>
<td>Multitool status - one to one replacement</td>
</tr>
<tr>
<td>MultiToolStateHandTool</td>
<td>Multitool status - manual tool</td>
</tr>
<tr>
<td>MultiToolStateLockMttIoTLock</td>
<td>Multitool status - multitool is locked if a tool is locked in multitool</td>
</tr>
</tbody>
</table>
### 13.4.7 Multitool location parameter identifiers

For the multitool location parameters, the following identifiers are used in the configuration file:

<table>
<thead>
<tr>
<th>Identifier</th>
<th>Parameter or property</th>
</tr>
</thead>
<tbody>
<tr>
<td>MultiToolDist</td>
<td>Multitool location distance taking into account the actual type of distance input of the multitool</td>
</tr>
<tr>
<td>MultiToolDistLength</td>
<td>Multitool location distance, length</td>
</tr>
<tr>
<td>MultiToolDistAngle</td>
<td>Multitool location distance angle, angle</td>
</tr>
<tr>
<td>MultiToolType</td>
<td>Location type</td>
</tr>
<tr>
<td>MultiToolTypeIdent</td>
<td>Location type as text</td>
</tr>
<tr>
<td>MultiToolStateLocked</td>
<td>Multitool location locked</td>
</tr>
<tr>
<td>MultiToolStateEmpty</td>
<td>Multitool location empty</td>
</tr>
<tr>
<td>MultiToolTNo</td>
<td>Tool number of the tool in this multitool location</td>
</tr>
<tr>
<td>MultiToolAdaptNo</td>
<td>Adapter number</td>
</tr>
<tr>
<td>MultiToolPlaceNo</td>
<td>Multitool location number</td>
</tr>
</tbody>
</table>
13.5 Configure the list parameters

<PARAMETERCONFIGURATION> tag

You can find the names for the technology-dependent configuration file in Chapter Configuring the user interface of the tool management (Page 127)

In the <PARAMETERCONFIGURATION> tag, you have the following options:
1. Changing list parameters.
2. Creating new list parameters based on an existing parameter.

Change list parameters

You can change all the parameters included in the system apart from the ISO parameters.

Tool parameter identifiers (Page 134)
Cutting parameter identifiers (Page 136)
Monitoring parameter identifiers (Page 138)
Grinding parameter identifiers (Page 138)
Magazine location parameter identifiers (Page 139)
Multitool parameter identifiers (Page 140)
Multitool location parameter identifiers (Page 141)

<table>
<thead>
<tr>
<th>Entries</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>HeadLine</td>
<td>Column header. Text entered is displayed as a header. Example: Text &quot;Radius&quot; is displayed as a header (default).</td>
</tr>
<tr>
<td>Tooltip</td>
<td>Text that is displayed in the tooltip. Example: Text &quot;Geometry radius&quot; is displayed in the tooltip (default).</td>
</tr>
<tr>
<td>ShortText</td>
<td>Text if the parameter is displayed in the &quot;More Data&quot; window. Example: Text &quot;Rad.&quot; is displayed in the &quot;More Data&quot; window (default).</td>
</tr>
<tr>
<td>DetailsText</td>
<td>Text, if the parameter is displayed in the &quot;Details&quot; window. Example: Text &quot;Radius&quot; is displayed in the &quot;Details&quot; window (default).</td>
</tr>
<tr>
<td>Width</td>
<td>Column width in pixels, in relation to a 640 x 480 resolution. See example below: The default column width is changed to 53 pixels.</td>
</tr>
<tr>
<td>DisplayMode</td>
<td>Values that the parameter is displayed with. See example below: The default setting is changed to &quot;DoubleMode&quot;. The following values can also be accepted:</td>
</tr>
<tr>
<td></td>
<td>AnyMode</td>
</tr>
<tr>
<td></td>
<td>IntegerMode</td>
</tr>
<tr>
<td></td>
<td>UnsignedIntegerMode</td>
</tr>
<tr>
<td></td>
<td>DoubleMode</td>
</tr>
</tbody>
</table>
### Entries

<table>
<thead>
<tr>
<th>Entry</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>UnsignedDoubleMode</td>
<td>Unsigned values with decimal places</td>
</tr>
<tr>
<td></td>
<td>The number of decimal places is specified in &quot;DecimalPlaces&quot;</td>
</tr>
<tr>
<td>Length</td>
<td>Specified length</td>
</tr>
<tr>
<td>Angle</td>
<td>Specified angle</td>
</tr>
<tr>
<td>LinearFeedPerTime</td>
<td>Linear feed in mm/minute</td>
</tr>
<tr>
<td>LinearFeedPerRevolution</td>
<td>Linear feed in mm/revolution</td>
</tr>
<tr>
<td>LinearFeedPerTooth</td>
<td>Linear feed in mm/tooth</td>
</tr>
<tr>
<td>RevolutionSpeed</td>
<td>Speed</td>
</tr>
<tr>
<td>ConstantCuttingSpeed</td>
<td>Constant cutting rate</td>
</tr>
<tr>
<td>DecimalPlaces</td>
<td>Number of decimal places if &quot;DoubleMode&quot; or &quot;UnsignedDoubleMode&quot; is</td>
</tr>
<tr>
<td></td>
<td>selected in the DisplayMode.</td>
</tr>
<tr>
<td></td>
<td>See example: 2 decimal places are entered.</td>
</tr>
<tr>
<td>ItemType</td>
<td>Field types in which a value is displayed.</td>
</tr>
<tr>
<td></td>
<td>TextField Input/output field for values and texts</td>
</tr>
<tr>
<td></td>
<td>TextFieldReadOnly Output field for values and texts</td>
</tr>
<tr>
<td></td>
<td>CheckBox Input/output field for states</td>
</tr>
<tr>
<td></td>
<td>CheckBoxReadOnly Output field for states</td>
</tr>
<tr>
<td>BitMask</td>
<td>Bit mask for the display of a bit from a value. The bit mask is entered</td>
</tr>
<tr>
<td></td>
<td>as integer value. Bit 0 → 1, Bit 1 → 2, Bit 2 → 4</td>
</tr>
<tr>
<td>AccessLevel</td>
<td>Value for the protection level, which is used for these parameters in</td>
</tr>
<tr>
<td></td>
<td>the user interface. Value range 1 to 7</td>
</tr>
<tr>
<td>UpperLimit</td>
<td>Upper input limit for these parameters in the user interface. Only</td>
</tr>
<tr>
<td></td>
<td>applies for numerically entered parameters.</td>
</tr>
<tr>
<td>LowerLimit</td>
<td>Lower input limit for these parameters in the user interface. Only</td>
</tr>
<tr>
<td></td>
<td>applies for numerically entered parameters.</td>
</tr>
</tbody>
</table>

### Example

In the following example, the `<GeoRadius>` parameter is used.

Only enter the modified data.

```xml
<PARAMETERCONFIGURATION>
  <GeoRadius>
    <Width value="53" type="int" />  
    <DisplayMode value="DoubleMode" type="QString" />  
    <DecimalPlaces value="2" type="int" />  
  </GeoRadius>
</PARAMETERCONFIGURATION>
```
Configuring new list parameters based on an existing list parameter

Assign a new parameter name and enter only the changed data:

<table>
<thead>
<tr>
<th>Entries</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assign new parameter name</td>
<td>See 1st example: Text &quot;NewGeoRadius&quot;</td>
</tr>
<tr>
<td>Base</td>
<td>Name of the parameter on which the new parameter is based.</td>
</tr>
<tr>
<td></td>
<td>See 1st example: &quot;GeoRadius&quot; parameter is used as a template.</td>
</tr>
<tr>
<td></td>
<td>Also enter only the changed data here. All other data is taken from the existing parameter.</td>
</tr>
<tr>
<td></td>
<td>See 1st example: Column width changed to 46 pixels. Number of decimal places changed to 1.</td>
</tr>
</tbody>
</table>

1st example

```
<PARAMETERCONFIGURATION>
  <NewGeoRadius>
    <Base value="GeoRadius" type="QString" />
    <Width value="46" type="int" />
    <DisplayMode value="DoubleMode" type="QString" />
    <DecimalPlaces value="1" type="int" />
  </NewGeoRadius>
</PARAMETERCONFIGURATION>
```

2nd example

<table>
<thead>
<tr>
<th>Entries</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assign new cutting edge parameter name</td>
<td>The name is &quot;EdgeUser_1_Bit0&quot; in the following example.</td>
</tr>
<tr>
<td>Base</td>
<td>Name of the parameter on which the new parameter is based.</td>
</tr>
<tr>
<td></td>
<td>In the following example, the &quot;EdgeUser_1&quot; parameter is used as template.</td>
</tr>
<tr>
<td></td>
<td>Also enter only the changed data here. All other data is taken from the existing cutting edge parameter.</td>
</tr>
<tr>
<td></td>
<td>The following entries are changed:</td>
</tr>
<tr>
<td></td>
<td>Field type: Input/output field for states</td>
</tr>
<tr>
<td></td>
<td>Value output: All characters</td>
</tr>
<tr>
<td></td>
<td>Bit mask: Bit 0</td>
</tr>
<tr>
<td></td>
<td>Column width changed to 17 pixels.</td>
</tr>
<tr>
<td></td>
<td>Header changed to &quot;TM_HL_EDGE_USER_1_Bit0&quot;</td>
</tr>
<tr>
<td></td>
<td>Text in the tooltip changed to &quot;TM_TT_EDGE_USER_1_Bit0&quot;</td>
</tr>
</tbody>
</table>
<PARAMETERCONFIGURATION>
   <EdgeUser_1_Bit0>
      <Base value="$EdgeUser_1" type="QString" />
      <ItemType value="CheckBox" type="QString" />
      <DisplayMode value="AnyMode" type="QString" />
      <BitMask value="1" type="int" />
      <Width value="17" type="int" />
      <HeadLine value="$TM_HL_EDGE_USER_1_Bit0" type="QString" />
      <ToolTip value="$TM_TT_EDGE_USER_1_Bit0" type="QString" />
   </EdgeUser_1_Bit0>
</PARAMETERCONFIGURATION>
### 13.6 List of tool types

#### Coding of tool types for milling tools

Group with type 1xy (milling tool):

<table>
<thead>
<tr>
<th>Code</th>
<th>Tool Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>Milling tool according to CLDATA (DIN 66215)</td>
</tr>
<tr>
<td>110</td>
<td>Ballhead cutter (cylindrical die milling tool)</td>
</tr>
<tr>
<td>111</td>
<td>Ballhead cutter (tapered die milling tool)</td>
</tr>
<tr>
<td>120</td>
<td>End mill (without corner rounding)</td>
</tr>
<tr>
<td>121</td>
<td>End mill (with corner rounding)</td>
</tr>
<tr>
<td>130</td>
<td>Angle head cutter (without corner rounding)</td>
</tr>
<tr>
<td>131</td>
<td>Angle head cutter (with corner rounding)</td>
</tr>
<tr>
<td>140</td>
<td>Facing cutter</td>
</tr>
<tr>
<td>145</td>
<td>Thread cutter</td>
</tr>
<tr>
<td>150</td>
<td>Side mill</td>
</tr>
<tr>
<td>151</td>
<td>Saw</td>
</tr>
<tr>
<td>155</td>
<td>Bevel cutter (without corner rounding)</td>
</tr>
<tr>
<td>156</td>
<td>Bevel cutter (with corner rounding)</td>
</tr>
<tr>
<td>157</td>
<td>Tapered die-sinking cutter</td>
</tr>
<tr>
<td>160</td>
<td>Drill and thread milling cutter</td>
</tr>
</tbody>
</table>

#### Coding of tool types for drills

Group type 2xy (drills):

<table>
<thead>
<tr>
<th>Code</th>
<th>Tool Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td>Twist drill</td>
</tr>
<tr>
<td>205</td>
<td>Solid drill</td>
</tr>
<tr>
<td>210</td>
<td>Boring bar</td>
</tr>
<tr>
<td>220</td>
<td>Center drill</td>
</tr>
<tr>
<td>230</td>
<td>Countersink</td>
</tr>
<tr>
<td>231</td>
<td>Counterbore</td>
</tr>
<tr>
<td>240</td>
<td>Tap regular thread</td>
</tr>
<tr>
<td>241</td>
<td>Tap fine thread</td>
</tr>
<tr>
<td>242</td>
<td>Tap Whitworth thread</td>
</tr>
<tr>
<td>250</td>
<td>Reamer</td>
</tr>
</tbody>
</table>
Coding of tool types for grinding tools

Group type 4xy (grinding tools):

<table>
<thead>
<tr>
<th>.Tool Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>400</td>
<td>Grinding wheel circumference</td>
</tr>
<tr>
<td>410</td>
<td>Face grinding wheel</td>
</tr>
<tr>
<td>490</td>
<td>Dresser</td>
</tr>
</tbody>
</table>

Grinding tool types 401, 402, 403 as well as 411, 412, 413 are not listed as tool types that can be selected. The grinding-specific tool monitoring - taking into account the basis dimension when calculating the grinding wheel radius - is set using dedicated parameters. These parameters act on the tool types in the usual form.

Coding of tool types for turning tools

Group type 5xy (turning tools):

<table>
<thead>
<tr>
<th>Tool Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>500</td>
<td>Roughing tool</td>
</tr>
<tr>
<td>510</td>
<td>Finishing tool</td>
</tr>
<tr>
<td>520</td>
<td>Plunge cutter</td>
</tr>
<tr>
<td>530</td>
<td>Parting tool</td>
</tr>
<tr>
<td>540</td>
<td>Threading tool</td>
</tr>
<tr>
<td>550</td>
<td>Steel profile</td>
</tr>
<tr>
<td>560</td>
<td>Rotary drill (ECOCUT)</td>
</tr>
<tr>
<td>580</td>
<td>Orientated probe</td>
</tr>
</tbody>
</table>

Coding of tool types for special tools

Group type 7xy (special tools):

<table>
<thead>
<tr>
<th>Tool Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>700</td>
<td>Slotting saw</td>
</tr>
<tr>
<td>710</td>
<td>3D probe</td>
</tr>
<tr>
<td>711</td>
<td>Edge probe</td>
</tr>
<tr>
<td>730</td>
<td>Stop</td>
</tr>
<tr>
<td>900</td>
<td>Auxiliary tools</td>
</tr>
</tbody>
</table>
13.7 Configuring the "More data" window

<MOREDATACONFIGURATION> tag

You can find the names for the technology-dependent configuration file in Chapter Configuring the user interface of the tool management (Page 127).

The entries used for configuring the "Additional data" window are located in the <MOREDATACONFIGURATION> tag. Various data items can be displayed for each tool type in a number of rows and columns. Each data item to be displayed is specified by entering a list parameter:

- Tool parameter identifiers (Page 134)
- Cutting parameter identifiers (Page 136)
- Monitoring parameter identifiers (Page 138)

A short description of the parameter then appears (ShortText), with the value itself beside it. Configure the list parameters (Page 142).

If another description text is required in the "More Data" window, a text can also be entered in a row or column. In the window, the width of the text is made to conform to that of the short description and value of a parameter.

Any number of rows and columns can be created. A scrollbar appears when the window reaches a certain size.

<table>
<thead>
<tr>
<th>Entries</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOOLTYPE_XXX</td>
<td>Number of the tool type. See example: Tool type 111 = Ball end mill (tapered die-sinking cutter).</td>
</tr>
<tr>
<td>ROWX_COLY</td>
<td>Particular rowX_columnY. If there is no entry after rowX and columnY, this field remains blank. See example: In the &quot;More Data&quot; window, the first row is blank.</td>
</tr>
<tr>
<td>Item</td>
<td>The following entries are possible:</td>
</tr>
<tr>
<td></td>
<td>- Parameter identifier</td>
</tr>
<tr>
<td></td>
<td>- Text</td>
</tr>
<tr>
<td></td>
<td>See example: The header &quot;Corner radius&quot; appears in the second row of the window.</td>
</tr>
<tr>
<td></td>
<td>The text &quot;Radius&quot; and an input field for the value appear in the third row of the window.</td>
</tr>
<tr>
<td></td>
<td>The fourth row is blank.</td>
</tr>
</tbody>
</table>
13.7 Configuring the “More data” window

Example

```xml
<MOREDATACONFIGURATION>
  <TOOLTYPE_111>
    <ROW1_COL1/>
    <ROW2_COL1>
      <Item value="TM_DGL_CORNER_RADIUS" type="QString"/>
    </ROW2_COL1>
    <ROW3_COL1>
      <Item value="GeoCornerRadius" type="QString"/>
    </ROW3_COL1>
    <ROW4_COL2/>
  </TOOLTYPE_111>
</MOREDATACONFIGURATION>
```
13.8 Configure the "New tool - favorites" window

**Tag <NEWTOOLFAVORITECONFIGURATION>**

You can find the names for the technology-dependent configuration file in Chapter Configuring the user interface of the tool management (Page 127). In the tag `<NEWTOOLFAVORITECONFIGURATION>`, you define the tool types that are most frequently used. The specified tool types are displayed in the "New Tool - Favorites" window.

<table>
<thead>
<tr>
<th>Entries</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>StaticTooltypes</td>
<td>Numbers of tool types Enter the individual numbers, separated by blanks. The following section describes the assignment of the tool type and number: List of tool types (Page 146)</td>
</tr>
</tbody>
</table>

**Example**

```xml
<NEWTOOLFAVORITECONFIGURATION>
  <StaticTooltypes value="120 140 200 220 710 711" type="QSting"/>
</NEWTOOLFAVORITECONFIGURATION>
```
13.9 Configuring the "Details" window

<DETAILSCONFIGURATION> tag

In the tag <DETAILSCONFIGURATION> you can make the settings at the "Detail" window:

<table>
<thead>
<tr>
<th>Entries</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>ShowToolNumber</td>
<td>The tool number is displayed in the upper right field of the &quot;Detail&quot; window.</td>
</tr>
<tr>
<td>UseAxisNameInLength</td>
<td>The tool lengths are displayed with axis identifiers, e.g. length X instead of length 1. If no data is specified, then the setting is taken from the tool lists.</td>
</tr>
<tr>
<td>ShowBaseLength</td>
<td>The basis length is displayed in the &quot;Detail&quot; window (AdaptLength1, AdaptLength2 and AdaptLength3). If no data is specified, then the setting is taken from the tool lists.</td>
</tr>
<tr>
<td>ShowYAxis</td>
<td>The Y axis is displayed in the &quot;Detail&quot; window. If no data is specified, then the setting is taken from the tool lists.</td>
</tr>
</tbody>
</table>

Example

<DETAILSCONFIGURATION>
  <ShowToolNumber value="true" type="bool" />
</DETAILSCONFIGURATION>
13.10 Configure tool types

<TOOLTYPECONFIGURATION> tag

You can find the names for the technology-dependent configuration file in Chapter Configuring the user interface of the tool management (Page 127).

The entries used for configuring the tool types are located in the <TOOLTYPECONFIGURATION> tag:

<table>
<thead>
<tr>
<th>Entries</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOOLTYPE_XXX</td>
<td>XXX stands for the number of the tool type. For the assignment of the tool type and number, please refer to Chapter &quot;List of tool types (Page 146)&quot;.</td>
</tr>
<tr>
<td>Tooltype</td>
<td>Number (XXX) of the tool type</td>
</tr>
<tr>
<td>Name</td>
<td>Text identifier of the tool name. The tool name is displayed in the following windows:</td>
</tr>
<tr>
<td></td>
<td>• &quot;New Tool - Favorites&quot;</td>
</tr>
<tr>
<td></td>
<td>• &quot;New Tool - Milling Cutter 100 - 199&quot;</td>
</tr>
<tr>
<td></td>
<td>• &quot;New Tool - Drill 200 - 299&quot;</td>
</tr>
<tr>
<td></td>
<td>• &quot;New Tool - special and auxiliary tools 700 - 900&quot;</td>
</tr>
<tr>
<td></td>
<td>See example: For the text identifier &quot;TM_PAR_SHANK_END_CUTTER&quot;, the name &quot;End mill&quot; appears on the user interface.</td>
</tr>
<tr>
<td>Shortname</td>
<td>Text identifier of the tool name. Tool name is displayed in the tool list.</td>
</tr>
<tr>
<td></td>
<td>See example: For the text identifier &quot;TM_PPTT_SHANK_END_CUTTER&quot;, the name &quot;MILLING CUTTER&quot; appears on the user interface.</td>
</tr>
<tr>
<td>Tooltip</td>
<td>Text identifier of the tool name. This tool name is displayed in the tooltip.</td>
</tr>
<tr>
<td></td>
<td>See example: For the text identifier &quot;TM_TTTT_SHANK_END_CUTTER&quot;, the name &quot;End mill&quot; appears on the user interface.</td>
</tr>
<tr>
<td>Icon9 - for milling technology</td>
<td>Icon representing the tool type. The icons are displayed in the following windows:</td>
</tr>
<tr>
<td></td>
<td>• &quot;Tool List&quot; in the &quot;Type&quot; column</td>
</tr>
<tr>
<td></td>
<td>• &quot;New Tool - Favorites&quot; in the &quot;Tool position&quot; column</td>
</tr>
<tr>
<td></td>
<td>• &quot;New Tool - Milling Cutter 100 - 199&quot; in the &quot;Tool position&quot; column</td>
</tr>
<tr>
<td></td>
<td>• &quot;New Tool - Milling Cutter 200 - 299&quot; in the &quot;Tool position&quot; column</td>
</tr>
<tr>
<td></td>
<td>• &quot;New Tool - Special Tool 700 - 900&quot; in the &quot;Tool position&quot; column</td>
</tr>
<tr>
<td></td>
<td>The icons are in &quot;.png&quot; format. They are stored according to image resolution in the following directories:</td>
</tr>
<tr>
<td></td>
<td>/oem/sinumerik/hmi/ico/ico640, or ico800, or ico1024</td>
</tr>
<tr>
<td></td>
<td>/user/sinumerik/hmi/ico/ico640, or ico800, or ico1024</td>
</tr>
</tbody>
</table>
### Entries Meaning

<table>
<thead>
<tr>
<th>Entries</th>
<th>Meaning</th>
</tr>
</thead>
</table>
| IconX - for turning technology | Icon representing the tool type (see Icon9 - for milling technology)  
Special feature - tool positions are supported in turning technology.  
X is for the tool position represented by the icon. Position 9 is an undefined position represented by a cross. |
| Iconorder                    | Order in which the tool positions, represented by icons, are switched.                                                                 |

#### Example

```xml
<TOOLTYPECONFIGURATION>
  <TOOLTYPE_120>
    <Tooltype value="120" type="uint" />
    <Name value="TM_PAR_SHANK_END_CUTTER" type="QString" />
    <Shortname value="TM_PPTT_SHANK_END_CUTTER" type="QString" />
    <Tooltip value="TM_TTTT_SHANK_END_CUTTER" type="QString" />
    <Icon9 value="to_poly_shank_end_cutter_down.png" type="QString" />
  </TOOLTYPE_120>
</TOOLTYPECONFIGURATION>
```
13.11 Assigning a name for magazines and magazine locations

<MAGAZINEPLACENAMECONFIGURATION> tag

You can find the names for the technology-dependent configuration file in Chapter Configuring the user interface of the tool management. The entries to assign dedicated magazine location names are located in the <MAGAZINEPLACENAMECONFIGURATION> tag. Magazine locations can be displayed with texts. Instead of the identifier, e.g. 1/5 for the first magazine, location five, the configured text is then output in the tool lists.

<table>
<thead>
<tr>
<th>Entries</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAGAZINE_XXX</td>
<td>XXX stands for the magazine number.</td>
</tr>
<tr>
<td>PLACE_XXX</td>
<td>XXX stands for the location number.</td>
</tr>
<tr>
<td>Name</td>
<td>Text identifier of the magazine location.</td>
</tr>
</tbody>
</table>

**Example**

```
<MAGAZINEPLACENAMECONFIGURATION>
  <MAGAZINE_9998>
    <PLACE_2>
      <Name value="TM_SPECIAL_MAG_PLACE_1" type="QSting" />
    </PLACE_2>
  </MAGAZINE_9998>
  <MAGAZINE_1>
    <PLACE_3>
      <Name value="TM_SPECIAL_MAG_PLACE_2" type="QSting" />
    </PLACE_3>
  </MAGAZINE_1>
</MAGAZINEPLACENAMECONFIGURATION>
```

**Name for a magazine**

Dedicated texts can also be allocated for magazines. The text or the text identifier is entered into the magazine configuration file (ini file) of the NC. The system variable for the magazine name is $TC_MAP2[magNo]. The magazine name is displayed at the top right in the tool lists.

**Example**

Magazine 1 should have the name "main magazine".

$TC_MAP2[1]="main magazine"

If the "main magazine" text is to be output language-dependent, then the language-dependent texts for the text identifier "main magazine" must be created.
See also

Please refer to the following chapter for the procedure to create language-dependent text:
Creating OEM texts (Page 169)
13.12 Assigning a name for magazine location types

<PLACETYPECONFIGURATION> tag

You can find the names for the technology-dependent configuration file in Chapter Configuring the user interface of the tool management (Page 127).

You can find entries to allocate your own location type identifiers in the tag <PLACETYPECONFIGURATION>. Magazines and magazine location types can be displayed with texts in the tool lists. Instead of identifier 2, e.g. for location type 2, the configured text is then output in the tool lists.

<table>
<thead>
<tr>
<th>Entries</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLACETYPEXXX</td>
<td>XXX stands for the number of the location type</td>
</tr>
<tr>
<td>Text</td>
<td>Text identifier of the location type</td>
</tr>
<tr>
<td>Tooltip</td>
<td>Tooltip text identifier of the location type</td>
</tr>
</tbody>
</table>

Example

```xml
<PLACETYPECONFIGURATION>
  <PLACETYPE1>
    <Text value="TM_PLACETYPE_1" type="QString" />  
    <Tooltip value="TM_TT_PLACETYPE_1" type="QString" /> 
  </PLACETYPE1>
  <PLACETYPE2>
    <Text value="TM_PLACETYPE_2" type="QString" />  
    <Tooltip value="TM_TT_PLACETYPE_2" type="QString" /> 
  </PLACETYPE2>
  <PLACETYPE3>
    <Text value="TM_PLACETYPE_3" type="QString" />  
    <Tooltip value="TM_TT_PLACETYPE_3" type="QString" /> 
  </PLACETYPE3>
</PLACETYPECONFIGURATION>
```

See also

Please refer to the following chapter for the procedure to create language-dependent text: Creating OEM texts (Page 169)
13.13 Assignment of magazines to channels

Precondition

Turning technology has been set: Name of the associated configuration file sltmturninglistconfig.xml (Configuring the user interface of the tool management (Page 127))

Assignment between magazine and channel

With this setting, magazines can be assigned to channels. This makes sense if the machine is configured so that several channels are assigned to one tool area (TOA area). If each magazine is then only used in one channel, here it is possible to specify this assignment between the magazine and channel.

As a consequence of this configuration, the tool symbols are output with reference to their position depending on the channel. Every channel can be assigned a position using the channel machine data MD52000 MCS_DISPCOORDINATE_SYSTEM. If a tool is at a magazine location, which is assigned a channel via this configuration, then the tool symbol is output depending on this position that has been set.

This setting option is only available for turning. This can be especially helpful if, on a multi-channel machine, a magazine is used before the turning center and another magazine after the turning center. This means that the tools can be entered into the tool list in a position visible for the operator.

Tag <CHANNELMAGAZINEASSIGNMENT>

Entries to assign magazines to channels are in the <CHANNELMAGAZINEASSIGNMENT> tag.

<table>
<thead>
<tr>
<th>Entries</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHANNELNO_XXX</td>
<td>XXX stands for the channel number.</td>
</tr>
<tr>
<td>MAGAZINES</td>
<td>Number of the magazines that are assigned to the channel.</td>
</tr>
</tbody>
</table>
Example

The following assignment between magazine and channel should apply:

<table>
<thead>
<tr>
<th>Magazine</th>
<th>Channel</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-3</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>4</td>
</tr>
</tbody>
</table>

```
<CHANNELMAGAZINEASSIGNMENT>
  <CHANNELNO_1>
    <Magazines value="1 2 3" type="QString"/>
  </CHANNELNO_1>
  <CHANNELNO_2>
    <Magazines value="4" type="QString"/>
  </CHANNELNO_2>
  <CHANNELNO_3>
    <Magazines value="5" type="QString"/>
  </CHANNELNO_3>
  <CHANNELNO_4>
    <Magazines value="6" type="QString"/>
  </CHANNELNO_4>
</CHANNELMAGAZINEASSIGNMENT>
```
13.14 Coolant and tool-specific functions

Assigning coolant (ShopMill / ShopTurn)

In the tool management of ShopMill / ShopTurn, you can assign coolant and tool-specific functions to each tool. These are activated when the tool is changed. You assign the coolant to the corresponding machine functions (M functions) using the following machine data:

<table>
<thead>
<tr>
<th>Machine Data</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MD52230</td>
<td>$MCS_M_CODE_ALL_COOLANTS_OFF</td>
</tr>
<tr>
<td>MD52231</td>
<td>$MCS_M_CODE_COOLANT_1_ON</td>
</tr>
<tr>
<td>MD52232</td>
<td>$MCS_M_CODE_COOLANT_2_ON</td>
</tr>
<tr>
<td>MD52233</td>
<td>$MCS_M_CODE_COOLANT_1_AND_2_ON</td>
</tr>
</tbody>
</table>

Tool-specific functions (ShopMill)

Tool-specific functions 1 ... 4 are intended for other M functions that can be activated for a tool, for example, third coolant, speed monitoring, tool breakage etc.

Up to 8 M functions can be programmed for the activation or deactivation of the tool-specific functions. Definition is realized using the following machine data:

<table>
<thead>
<tr>
<th>Machine Data</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MD52281</td>
<td>$MCS_TOOL_MCODE_FUNC_ON[0...3]</td>
</tr>
<tr>
<td>MD52282</td>
<td>$MCS_TOOL_MCODE_FUNC_OFF[0...3]</td>
</tr>
</tbody>
</table>

The M functions for the tool-specific functions are generated by the ShopMill cycles in a set (up to 4 M commands are possible).

The number and also the sequence of the M commands are dependent on the settings of the machine data (MD52281 to MD52282) and the programming.

With machine data setting "-1", no M command is issued for the corresponding tool-specific function. The same applies if no entry (neither "on" nor "off") is made during programming in the menu "Program", "Line/circle", "Machine functions".

If M functions less than 100 are used, the number and sequence of the M commands has no significance. They are located in the user PLC in the decoded area (DB21.DBB194 to DB21.DBB206), independent of the number and the sequence when programming.
However, if M functions from 100 and higher are used, then you must decode these yourself in the user PLC. In this case, you must take into consideration the number and sequence (M function 1 to M function 4).

The machine data are pre-selected so that no M values are output for the corresponding functions. For example, only the "On" states can be output via separate M commands and the "Off" state via a common M command.

Example: Machine data settings

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>MD52281 $MCS_TOOL_MCODE_FUNC_ON[0]</td>
<td>= 90</td>
</tr>
<tr>
<td>MD52281 $MCS_TOOL_MCODE_FUNC_ON[1]</td>
<td>= 92</td>
</tr>
<tr>
<td>MD52281 $MCS_TOOL_MCODE_FUNC_ON[2]</td>
<td>= 94</td>
</tr>
<tr>
<td>MD52281 $MCS_TOOL_MCODE_FUNC_ON[3]</td>
<td>= 96</td>
</tr>
</tbody>
</table>

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>MD52282 $MCS_TOOL_MCODE_FUNC_OFF[0]</td>
<td>= 91</td>
</tr>
<tr>
<td>MD52282 $MCS_TOOL_MCODE_FUNC_OFF[1]</td>
<td>= -1</td>
</tr>
<tr>
<td>MD52282 $MCS_TOOL_MCODE_FUNC_OFF[2]</td>
<td>= 95</td>
</tr>
<tr>
<td>MD52282 $MCS_TOOL_MCODE_FUNC_OFF[3]</td>
<td>= 97</td>
</tr>
</tbody>
</table>

The following functions are programmed in the menu "Program", "Line/circle", "Machine functions":

- Tool-specific function 1: On
- Tool-specific function 2: Not programmed, "Off" state is not listed in the selection box.
- Tool-specific function 3: Not programmed
- Tool-specific function 4: Off

The ShopMill interface generates M functions M90 and M97.

Hiding fields in the tool list

If you wish to hide the fields to display the tool-specific functions in the tool list, then set the associated machine data to -1 for the M commands of these tool-specific functions.

In the JOG mode, no coolant and tool-specific functions are output to the interface. For a tool change in the JOG mode, these functions can be initiated by the operator using the keys on the machine control panel (implementation via the PLC user program).

You can change the cursor texts for "Coolant 1/2 on/off" and "Tool-spec. fct. 1, ...".
Creating user-specific texts for the "Machine functions" window

If you require an additional possibility of switching-in or switching-out coolant and tool-specific functions, then you can program this in the "Program" operating area using the input window "Machine functions". You can create the texts and the tooltips for the tool-specific functions, which are used in this window.

Define the texts for the M functions in the file "slstepforms_xxx.ts".

If you require the texts in additional languages, then you must create a separate file for each language. The names of the files only differ by the language code "xxx" (Supported languages (Page 502)). Use only the specified language codes.

File "slstepforms_xxx.ts"

<table>
<thead>
<tr>
<th>Tag</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>source</td>
<td>Text identifier for label: SIStepLabels</td>
</tr>
<tr>
<td></td>
<td>A maximum of up to 4 M functions can be defined:</td>
</tr>
<tr>
<td></td>
<td>T_LAB_USER_MACHINE_FUNC_1</td>
</tr>
<tr>
<td></td>
<td>T_LAB_USER_MACHINE_FUNC_2</td>
</tr>
<tr>
<td></td>
<td>T_LAB_USER_MACHINE_FUNC_3</td>
</tr>
<tr>
<td></td>
<td>T_LAB_USER_MACHINE_FUNC_4</td>
</tr>
<tr>
<td>source</td>
<td>Text identifier for tooltip: SIStepToolTip</td>
</tr>
<tr>
<td></td>
<td>There are 3 tooltips for every machine function x (1 - 4):</td>
</tr>
<tr>
<td></td>
<td>T_TT_USER_MACHINE_FUNC_x: Standard tooltip, if the machine function was not selected.</td>
</tr>
<tr>
<td></td>
<td>T_TT_USER_MACHINE_FUNC_x_ON: Tooltip when the machine function is activated</td>
</tr>
<tr>
<td></td>
<td>T_TT_USER_MACHINE_FUNC_x_OFF: Tooltip for deactivated machine function</td>
</tr>
<tr>
<td>translation</td>
<td>Text, which is displayed at the user interface.</td>
</tr>
<tr>
<td></td>
<td>Label texts: You can only enter texts on one line. The &quot;lines&quot; entry is not applicable.</td>
</tr>
<tr>
<td></td>
<td>Tooltip: You can enter multi-line texts. A line break is set using the &quot;%n&quot; character.</td>
</tr>
<tr>
<td>chars</td>
<td>Text length</td>
</tr>
<tr>
<td>lines</td>
<td>Number of rows</td>
</tr>
<tr>
<td></td>
<td>The maximum number of lines is 3.</td>
</tr>
<tr>
<td>remark</td>
<td>Own comment - entry is not displayed at the user interface.</td>
</tr>
<tr>
<td></td>
<td>The maximum text length is 30 characters.</td>
</tr>
</tbody>
</table>
**Procedure**

1. You can copy the sample file "oem_slstepforms_deu.ts" from the following directory:
   `/siemens/sinumerik/hmi/template/lng.`
2. Save or create the file in the `/oem/sinumerik/hmi/lng` or `/user/sinumerik/hmi/lng` directory.
3. Change the file name to "slstepforms_deu.ts".
   If you require texts 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.
4. Open the file and define the texts in the `<message>` and `</message>` areas.
5. Restart the system.
   The file must still be converted into a binary format in order that the texts are displayed during the program runtime. This data is only converted during power up.

**Example of a file "slstepforms_deu.ts"**

```xml
<?xml version="1.0" encoding="utf-8"?>
<!DOCTYPE TS><TS>
<context>
  <name>SlStepLabels</name>
  <message>
    <source>T_LAB_USER_MACHINE_FUNC_1</source>
    <translation>tool-specific function 1</translation>
    <chars>20</chars>
  </message>
</context>
<context>
  <name>SlStepToolTip</name>
  <!-- tooltips of user machine function 1-->
  <message>
    <source>T_TT_USER_MACHINE_FUNC_1</source>
    <translation>User%nMachine functions 1</translation>
    <chars>25</chars>
    <lines>3</lines>
  </message>
</context>
</TS>
```
13.15 Reason for the tool change when reactivating

Precondition

**Software option**
You require the "MC Information System TDI Statistic" option for this function.

Function

When reactivating a tool, you have the option of specifying the reason for the tool change, e.g. to use this information for statistical purposes. The "Reason for tool change" selection window is opened after pressing the "Reactivate" softkey. In a checkbox, you can select the reason for the tool change.

Tool change reasons

You can adapt or expand the tool change reasons as required. The operating software provides the following pre-defined texts for the configuration:

<table>
<thead>
<tr>
<th>Text identifier</th>
<th>Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>TM_DGL_DESIRED_PIECES_ELAPSED</td>
<td>Unit quantity setpoint (desired pieces) elapsed</td>
</tr>
<tr>
<td>TM_DGL_TOOL_BREAKAGE</td>
<td>Tool breakage</td>
</tr>
<tr>
<td>TM_DGL_CUTTING_EDGE_DAMAGE</td>
<td>Cutting edge damage</td>
</tr>
<tr>
<td>TM_DGL_PREMATURE_WEAR</td>
<td>Premature wear</td>
</tr>
<tr>
<td>TM_DGL_TYPE_REEQUIPPING</td>
<td>Type reequipping</td>
</tr>
<tr>
<td>TM_DGL_TOOL_TRIAL</td>
<td>Tool trial</td>
</tr>
<tr>
<td>TM_DGL_PREVENTIVE_CHANGE</td>
<td>Preventive change</td>
</tr>
</tbody>
</table>

**<TOOLCHANGEREASON> tag**

You define the "Tool change reason" window in the configuration file, see Chapter Configuring the user interface of the tool management (Page 127). You configure the function in the **<TOOLCHANGEREASON>** tag:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable</td>
<td>true The &quot;Reason for tool change&quot; selection window is displayed when reactivating.</td>
</tr>
<tr>
<td></td>
<td>false Default value, selection window is not displayed.</td>
</tr>
<tr>
<td>REASONXXX</td>
<td>XXX stands for an internal number. The numbers for the tool change reason must be clear and unique.</td>
</tr>
<tr>
<td>Text</td>
<td>Text identifier of the tool change reason.</td>
</tr>
<tr>
<td>Parameter</td>
<td>Parameter identifier of the parameter in which it is entered whether the tool change reason was selected.</td>
</tr>
</tbody>
</table>
Example

The following example uses the texts for the tool change reason, already prepared in the operating software. In this example, the tool change reason is stored in parameters that still have to be configured, e.g. the OEM tool data 1, bit 1 and following.

```xml
<TOOLCHANGEREASON>
  <Enabled value="true" type="bool" />
  <REASON1>
    <Text value="TM_DGL_DESIRED_PIECES_ELAPSED" type="QString" />
    <Parameter value="ToolUser_1_Bit1" type="QString" />
  </REASON1>
  <REASON2>
    <Text value="TM_DGL_TOOL_BREAKAGE" type="QString" />
    <Parameter value="ToolUser_1_Bit2" type="QString" />
  </REASON2>
  <REASON3>
    <Text value="TM_DGL_CUTTING_EDGE_DAMAGE" type="QString" />
    <Parameter value="ToolUser_1_Bit3" type="QString" />
  </REASON3>
  <REASON4>
    <Text value="TM_DGL_PREMATURE_WEAR" type="QString" />
    <Parameter value="ToolUser_1_Bit4" type="QString" />
  </REASON4>
  <REASON5>
    <Text value="TM_DGL_TYPE_REEQUIPPING" type="QString" />
    <Parameter value="ToolUser_1_Bit5" type="QString" />
  </REASON5>
  <REASON6>
    <Text value="TM_DGL_TOOL_TRIAL" type="QString" />
    <Parameter value="ToolUser_1_Bit6" type="QString" />
  </REASON6>
  <REASON7>
    <Text value="TM_DGL_PREVENTIVE_CHANGE" type="QString" />
    <Parameter value="ToolUser_1_Bit7" type="QString" />
  </REASON7>
</TOOLCHANGEREASON>
```

See also

For configuring new parameters, see Configure the list parameters (Page 142).
### 13.16 General settings

**<SETTINGS> tag**

You can find the names for the technology-dependent configuration file in Chapter Configuring the user interface of the tool management (Page 127).

The general settings for the tool management user interface are stored in the `<SETTINGS>` tag.

<table>
<thead>
<tr>
<th>Entries</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>ReactivateWithMagPos</td>
<td>true - Reactivate with positioning of the tool to the tool magazine loading point.</td>
</tr>
<tr>
<td></td>
<td>false - Default setting, reactivate without positioning the tool magazine.</td>
</tr>
<tr>
<td>ReactivateAllMonitorModes</td>
<td>true - The actual values of all the monitoring types set in the NC are reset.</td>
</tr>
<tr>
<td></td>
<td>false - Default setting, actual value of the active monitoring type is reset.</td>
</tr>
<tr>
<td>ReactivateEnabled</td>
<td>true - Default setting, reactivation is enabled.</td>
</tr>
<tr>
<td></td>
<td>false - Reactivation is disabled.</td>
</tr>
<tr>
<td>CreateNewToolDialog</td>
<td>true - The &quot;New Tool&quot; window appears. In this window, before actually creating the tool, you can enter the tool name, tool location type and the size left and right in half locations.</td>
</tr>
<tr>
<td></td>
<td>false - Default setting, &quot;New Tool&quot; window is not displayed. Once the name has been entered, the tool will be created directly in the tool list.</td>
</tr>
<tr>
<td>CreateNewMultiToolDialog</td>
<td>true - Standard setting, &quot;New multitool&quot; window is displayed. In this window, you can configure the following before actually creating the multitool:</td>
</tr>
<tr>
<td></td>
<td>• Multitool names</td>
</tr>
<tr>
<td></td>
<td>• Number of multitool locations</td>
</tr>
<tr>
<td></td>
<td>• Type of clearance input</td>
</tr>
<tr>
<td></td>
<td>• Value of the location clearance for each multitool location</td>
</tr>
<tr>
<td></td>
<td>false - The &quot;New multitool&quot; window is not displayed. Once the name has been entered, the multitool will be created directly in the tool list.</td>
</tr>
</tbody>
</table>
### Tool management

#### 13.16 General settings

<table>
<thead>
<tr>
<th>Entries</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>MagazineSelectionDialog</td>
<td><strong>true</strong> - A dialog box displaying the buffer, tool magazine and NC memory is displayed. A mark can be added to or removed from each of these elements to indicate whether that element appears in the list display. The &quot;Go to&quot; softkey can be used to select an element directly in the list display. <strong>false</strong> - No dialog box for magazine selection. The system switches between the buffer, the tool magazines and the NC memory. If there is no MagazineSelectionDialog entry in the <code>&lt;Settings&gt;</code> tag, the dialog box is automatically displayed with more than one tool magazine (excluding the system magazine) when magazine configuration is taking place. If there is only one tool magazine, the switchover function is used.</td>
</tr>
<tr>
<td>NewToolFavoritesOnly</td>
<td><strong>true</strong> - Only those tool types that are configured as favorites are listed. <strong>false</strong> - Default setting, all tool types are listed.</td>
</tr>
<tr>
<td>SortationInFirstEtcLevel</td>
<td><strong>true</strong> - The Sorting function is placed at the first softkey level. The &quot;Continue&quot; function is omitted. <strong>false</strong> - Default setting, sorting at all softkey levels.</td>
</tr>
<tr>
<td>ToolBufferOnceOnTop</td>
<td><strong>true</strong> - Default setting, buffer is displayed at the start of the list. <strong>false</strong> – Buffer is displayed for each magazine. Only those locations are displayed that are assigned to the magazine.</td>
</tr>
<tr>
<td>UnloadToolFromLoadPlaceEnabled</td>
<td><strong>true</strong> - A tool at the load position can be removed from the load position using the &quot;Unload&quot; softkey. <strong>false</strong> – Default setting. The &quot;Unload&quot; softkey is not displayed for a tool at the load position.</td>
</tr>
<tr>
<td>AutoHNumberDisplayEnabled</td>
<td><strong>true</strong> - Default settings, the column is automatically displayed. <strong>false</strong> - The column is not automatically displayed. Column of the cutting parameter &quot;IsoHNoDPH - ISO H number&quot; depending on the machine configuration.</td>
</tr>
<tr>
<td>AutoFixedPlaceDisplayEnabled</td>
<td><strong>true</strong> - standard setting, the column is automatically hidden, if all of the configured magazines are fixed location coded. <strong>false</strong> - The column is not automatically hidden. Column of the tool parameter &quot;ToolStateFixed&quot; - tool status - tool is fixed-location coded and acts dependent on the magazine configuration.</td>
</tr>
</tbody>
</table>
### Tool management

#### 13.16 General settings

<table>
<thead>
<tr>
<th>Entries</th>
<th>Meaning</th>
</tr>
</thead>
</table>
| AccessLevelWriteDetailsAllParameter | The following entry defines the access rights from which protection level in the window "Details - all parameters" write access applies.  
The default setting is access rights: Protection level 4 (key switch position 3). |
| MagazineMoveMessage      | true - "Magazine movement running" or "Magazine movement ended" message is displayed.  
false - Default setting, message is not displayed.                                        |
| ToolLoadErrorMessage     | Refers to the output of the fault message due to a negative PLC.  
true - Default setting, the fault message is displayed.  
false - The fault message is not displayed.                                               |

The following settings refer to markings in the lists.

true - marking is displayed.

false - marking is not displayed (default setting).

If several markings apply to one location, the most important information is displayed. For instance, if a tool is locked, and at the same time, the "Tool position" and the "Reference direction holder angle" for this tool do not match, then a red cross is displayed for locked. The yellow triangle for the conflict cannot be seen.

<table>
<thead>
<tr>
<th>Entries</th>
<th>Meaning</th>
</tr>
</thead>
</table>
| ShowSymbolActivePlace        | Marking of the magazine location at the machining position.  
true - Default setting applies for the "Revolver" magazine type.  
false - Setting for all other magazine types.                                  |
| ShowSymbolLoadPlace          | Selection of the magazine location at the loading position.  
true - Default setting applies for all magazine types (except Revolver is true).  
false - Setting for the "Revolver" magazine type.                              |
| ShowSymbolChangeInSpindlePlace | Marking of the magazine location at the change position.  
true - Default setting applies for all magazine types (except Revolver is true).  
false - Setting for the "Revolver" magazine type.                              |
| ShowSymbolActiveTool         | Marking of the active tool.  
false - Default setting.                                                          |
| ShowSymbolProgrammedTool     | Marking of the follow-on tool.  
true - Default setting.                                                            |
| ShowSymbolActiveDNo          | Marking of the active cutting edge.  
false - Default setting.                                                            |
### Tool management

#### 13.16 General settings

<table>
<thead>
<tr>
<th>Entries</th>
<th>Meaning</th>
</tr>
</thead>
</table>
| **ShowSymbolActiveDNoInTool** | Marking of the active tool by marking the active cutting edge.  
true - Default setting for configuration without magazine management.  
false - Setting for configuration with magazine management. |
| **ShowConflictPositionAndDirection** | Marking of a conflict; tool position and cutting direction do not match.  
true - Default setting. |
| **ShowConflictActiveToolWarning** | Marking of a conflict; revolver magazine type and the active tool are not at the machining position.  
true - Default setting. |
| **ShowSymbolActiveIsoHNoL1** | Marking of the active H number for length 1 in the ISO tool list.  
true - Default setting. |
| **ShowSymbolActiveIsoHNoL2** | Marking of the active H number for length 2 in the ISO tool list.  
true - Default setting. |
| **ShowSymbolActiveIsoHNoL3** | Marking of the active H number for length 3 in the ISO tool list.  
true - Default setting. |
| **ShowSymbolActiveIsoDNo** | Marking of the active D number in the ISO tool list.  
true - Default setting. |
| **ShowSymbolActiveIsoHDNo** | Marking of the active HD number in the ISO tool list.  
true - Default setting. |

**Example**

```xml
<SETTINGS>
  <ReactivateWithMagPos value="false" type="bool" />  
  <MagazineMoveMessage value="false" type="bool" />  
  <CreateNewToolDialog value="true" type="bool" />  
  <MagazineSelectionDialog value="false" type="bool" />  
  <AccessLevelWriteDetailsAllParameter value="4" type="int" />
</SETTINGS>
```

**See also**

Definition of access levels (Page 59)  
Configure the "New tool - favorites" window (Page 150)
13.17 Creating OEM texts

Overview

This chapter describes how you create OEM texts in a particular language.

The texts are created in the "sltmlistdialog_xxx.ts" file.

A dedicated file must be created for each language. The file names differ by the language code (Supported languages (Page 502)). For "xxx", set the appropriate language code.

Creating texts

All OEM texts from the previous chapters, such as e.g. the tooltip, can be made language-dependent by using the OEM text as text identifier under the "source" tag. The translation of the text in the particular language is entered under the "translation" tag.

<table>
<thead>
<tr>
<th>Entries</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>source</td>
<td>Text identifier</td>
</tr>
<tr>
<td></td>
<td>See 1st example: Single-line text with new text identifier &quot;MY_NEW_TEXT&quot;.</td>
</tr>
<tr>
<td></td>
<td>See 2nd example: Two-line text with new text identifier &quot;MY_NEW_TEXT_2_LINES&quot;.</td>
</tr>
<tr>
<td>Translation</td>
<td>Text, which is displayed on the user interface.</td>
</tr>
<tr>
<td></td>
<td>You can enter single and multi-line texts. &quot;\n&quot; is used to indicate a line break.</td>
</tr>
<tr>
<td></td>
<td>See 1st example: Single-line text &quot;My new text&quot; is displayed.</td>
</tr>
<tr>
<td></td>
<td>See 2nd example: Two-line text &quot;My new text&quot; is displayed.</td>
</tr>
<tr>
<td>chars</td>
<td>Text length</td>
</tr>
<tr>
<td></td>
<td>See 1st example: Text length of 30 characters is specified.</td>
</tr>
<tr>
<td></td>
<td>See 2nd example: Text length of ten characters per line is specified.</td>
</tr>
<tr>
<td>lines</td>
<td>Number of rows</td>
</tr>
<tr>
<td></td>
<td>See 2nd example: The number of rows is 2.</td>
</tr>
<tr>
<td>remark</td>
<td>Own comments - are not displayed.</td>
</tr>
</tbody>
</table>

Procedure

1. You can copy the sample file "oem_sltmlistdialog_deu.ts" from the following directory: 
   /siemens/sinumerik/hmi/template/lng.
2. Save the file in the /oem/sinumerik/hmi/lng or /user/sinumerik/hmi/lng directory.
3. Change the file name to "sltmlistdialog_deu.ts".
   If you wish to create texts 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.
4. Open the file and define the texts in the <message> and </message> areas.
5. Restart the system.
   The file must still be converted into a binary format in order that the texts are displayed during the program runtime. This data is only converted during power up.
Example 1 with a single-line and double-line text

```xml
<?xml version="1.0" encoding="UTF-8"?>
<DOCTYPE TS>TS>
<!-- **************************************************************** -->
<!-- Definition of OEM-Texts -->
<!-- **************************************************************** -->
<context>
  <name>SlTmListForm</name>
  <!-- enter your text behind this comment -->
  <!--**************************************************************** -->
  <!-- 1st example of a single-line text -->
  <!-- **************************************************************** -->
  <!-- <message>
    <source>MY_NEW_TEXT</source>
    <translation>My new text</translation>
    <chars>30</chars>
  </message> -->
  <!-- enter your text ahead of this comment -->
  <!--**************************************************************** -->
  <!-- 2nd example of a double spaced text -->
  <!-- **************************************************************** -->
  <!-- <message>
    <source>MY_NEW_TEXT_2_LINES</source>
    <translation>My new%n text</translation>
    <remark>My comment to the text</remark>
    <chars>10</chars>
    <lines>2</lines>
  </message> -->
</context>
</TS>
```
Example 2

In the following example, from chapter Configure the list parameters (Page 142), a new parameter is configured:

```xml
<PARAMETERCONFIGURATION>
  <EdgeUser_1_Bit0>
    <Base value="EdgeUser_1" type="QString" />
    <ItemType value="CheckBox" type="QString" />
    <DisplayMode value="AnyMode" type="QString" />
    <BitMask value="1" type="int" />
    <Width value="17" type="int" />
    <HeadLine value="TM_HL_EDGE_USER_1_Bit0" type="QString" />
    <ToolTip value="TM_TT_EDGE_USER_1_Bit0" type="QString" />
  </EdgeUser_1_Bit0>
</PARAMETERCONFIGURATION>
```

The two texts under HeadLine and ToolTip should be output depending on the language. To do this, the two text identifiers must be included in the sltmlistdialog_XXX.ts file:

```xml
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE TS><TS>
<!-- Definition of OEM-Texts -->
<context>
  <name>SlTmListForm</name>
<!-- enter your text behind this comment -->
<!-- Definition of OEM-Texts -->
<!-- enter your text behind this comment -->
<!-- Translate the text for the HeadLine -->
<!-- enter your text behind this comment -->
<message>
  <source>TM_HL_EDGE_USER_1_Bit0</source>
  <translation>heavy %n tool</translation>
  <chars>10</chars>
  <lines>2</lines>
</message>
<!-- enter your text behind this comment -->
<!-- Translate the text for ToolTip -->
<!-- enter your text behind this comment -->
<message>
  <source>TM_TT_EDGE_USER_1_Bit0</source>
  <translation>heavy tool</translation>
  <chars>20</chars>
</message>
</TS>
```
13.17 Creating OEM texts

Identifiers of the standard texts

In the tool list, you can change the standard texts of headers and/or tooltips using identifiers, for the columns of the OEM parameters as well as the coolant and tool-specific functions.

A list of the identifiers is provided below:

Identifiers of OEM tool parameters

"ToolUser_1" to "ToolUser_10" /
"ToolAppl_1" to "ToolAppl_10"

<table>
<thead>
<tr>
<th>Header</th>
<th>Tooltip</th>
<th>Identifier in the detailed screen</th>
</tr>
</thead>
<tbody>
<tr>
<td>TM_HL_TOOL_USER_1</td>
<td>TM_TT_TOOL_USER_1</td>
<td>TM_HL_TOOL_USER_1_LONG</td>
</tr>
<tr>
<td>to</td>
<td>to</td>
<td>to</td>
</tr>
<tr>
<td>TM HL TOOL USER 10</td>
<td>TM TT TOOL USER 10</td>
<td>TM HL TOOL USER 10_LONG</td>
</tr>
<tr>
<td>TM_HL_TOOL_APPL_1</td>
<td>TM_TT_TOOL_APPL_1</td>
<td>TM_HL_TOOL_APPL_1_LONG</td>
</tr>
<tr>
<td>to</td>
<td>to</td>
<td>to</td>
</tr>
<tr>
<td>TM HL TOOL APPL 10</td>
<td>TM TT TOOL APPL 10</td>
<td>TM HL TOOL APPL 10_LONG</td>
</tr>
</tbody>
</table>

Identifiers of the OEM cutting edge parameters

"EdgeUser_1" to "EdgeUser_10" /
"EdgeAppl_1" to "EdgeAppl_10"

<table>
<thead>
<tr>
<th>Header</th>
<th>Tooltip</th>
<th>Identifier in the detailed screen</th>
</tr>
</thead>
<tbody>
<tr>
<td>TM_HL_EDGE_USER_1</td>
<td>TM_TT_EDGE_USER_1</td>
<td>TM_HL_EDGE_USER_1_LONG</td>
</tr>
<tr>
<td>to</td>
<td>to</td>
<td>to</td>
</tr>
<tr>
<td>TM HL EDGE USER 10</td>
<td>TM TT EDGE USER 10</td>
<td>TM HL EDGE USER 10_LONG</td>
</tr>
<tr>
<td>TM_HL_EDGE_APPL_1</td>
<td>TM_TT_EDGE_APPL_1</td>
<td>TM_HL_EDGE_APPL_1_LONG</td>
</tr>
<tr>
<td>to</td>
<td>to</td>
<td>to</td>
</tr>
<tr>
<td>TM HL EDGE APPL 10</td>
<td>TM TT EDGE APPL 10</td>
<td>TM HL EDGE APPL 10_LONG</td>
</tr>
</tbody>
</table>
Identifiers of the OEM monitoring parameters

- "EdgeSupUser_1" to "EdgeSupUser_10"
- "EdgeSupAppl_1" to "EdgeSupAppl_10"

<table>
<thead>
<tr>
<th>Header</th>
<th>Tooltip</th>
<th>Identifier in the detailed screen</th>
</tr>
</thead>
<tbody>
<tr>
<td>TM_HL_EDGE_SUPUSER_1 to TM_HL_EDGE_SUPUSER_10</td>
<td>TM_TT_EDGE_SUPUSER_1 to TM_TT Edge SUPUSER_10</td>
<td>TM_TT_EDGE_SUPUSER_1_LONG to TM TT EDGE_SUPUSER_10 LONG</td>
</tr>
<tr>
<td>TM_HL_EDGE_SUPAPPL_1 to TM_HL_EDGE_SUPAPPL_10</td>
<td>TM_TT_EDGE_SUPAPPL_1 to TM_TT EDGE_SUPAPPL_10</td>
<td>TM_TT_EDGE_SUPAPPL_1_LONG to TM TT EDGE_SUPAPPL_10 LONG</td>
</tr>
</tbody>
</table>

Identifiers of the OEM magazine location parameters

- "MagPlaceUser_1" to "MagPlaceUser_10"
- "MagPlaceAppl_1" to "MagPlaceAppl_10"

<table>
<thead>
<tr>
<th>Header</th>
<th>Tooltip</th>
<th>Identifier in the detailed screen</th>
</tr>
</thead>
<tbody>
<tr>
<td>TM_HL_MAGPLACE_USER_1 to TM_HL_MAGPLACE_USER_10</td>
<td>TM_TT_MAGPLACE_USER_1 to TM_TT MAGPLACE USER_10</td>
<td>No detailed screen</td>
</tr>
<tr>
<td>TM_HL_MAGPLACE_APPL_1 to TM_HL_MAGPLACE_APPL_10</td>
<td>TM_TT_MAGPLACE_APPL_1 to TM_TT MAGPLACE APPL_10</td>
<td>No detailed screen</td>
</tr>
</tbody>
</table>

Identifiers of OEM multitool parameters

- "MultiToolUser_1" to "MultiToolUser_10"
- "MultiToolAppl_1" to "MultiToolAppl_10"

<table>
<thead>
<tr>
<th>Header</th>
<th>Tooltip</th>
<th>Identifier in the detailed screen</th>
</tr>
</thead>
<tbody>
<tr>
<td>TM_HL_MULTITOOL_USER_1 to TM_HL_MULTITOOL_USER_10</td>
<td>TM_TT_MULTITOOL_USER_1 to TM_TT MULTITOOL USER_10</td>
<td>No detailed screen</td>
</tr>
</tbody>
</table>

Identifiers of the coolant and tool-specific functions

- "Coolant1" and "Coolant2"
- "MFunction1" to "MFunction4"

<table>
<thead>
<tr>
<th>Header</th>
<th>Tooltip</th>
<th>Identifier in the detailed screen</th>
</tr>
</thead>
<tbody>
<tr>
<td>No column</td>
<td>TM_TT_STATE_COOL_1 to TM_TT STATE COOL 2</td>
<td>No detailed screen</td>
</tr>
<tr>
<td>TM_HL_MFCT1 to TM_HL MFCT4</td>
<td>TM_TT_MFCT1 to TM TT MFCT4</td>
<td>No detailed screen</td>
</tr>
</tbody>
</table>
Configuring machine data/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.

<table>
<thead>
<tr>
<th>File</th>
<th>Alarms</th>
<th>Number ranges</th>
<th>Color</th>
<th>PopUp</th>
</tr>
</thead>
<tbody>
<tr>
<td>oem_alarms_plc</td>
<td>User PLC alarm texts</td>
<td>500 000 to 899 999</td>
<td>Black/ red (selectable)</td>
<td>Additional text display yes/no</td>
</tr>
<tr>
<td>oem_alarms_cycles</td>
<td>User cycle alarm texts</td>
<td>60 000 to 69 999</td>
<td>Black/ red (selectable)</td>
<td>Additional text display yes/no</td>
</tr>
<tr>
<td>oem_partprogram_messages</td>
<td>User message texts from the part program</td>
<td>1 to 999 999</td>
<td>green (specified)</td>
<td>Additional text display yes/no</td>
</tr>
</tbody>
</table>

An overview of the alarm and number ranges is provided in Chapter Range of alarms (Page 194)

Storage

The text files are created in the following directory:

/oem/sinumerik/hmi/lng

Foreign language alarm and message texts

If you create foreign language alarm and message texts, change over into 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.
14.1 Creating alarm and message texts via the user interface

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.
   The window, e.g. "Edit alarm texts (user PLC alarm texts) German" opens.

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 acknowledgement - 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 "Find" window appears.
   Enter the desired alarm text or the alarm number in the "Text" field.
   Activate the "Case sensitive" check box if a distinction must be made between upper and lower case letters when entering text.
   - OR
   Press the "Find + replace" softkey.
   The "Find and replace" window appears.
   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 Find or Find 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."

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.
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.

Creating and editing alarm texts

- Creating your own alarm texts
- Creating texts for indexed alarm parameters
- Creating part program message texts
- Changing alarm colors
- 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_deu.ts" from the following directory:
   /siemens/sinumerik/hmi/template/lang.
2. Save or create the file in the /oem/sinumerik/hmi/lang or /user/sinumerik/hmi/lang directory. Create a separate file for each country language that is supported.
3. Assign a unique name to the file, e.g. "my_alarms_deu.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. For example "my_alarms_deu.ts" for German or "my_alarms_eng.ts" for English.

Creating alarm texts

1. Open the file "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> and </message> tags.
3. Enter the "slaeconv" name between the <name> and </name> tags. This name must not be changed!

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. For the possible alarm sources, URLs, see the table "Source URLs of the NC".

5. The <translation> tag contains the alarm text.

Example

```xml
<!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. The registration is made in the "slaesvcadapconf.xml" file.

1. You can copy a sample configuration file "oem_slaesvcadapconf.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 enter the BaseName of your alarm text file into the <BaseNames> section. The BaseName is the file name of the alarm text file without language code and file extension, e.g. "my_alarms". The registration of your alarm text file starts with the "BaseName_02" tag. The tag "BaseName_01" is reserved for Siemens. Several alarm text files can also be registered. To do this, use the tags "BaseName_03", "BaseName_04", etc.
Configuring machine data/alarms

14.2 Configuring alarm and message texts via alarm text files

Example

```xml
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<!-- Configuration of the Solutionline Alarm & Event Service Adapter -->
<CONFIGURATION>
  <AlarmTexts>
    <BaseNames>
      <BaseName_02 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 power 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 file "alarmtext_conversion.log". 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/alarm_log" directory.

**Note**

The conversion is only made if the .ts file is newer than the associated .qm file. The .ts file must be edited to force a new conversion. The .qm file cannot be deleted as this is loaded during the runtime.

14.2.2 Creating texts for indexed alarm parameters

If a string, called the so-called "index identifier", is specified in the alarm text in pointed brackets after a space holder (e.g. "%1<ALNX>"), the parameter itself is not inserted in the alarm text, but a text from another alarm text file, a so-called 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.

Creating an index text file

1. You can copy a sample index text file "oem_indextexts_eng.ts" from the following directory: /siemens/sinumerik/hmi/template/lng.
2. Save 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_indextexts_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. For instance, "my_indextexts_deu.ts" for German or "my_indextexts_eng.ts" for English.

Creating index texts

1. Open the "my_indextexts_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

```xml
<!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 "slaesvcdapconf.xml" file.

1. Open the file "slaesvcdapconf.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 so-called 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="oem_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 `<OEM_IndexText_01>`, `<OEM_IndexText_02>`, `<OEM_IndexText_03>` etc. The tags `<IndexText_01>` to `<IndexText_99>` are reserved for Siemens.

Example

```xml
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<!- Configuration of the Solutionline Alarm & Event Service Adapter -->
<CONFIGURATION>

<!-- The following narrated part of the configuration is used only when 'Indexparameters' (e.g. '%1<OEM>') 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. -->

<iIndexTexts>

<iOEM_IndexText_01>

  <Identifier type="QString" value="ALNX"/>
  <BaseName type="QString" value="my_indextexts"/>
  <ContextName type="QString" value="oem_context"/>
  <MetaTextID type="QString" value="%ParamValue%"/>

</iOEM_IndexText_01>

</iIndexTexts>

</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 power 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 file "alarmtext_conversion.log". 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/alarm_log directory.

Note
The conversion is only made if the .ts file is newer than the associated .qm file. The .ts file must be edited to force a new conversion. The .qm file cannot be deleted as this is loaded during the runtime.

14.2.3 Creating part program message texts

You can create your own message texts from the part program.

You can create your own message texts for each NC channel. The message texts are referenced via the numbers following the "$" character in the MSG command of the part program, e.g. MSG("$4711").

Creating a message text file

1. You can copy a sample message text file "oem_msgs_eng.ts" from the following directory: /siemens/sinumerik/hmi/template/lng.

2. Save 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. For instance, "my_msgs_deu.ts" for German or "my_msgs_eng.ts" for English.

Creating message texts

1. Open the "my_msgs_eng.ts" file.

2. Enter the character string "partprogmsg01" in the <name> tag. This is the default for the part program message texts from all channels.

3. For each message text, a separate area must be inserted between the <message> and </message> tags.

4. The <source> tag contains the number from the MSG command in the part program.

5. The <translation> tag contains the message text.

Example

```xml
<!DOCTYPE TS>
<TS>
  <context>
    <name>partprogmsg01</name>
```
14.2 Configuring alarm and message texts via alarm text files

Registering a message text file

You still have to declare your message text file so that the system knows your message texts during the program runtime. The registration is made in the "slaesvcadapconf.xml" file.

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 enter the BaseName of your message text file into the <BaseNames> section. The BaseName is the file name of the message text file without language code and file extension, e.g. "my_msgs". The registration of your alarm text file starts with the "BaseName_02" tag. The tag "BaseName_01" is reserved for Siemens. Several alarm text files can also be registered. To do this, use the tags "BaseName_03", "BaseName_04", etc.

Example

```xml
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<!-- Configuration of the Solutionline Alarm & Event Service Adapter -->
<CONFIGURATION>
  <AlarmTexts>
    <BaseNames>
      <BaseName_02 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.

<table>
<thead>
<tr>
<th>NC channel</th>
<th>XML tag</th>
<th>ContextName</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PartprogramMessageChannel_01</td>
<td>partprogmsg01</td>
</tr>
<tr>
<td>2</td>
<td>PartprogramMessageChannel_02</td>
<td>partprogmsg02</td>
</tr>
<tr>
<td>3</td>
<td>PartprogramMessageChannel_03</td>
<td>partprogmsg03</td>
</tr>
<tr>
<td>4</td>
<td>PartprogramMessageChannel_04</td>
<td>partprogmsg04</td>
</tr>
<tr>
<td>5</td>
<td>PartprogramMessageChannel_05</td>
<td>partprogmsg05</td>
</tr>
<tr>
<td>6</td>
<td>PartprogramMessageChannel_06</td>
<td>partprogmsg06</td>
</tr>
<tr>
<td>7</td>
<td>PartprogramMessageChannel_07</td>
<td>partprogmsg07</td>
</tr>
<tr>
<td>8</td>
<td>PartprogramMessageChannel_08</td>
<td>partprogmsg08</td>
</tr>
<tr>
<td>9</td>
<td>PartprogramMessageChannel_09</td>
<td>partprogmsg09</td>
</tr>
<tr>
<td>10</td>
<td>PartprogramMessageChannel_10</td>
<td>partprogmsg10</td>
</tr>
</tbody>
</table>

Example

```xml
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<!-- Configuration of the Solutionline 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 power 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 file "alarmtext_conversion.log". 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/alarm_log directory.

Note
The conversion is only made if the .ts file is newer than the associated .qm file. The .ts file must be edited to force a new conversion. The .qm file cannot be deleted as this is loaded during the runtime.

14.2.4 Changing alarm colors
You can individually change the colors of the alarms and messages displayed in the message line.

Color types of the alarms
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
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 not contain any lower case letters.

Defining alarm colors
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 COLOR
- Font color of the alarm number = NUMBERCOLOR
- Background color of the alarm number = NUMBER BACKGROUND COLOR

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 SourceIDs and URLs can be taken from the table in Chapter Range of alarms (Page 194)

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 the `<Alarm AlarmID= "...">` tag, or enter the alarm number range in the `<Range FromAlarmID= "..." ToAlarmID= "...">` tag.

7. Enter the required color values in the following tags:

   `<TEXTCOLOR>`
   `<TEXTBACKGROUND COLOR>`
   `<NUMBERCOLOR>`
   `<NUMBERBACKGROUND COLOR>`

The attributes of the color values are defined by specifying an RGB value:

- An RGB value always starts with the "#" character.
- Each R, G or B represents a single-digit hexadecimal number. The RGB value can, e.g. be specified in one of the following formats: "#RRGGBB".

```xml
<?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 810/840 D(i).
        </CatDescr>
        <Attributes>
          <Attribute AttrName="TEXTCOLOR" AttrID="5003" AttrDataType="10">
            <AttrDescr>
              Text color of an alarm used when displayed within the header panel.
            </AttrDescr>
          </Attribute>
        </Attributes>
      </Category>
    </Type>
  </Types>
</SlAeAlarmAttributes>
```
14.2 Configuring alarm and message texts via alarm text files

<Attribute AttrName="TEXTBACKGROUND COLOR" 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="NUMBERBACKGROUND COLOR" AttrID="5006" AttrDataType="10">
    <AttrDescr>
        Background color of an alarm used when displayed within the header panel.
    </AttrDescr>
</Attribute>

<Source> CatLink="1" SourceID="10000" SourceURL="/HMI">
    <Alarms>
        <Alarm AlarmID="130000">
            <TEXTCOLOR>#000000</TEXTCOLOR>
            <TEXTBACKGROUND COLOR="#FFFFFF"></TEXTBACKGROUND COLOR>
            <NUMBERCOLOR>#FFFFFF</NUMBERCOLOR>
            <NUMBERBACKGROUND COLOR="#000000"></NUMBERBACKGROUND COLOR>
        </Alarm>
    </Alarms>
</Source>

<Source> CatLink="1" SourceID="51" SourceURL="/PLC/PMC">
    <Alarms>
        <Alarm AlarmID="700000">
            <TEXTCOLOR>#000000</TEXTCOLOR>
            <TEXTBACKGROUND COLOR="#FFFFFF"></TEXTBACKGROUND COLOR>
            <NUMBERCOLOR>#FFFFFF</NUMBERCOLOR>
            <NUMBERBACKGROUND COLOR="#000000"></NUMBERBACKGROUND COLOR>
        </Alarm>
        <Range FromAlarmID="700100" ToAlarmID="700199">
            <TEXTCOLOR>#00FF00</TEXTCOLOR>
            <NUMBERCOLOR>#00FF00</NUMBERCOLOR>
        </Range>
    </Alarms>
</Source>
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. The registration is made in the "slaesvcconf.xml" file.

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 tag <OEM_DataBase_02> enter the BaseName of the alarm attribute file, e.g. "muster_slaedatabase". If you register additional alarm attribute files, i.e. you wish to include them in the configuration file, use the tags <OEM_DataBase_03>, <OEM_DataBase_04>, etc.

Note

The names for the <OEM_DataBase_02>, <OEM_DataBase_03>, <OEM_DataBase_04> tags, etc. can be freely selected. They must be unique for all systems and must not clash with names used by Siemens.

The tag or tag name <DataBase_01> is reserved for Siemens.

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 power 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. The XML file must be edited in order to force a new conversion. The hmi file cannot be deleted as this is loaded during the runtime.
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/ling.
2. Save or create the file in the /oem/sinumerik/hmi/ling or /user/sinumerik/hmi/ling 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. For example "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. For each alarm text, a separate area must be inserted between the <message> and </message> tags.
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, it is not permissible that the name coincides with names used by Siemens. The tag or tag name <slaeconv> is reserved for 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

```xml
<!DOCTYPE TS>
<TS>
  <context>
    <name>myNckAlarms</name>
    <message>
      <source>10000</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. The registration is made in the "slaesvcadapconf.xml" file.

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 enter the BaseName of your alarm text file into the <BaseNames> section. The BaseName is the file name of the alarm text file without language code and file extension, e.g. "my_nck_alarms".

The registration of your alarm text file starts with the "BaseName_02" tag. The tag "BaseName_01" is reserved for Siemens. Several alarm text files can also be registered. To do this, use the tags "BaseName_03", "BaseName_04", etc.

Example

```xml
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<!-- Configuration of the Solutionline Alarm & Event Service Adapter -->
<CONFIGURATION>
 <AlarmTexts>
  <BaseNames>
   <BaseName_02 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 in directory /oem/sinumerik/hmi/cfg or /user/sinumerik/hmi/cfg. 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>. The <Types> tag includes the definition of the alarm attribute "MSGTEXT" used in the second <Sources> area.

4. The <sources> tag includes the references, assigned to an alarm source, e.g. "NCK", to the associated alarm text.

5. Link the contents of the <context> <name> tag from your alarm text file with the contents of the <message> <source> tags from your alarm text file.
   - <context> <name> = the context name that you assigned
   - <message> <source> = number of the alarm whose text is to be replaced.
     e.g. enter the following link into the alarm attribute file: <MSGTEXT>myNckAlarms I 10000</MSGTEXT>
     Make sure that the alarm 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 -URL from the table in Chapter Range of alarms (Page 194)

Note
A dedicated link must be made for each standard alarm for which the standard text is to be replaced.

Example

```xml
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE SIAeAlarmAttributes>
<SIAeAlarmAttributes Version="01.00.00.00">
  <Types>
    <Type TypeName="Condition" TypeID="32">
      <Category Version="1.0" CatID="1">
        <CatDescr>Alarms of the Sinumerik 810/840 D(i).</CatDescr>
        <Attributes>
          <Attribute AttrName="MSGTEXT" AttrID="-1" AttrDataType="10" />
        </Attributes>
      </Category>
    </Type>
  </Types>
  <Sources>
    <Source CatLink="1" SourceID="0" SourceURL="/NCK">
      <Alarms>
        <Alarm AlarmID="10000">
          <!-- Alarm text here -->
        </Alarm>
      </Alarms>
    </Source>
  </Sources>
</SIAeAlarmAttributes>
```
14.2 Configuring alarm and message texts via alarm text files

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. The registration is made in the "slaesvcconf.xml" file.

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.
5. Enter the BaseName of the alarm attribute file into the tag <OEM_DataBase_02>, in the example, "my_nck_alarms_db".

Note
The name for the <OEM_DataBase_02> tag can always be freely selected. However, the name for all systems must be unique and must not conflict with other names that Siemens uses. The tag or tag name <DataBase_01> is reserved for Siemens.

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 power 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 file "alarmtext_conversion.log". 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/alarm.log" directory.

Note
The conversion is only made if the .ts file is newer than the associated .qm file. The .ts file must be edited to force a new conversion. The .qm file cannot be deleted as this is loaded during the runtime.
### 14.2.6 Range of alarms

**Number ranges of alarms**

<table>
<thead>
<tr>
<th>Numerical range</th>
<th>Description</th>
<th>Source ID</th>
<th>Source URL</th>
</tr>
</thead>
<tbody>
<tr>
<td>000.000 – 009.999</td>
<td>General alarms</td>
<td>0 (standard NCU)</td>
<td>/NCK</td>
</tr>
<tr>
<td>010.000 – 019.999</td>
<td>Channel alarms</td>
<td>100 (1st NCU)</td>
<td>/configuration-spec. designation&gt;/NCK</td>
</tr>
<tr>
<td>020.000 – 029.999</td>
<td>Axis/spindle alarms</td>
<td>...</td>
<td>9999 (99th NCU)</td>
</tr>
<tr>
<td>030.000 – 039.999</td>
<td>Functional alarms</td>
<td>General</td>
<td></td>
</tr>
<tr>
<td>040.000 – 059.999</td>
<td></td>
<td>Reserved</td>
<td></td>
</tr>
<tr>
<td>060.000 – 064.999</td>
<td>Cycle alarms SIEMENS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>065.000 – 069.999</td>
<td>Cycle alarms user</td>
<td></td>
<td></td>
</tr>
<tr>
<td>070.000 – 079.999</td>
<td>Compile cycles manufacturer and OEM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>080.000 – 084.999</td>
<td>Message texts SIEMENS cycles</td>
<td></td>
<td></td>
</tr>
<tr>
<td>085.000 – 089.999</td>
<td>Message texts user cycles</td>
<td></td>
<td></td>
</tr>
<tr>
<td>090.000 – 099.999</td>
<td></td>
<td>Reserved</td>
<td></td>
</tr>
<tr>
<td>100.000 – 129.000</td>
<td>System</td>
<td>10.000</td>
<td>/HMI</td>
</tr>
<tr>
<td>130.000 – 139.000</td>
<td>OEM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>140.000 – 199.999</td>
<td>Reserved</td>
<td></td>
<td></td>
</tr>
<tr>
<td>200.000 – 299.999</td>
<td>SINAMICS drive</td>
<td>0</td>
<td>/NCK</td>
</tr>
<tr>
<td>300.000 – 399.999</td>
<td>611D drive</td>
<td></td>
<td></td>
</tr>
<tr>
<td>400.000 – 499.999</td>
<td>General alarms</td>
<td>51</td>
<td>/PLC/PMC</td>
</tr>
<tr>
<td>500.000 – 599.999</td>
<td>Channel alarms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>600.000 – 699.000</td>
<td>Axis/spindle alarms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>700.000 – 799.999</td>
<td>User area</td>
<td></td>
<td></td>
</tr>
<tr>
<td>800.000 – 899.999</td>
<td>Sequencers/graphs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>810.000 – 810.009</td>
<td>System error messages</td>
<td>50</td>
<td>/PLC/DiagBuffer/&lt;configuration-spec. Designation&gt;/PLC/DiagBuffer</td>
</tr>
<tr>
<td>900.000 – 999.999</td>
<td>611U drive</td>
<td>0</td>
<td>/NCK</td>
</tr>
</tbody>
</table>

**Additional source IDs**

There are further Source IDs in addition to the above IDs:

<table>
<thead>
<tr>
<th>Source ID</th>
<th>Source URL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>/NCK/Channel#1/Partprogram</td>
</tr>
<tr>
<td>2</td>
<td>/NCK/Channel#2/Partprogram</td>
</tr>
<tr>
<td>3</td>
<td>/NCK/Channel#3/Partprogram</td>
</tr>
</tbody>
</table>
14.2 Configuring alarm and message texts via alarm text files

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>
<thead>
<tr>
<th>Parameter specifier</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>%1</td>
<td>First parameter from the alarm data of the alarm source.</td>
</tr>
<tr>
<td>%2</td>
<td>Second parameter from the alarm data of the alarm source.</td>
</tr>
<tr>
<td>%3</td>
<td>Third parameter from the alarm data of the alarm source.</td>
</tr>
<tr>
<td>%4</td>
<td>Fourth parameter from the alarm data of the alarm source.</td>
</tr>
<tr>
<td>%5</td>
<td>Fifth parameter from the alarm data of the alarm source. First part (up to the separator) of the fourth parameter from the alarm data of the alarm source. Only for NCK alarms:</td>
</tr>
<tr>
<td>%7</td>
<td>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.</td>
</tr>
<tr>
<td>%8</td>
<td>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.</td>
</tr>
<tr>
<td>%9</td>
<td>Ninth parameter from the alarm data of the alarm source.</td>
</tr>
</tbody>
</table>
### 14.2 Configuring alarm and message texts via alarm text files

<table>
<thead>
<tr>
<th>Parameter specifier</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>%0</td>
<td>Tenth parameter from the alarm data of the alarm source.</td>
</tr>
<tr>
<td>%Z</td>
<td>Especially for PLC alarms: Like %1, for S7-HiGraph alarms, the step number of the graph is displayed.</td>
</tr>
<tr>
<td>%A</td>
<td>Especially for PLC alarms: Third and fourth places of the decimal Alarm-ID: 123456, corresponds to the axis number.</td>
</tr>
<tr>
<td>%K</td>
<td>Especially for PLC alarms: Fifth and sixth places of the decimal Alarm-ID: 123456, corresponds to the channel number.</td>
</tr>
<tr>
<td>%N</td>
<td>Especially for PLC alarms: First and second places of the decimal Alarm-ID: 123456, corresponds to the signal number.</td>
</tr>
</tbody>
</table>

#### 14.2.8 Opening error file

The errors that occur during the converter are written to the "alarmtext_conversion.log" and the "crash.log".

### Storage

<table>
<thead>
<tr>
<th>Directory</th>
<th>Error file</th>
</tr>
</thead>
<tbody>
<tr>
<td>/user/sinumerik/hmi/log/alarm_log</td>
<td>alarmtext_conversion.log</td>
</tr>
<tr>
<td>/user/sinumerik/hmi/log/action_log</td>
<td>crash.log</td>
</tr>
</tbody>
</table>

#### Opening error file

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

2. Press the "System data" softkey.

3. Open the corresponding directory and select the desired file.

4. Press the "Open" softkey to open the error file.
14.3 Converting alarm texts from HMI-Advanced/HMI-Embedded

Use the alarm text converter "HMI SolutionLine Alarm Text Converter" to transfer alarm texts from HMI-Advanced or HMI-Embedded to SINUMERIK Operate.

The alarm text converter is supplied as installation package in the directory on the following DVD:

<table>
<thead>
<tr>
<th>DVD name</th>
<th>Directory</th>
</tr>
</thead>
<tbody>
<tr>
<td>CNC-Software 6-3/31-5 with SINUMERIK Operate</td>
<td>tools\alarm_text_converter</td>
</tr>
<tr>
<td>CNC-Software 6-3/31-5 with SINUMERIK Operate, Export</td>
<td>tools\alarm_text_converter</td>
</tr>
</tbody>
</table>

User alarm texts of the "com" format of HMI-Advanced/HMI-Embedded are converted to the "ts" format of the SINUMERIK Operate. Only the alarm numbers and the alarm texts are taken over.

**Note**
The following data is not converted:
- References to the alarm online help
- Message texts for part program messages with the extended $-Syntax, e.g. MSG ("$4711").

**Precondition**
The alarm text converter can only run on Windows XP.

**Installing the alarm text converter**
1. Start the "Setup_AlarmTextConverter.exe" installation package from the DVD and follow the instructions in the "LiesMich.txt" or "ReadMe.txt" text file.
2. Select an arbitrary installation directory. During installation, the program group "HMI SolutionLine Alarm Text Converter" with the entries "Launch AlarmTextConverter" and "Uninstall AlarmTextConverter" is created in the Start menu.
Starting the alarm text converter

1. Start the converter via Start > Programs > HMI SolutionLine Alarm Text Converter > Launch Alarm Text Converter.

2. If you convert the alarm texts:
   Copy the alarm texts to be converted (*.com) in all languages to the directory /Installation path/alarmsconverter/source/source path (e.g. with the Windows Explorer).
   - The file names of the alarm texts must contain a valid language code.
   - The file extension must be ".com", e.g. "XYZ_gr.com".

3. If you convert index texts, i.e. texts that are indexed via a parameter value (syntax: "%1<file selector>", e.g. Alarm No. 10203 "Channel %1 NC start without reference point (action=%2<ALNX>)":
   - First create a new directory under "Installationpath/alarmsconverter/source".
   - Use the name of the "file selector" as directory name, e.g. /ALNX. If you are using several file selectors, create a corresponding number of directories.
   - Note: Observe upper and lower case when creating directories.
   - Copy the index texts to be converted to the directory.

4. Enter the first part of the file name (without language code and file extension) of the HMI alarm texts in the "Output File Prefix" input field. This file name is subsequently used to distinguish between the alarm texts of different manufacturers. For this reason, the file name should be easily recognizable, e.g. contain the name of the manufacturer.
   - Note: The prefix may not begin with a number!

5. Click the "Convert" button.
   The converter is started. Two new subdirectories are created below the directory specified in the Target Path:
   - ".../lng" contains the newly created alarm and index texts (my_oem_alarms_.ts) for SINUMERIK Operate.
   - ".../cfg" contains the language-neutral database "my_oem_alarms_db.xml" and the newly created configuration files "slaesvcconf.xml" and "slaesvcadapconf.xml".
   The result of the conversion is displayed in a window.

6. Click "OK" to exit the display.

7. Click "Close" to exit the converter.

8. Copy the newly created files, e.g. with "WinSCP", to the appropriate directories. If the configuration files "slaesvcconf.xml" and "slaesvcadapconf.xml" already exist, copy the newly created contents to the already available configuration file.

9. Restart the operating software.
   The new database and the new alarm texts are converted to binary format at power up, and are then available.

10. The results of the conversion are recorded in the "oem_text_conversion.log" and "oem_ae_database_conversion.log" files.
   The files are in the directory: /user/sinumerik/hmi/log.
Supplementing the "slaesvcconf.xml" configuration file

Copy the line that is indented the furthest from the newly created configuration file to the already available file:

```xml
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<!-- Configuration of the Solutionline Alarm & Event Service -->
-  <CONFIGURATION>
    ...
    <DataBases>
    ...
    <My_Oem_DataBase type="QString" value="my_oem_alarms_db.hmi"/>
    </DataBases>
    ...
  </CONFIGURATION>

Make sure that the line is inserted between the opening tags <CONFIGURATION> and <DataBases> and the closing tags </DataBases> and </CONFIGURATION>. These tags may only be present once!

Completing the "slaesvcadapconf.xml" configuration file

Alarm texts

Copy the line that is indented the furthest from the newly created configuration file to the already available file:

```xml
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<!-- Configuration of the Solutionline Alarm & Event Service -->
-  <CONFIGURATION>
    ...
    -  <AlarmTexts>
    ...
    <BaseNames>
    ...
    <My_Oem_Alarms type="QString" value="my_oem_alarms"/>
    </BaseNames>
    ...
  </AlarmTexts>
    ...
  </CONFIGURATION>

Make sure that the line is inserted between the opening tags <CONFIGURATION>, <AlarmTexts> and <BaseNames> and the closing tags </BaseNames>, </AlarmTexts> and </CONFIGURATION>. These tags may only be present once in each file!
Index texts

Copy the six lines from the opening tag, e.g. <My_Oem_IndexText_01>, to the closing tag, e.g. </My_Oem_IndexText_01>, to the already available file:

```xml
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<!-- Configuration of the Solutionline Alarm & Event Service -->
- <CONFIGURATION>
  ...
  - <IndexTexts>
    ...
    <My_Oem_IndexText_01>
      <Identifier type="QString" value="ALNX"/>
      <BaseName type="QString" value="my_oem_idxALNX"/>
      <ContextName type="QString" value="My_Oem_Index_ALNX"/>
      <MetaTextID type="QString" value="%ParamValue\"/>
    </My_Oem_IndexText_01>
    ...
  </IndexTexts>
  ...
</CONFIGURATION>
```

Make sure that the lines are inserted between the opening tags `<CONFIGURATION>` and `<IndexTexts>` and the closing tags `</CONFIGURATION>` and `</IndexTexts>`. These tags may only be present once in each file.
14.4 Configuring an alarm log

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).

Specify the number of results

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.

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 for each alarm event, is backed-up in an internal binary format in the file system.

Depending on the hardware being used, for the NCU, the alarm log is saved on the CompactFlash Card or for PC/ PCU 50.3, on the hard disk.

NOTICE
If the alarm log is written to the CompactFlash Card for persistent storage, then only a limited number of write cycles is possible. Therefore, ensure that the storage is only performed when there is a justifiable need!

The alarm log is not saved in the default configuration.

Set filter properties

You can filter alarms and messages according to your requirements.

Configuring an alarm log

1. From the user interface in the "Diagnostics" operating area
2. In the configuration file
14.4 Configuring an alarm log

14.4.1 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 raised and cleared 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 0 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 that the alarm log is backed-up (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.

<table>
<thead>
<tr>
<th>NOTICE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Limited number of write cycles</strong></td>
</tr>
</tbody>
</table>

Depending on the type of hardware used, the alarm log is either written to the hard disk or to a CompactFlash card.

The CompactFlash card, in particular only has a limited number of write cycles. Make sure you undo the setting "on every event" if you no longer require storage of the alarm log.
14.4.2 Loading alarm log via configuration file

Create configuration file

Adjustments are made in file "slaesvconf.xml".

1. You can copy a sample configuration file "oem_alarmprot_slaesvconf.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 "slaesvconf.xml" to the file.
4. Open the file and enter the number of events to be output in the tag <Records type .../>. The preset value is 500. The maximum number depends on the storage medium (hard disk or CompactFlash card).
5. Enter the backup mode in the <DiskCare type="int" value="-1"/> tag. The following values are possible:
   -1: There is no saving 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).
6. 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 must be 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 an entry even when this is presently not recognizable in the alarm log.
Filter properties

A filter consists of the following three elements <identification> <relation> <value>.

<table>
<thead>
<tr>
<th>Entry &lt;identification&gt;</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AlarmID</td>
<td>Alarm number</td>
</tr>
<tr>
<td>SourceID:</td>
<td>Take the pre-assigned SourceID and -URL from the table in Chapter Range of alarms (Page 194).</td>
</tr>
<tr>
<td>SourceURL:</td>
<td></td>
</tr>
<tr>
<td>&lt;Attribute name&gt;:</td>
<td>Arbitrary alarm attribute from the &quot;slaedatabase.xml&quot; file, such as &quot;SEVERITY&quot; or &quot;CLEARINFO&quot;.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Entry &lt;relation&gt;</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>EQUAL</td>
<td>Equal to</td>
</tr>
<tr>
<td>NOT</td>
<td>Not equal to</td>
</tr>
<tr>
<td>LOWER</td>
<td>Less than</td>
</tr>
<tr>
<td>HIGHER</td>
<td>Greater than</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Entry &lt;value&gt;</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Numbers</td>
<td></td>
</tr>
<tr>
<td>Character strings</td>
<td></td>
</tr>
</tbody>
</table>

Cancel criteria

<table>
<thead>
<tr>
<th>Cancel criterion (ClearInfo)</th>
<th>Alarm source (Source)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>HMI</td>
<td>Alarms that are canceled by the HMI.</td>
</tr>
<tr>
<td>1</td>
<td>NCK</td>
<td>Alarms that are canceled by power-on of the NCU.</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>Conditions are canceled by a hardware reset of the NCU.</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>Conditions are canceled by a cancel command to the NCU.</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>Conditions are canceled by the NCK itself.</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>Conditions are canceled by an &quot;NC Start&quot; command on the NCU.</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>Conditions are canceled by a reset of the mode group (BAG).</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>Conditions are canceled by an &quot;NC Reset&quot; command on the NCU.</td>
</tr>
<tr>
<td>8</td>
<td>PLC</td>
<td>PLC messages of the FB15 (basic program)</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td>PLC alarms of the FB15 (basic program)</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>Dialog alarms of the HMI that are canceled by the &quot;Recall&quot; key [*].</td>
</tr>
<tr>
<td>11</td>
<td></td>
<td>Reserved</td>
</tr>
</tbody>
</table>
Configuring machine data/alarms

14.4 Configuring an alarm log

<table>
<thead>
<tr>
<th>Cancel criterion (ClearInfo)</th>
<th>Alarm source (Source)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>S7-PDiag, S7-Graph, S7-HiGraph or other Alarm_S(Q) alarms of the PLC (SFC17/18) with alarm state “not acknowledged”</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>S7-PDiag, S7-Graph, S7-HiGraph or other Alarm_S(Q) alarms of the PLC (SFC17/18) with alarm state “acknowledged”.</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Drive (NCK)</td>
<td>Drive alarms via NCK</td>
</tr>
<tr>
<td>15</td>
<td></td>
<td>Part program messages</td>
</tr>
</tbody>
</table>

**Examples**

Log all alarms with a ClearInfo not equal to 15, i.e. no part program messages:

```xml
<CONFIGURATION>
  <Protocol>
    <Filters>
      <Siemens_Filter_01 type="QString" value="CLEARINFO NOT 15" />
    </Filters>
  </Protocol>
</CONFIGURATION>
```

Log all alarms with the SourceURL "/NCK" or "/HMI":

```xml
<CONFIGURATION>
  <Protocol>
    <Filters>
      <Filter_01 type="QString" value="SourceURL EQUAL /NCK" />
      <Filter_02 type="QString" value="SourceURL EQUAL /HMI" />
    </Filters>
  </Protocol>
</CONFIGURATION>
```

Log all alarms with a “SEVERITY greater than 10” and “less than 500”:

```xml
<CONFIGURATION>
  <Protocol>
    <Filters>
      <Filter_01 type="QString" value="SEVERITY HIGHER 10 AND SEVERITY LOWER 500" />
    </Filters>
  </Protocol>
</CONFIGURATION>
```
14.4 Configuring an alarm log

Note
The "Siemens_Filter_01" filter is reserved for Siemens.

In the <FilePath> tag, adapt the path and file name for the file in which the alarm log is stored persistently:

```xml
<CONFIGURATION>
  <Protocol>
    <Filters>
      <FilePath type="QString" value="$(HMI_INSTALL_DIR)user/sinumerik/hmi/log/alarm_log/slaepp_" />
    </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 3-digit number and the file extension "hmi" are automatically added to the specified file name during operation, e.g. "slaep_123.xml". 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.

NOTICE
The CompactFlash card only allows a limited number of write cycles! Therefore, ensure that the storage is only performed when there is a justifiable need! The alarm log is not saved in the default configuration.

Restart SINUMERIK Operate
Restart the operating software, as the conversion is only made when powering-up.
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 "slaesvcadapconf.xml" configuration file.

You can copy this area from the original file. The "slaesvcadapconf.xml" file is in the following directory: /siemens/sinumerik/hmi/base

Setting

In the <MissingTextWarning type="bool" value="FALSE"/> tag, deactivate/activate the warning.

<table>
<thead>
<tr>
<th>Entry</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRUE</td>
<td>The warning is displayed.</td>
</tr>
<tr>
<td>FALSE</td>
<td>The warning is deactivated.</td>
</tr>
</tbody>
</table>

Example

```xml
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<CONFIGURATION>
    <ControlFlags>
        <MissingTextWarning type="bool" value="FALSE"/>
    </ControlFlags>
</CONFIGURATION>
```
14.6 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:

<table>
<thead>
<tr>
<th>MD9900 $MM_MD_TEXT_SWITCH</th>
<th>Plain texts instead of MD identifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 1</td>
<td>Plain text is displayed in the table</td>
</tr>
<tr>
<td>= 0</td>
<td>Plain text is displayed in the dialog line</td>
</tr>
</tbody>
</table>

Files

<table>
<thead>
<tr>
<th>File</th>
<th>Machine/setting data</th>
</tr>
</thead>
<tbody>
<tr>
<td>nctea_xxx.txt</td>
<td>General machine/setting data</td>
</tr>
<tr>
<td>chtea_xxx.txt</td>
<td>Channel-specific machine/setting data</td>
</tr>
<tr>
<td>axtea_xxx.txt</td>
<td>Axis-specific machine/setting data</td>
</tr>
<tr>
<td>hmitea_xxx.txt</td>
<td>Display machine data</td>
</tr>
</tbody>
</table>

For "xxx" the specified language code must be used, e.g. "deu" for German, "eng" for English, etc.

Supported languages (Page 502)

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 Mein Integer-Text für PLC_MD 14510

Result in the display

The plain text is displayed in the table or in the diagnostics line in the operating area "Startup", "General MD".

<table>
<thead>
<tr>
<th>Machine data</th>
<th>Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>14510</td>
<td>My integer text for PLC_MD 14510</td>
</tr>
</tbody>
</table>
Data backup

The following times are recommended for performing a data backup:

- After commissioning
- After changing machine-specific settings
- After the replacement of a hardware component
- For a software upgrade
- Before activation of memory-configuring machine data.

**Note**

Series machine startup data is saved in a file of type .arc (archive). If required, archives can be processed using the SinuCom commissioning and service tool SinuCom ARC.

There are various ways of creating and reloading archives via the SINUMERIK Operate user interface.

- Data can be selected specifically in the data tree and backed up using the "System data" softkey.
- The following selection is offered via the "Series startup" softkey:
  - Creating and reading in series startup
  - Creating PLC hardware upgrade archive (SDBs only)
  - Creating and reading 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 50.3: F:hmisl\user\sinumerik\data\archive or \oem\sinumerik\data\archive
- All configured logical drives (USB, network drives)

**NOTICE**

**USB FlashDrive**

USB FlashDrives are not suitable as persistent memory media.
15.1 Creating a start-up archive

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. However, it is recommended to save the individual components separately in their own start-up files. It is thus possible to reload them independently of each other.

It is also possible to transfer the backed-up data to other controllers so that they can be updated to the same status.

Precondition

You require, as a minimum, the access rights: Protection level 2 (password: Service).

Data of the control components

<table>
<thead>
<tr>
<th>Control components</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>NC data</td>
<td>Machine data</td>
</tr>
<tr>
<td></td>
<td>Setting data</td>
</tr>
<tr>
<td></td>
<td>Option data</td>
</tr>
<tr>
<td></td>
<td>Global (GUD) and local (LUD) user data</td>
</tr>
<tr>
<td></td>
<td>Tool and magazine data</td>
</tr>
<tr>
<td></td>
<td>Protection zone data</td>
</tr>
<tr>
<td></td>
<td>R parameters</td>
</tr>
<tr>
<td></td>
<td>Work offsets</td>
</tr>
<tr>
<td></td>
<td>Compensation data</td>
</tr>
<tr>
<td></td>
<td>Workpieces, global part programs and subprograms</td>
</tr>
<tr>
<td></td>
<td>Standard and user cycles</td>
</tr>
<tr>
<td></td>
<td>Definitions and macros</td>
</tr>
</tbody>
</table>

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

- OB (organization blocks)
- FB (function blocks)
- SFB (system function blocks)
- FC (functions)
- SFC (system functions)
- DB (data blocks)
- SDB (system data blocks)
## 15.1 Creating a start-up archive

### Control components

| Data | 
|---|---|
| Drive data | Archiving the drive data, either in the binary or ASCII format. |
| HMI data, all | 
| HMI data, selection: | 
| Cycle storage | Definitions and cycles |
| Texts | User texts, alarm texts |
| Templates | Individual templates, workpiece templates |
| Applications | HMI applications, OEM applications |
| Configurations | Configurations |
| Configuration | Configuration, 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 | Programs that are in the user memory area of the CompactFlash card. |
| 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 is opened.

4. Activate the "Start-up" checkbox and press the "OK" softkey.  
   The "Create start-up" window is opened.

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.
7. Press the "OK" softkey.
   The "Generate Archive: Select Archiving" 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 wish to search for a certain directory or
   subdirectory.

   Note: The place holder "*" (replaces any character string) and "?"
   (replaces any character) simplifies the search for you.

   - 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 in order to create a directory.

9. Press the "OK" softkey.
   The "Create 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.
15.2 Reading-in a start-up archive

Procedure

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

   ![](image)
   Press the menu forward key.

2. Press the "Start-up archive" softkey.

3. Activate the "Read-in start-up" checkbox 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" window is opened.
   You obtain an overview with path data, version information as well as a possible name of the archive, date of creation, name of the creator (person who created the file) and comments on the archive file.

6. Press the "OK" software to download the selected archive file.
   The "Read in archive" window opens and a progress message box appears for the read-in process.

7. Press the "Overwrite all" softkey if you wish to overwrite the existing files.
   - OR -
   Press the "No overwriting" softkey if you wish to keep existing files.
   - OR -
Data backup

15.2 Reading-in a start-up archive

Press the “Skip” softkey if you only wish 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.
15.3 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.

   ![Start-up]

   Press the menu forward key.

2. Press the "Start-up archive" softkey.

   The "Start-up" window is opened.

3. Activate "Create PLC hardware upgrade archive (SDBs only)" and press the "OK" softkey.

   The "Create PLC hardware upgrade archive (SDBs only): Select archiving" 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.
15.4 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 controller state as delivered.

As for "Create start-up", control components can be saved individually or jointly.

Precondition

In order to save NC data, you require the access rights: Protection level 2 (password: Service).

To backup programs/workpieces, you need access rights: Protection level 6 (key switch, position 1)

Data of the control components

<table>
<thead>
<tr>
<th>Control components</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>NC data</td>
<td>Machine data</td>
</tr>
<tr>
<td></td>
<td>Setting data</td>
</tr>
<tr>
<td></td>
<td>Option data</td>
</tr>
<tr>
<td></td>
<td>Global (GUD) and local (LUD) user data</td>
</tr>
<tr>
<td></td>
<td>Tool and magazine data</td>
</tr>
<tr>
<td></td>
<td>Protection zone data</td>
</tr>
<tr>
<td></td>
<td>R parameters</td>
</tr>
<tr>
<td></td>
<td>Work offsets</td>
</tr>
<tr>
<td></td>
<td>Compensation data</td>
</tr>
<tr>
<td></td>
<td>Workpieces, global part programs and subprograms</td>
</tr>
<tr>
<td></td>
<td>Standard and user cycles</td>
</tr>
<tr>
<td></td>
<td>Definitions and macros</td>
</tr>
</tbody>
</table>

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.
### Control components

<table>
<thead>
<tr>
<th>PLC data</th>
<th>OB (organization blocks)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>FB (function blocks)</td>
</tr>
<tr>
<td></td>
<td>SFB (system function blocks)</td>
</tr>
<tr>
<td></td>
<td>FC (functions)</td>
</tr>
<tr>
<td></td>
<td>SFC (system functions)</td>
</tr>
<tr>
<td></td>
<td>DB (data blocks)</td>
</tr>
<tr>
<td></td>
<td>SDB (system data blocks)</td>
</tr>
<tr>
<td>HMI data, all</td>
<td></td>
</tr>
<tr>
<td>HMI data, selection:</td>
<td></td>
</tr>
<tr>
<td>Cycle storage</td>
<td>Definitions and cycles</td>
</tr>
<tr>
<td>Texts</td>
<td>User texts, alarm texts</td>
</tr>
<tr>
<td>Templates</td>
<td>Individual templates, workpiece templates</td>
</tr>
<tr>
<td>Applications</td>
<td>HMI applications, OEM applications</td>
</tr>
<tr>
<td>Configurations</td>
<td>Configurations</td>
</tr>
<tr>
<td>Configuration</td>
<td>Configuration, incl. display machine data</td>
</tr>
<tr>
<td>Help</td>
<td>Help files</td>
</tr>
<tr>
<td>Version data</td>
<td>Version data</td>
</tr>
<tr>
<td>Logs</td>
<td>Error logs</td>
</tr>
<tr>
<td>User views</td>
<td>Individually compiled tables with selected machine and setting data.</td>
</tr>
<tr>
<td>Dictionaries</td>
<td>Dictionaries</td>
</tr>
<tr>
<td>Programs on local drive</td>
<td>Programs that are in the user memory area of the CompactFlash card.</td>
</tr>
</tbody>
</table>

### 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 is opened.

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.
15.5 Reading in an archive with original data

The data of the original control 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 the access rights: Protection level 3 (password: end user)

Procedure

1. Select the "Start-up" operating area.
2. Press the menu forward key.
3. Press the "Start-up archive" softkey.
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 carry-out commissioning.
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.
15.6 Serial interface (V24 / RS232)

15.6.1 Reading-in and reading-out archives

You have the option of reading-out and reading-in archives in the "Program Manager" operating area as well as in the "Start-up" operating area via the serial V24 interface.

Availability of the serial V24 interface

- SINUMERIK Operate in the NCU
  The softkeys for the V24 interface are available as soon as option module is connected and the slot is occupied.
- SINUMERIK Operate on PCU 50.3
  The softkeys for the V24 interface are always available.

Reading-out archives

The files to be sent (directories or 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

Only archives can be read-in via the V24 interface. These are transferred and then subsequently unzipped.

Note

Series commissioning archive

If you read-in a series 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 punch tape format. Using the SinuCom commissioning and Servicetool SinuCom ARC, you can process the archive in the binary format and in the series commissioning archive.
Procedure

1. Select the "Program Manager" operating area, and press the "NC" or "Local drive" softkey.

- OR -

Select the "Start-up" 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 "Send V24" softkey.

- OR -

Reading in an archive

Press the "Receive V24" softkey if you wish to read-in files via V24.
15.6.2 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 "V24 settings" softkey. The "Interface: V24" 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.

V24 settings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protocol</td>
<td>The following protocol is supported for transfer via the V24 interface: • RTS/CTS</td>
</tr>
<tr>
<td>Transfer</td>
<td>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.</td>
</tr>
</tbody>
</table>
### Parameter Meaning

**Baud rate**
- Transfer rate: Transfer rates of up to 115 kbaud can be selected. The baud rate that can be used depends on the connected device, the cable length and the general electrical conditions.
  - 110
  - ....
  - 19200 (default)
  - ...
  - 115200

**Archive format**
- Punched tape
- Binary format (PC format)

**V24 settings (details)**

<table>
<thead>
<tr>
<th>Interface</th>
<th>COM1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>COM2 only relevant for SINUMERIK Operate on PC</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parity</th>
<th>Parity bits are used for error detection: The parity bits are added to the coded characters to make the number of positions set to &quot;1&quot; an uneven number (uneven parity) or to an even number (even parity).</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>None (default setting)</td>
</tr>
<tr>
<td></td>
<td>Odd</td>
</tr>
<tr>
<td></td>
<td>Even</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stop bits</th>
<th>Number of stop bits for asynchronous data transfer.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 (default setting)</td>
</tr>
<tr>
<td></td>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Data bits</th>
<th>Number of data bits for asynchronous data transfer.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5 bits</td>
</tr>
<tr>
<td></td>
<td>...</td>
</tr>
<tr>
<td></td>
<td>-8 bits (default setting))</td>
</tr>
</tbody>
</table>

**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.

<table>
<thead>
<tr>
<th>Time monitoring (sec)</th>
<th>Time monitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td>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).</td>
</tr>
</tbody>
</table>
15.7 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:

<table>
<thead>
<tr>
<th>MD11280 $MN_WPD_INI_MODE</th>
<th>Processing mode of ini files in the workpiece directory</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>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:</td>
</tr>
<tr>
<td></td>
<td>CEC</td>
</tr>
<tr>
<td></td>
<td>GUD</td>
</tr>
<tr>
<td></td>
<td>PRO</td>
</tr>
<tr>
<td></td>
<td>RPA</td>
</tr>
<tr>
<td></td>
<td>SEA</td>
</tr>
<tr>
<td></td>
<td>TMA</td>
</tr>
<tr>
<td></td>
<td>TOA</td>
</tr>
<tr>
<td></td>
<td>UFR</td>
</tr>
</tbody>
</table>
16.1 NC/PLC variables

16.1.1 Displaying and editing PLC and NC variables

The "NC/PLC variables" window allows NC system variables and PLC variables to be monitored and changed.

You receive the following list in which you can enter the desired NC/PLC variables in order to display the actual values.

- **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 variable.
  - The columns can be displayed and hidden.

- **Format**
  - Specify the format in which the variable is to be displayed.
  - The format can be specified (e.g. floating point)

- **Value**
  - Displays the actual value of the NC/PLC variables

<table>
<thead>
<tr>
<th>PLC variables</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inputs</td>
<td>Input bit (Ex), input byte (EBx), input word (EWx), input double word (EDx)</td>
</tr>
<tr>
<td>Outputs</td>
<td>Output bit (Ax), output byte (ABx), output word (AWx), output double word (ADx)</td>
</tr>
<tr>
<td>Bit memory</td>
<td>Memory bit (Mx), memory byte (MBx), memory word (MWx), memory double word (MDx)</td>
</tr>
<tr>
<td>Times</td>
<td>Time (Tx)</td>
</tr>
<tr>
<td>Meters</td>
<td>Counter (Cx)</td>
</tr>
<tr>
<td>Data</td>
<td>Data block (DBx); data bit (DBXx); data byte (DBBx); data word (DBWx); data double word (DBDx)</td>
</tr>
</tbody>
</table>
16.1 NC/PLC variables

### Formats

<table>
<thead>
<tr>
<th>Format</th>
<th>Notation</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>Binary</td>
</tr>
<tr>
<td>H</td>
<td>Hexadecimal</td>
</tr>
<tr>
<td>D</td>
<td>Decimal without sign</td>
</tr>
<tr>
<td>+/-D</td>
<td>Decimal with sign</td>
</tr>
<tr>
<td>F</td>
<td>Floating point (for double words)</td>
</tr>
<tr>
<td>A</td>
<td>ASCII character</td>
</tr>
</tbody>
</table>

### Notation for variables

- **PLC variables**
  - EB2
  - A1.2
  - DB2,DBW2
- **NC variables**
  - NC system variables - notation
    - $AA_IM[1]$
  - User variables/GUDs - notation
    - GUD/MyVariable[1,3]
  - OPI - notation
    - /CHANNEL/PARAMETER/R[u1,2]

### Note

**NC system variables and PLC variables**

- System variables can be dependent on the channel. When the channel is switched over, the values from the corresponding channel are displayed.
- For user variables (GUDs) it is not necessary to make a specification according to global or channel-specific GUDs. The indices of GUD arrays are, just like NC variables in the system variable syntax, 0-based; this means that the first element starts with the index 0.
- Using the tooltip, for NC system variables, you can display the OPI notation (with the exception of GUDs).
Changing PLC variables

Changes can only be made to the PLC variables with the appropriate password.

⚠️ DANGER

Changes in the states of NC/PLC variables have a major impact on the machine. Incorrect configuration of the parameters can endanger human life and cause damage to the machine.

Changing and deleting values

1. Select the "Diagnostics" operating area.

2. Press the "NC/PLC variab." softkey.

   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 is opened. The information for "Variable", "Comment" and "Value" are displayed in the full length.

6. Position the cursor in the "Format" field and choose 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 again.

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 of the 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 groups-variables) using the "Filter" selection box and/or select the desired variable using the "Search" input box.

Press the "Delete all" softkey if you would like to delete the entries for the operands.

11. Press the "OK" softkey to confirm the changes or the deletion.

- OR -

Press the "Cancel" softkey to cancel the changes.

---

**Note**

"Filter/Search" when inserting variables

The start value for "Filter/Search" of variables differs.

For example, to insert the variable $R[0], set "Filter/Search":

- 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.

---

**Changing operands**

Depending on the type of operand, you can increment or decrement the address by 1 place at a time using the "Operand +" and "Operand -" softkeys.

**Note**

Axis names as index

For axis names, the softkeys "Operand +" and "Operand -" do not act as index, e.g. for $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]
16.1.2 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, they 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.
16.1.3 Generating and loading PLC symbols

16.1.3.1 Generating PLC symbols

You also have the option of processing PLC information via symbols. In this case, you must first create the symbols of the corresponding PLC projects and then generate them for SINUMERIK Operate so that they can then be loaded for processing?

Precondition

You require the SIMATIC STEP 7 software and the "Plc Symbols Generator" program (this is provided in the Toolbox).

Procedure

- Generating PLC symbols:
  Using STEP 7, generate the symbol tables and the texts for the symbols of the PLC project.
- Loading PLC symbols:
  The symbols are provided and can be loaded via SINUMERIK Operate user interface.

Generating PLC symbols

1. In the SIMATIC Manager, start the STEP 7 program (S7_Pro1).
2. Under SINUMERIK, open the corresponding PLC directory and the "Symbols".
   The symbols are then generated in the symbol table and assigned to the corresponding addresses.
3. Open the "PLC Symbols Generator" and navigate to the corresponding PLC project.
4. First select the "PlcSym.snh" file and then start the generation.
5. Then select the "PlcSym_GR.snt" file and start the generation.
   The generated files are saved on the CompactFlash Card in the following directory:
   /oem/sinumerik/plc/symbols.
16.1.3.2 Load symbols

PLC data can also be edited via symbols.

To do this, the symbol tables and texts for the symbols in the PLC project must have been suitably prepared (STEP7) and made available in SINUMERIK Operate.

Preparing PLC data
Save the generated files in the /oem/sinumerik/plc/symbols directory.

Procedure

1. The variable view is opened.

2. Press the ">>" and "Load icons" softkeys. The "Import PLC symbols: *.snh" window opens.

3. In the folder "/oem/sinumerik/plc/symbols", select the "PlcSym.snh" file to import the symbols and then click on "OK".

4. In the folder "/oem/sinumerik/plc/symbols", select the "PlcSym.snt" file to import the symbols and then press the "OK" softkey. You will obtain an appropriate note if the tables were successfully imported.

5. Press the "OK" softkey. You return to the "NC/PLC variables" window.

6. Restart the SINUMERIK Operate in order to activate the files.
16.2 Displaying the Service overview

The status of each machine axis is displayed in the "Service Overview" window. Information for up to 31 machine axes can be displayed. A column for each available axis is created for this purpose.

Status displays

<table>
<thead>
<tr>
<th>Display icon</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green</td>
<td>The axis is behaving normally.</td>
</tr>
<tr>
<td>Yellow</td>
<td>The axis is not ready.</td>
</tr>
<tr>
<td>Red</td>
<td>An alarm is pending for this axis.</td>
</tr>
<tr>
<td>Gray</td>
<td>The axis is not affected.</td>
</tr>
<tr>
<td>Dash</td>
<td>No drive assigned to axis.</td>
</tr>
<tr>
<td>Special characters</td>
<td>Error when reading the data, e.g. if data is not available.</td>
</tr>
</tbody>
</table>

Enable displays

From NC: On/Off1
From NC: Off2
From NC: Off 3
From the drive: Operation enabled
From the infeed: Enable operation
Pulse enable NC
Speed controller enable NC
Enable pulses
Drive ready
Heat sink temperature
Power section in i²t limiting
Motor temperature
Measuring system 1 active
Measuring system 2 active
16.2 Displaying the Service overview

Procedure

1. Select the "Diagnostics" operating area.

2. Press the menu forward key.
   New horizontal softkeys are displayed.

   The "Service Overview" window opens.

16.2.1 Selecting axes

To display certain enables and statuses of machine axes, you can arrange a selection of all the axes that are available in any order you wish.

Procedure

1. Select the "Diagnostics" operating area.

2. Press the menu forward key.
   New horizontal softkeys are displayed.

   The "Service overview" window opens.

4. Press the "Change overview" softkey.
   A new softkey bar is displayed.

5. If you want to display the information relating to the axes that are active, press the "Active axes" softkey. This will display the axes to which a real drive is assigned.
   - OR -
   Press the "All axes" softkey if you want the information for all axes to be displayed. This will display all the axes that are defined in at least one channel.
   - OR -
   Press the "Change selection" softkey if you want to make a new axis selection to be displayed.
   The "Change selection" window opens and the previous axis list is displayed.
6. Enter the required axes.
The axes entered must be separated by blanks.

7. Press the "OK" softkey to confirm your selection.

8. If you press the "Select, axes" softkey, the axes configured with "Change selection" will be displayed.

9. If you click the "Back" softkey, you will return to the "Service overview" main screen.

### 16.2.2 Axis diagnosis

The information in the "Service axis/Spindle" window is used to

- check the setpoint branch (e.g. position setpoint, speed setpoint, spindle speed setpoint prog.)
- check the actual-value branch (e.g. actual position value, measuring system ½, actual speed value), optimize the position control loop of the axis (e.g. following error, control difference, servo gain factor)
- check the entire control loop of the axis (e.g. through position setpoint/actual-value comparison and speed setpoint/actual-value comparison)
- check hardware faults (e.g. encoder check: if the axis is moved mechanically, the actual position value must change)
- set and check axis monitoring functions.

### References

CNC Commissioning Manual: NCK, PLC, drive

### Procedure

1. Select the "Diagnostics" operating area.

2. Press the menu forward key.
New horizontal softkeys are displayed.

The "Service Overview" window opens.
4. Press the "Service axis" softkey.
The "Service Axis/Spindle" window opens.

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

- 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.
16.3 System utilization

For the NC areas you can display the system resources (utilization display) currently being used:

- Runtime for the position controller, interpolator and pre-processing are displayed
- Time required for synchronized actions

**Machine manufacturer**

Please observe the machine manufacturer’s data for the display of the time required for synchronized actions.

- Position controller and interpolator NC load
- Interpolator buffer level

**Procedure**

1. Select the "Diagnostics" operating area.
2. Press the menu forward key.
   New horizontal softkeys are displayed.
3. Press the "System utilization" softkey.
   The "System Utilization" window appears.
   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.
16.4 Displaying the time required for synchronized actions

General machine data

If you wish to display the utilization evaluation across synchronized actions in the operating area "Diagnostics", "System utilization", then set the general machine data as follows:

<table>
<thead>
<tr>
<th>MD11510_$MN_IPO_MAX_LOAD</th>
<th>Maximum permissible IPO load</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 0</td>
<td>The time required for synchronized actions is activated and the line &quot;Time required for synchronized actions&quot; is displayed with the actual values.</td>
</tr>
<tr>
<td>= 0</td>
<td>Display deactivated (default value)</td>
</tr>
</tbody>
</table>
16.5 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 run in ascending order from

"SCR_SAVE_0001.png" to "SCR_SAVE_9999". You can create up to 9,999
screenshots.

**Copy file**

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

2. Press the "System data" softkey and open the specified folder.

As you cannot open screenshots in SINUMERIK Operate, you must

- copy the files to a Windows PC either via "WinSCP" or via a USB
  FlashDrive.

You can open the files using a graphics program, e.g. "Office Picture
Manager".
16.6 **Machine identity**

You can store important information about the machine electronically that until now has only been available on paper for the end user notification administration (EUNA). This information can be viewed and/or transferred directly to EUNA (End User Notification Administration) via the set-up drives during servicing.

You can store the following data for each machine:

- Machine type
- Machine number
- Manufacturer information
- Dealer information
- End user information

You enter the machine information and address information in the "machine identity" window. The information can be either manually entered or using selection files.

### Machine information

<table>
<thead>
<tr>
<th>Entries</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Machine No.</td>
<td>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.</td>
</tr>
<tr>
<td>Machine name</td>
<td>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.</td>
</tr>
<tr>
<td>Machine type</td>
<td>Machine type.</td>
</tr>
</tbody>
</table>

### 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
16.6 Machine identity

16.6.1 Entering machine-specific information

Preconditions

You must have the following access rights to be able to enter or change machine-specific information.

- Access rights: Protection level 1 (password: Machine manufacturer)
- Access rights: Protection level 2 (password: Service)
- Access rights: Protection level 3 (password: end 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" and "Change" softkeys.
   The "Machine Identity" window opens.

4. Press the softkey "Manufacturer" if you want to acquire and store manufacturer-specific data.
   If you press the "Manufacturer" softkey again, the softkey changes to "Manufacturer branch".
   - OR / AND -
   Press the softkey "Manufacturer branch" if you want to acquire and store address data of the manufacturer branch.
   Pressing the softkey once again changes it back to "Manufacturer".
   - OR / AND -
   Press the softkey "Dealer" if you want to acquire and store dealer-specific data.
   - OR / AND -
Press the softkey "End user" if you want to acquire and store user-specific data.

5. Enter the address data in the following text fields.

- OR -

If selection files exist, all unique information will automatically be set to valid for the system when you press the "OK" softkey. The entries are stored in the operating software.

See also

Defining 1st startup (Page 251)
Defining 2nd start-up (Page 252)
Making a logbook entry (Page 252)

16.6.2 Creating a selection file

Using the selection files, you can prepare the machine information and address information and transfer it into the control. This means that it does not have to be manually entered.

If there is only one entry in the selection file, then the control uses this entry as default value.

Selection files

You can store the following selection files in the control:

- "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

Templates

Templates for selection files are available under the directory /HMI-data/templates/examples/machine identity.

In future, EUNA data will also be available, which you can store in the controller. This therefore ensures that the address information is clear.
Service and diagnostics
16.6 Machine identity

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 so that you can edit them more easily there.
5. After editing, copy the files to a data carrier so that these can then be
   transferred to the control.
6. Insert the copies into the folder
   /HMI-data/templates/manufacturer/machine identity.

Note
- If you have only specified one address or one machine type, the data
  is automatically entered in the input fields when the window opens.
- If you have entered several addresses or machine types, they 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 can acquire the address data of any number of dealers in file "dealer.xml". If you wish to enter additional dealers, for each dealer, copy the area <Dealer> to <Dealer>.

```xml
<?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 can list the address data of any number of manufacturers in the "oem.xml" file. If you wish to enter additional manufacturers (OEMS), for each dealer, copy the area <Manufacturer> to </Manufacturer>.

You can list the address data of any number of OEM regional offices in the "oemsubs.xml" file. If you wish to enter additional regional offices, copy the area <Manufacturer-Subsidiary> to </Manufacturer-Subsidiary>.

You can list the address data of any number of users in the "user.xml" file. If you wish to enter additional users, copy the area <User> to </User>.

Example of file "ma_types.xml"

You can acquire the available machine types in file "ma_types.xml".

```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>
```
16.6 Machine identity

16.6.3 Reading in a selection file

You can directly read-in your selection files into the control. Depending on the configuration, files can be selected and imported from a local drive, network drive or USB. The data are then automatically copied into the following folder: /oem/sinumerik/hmi/template/identity.

Selection files

This procedure applies for the following selection files:

<table>
<thead>
<tr>
<th>File</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>ma_types.xml</td>
<td>Machine types</td>
</tr>
<tr>
<td>dealer.xml</td>
<td>Dealer's data</td>
</tr>
<tr>
<td>oem.xml</td>
<td>Manufacturer's data</td>
</tr>
<tr>
<td>oemsubs.xml</td>
<td>Manufacturer's data of a regional office</td>
</tr>
<tr>
<td>user.xml</td>
<td>End customer data</td>
</tr>
</tbody>
</table>

Additional information on the selection files is provided in Chapter: Creating a selection file (Page 243)

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" and "Change" softkeys.

4. Press the "Import data" softkey. The "Read-in selection files: Select file(s)" window is opened.

5. Select the appropriate drive and the required file(s).

6. Press the "OK" softkey, the file is automatically copied to the correct location in the system.
16.6 Machine identity

Note
Effectiveness of the selection file

A file selection (e.g. oem.xml) only becomes effective if you have still not saved any files in this area (e.g. manufacturer). In spite of this, if you download a new selection file, delete all of the fields of the area that have been completed and confirm the procedure using the "OK" softkey.

16.6.4 Save information

All the machine-specific information of the controller is combined in a configuration via the user interface. You can save 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. The following options are available:

- In the "Name:" text 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.
- In text field "Comment", you can add a comment, which is stored with the configuration data.

Select the following via a checkbox:

- Version data (.TXT): Output of pure version data in text format.
- Configuration data (.XML): Output of configuration data in XML format. The configuration file contains the data you entered under Machine identity, the license requirements, the version information and the logbook entries.

7. Press the "OK" softkey to start the data transfer.

16.6.5 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 the access rights: Protection level 2 (password: Service), to supplement additional 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:

<table>
<thead>
<tr>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>NCU/PLC</td>
</tr>
<tr>
<td>Operator Panel</td>
</tr>
<tr>
<td>PLC-peripheral devices</td>
</tr>
<tr>
<td>Drive/Motor</td>
</tr>
<tr>
<td>Cable</td>
</tr>
<tr>
<td>Accessories/Miscellaneous</td>
</tr>
</tbody>
</table>
You record the following data in the "Enter Additional Components (Configuration Data)" window.

<table>
<thead>
<tr>
<th>Entries</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Hardware designation</td>
</tr>
<tr>
<td>Version</td>
<td>Version of the program</td>
</tr>
<tr>
<td>Order No.[MLFB]</td>
<td>Order number</td>
</tr>
<tr>
<td>Serial number</td>
<td>Serial number</td>
</tr>
<tr>
<td>Number</td>
<td>Number of components</td>
</tr>
</tbody>
</table>

### 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 appears.


   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 EUNA 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. They are read-in according to the CSV format of the parts list from EUNA. 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+.

16.6.6 Configuration data

The machine-specific information is stored in the configuration data. This file saved in the XML format provides the basis for further processing in EUNA.

- The data can be read by remote diagnostics.
- The data can also be transferred directly to EUNA, e.g. via network or USB FlashDrive.

Configuration data

The configuration data includes:

- Machine-specific data that is stored in the "Machine identity" dialog box, see Machine identity (Page 241)
- Hardware/software versions that are stored in the "Versions" dialog box, see Adding hardware components (Page 248)
- Options requiring licenses, which are stored in the "Licensing" dialog box, see Licensing (Page 25)
- Logbook, whose entries are stored in the "Logbook" dialog box, see Logbook (Page 251)

Storage path

Depending on how the drives have been configured, the configuration data can be stored in the available directories.
16.7 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.

16.7.1 Defining 1st 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.

See also

Entering machine-specific information (Page 242)
16.7.2 Defining 2nd 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.

See also

Entering machine-specific information (Page 242)

16.7.3 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

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.
Service and diagnostics
16.7 Logbook

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
Once you have stored an entry this can no longer be changed or deleted.

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 "Search..." softkey and 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.
3. 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.
16.8 **Action log**

16.8.1 **Settings for 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.

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**

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Logging on</td>
<td>Logging is activated or deactivated.</td>
</tr>
<tr>
<td>Alarm status change</td>
<td>Incoming and outgoing alarms are logged.</td>
</tr>
<tr>
<td>Keyboard actions</td>
<td>All actions on the operator panel front and on an external keyboard are logged.</td>
</tr>
<tr>
<td>Channel status change</td>
<td>NC/PLC states are logged via the information channel status.</td>
</tr>
<tr>
<td></td>
<td>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.</td>
</tr>
<tr>
<td>Window switchover</td>
<td>The form and dialog names (assigned by the programmer) are logged each time a window is opened or closed.</td>
</tr>
<tr>
<td>Writing NCK/PLC data</td>
<td>The writing of NCK and PLC variables is logged.</td>
</tr>
<tr>
<td>File access</td>
<td>Copying to the NC is logged.</td>
</tr>
<tr>
<td>Function calls in the NCK (PI service)</td>
<td>Some program sequences, for example, ASUB, are logged.</td>
</tr>
<tr>
<td>Curr. program status</td>
<td>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.</td>
</tr>
</tbody>
</table>
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 to be 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 time 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

The "actual_crashlog.com" is a backup file of the actual log when a critical event occurs (for example, Emergency Off 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

<table>
<thead>
<tr>
<th>DB19 (PLC → HMI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit 7</td>
</tr>
<tr>
<td>DBB00</td>
</tr>
</tbody>
</table>
**16.8 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.

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.

**See also**

Displaying the log file (Page 256)

**16.8.2 Displaying the log file**

Loggable data that was logged when the action log function was active are 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 on 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.

16.8.3 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.
16.8 Action log

16.8.4 Storing a log

You can store the displayed log in any directory you select. It is stored as a binary file as well as ASCII file. You can read an ASCII file with any editor.

The following logs are generated:
- action.com (binary file)
- action.log (ASCII file)
- crash.com (binary file)
- crash.log (ASCII file)

Precondition

The relevant log file is open.

Procedure

1. Press the "Save Log" softkey. The "Please Select the Target Directory" window opens in which you can select a storage location.
2. Press the "New Directory" softkey if you want to create a new folder in one of the listed directories.
3. Press the "OK" softkey.

Note

The "Save Log" softkey is only available for files that have not yet been saved.

16.8.5 Structure of a log file

Content of the log file

The following data are recorded for every logged event:

<table>
<thead>
<tr>
<th>HMI version</th>
<th>Entry keyword</th>
<th>NCK version</th>
<th>Date/time</th>
</tr>
</thead>
<tbody>
<tr>
<td>System</td>
<td>Entry text</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>DETAILS</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 16.8 Action log

<table>
<thead>
<tr>
<th>Entry</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HMI and NCK version output</td>
<td></td>
</tr>
<tr>
<td><strong>System:</strong></td>
<td></td>
</tr>
<tr>
<td>HMI</td>
<td>Keystrokes, window change</td>
</tr>
<tr>
<td>NCK</td>
<td>Write variables, PI services</td>
</tr>
<tr>
<td>MSG</td>
<td>Alarm entries</td>
</tr>
<tr>
<td>USR</td>
<td>Entries generated by the machine manufacturer for the user</td>
</tr>
<tr>
<td>ERR</td>
<td>Action log error, e.g. log file not found</td>
</tr>
<tr>
<td><strong>Entry keyword:</strong></td>
<td></td>
</tr>
<tr>
<td>HMI_START</td>
<td>Entry of an HMI boot</td>
</tr>
<tr>
<td>HMI_EXIT</td>
<td>Entry of an HMI shutdown</td>
</tr>
<tr>
<td>PLC_CRASH</td>
<td>Entry of a PLC crash</td>
</tr>
<tr>
<td>KEY_PRESSED</td>
<td>Entry of a keystroke</td>
</tr>
<tr>
<td>KEY_HOLD</td>
<td>Entry of a key hold</td>
</tr>
<tr>
<td>KEY_RELEASED</td>
<td>Entry of a key released</td>
</tr>
<tr>
<td>ALARM_ON</td>
<td>Entry of an incoming alarm event</td>
</tr>
<tr>
<td>ALARM_OFF</td>
<td>Entry of an alarm going event</td>
</tr>
<tr>
<td>ALARM_ACK</td>
<td>Entry of an alarm acknowledgement event</td>
</tr>
<tr>
<td>OPEN_WINDOW</td>
<td>Entry of a window opening</td>
</tr>
<tr>
<td>CHN_STATE_CHANGED</td>
<td>Entry of a channel status change</td>
</tr>
<tr>
<td>OPMODE_CHANGED</td>
<td>Entry of an operating mode change</td>
</tr>
<tr>
<td>TOOL_CHANGED</td>
<td>Entry of a tool change</td>
</tr>
<tr>
<td>OVERRIDE_CHANGED</td>
<td>Entry of override changes</td>
</tr>
<tr>
<td>DOM_CMD</td>
<td>Entry of a download to the NC</td>
</tr>
<tr>
<td>PI_CMD</td>
<td>Entry of a PI service</td>
</tr>
<tr>
<td>WRITE_VAR</td>
<td>Entry of a write to NCK/PLC variable</td>
</tr>
<tr>
<td>AREA_CHANGED</td>
<td>Entry of an area changeover</td>
</tr>
<tr>
<td>NC_CONNECTION</td>
<td>Entry of an coming/going NC connection</td>
</tr>
<tr>
<td>USER</td>
<td>User entry via the OEM interface</td>
</tr>
<tr>
<td>ACTIVATED</td>
<td>Action log was activated</td>
</tr>
<tr>
<td>DEACTIVATED</td>
<td>Action log was deactivated</td>
</tr>
<tr>
<td>INTERNAL</td>
<td>Internal action log entry</td>
</tr>
<tr>
<td><strong>Date/time</strong></td>
<td>Date and time of the event</td>
</tr>
<tr>
<td>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 &quot;.&quot;.</td>
<td></td>
</tr>
<tr>
<td><strong>Entry text</strong></td>
<td>Event data are written in plain text.</td>
</tr>
<tr>
<td><strong>DETAILS</strong></td>
<td>If additional information regarding an entry is know, e.g. a recorded IPO trace.</td>
</tr>
</tbody>
</table>
16.8 Action log

Example

NCK WRITE_VAR  18.02.2009 09:40:12
cul.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

<table>
<thead>
<tr>
<th>MSG</th>
<th>ALARM</th>
<th>Date/time</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No.</th>
<th>Deletion criterion</th>
<th>Text</th>
<th>DETAILS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**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 | Acknowledgment using HMI
PLC | Acknowledge 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: 
1 /_N_MPF0 
Invoc 0 Offset 0
16.8 Action log

16.8.6 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
16.9 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. 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.
16.10 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 modify them.

PROFIBUS connections

- DP1 X126
- DP2 X136
- DP integrated

<table>
<thead>
<tr>
<th>Display</th>
<th>Meaning/Information</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Status</strong></td>
<td>Status of the configuration</td>
</tr>
<tr>
<td>Configuration ok</td>
<td>Green: DP master has ramped up</td>
</tr>
<tr>
<td></td>
<td>Red: Incorrect response / no communication</td>
</tr>
<tr>
<td>Bus status</td>
<td>POWER ON: Status after the controller is switched on.</td>
</tr>
<tr>
<td></td>
<td>OFFLINE: Basic initialization has been performed.</td>
</tr>
<tr>
<td></td>
<td>STOP: Start in accordance with the hardware configuration (SDB).</td>
</tr>
<tr>
<td></td>
<td>CLEAR: 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.</td>
</tr>
<tr>
<td></td>
<td>OPERATE: Cyclic data exchange with the PROFIBUS slaves running.</td>
</tr>
<tr>
<td></td>
<td>ERROR: A fatal error had been detected (e.g. invalid or faulty SDB)</td>
</tr>
<tr>
<td><strong>Bus configuration</strong></td>
<td>S7 Subnet ID of the PROFIBUS subnet</td>
</tr>
<tr>
<td>S7 Subnet ID</td>
<td>S7 Subnet ID</td>
</tr>
<tr>
<td>Baudrate in MBd</td>
<td>Transmission rate</td>
</tr>
<tr>
<td>Cycle time in msec</td>
<td>Configured bus-cycle time; also defines the position controller cycle at the same time</td>
</tr>
<tr>
<td>Sync. Component (TDX) in msec</td>
<td>Configured period for the cyclic data exchange within a PROFIBUS DP cycle</td>
</tr>
<tr>
<td><strong>PROFIBUS diagnostics/slaves</strong></td>
<td>Configured DP address of the DP slave</td>
</tr>
<tr>
<td>Slave no. (DP address)</td>
<td>Configured DP address of the DP slave</td>
</tr>
<tr>
<td>Assignment</td>
<td>Information whether the DP slave is assigned to the NC or to the PLC</td>
</tr>
<tr>
<td></td>
<td>NC: e.g. one or more drives controlled by the NC.</td>
</tr>
<tr>
<td></td>
<td>PLC: e.g. I/O peripherals or an axis controlled by the PLC.</td>
</tr>
<tr>
<td></td>
<td>NC/PLC (for DP integrated)</td>
</tr>
<tr>
<td>active on the bus</td>
<td>Information whether the DP slave is identified on the bus</td>
</tr>
<tr>
<td></td>
<td>Green: DP slave has been detected on the PROFIBUS DP and the data exchange is working error-free with the assigned component (NC and/or PLC)</td>
</tr>
<tr>
<td></td>
<td>Red: Incorrect response / no communication</td>
</tr>
</tbody>
</table>
Service and diagnostics

16.10 PROFIBUS diagnosis

<table>
<thead>
<tr>
<th>Display</th>
<th>Meaning/Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Synchr. with NC</td>
<td>Information whether the DP slave is running synchronously to NC on the bus.</td>
</tr>
<tr>
<td>Green:</td>
<td>DP slave runs synchronously to NC on the PROFIBUS DP, i.e. there is an isochronous data exchange.</td>
</tr>
<tr>
<td>Red:</td>
<td>Incorrect response / no communication</td>
</tr>
<tr>
<td>Gray:</td>
<td>DP slave is not assigned to the NC, but to the PLC</td>
</tr>
<tr>
<td>Number of slots</td>
<td>Number of configured slots within the DP slave</td>
</tr>
</tbody>
</table>

References

Further information about the configuration of the properties of the network interface for PROFIBUS can be found in the following:

CNC Commissioning Manual: NCK, PLC, Drives, SINUMERIK 840D sl, SINAMICS S120

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. If several PROFIBUS connections have been configured, press the "Bus -" or "Bus +" softkey to select the desired configuration.

   - OR -

   Press the "Select bus" softkey and in the list that is displayed, select the required configuration.

   Press the "OK" softkey.
16.10 PROFIBUS diagnosis

16.10.1 Displaying details for DP slaves

Further information about the slots of a selected DP slave is displayed here.

<table>
<thead>
<tr>
<th>Display</th>
<th>Meaning/Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slave</td>
<td></td>
</tr>
<tr>
<td>Slave no. .....</td>
<td>The DP slaves selected in the PROFIBUS Diagnostics / Slaves pane with information on</td>
</tr>
<tr>
<td></td>
<td>the NC or PLC assignment.</td>
</tr>
<tr>
<td>Slots</td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Slot number within the DP slave</td>
</tr>
<tr>
<td>I/O address</td>
<td>I/O address in the I/O address space of the PLC assigned to this slot.</td>
</tr>
<tr>
<td></td>
<td>For NC axes, the setpoint and the actual value must always be configured on the same</td>
</tr>
<tr>
<td></td>
<td>I/O address.</td>
</tr>
<tr>
<td>Logical drive no.</td>
<td>Drive number specified in the NC machine date for the axis.</td>
</tr>
<tr>
<td>Length (bytes)</td>
<td>Length of the I/O area reserved for the slot in the STEP7 I/O address space.</td>
</tr>
<tr>
<td>Type</td>
<td>Specification, whether the slot is input, output or diagnostic slot. If the slot</td>
</tr>
<tr>
<td></td>
<td>is assigned to an NC axis, then the output is always denoted as setpoint value and the</td>
</tr>
<tr>
<td></td>
<td>input always as actual value.</td>
</tr>
<tr>
<td>Machine axis</td>
<td>Display of the name defined in the machine data for this slot. If the slot is</td>
</tr>
<tr>
<td></td>
<td>not assigned to any NC axis, &lt;No NC-axis&gt; is shown.</td>
</tr>
<tr>
<td>Message frame type</td>
<td>If a telegram type has not been assigned in the NC machine data, the telegram type is</td>
</tr>
<tr>
<td></td>
<td>not occupied (-).</td>
</tr>
<tr>
<td>State</td>
<td>Current state of slot. Displayed only for NC axes.</td>
</tr>
<tr>
<td></td>
<td>Green: Slot used by NC, communication active.</td>
</tr>
<tr>
<td></td>
<td>Red: Slot used by NC, communication currently not active.</td>
</tr>
<tr>
<td></td>
<td>Gray: No NC axis.</td>
</tr>
</tbody>
</table>

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.
16.11 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.

16.11.1 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.
16.11 Station-related network diagnostics

**Input rights**
Operator panels, which have input rights, have a green background.

**Detailed display**
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

**References**
For additional information about network configuration, please refer to the following documentation:
Commissioning Manual, IBN CNC: NCK, PLC, drive

**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 is opened 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.

16.11.2 Error analysis

16.11.2.1 Performing error diagnostics

Precondition

Error analysis only functions for a PCU.

Procedure

1. The "TCP/IP diagnostics" window is opened.

2. Position the cursor on the component that is marked as having an error (NCU).

3. Press the "Error analysis" softkey.

4. The corresponding error message is displayed.
### 16.11.2 MCP/EKS as network participant cannot be accessed

<table>
<thead>
<tr>
<th>Error</th>
<th>Possible error causes and remedies</th>
</tr>
</thead>
</table>
| 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/ECS 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**  
No active DHCP server is found in the system network. Possible causes:  
- Only one 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 PCU50 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.
### 16.11.2.3 HMI on PCU 50.3 cannot establish a network connection to the NC

<table>
<thead>
<tr>
<th>Error</th>
<th>Error cause 1</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>HMI displays alarm 120202 &quot;Wait for connection to NC/PLC&quot; and/or no values (only '#').</td>
<td>The IP address of the target NCK/PLC set on the PCU 50.3 is incorrect.</td>
<td>From the HMI, correct the target address for NCK/PLC and restart the PCU 50.3.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Error</th>
<th>Error cause 2.1</th>
<th>Remedy</th>
</tr>
</thead>
</table>
| HMI displays alarm 120202 "Wait for connection to NC/PLC" and/or no values (only '#'). | PCU 50 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 50 (= DHCP is disabled) and the PCU 50 either operates with a permanently set IP address, which 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. |

<table>
<thead>
<tr>
<th>Error</th>
<th>Error cause 2.2</th>
<th>Remedy</th>
</tr>
</thead>
</table>
| HMI displays alarm 120202 "Wait for connection to NC/PLC" and/or no values (only '#'). | PCU 50 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 50 (= DHCP is enabled) and the PCU 50 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 50 is a DHCP client. As a result of an SW error or the actual network configuration, the PCU 50 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: HMI displays alarm 120202 "Wait for connection to NC/PLC" and/or no values (only '#').

#### Error cause 2.3
- **PCU 50** 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 50 (= DHCP is enabled) and the PCU 50 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 50 is set for the IP addresses that can be dynamically allocated, with an incorrect IP address and an incorrect IP area. The PCU 50 possibly changed from DHCP standby to active server as the computer with DHCP MASTER has failed/has been switched-off.

**Remedy**
- 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 cause 2.4
- **PCU 50** 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 50 (= DHCP is enabled) and the PCU 50 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 DNCP server also has an incorrect address range. This is a configuration error.

**Remedy**
- 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.
## Service and diagnostics

### 16.11 Station-related network diagnostics

#### 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 DHCPSvr –X120 or the equivalent sc enable DHCPSvr –eth0 to activate DHCP operation
- sc enable DHCPSync –X120 -LOW|HIGH|MASTER or equivalent sc enable DHCPSync –eth0 -LOW|HIGH|MASTER to set the DHCP synchronization mode of this NCU

Correctly enter the following entries into the file /user/system/etc/basesys.ini:

```plaintext
[InternallInterface]
; With InternallIP and InternallNetMask (both must be set together),
; you can change the address on the internal/TCU/automation/system net.
InternallIP=192.168.214.1
InternallNetMask=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
```

The values in green should be set corresponding to the overall system. Then restart the NCU.

#### 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

---

### Table: Error Possible error causes and remedies

<table>
<thead>
<tr>
<th>Error</th>
<th>Possible error causes and remedies</th>
</tr>
</thead>
<tbody>
<tr>
<td>HMI displays alarm 120202 &quot;Wait for connection to NC/PLC&quot; and/or no values (only '#').</td>
<td>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.</td>
</tr>
</tbody>
</table>
| **Error cause 3.1** | **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 DHCPSvr –X120 or the equivalent sc enable DHCPSvr –eth0 to activate DHCP operation  
  - sc enable DHCPSync –X120 -LOW|HIGH|MASTER or equivalent sc enable DHCPSync –eth0 -LOW|HIGH|MASTER to set the DHCP synchronization mode of this NCU  

Correctly enter the following entries into the file /user/system/etc/basesys.ini:  

```plaintext
[InternallInterface]
; With InternallIP and InternallNetMask (both must be set together),
; you can change the address on the internal/TCU/automation/system net.
InternallIP=192.168.214.1
InternallNetMask=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
```

The values in green should be set corresponding to the overall system. Then restart the NCU. |
| HMI displays alarm 120202 "Wait for connection to NC/PLC" and/or no values (only '#'). | 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. |
| **Error cause 3.2** | **Remedy 3.2** The same as for remedy 3.1 |
### Error Possible error causes and remedies

#### 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 DHCP 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

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
### 16.11 Station-related network diagnostics

<table>
<thead>
<tr>
<th>Error</th>
<th>Possible error causes and remedies</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Error cause 4.4</strong></td>
<td></td>
</tr>
<tr>
<td>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.</td>
<td></td>
</tr>
</tbody>
</table>

**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.

---

### 16.11.2.4 TCU cannot establish a network connection to the HMI

<table>
<thead>
<tr>
<th>Error</th>
<th>Possible error causes and remedies</th>
</tr>
</thead>
<tbody>
<tr>
<td>When booting, TCU signals 'ERROR: Network connection not established'.</td>
<td></td>
</tr>
<tr>
<td><strong>Cause of the error</strong></td>
<td></td>
</tr>
<tr>
<td>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.</td>
<td></td>
</tr>
<tr>
<td>• the Ethernet cable is not directly inserted at the TCU,</td>
<td></td>
</tr>
<tr>
<td>• the Ethernet cable is not inserted at the direct connection partner or the partner is not available (e.g. MCP),</td>
<td></td>
</tr>
<tr>
<td>• the Ethernet cable at the TCU is defective.</td>
<td></td>
</tr>
</tbody>
</table>

**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.
### Service and diagnostics

#### 16.11 Station-related network diagnostics

**SINUMERIK Operate (IM9)**

**Commissioning Manual, 02/2011, 6FC5397-1DP40-0BA0**

<table>
<thead>
<tr>
<th>Error</th>
<th>Possible error causes and remedies</th>
</tr>
</thead>
<tbody>
<tr>
<td>When the TCU boots, it signals 'connection established – no DHCPServer available'.</td>
<td><strong>Cause of the error</strong>&lt;br&gt;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.</td>
</tr>
<tr>
<td></td>
<td><strong>Remedy</strong>&lt;br&gt;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.</td>
</tr>
<tr>
<td>When the TCU boots, it signals 'connection established – no DHCPServer available'. There is a physical network connection to the system network.</td>
<td><strong>Cause of the error</strong>&lt;br&gt;No active DHCP server is found in the system network. Possible error causes include: 1. Only one 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. 2. 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. 3. In the system network, there is no NCU or PCU 50.3 computer available that has DHCP operation activated on it and could be a server.</td>
</tr>
<tr>
<td></td>
<td><strong>Remedy</strong>&lt;br&gt;In the system network, configure a computer that is available as DHCP server.</td>
</tr>
<tr>
<td>After it has booted, the TCU displays 'Waiting for HMI'. (The TCU cannot establish its connection to the HMI.)</td>
<td><strong>Error cause 1</strong>&lt;br&gt;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.</td>
</tr>
<tr>
<td></td>
<td><strong>Remedy</strong>&lt;br&gt;Correct the configuration using the &quot;System Network Center&quot; program. The TCU automatically reboots.</td>
</tr>
<tr>
<td>Error cause 2</td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td><strong>Remedy</strong>&lt;br&gt;Switch off the computer (NCU or PCU) and switch on again.</td>
</tr>
</tbody>
</table>
## 16.11 Station-related network diagnostics

### Error cause 3

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 `sc enable HMI`.

### 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.

### 16.11.2.5 The TCU cannot establish a network connection to the assigned PCU

<table>
<thead>
<tr>
<th>Error cause 1</th>
<th>Possible error causes and remedies</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP address assigned twice</td>
<td></td>
</tr>
<tr>
<td>The PCU 50.3 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.</td>
<td></td>
</tr>
<tr>
<td>The PCU 50.3 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 50.3 has already been assigned, the PCU 50.3 is allocated an address from the dynamic address range via DHCP.</td>
<td></td>
</tr>
</tbody>
</table>
### Error 16.11 Station-related network diagnostics

#### Remedy

A decision has to be made which computer should keep the IP address that has been assigned twice. If it is the PCU 50.3, then

- on the PCU 50.3, 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 using the sc command `sc clear dhcp -X120`, for a PCU 50.3 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 50.3, 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 50.3 is to change its address, then on the PCU 50.3

- 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 sc command, for a PCU 50.3, using the "System Network Center" program).

Restart the system.

#### Error cause 2

This was preceded by replacing the PCU 50.3 hardware.

As a result of the hardware replacement, in spite of the same settings of the new PCU 50.3, the requested (set) IP address is still internally reserved for the previous hardware as this is an inherent feature of the system. The PCU 50.3 is either active or non-active DHCP server, however, is operated in the synchronizing DHCP mode. As the address requested from the PCU 50.3 is still reserved, the PCU 50.3 is allocated an address from the dynamic address range via DHCP.

#### Remedy

Carry out the following steps:

- Under network settings, on the PCU 50.3, 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 `sc clear dhcp -X120`, for a PCU 50.3, using the "System Network Center" program).
- Restart the system.
### Service and diagnostics

#### 16.11 Station-related network diagnostics

<table>
<thead>
<tr>
<th>Error</th>
<th>Possible error causes and remedies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Error cause 3</td>
<td>An address that does not belong to the network has been configured for the PCU 50.3. An address has been configured for the PCU 50.3, 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 50.3 is not an active DHCP server, but is operated in the synchronizing DHCP mode.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Remedy</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Carry out the following steps:</td>
<td></td>
</tr>
<tr>
<td>• Under network settings, on the PCU 50.3, set the required address again as fixed IP address in the system network.</td>
<td></td>
</tr>
<tr>
<td>• On the PCU 50.3, using the &quot;System Network Center&quot; program, link the DHCP service to this new address (first screen in the &quot;System Network Center&quot; program), if required, adapt the other DHCP settings (dynamic address range).</td>
<td></td>
</tr>
<tr>
<td>• 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 sc clear dhcp – X120, for a PCU 50.3, using the &quot;System Network Center&quot; program).</td>
<td></td>
</tr>
<tr>
<td>• Restart the system.</td>
<td></td>
</tr>
</tbody>
</table>

#### 16.11.3 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 system network via Ethernet interface X120.

A PCU 50.3 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 50.3 is connected via the ETH1 Ethernet adapter.
Availability of the network connections

Network adapter connection

<table>
<thead>
<tr>
<th>Color</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>Network cable inserted</td>
</tr>
<tr>
<td>Red</td>
<td>Network cable not inserted</td>
</tr>
</tbody>
</table>

Availability

The availability describes the percentage of faulty packages compared to all the sent and received packages. 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.

<table>
<thead>
<tr>
<th>Color</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green</td>
<td>Greater than 95%</td>
</tr>
<tr>
<td>Yellow</td>
<td>50 - 95 %</td>
</tr>
<tr>
<td>Red</td>
<td>Less than 50%</td>
</tr>
</tbody>
</table>

Details of the network connections

- **Computer name**
- **DNS name**
  - Computer name of the controller as stored at the DNS server (Domain Name Service).
- **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 several NCUs synchronize with each other. This ensures that always only one of these NCUs functions as DHCP server and, for example, no double IP addresses are assigned.
    If a network adapter operates as "Synced Server", then additional information is displayed in the "Status of sync. DHCP server" line.
    If no changes have been made for the network adapters in the configuration file, then "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**
  Status of the synch. DHCP server:
  - Active (actual 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 task of the server).

• **Mode, DHCP synchron.**
  Priority of the synch. DHCP server:
  Low, High, Master
16.11 Station-related network diagnostics

- 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".

**References**
For additional information about network configuration, please refer to the following documentation:
SINUMERIK 840D sl, Operator Components and Networking (IM5)

**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 is opened.

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.
16.12 Safety Integrated diagnostics

16.12.1 Status display for NCK Safety Integrated

The status display shows signals or values with NCK and drive information for a selected axis.

**Available signals**
- Safe actual position
- Position deviation NCK/drive
- "Safe operating stop" monitoring active
- "Safe velocity" monitoring active
- Active SV step
- Active SV correction factor
- Safe actual velocity limit
- Set velocity limit
- Current velocity difference
- Maximum velocity difference
- Active safe software limit switch
- Active gear ratio (step)
- Active stop
- Currently requested external stop
- Stop F code value
- Pulses enabled
- Traversing inhibit, stop in other axis

**Procedure**

1. Select the "Diagnostics" operating area.

2. Press the menu forward key and the "Safety" softkey.
3. Press the "SI status" softkeys.

The "Safety Integrated Status (NCK)" window appears.

3. Press the "Axis +" or "Axis -" softkey.

The values of the next or the previous axis are displayed.

- OR -

Press the "Axis selection" softkey and select the desired axis directly from the displayed list of available axes.

16.12.2 Display SGE/SGA signals

Safety-related inputs and outputs

SGE
Safe input signals, NCK Bit15...0
Safe input signals, drive Bit15...0
Safe input signals, NCK, Bit 16...31
Safe input signals, drive, Bit 16...31

SGA
Safe output signals, NCK Bit15...0
Safe output signals, drive Bit15...0
Safe output signals, NCK, Bit 16...31
Safe output signals, drive, Bit 16...31

Procedure

1. Select the "Diagnostics" operating area.

2. Press the menu forward key and the "Safety" softkey.
3. Press the "SGE/SGA" softkey to display the safety-related input and output signals. The "Safety Integrated SGE/SGA" window appears.

4. Press the "Axis +" or "Axis -" softkey. The values of the next or the previous axis are displayed.

- OR -

Press the "Axis selection" softkey and select the desired axis directly from the displayed list of available axes.

16.12.3 Display SPL signals

Safe programmable logic

Variables

$A\_INSE (P) - corresponds to simultaneous selection of:
$A\_INSE (upper line, origin of the NCK) and
$A\_INSE (lower line, origin of the PLC)

$A\_OUTSE (P) comp. $A\_INSE (P)
$A\_INSI (P) comp. $A\_INSE (P)
$A\_OUTSI (P) comp. $A\_INSE (P)
$A\_MARKERSI (P) comp. $A\_INSE (P)
$A\_PLCSIIN comp. $A\_INSE (P)
$A\_PLCSIOUT comp. $A\_INSE (P)

Bit Selection of an 8-bit area of the selected signal.

Available signals/values

DCC fill level
DCC status
DCC control word
SPL booting state
SPL started up
SPL interfaces have been parameterized
SPL program file SAFE.SPL loaded
NCK and PLC state
Interrupt for PLC start should be assigned
Interrupt has been assigned for PLC start
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Interrupt processing for SPL start called
Interrupt processing for SPL start terminated
SPL start implemented using PROG_EVENT mechanism
SPL started via AUTO start
SPL processing completed, end of program reached.
NCK data cross-checking (DCC) has been started
PLC data cross-checking has been started
Cyclic SPL checksum test active
All SPL protective mechanisms active

Procedure

1. Select the "Diagnostics" operating area.

2. Press the menu forward key and the "Safety" softkey.

3. Press the "SPL" softkey to display the safe programmable logic signals. The "Safety Integrated SPL" window is opened

16.12.4 Displaying Safety Integrated checksums

You obtain the following information areas in the "SI configuration" window:

- Overview of the settings of the Safety Integrated option
- Tables indicate the checksum for the actual Safety Integrated configuration.

Safety Integrated options

The overview of the Safety Integrated options includes the number of the Safety Integrated axes configured as well as an overview of the active Safety Integrated options.

Safety Integrated checksum area

The following checksums are displayed for the overview of the Safety Integrated checksum area:
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- Checksum for the "SAFE.SPF" program
- General checksums
- Checksum for NCK and drive for each axis and the corresponding drive, for which the Safety Integrated has been enabled.

You receive information about the time of the last change of the checksum in the NCK.

Procedure

1. Select the "Diagnostics" operating area.

2. Press the menu forward key and the "Safety" softkey.

3. Press the "SI checksum" softkey.
The "SI configuration" window is opened.

4. Press the "Axis +" or "Axis -" softkey.
The values of the next or the previous axis are displayed.

- OR -

Press the "Axis selection" softkey and select the desired axis directly from the displayed list of available axes.
16.12.5 Safety Integrated Basic Functions (Drive)

Supported functions
The following Safety Integrated functions (Safety Integrated Basic Functions) are available:
These functions are available in the standard drive version.

- **Safe Torque Off (STO)**
  STO is a safety function that prevents the drive from restarting unexpectedly in accordance with EN 60204-1.

- **Safe Stop 1 (SS1, time controlled)**
  The SS1 function is based on the “Safe Torque Off” function. This means that a Category 1 stop in accordance with EN 60204-1 can be implemented.

- **Safe Brake Control (SBC)**
  The SBC function permits the safe control of a holding brake.

Note
Safety Integrated Basic Functions
When a drive object that has Safety Integrated functions released is switched to "Parking" state, the Safety Integrated software responds by activating STO without generating a separate message.

References
The functions are described in: Function Manual Safety Integrated /FBSIsl/

Procedure
1. Select the "Diagnostics" operating area.
2. Press the menu forward key and the "Safety" softkey.
3. Press the "SI status" softkey.
The "SI status" window is opened.
4. Press the "Display drive status" softkey to display the status of safe drives.
5. Press the "Drive +" or "Drive -" softkey. The parameters are displayed for the next or previous drive object.

... - OR -

6. Press the "Drive selection" softkey and in the drop-down list that appears, directly select the desired drive object.

16.12.6 Safety Integrated fail-safe I/O

Fail-safe I/O modules ("fail-safe modules")

The "SI I/O" display provides a summary of the configuration and status of the PROFIsafe I/O. The following signals are displayed:

- Fail-safe master address
- Parameterized PROFIsafe cycle time
- Maximum occurring PROFIsafe cycle time
- Modular PROFIsafe I/O interface
- Number of active I/O modules
- Number of passive I/O modules

Procedure

1. Select the "Diagnostics" operating area.

2. Press the menu forward key and the "Safety" softkey.

3. Press the "SI I/O" softkey. The "SI I/O" window is opened and the status of the signals is displayed.
Press the "Fail-safe modules" softkey to display the status of the fail-safe modules and their PROFIsafe address.

4. Press the "Details" softkey to display further information on this fail-safe module.

16.12.7 Displaying cam signals

The signals of the cam SGA are displayed in the "Cam SGA" window. Cam synchronization is executed between NCK and PLC at the cam SGA.

Procedure

1. Select the "Diagnostics" operating area.

2. Press the menu forward key and the "Safety" softkey.

3. Press the ">>" and "Cam SGA" softkeys.

The "Cam SGA" window is opened.

4. Press the "Axis +" or "Axis -" softkey.

The values of the next or the previous axis are displayed.

- OR -

Press the "Axis selection" softkey and select the desired axis directly from the displayed list of available axes.
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16.12.8 Displaying SI communication data

Signals and values for the following communication data are displayed in the "SI communication (general)" window:

- Parameterized CPU-CPU communication clock cycle status
- Actual CPU-CPU communication clock cycle status
- Maximum CPU-CPU communication clock cycle
- Number of active send data connections (F_SENDDP)
- Number of active receive data connections (F_RECVDP)

Procedure

1. Select the "Diagnostics" operating area.

2. Press the menu forward key and the "Safety" softkey.

3. Press the ">>" and "SI communication" softkeys.

The "SI communication (general)" window is opened.

16.12.9 SI communication send connections

The configuration as well as the status of F_SENDDP are displayed in the SI communication (send)" window.

Displayed signals

The following signals of the selected connection are displayed:

- CPU-CPU communication ID
- Logical base address
- Connection number
- Maximum parameterized communication time
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- Actual communication time
- Maximum communication time
- Error reaction
  - Error reactions that can be set:
    - [0] "Alarm 27350 + STOP D/E"
    - [1] "Alarm 27350"
    - [2] "Alarm 27351 (self clearing)"
    - [3] "No reaction"
- Error
- Diagnostics error code
- Substitute values active
- Actual communication data
- Driver state
  - Status display:
    - [0] "Not initialized"
    - [1] "Establish communication after booting"
    - [2] "Establish communication after error"
    - [3] "Wait for checkback signals SN=1"
    - [4] "Receiver waits for user acknowledgement"
    - [5] "Normal operation"

Procedure

1. The "SI communication (general)" window with the communication data is opened.
2. Press the "Send connection" softkey.
   - The "SI communication (send)" window is opened.
3. Press the "Connection +" or "Connection -" softkey to select the connection whose data you wish to display.
4. Press the "Display SPL connection" softkey in order to display additional details, e.g. connection data that has been set.
   - The softkey is only available if send connections have been configured.
5. Press the "Display connection" softkey to return to the window with the send connections of the selected connection.
16.12.10 SI communication receive connections

The configuration as well as the status of F_ RECEIVED are displayed in the SI communication (receive) window.

Displayed signals
The following signals of the selected connection are displayed:

- CPU-CPU communication ID
- Logical base address
- Connection number
- Maximum parameterized communication time
- Actual communication time
- Maximum communication time
- Error reaction
  Error reactions that can be set:
  - [0] "Alarm 27350 + STOP D/E"
  - [1] "Alarm 27350"
  - [2] "Alarm 27351 (self clearing)"
  - [3] "No reaction"
- Error
- Diagnostics error code
- Substitute values active
- Substitute values
- Actual communication data
- Driver state
  Status display:
  - [0] "Not initialized"
  - [1] "Establish communication after booting"
  - [2] "Establish communication after error"
  - [3] "Wait for checkback signals SN=1"
  - [4] "Receiver waits for user acknowledgement"
  - [5] "Normal operation"
- Request user acknowledgement
- Sender in the deactivated safety mode
16.12 Safety Integrated diagnostics

Procedure

1. The "SI communication (general)" window with the communication data is opened.
2. Press the "Receive connection" softkey.
   The "SI communication (send)" window is opened.
3. Press the "Connection +" or "Connection -" softkey to select the connection whose data you wish to display.
4. Press the "Display SPL connection" softkey to display additional details, e.g. connection data that has been set.
   The softkey is only available if send connections have been configured.
5. Press the "Display connection" softkey to return to the window with the receive connections of the selected connection.
16.13 Drive system diagnostics

16.13.1 Displaying drive states

In the "Drive system system diagnostics" window, you obtain information about the status for the drive units assigned to the NCU with the associated drive objects.

Use the softkeys to select the desired drive unit, for which you want to view the drive states. Then use the cursor to select the desired drive object, for which you want to view the drive states in detail. The window with the detailed drive states is opened using the "Details" softkey.

The status display (r0002) of the selected drive object is displayed completely in the lower pane, as this information cannot be displayed fully in the upper main window for space reasons.

<table>
<thead>
<tr>
<th>Display icon</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>☑</td>
<td>Green The drive object is in (cyclic) operation, without any detected problems.</td>
</tr>
<tr>
<td>☢</td>
<td>Yellow The drive object has detected a less serious problem, i.e. a warning is pending, for example, or enables are missing.</td>
</tr>
<tr>
<td>☢</td>
<td>Red This drive object has detected a serious problem, for example, an alarm is pending.</td>
</tr>
<tr>
<td>☢</td>
<td>Gray The drive status could not be determined for this drive object.</td>
</tr>
<tr>
<td>#</td>
<td>Special characters Error when reading the data.</td>
</tr>
</tbody>
</table>

Details of the drive objects

You can display detailed information for every drive object.

Displaying details of the drive objects (Page 296)

Procedure

1. Select the "Diagnostics" operating area.
2. Press the menu forward key and the "Drive system" softkey.
3. The “Drive system diagnostics” window is opened. 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 -
Press the "Select drive unit" softkey. The "Select Drive Unit" window opens.

4. Select the desired drive unit via the drop-down list box and press "OK" to confirm the selection.

### 16.13.2 Displaying details of the drive objects

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

<table>
<thead>
<tr>
<th>Display icon</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green</td>
<td>The relevant value of the drive object signals no problem detected.</td>
</tr>
<tr>
<td>Yellow</td>
<td>The relevant value of the drive object signals a less serious problem, i.e. a warning is pending, for example, or enables are missing.</td>
</tr>
<tr>
<td>Red</td>
<td>The relevant value of the drive object signals a serious problem, for example, an alarm is pending.</td>
</tr>
<tr>
<td>Gray</td>
<td>The drive status could not be determined for this drive object.</td>
</tr>
<tr>
<td># Special characters</td>
<td>Error when reading the data.</td>
</tr>
</tbody>
</table>

Procedure

1. Select the "Diagnostics" operating area.

2. Press the menu forward key and the "Drive system" softkey.

   The "Drive system diagnostics" window is opened.
16.13 Drive system diagnostics

3. Select the drive object for which you want to display further details.

4. Press the "Details" softkey.

The "Drive system diagnostics - details" window is opened.

The name of the drive object is displayed in the window header.

Press the "Faults" softkey.

The "Drive unit faults" window is opened and you obtain an overview of the faults that have been output.

Press the "Alarms" softkey.

The "Drive unit alarms" window is opened and you obtain an overview of the alarms that have been output.

You can display the pending SI messages if Safety Integrated is integrated in your control.

16.13.3 Displaying the drive system configuration

You can obtain a list of all of the components of the selected drive unit in the "Configuration" overview screen. You can identify the assignment of the components to the drive objects, e.g. the assignment of motor modules, motors and encoders to SERVOs and which NC machine axis the SERVOs are assigned.

The state is specified as follows using the font color:

Gray: Component in the reference topology, which is missing in the actual topology.

Red: Component in the actual topology, which is missing in the reference topology.

Only DRIVE-CLiQ components are included in the actual topology. None-DRIVE-CLiQ components - such as encoders or motors without DRIVE-CLiQ interface are as a consequence displayed in gray in the "Actual topology" view.

Details of the connection

You can display information about the individual components of each connection in a separate window.

<table>
<thead>
<tr>
<th>Column</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Axis</td>
<td>Name of the axis assigned to the drive object, which in turn is assigned to the component, e.g. Y1.</td>
</tr>
<tr>
<td>Drive object</td>
<td>Name of the drive object to which the component is assigned, e.g. SERVO_3.3.</td>
</tr>
<tr>
<td>Component</td>
<td>Name of the component, e.g. Motor_Module_5.</td>
</tr>
<tr>
<td>-No.</td>
<td>Component number, e.g. 5.</td>
</tr>
<tr>
<td>-Type</td>
<td>Brief description of the component type, e.g. MM_2AXIS_DCAC.</td>
</tr>
<tr>
<td>-Type description</td>
<td>Description of the component type, e.g. double-axis motor with 4 DRIVE-CLiQ interfaces.</td>
</tr>
</tbody>
</table>
### Column Description

<table>
<thead>
<tr>
<th>Column</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firmware card</td>
<td>Version of the firmware for the component available on the CompactFlash Card.</td>
</tr>
<tr>
<td>Order No.</td>
<td>Order No. of the component, e.g. 6SL3120-2TE21-0AA3.</td>
</tr>
<tr>
<td>HW version</td>
<td>Hardware version of the components, e.g. B.</td>
</tr>
<tr>
<td>Serial No.</td>
<td>Serial number of the components, e.g. T.W12013605.</td>
</tr>
<tr>
<td>Comparison level</td>
<td>Selected comparison type of the actual topology with the reference topology.</td>
</tr>
</tbody>
</table>

### Defining the sorting

As standard, the overview is sorted according to drive object numbers. Beyond this, you can select other sorting criteria:

- Drive object
- Wiring
- Component number
- Axis number

### Defining display options

- **Topology**
  - Comparison, actual/reference topology
  - Actual topology
  - Reference topology

- **Filters**
  - Off
  - DRIVE CLiQ + Option Slot
  - DRIVE-CLiQ

- **Selecting and deseleting columns**
  - Axis
  - Firmware version
16.13 Drive system diagnostics

- Firmware card: Version of the firmware for the component available on the CompactFlash Card.
- Type: Brief description of the component type.
- Order No.: Order No. of the component.
- HW version: Hardware version number of the component.
- Serial No.: Serial No. of the component.
- C.level: Type of comparison of the actual topology with the reference topology.

Procedure

1. Select the "Diagnostics" operating area.

2. Press the menu forward key and the "Drive system" softkey.

3. Press the "Configuration" softkey.

   The "Configuration" window opens and displays an overview of the configured components.

4. Select a component and press the "Details" softkey.

   All data for this component is displayed in a new window.

5. Press the "Sort" softkey.

   The "Sort" window opens and using a check box, you can select the criteria used to sort the components to be displayed.

6. Press the "Display options" softkey.

   The "Display options" window is opened and using the check box, you can select which components in the table are displayed.

16.13.4 Display the drive system topology

The (DRIVE-CLiQ) wiring of the components of the selected drive unit are shown in the topology display. The connected component connections are arranged directly next to one another and shown in a table. This means that you can follow the wiring of every DRIVE-CLiQ line starting from the CU/NX up to the end (e.g. up to an encoder).
Representations

<table>
<thead>
<tr>
<th>Column</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drive object</td>
<td>Name of the drive object to which the component is assigned.</td>
</tr>
<tr>
<td>-No.</td>
<td>Number of the drive object</td>
</tr>
<tr>
<td>Component</td>
<td>Name of the component, e.g. Control_Unit_1, Motor, Module_2u. a.</td>
</tr>
<tr>
<td>-No.</td>
<td>Number of the component.</td>
</tr>
<tr>
<td>Socket</td>
<td>Designation of the connection socket.</td>
</tr>
</tbody>
</table>

The lines at the center of the table indicate the cable of the (DRIVE-CLiQ) connection.

The state is represented as follows by the font color:

- **Gray**: Existing connection in the reference topology, which is missing in the actual topology.
- **Red**: Existing connection in the actual topology, which is missing in the reference topology.

Only DRIVE-CLiQ components are included in the actual topology. None-DRIVE-CLiQ components - such as encoders or motors without DRIVE-CLiQ interface are as a consequence displayed in gray in the "Actual topology" view.

The wiring of the drive objects "from/to" is displayed below the table.

Display options

**Topology**

- **Comparison, actual/reference topology**: The connections in the actual and reference topology are displayed. Connections that are included both in the actual as well as reference topology are displayed only once.
- **Actual topology**: Only the connections in the actual topology are displayed.
- **Reference topology**: Only the connections in the reference topology are displayed.

**Filters**

- **Off**: All the connections are displayed.
- **DRIVE CLiQ + Option Slot**: Only DRIVE-CLiQ connections to the option slot are displayed.
- **DRIVE-CLiQ**: Only DRIVE-CLiQ connections are displayed.
- **Display free connections**: Component connections that are not used are displayed.
Procedure

1. Select the "Diagnostics" operating area.

2. Press the menu forward key and the "Drive system" softkey.

3. Press the "Topology" softkey.
   The "Topology" window opens. The component wiring is displayed in a table.

4. Press the "Display options" softkey.
   The "Display options" window is opened and using the check box, you can select which connections in the table are displayed.
16.14 Remote diagnostics

16.14.1 Adapting remote diagnostics

Depending on the operating mode, the initiative for remote diagnostics comes from the service provider or from the control.

If the initiative comes from the control, 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 addition to these variables, 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
16.14.2 Remote diagnostics via Teleservice adapter IE at X127

The following settings must be made for remote diagnostics via modem using a Teleservice adapters IE (TS adapter) that is connected at X127:

**Settings in 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, the entries "X127ModemIP" and "X127RemoteAccessIP" must be appropriately changed 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**

![Diagram](image)

Figure 16-1 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.
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.
The "MC Information System RCS Host" 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.
The "MC Information System RCS Host" 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.
16.14 Remote diagnostics

16.14.3 PLC control for remote access

In the PLC user program, you can control external viewers using the following settings.

<table>
<thead>
<tr>
<th>DB19.DBX1.0</th>
<th>PLCExtViewerReject</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value</td>
<td>= 0</td>
</tr>
<tr>
<td>Meaning</td>
<td>Permit remote control</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DB19.DBX1.1</th>
<th>PLCExtViewerMode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value</td>
<td>= 0</td>
</tr>
<tr>
<td>Meaning</td>
<td>Operating rights for remote control</td>
</tr>
<tr>
<td>Result</td>
<td>Operating rights for remote control</td>
</tr>
</tbody>
</table>
16.15 NC/PLC trace

The trace provides you with an oscilloscope function that allows the following data (signals) to be graphically displayed:

- General NCK data
- PLC data

Trace session

The function is used 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 are 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

16.15.1 General procedure

Sequence

- Create a trace session file as follows:
  - Select the variable and define its representation type, see Variable for Trace (Page 314)
  - Set the graphics window, and the memory mode, see Trace settings (Page 320)
  - Set the trigger property to define the start and end of recording, see Trace settings (Page 320)
- Save the recording and its associated properties that have been set, see Saving the trace file (Page 311)
- 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 Evaluate a trace (Page 323)

See also

Setting-up the trigger (Page 321)
16.15.2 Trace session

16.15.2.1 Creating a session file

Procedure

1. Select the "Diagnostics" operating area.

2. Press the menu forward key.

3. Press the "NC/PLC trace" softkey.

4. 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".

5. Supplement the file name or enter a new file name and press the "OK" softkey.
   You return to the "Select variables: ...." window.
   The name of the session that has been newly created is displayed in the header.

See also

Creating a variable (Page 314)

16.15.2.2 Saving the trace file

There are two options of saving a trace session:

1. Variables and settings: Only the variables and the settings are saved.

2. Variables, settings and recorded values: The variables, settings and the recorded values are saved.
Service and diagnostics
16.15 NC/PLC trace

Procedure

1. You have edited an active trace session.

2. Press the "Store trace" softkey.
   The "Store trace: Session..." window opens and offers you options to save the data.

3. Select the corresponding check box and press the "OK" softkey.
   The "Store trace" window opens and in the entry field of "Name of session file:" specifies the file name. 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 files.
   - OR -
   Press the "Save as" softkey if you do not wish to overwrite the existing session file.
   A new name is suggested or, 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 "NC-PLC-Trace" directory.
   The data tree opens and you can select between the configured drives.
   Then press the "New directory" softkey if you wish to create a new directory.
   The "New directory" window opens and you can assign a directory name.
   Press the "OK" softkey.
   The "Store trace" window opens and the name of the target directory and session file is 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.
16.15.2.3 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.

<table>
<thead>
<tr>
<th>Settings</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variables, settings</td>
<td>You can restart a trace session that has already been created.</td>
</tr>
<tr>
<td>Variables, settings and recorded</td>
<td>You can view the result of a trace session, change the</td>
</tr>
<tr>
<td>values</td>
<td>variable and if required, restart.</td>
</tr>
</tbody>
</table>

Precondition

A session file of recorded traces is available.

Procedure

1. You have selected the "NC/PLC 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. "NC-PLC trace" and press the "Display trace" softkey.
   The "Load trace: session..." is opened.

4. Select the check box "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 check box "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.
16.15 NC/PLC trace

16.15.3 Variable for Trace

16.15.3.1 Creating a variable

Selection of variables

To limit the selection of variables, set a filter and/or enter an initial value for the search. The following filters are available for selection:

<table>
<thead>
<tr>
<th>Filter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drive parameters</td>
<td>Displaying the drive parameters</td>
</tr>
<tr>
<td>System variables</td>
<td>Displays the system variables</td>
</tr>
<tr>
<td>NC</td>
<td>Display of NC, axis and channel signals as well as signals of the mode group in the OPI notation.</td>
</tr>
<tr>
<td>Axis</td>
<td></td>
</tr>
<tr>
<td>Channel</td>
<td></td>
</tr>
<tr>
<td>Mode groups</td>
<td></td>
</tr>
<tr>
<td>Servo</td>
<td>Displays the servo-trace signals</td>
</tr>
<tr>
<td>PLC</td>
<td>Displays the PLC signals</td>
</tr>
<tr>
<td>PLC alarms</td>
<td>Displays the manufacturer-specific PLC alarm signals</td>
</tr>
<tr>
<td>All (no filter)</td>
<td>Displays all signals without filter: NC, axis and channel setting data as well as signals of the mode group in the OPI notation.</td>
</tr>
</tbody>
</table>

Note

"Filter/Search" when inserting variables

The start value for "Filter/Search" of variables differs.

For example, to insert the variable $R[0], set "Filter/Search":

- 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.

Procedure

For a trace session, in the window "Selected variables for trace: Session ..." 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 is opened and you can select the appropriate value (e.g. channel data, drive bus No.) from a combo box.
   - 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.
16.15 NC/PLC trace

Editing variables of a trace session

<table>
<thead>
<tr>
<th>Function</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ctrl + X</td>
<td>Press the key combination or open the shortcut menu in order to cut out a variable.</td>
</tr>
<tr>
<td>or right-click, shortcut menu &quot;Cut&quot;</td>
<td></td>
</tr>
<tr>
<td>Ctrl + C</td>
<td>Press the key combination or open the shortcut menu in order to copy a variable.</td>
</tr>
<tr>
<td>or right-click, shortcut menu &quot;Copy&quot;</td>
<td></td>
</tr>
<tr>
<td>Ctrl + V</td>
<td>Press the key combination or open the shortcut menu in order to insert a variable.</td>
</tr>
<tr>
<td>or right-click, shortcut menu &quot;Paste&quot;</td>
<td></td>
</tr>
</tbody>
</table>

16.15.3.2 Selecting attributes of a variable

Attributes

For a trace session, select the variables and assign the corresponding attributes:

<table>
<thead>
<tr>
<th>Column</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable</td>
<td>Address of the variables</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comment</td>
<td>• Name of the selected variables</td>
</tr>
<tr>
<td></td>
<td>• A general description for the variables.</td>
</tr>
<tr>
<td>Color</td>
<td>Color selection, the representation of the characteristic graphs.</td>
</tr>
<tr>
<td></td>
<td>When creating a variable, the next color from the palette available is automatically used.</td>
</tr>
</tbody>
</table>
### Attributes and Meaning

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pen</td>
<td>Line type selection, to display the characteristic graphs.</td>
</tr>
<tr>
<td></td>
<td>• No line</td>
</tr>
<tr>
<td></td>
<td>• Solid line</td>
</tr>
<tr>
<td></td>
<td>• Dashed line</td>
</tr>
<tr>
<td></td>
<td>• Dash-dot line</td>
</tr>
<tr>
<td></td>
<td>• Dash-dot-dot line</td>
</tr>
<tr>
<td></td>
<td>• Dotted line</td>
</tr>
<tr>
<td></td>
<td>• Stepped line XY</td>
</tr>
<tr>
<td></td>
<td>• Stepped line YX</td>
</tr>
<tr>
<td></td>
<td>• &quot;* line&quot; (line made up of * symbols)</td>
</tr>
<tr>
<td></td>
<td>• + line</td>
</tr>
<tr>
<td></td>
<td>• X line</td>
</tr>
<tr>
<td>Qty.</td>
<td>Defines whether the characteristic of the variables is displayed in the &quot;Trace&quot; window. If the checkbox is not selected, then no characteristic graphs are displayed.</td>
</tr>
</tbody>
</table>
### 16.15 NC/PLC trace

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Event</td>
<td>Event selection, which triggers that the signal is traced:</td>
</tr>
<tr>
<td></td>
<td>- Interpolation clock cycle (IPO clock cycle)</td>
</tr>
<tr>
<td></td>
<td>- Drive trace rate</td>
</tr>
<tr>
<td></td>
<td>- Start geometry axis/direction change</td>
</tr>
<tr>
<td></td>
<td>- Stop, geometry axis</td>
</tr>
<tr>
<td></td>
<td>- Machine axis start / direction change</td>
</tr>
<tr>
<td></td>
<td>- Machine axis stop</td>
</tr>
<tr>
<td></td>
<td>- NC start (program runs)</td>
</tr>
<tr>
<td></td>
<td>- NC start (program ran)</td>
</tr>
<tr>
<td></td>
<td>- Block start, type 1 or block end (all program levels, without intermediate blocks)</td>
</tr>
<tr>
<td></td>
<td>- Block start, type 2 or block end (all program levels, with intermediate blocks)</td>
</tr>
<tr>
<td></td>
<td>- Block start, type 3 or block end (all main programs, without intermediate blocks)</td>
</tr>
<tr>
<td></td>
<td>- Start of the data recording</td>
</tr>
<tr>
<td></td>
<td>- Interpolation cycle (IPO2)</td>
</tr>
<tr>
<td></td>
<td>- Block start or block end, block search (all program levels, without intermediate blocks)</td>
</tr>
<tr>
<td></td>
<td>- Geo axis start / direction change (2nd event)</td>
</tr>
<tr>
<td></td>
<td>- Geo axis stop (2nd event)</td>
</tr>
<tr>
<td></td>
<td>- Block start, type 2 (2nd event: all program levels, without intermediate blocks)</td>
</tr>
<tr>
<td></td>
<td>- Block end, type 2 (2nd event: all program levels, with intermediate blocks)</td>
</tr>
<tr>
<td></td>
<td>- Block start, block advance, type 1 (2nd event)</td>
</tr>
<tr>
<td></td>
<td>- WRTPR part program command</td>
</tr>
<tr>
<td></td>
<td>- WRTPR part program command (block search)</td>
</tr>
<tr>
<td></td>
<td>- Tool change</td>
</tr>
<tr>
<td></td>
<td>- Cutting edge change</td>
</tr>
<tr>
<td></td>
<td>- Tool change (block search)</td>
</tr>
<tr>
<td></td>
<td>- Cutting edge (block search)</td>
</tr>
<tr>
<td></td>
<td>- Start trigger initiated</td>
</tr>
<tr>
<td></td>
<td>- Stop trigger initiated</td>
</tr>
<tr>
<td></td>
<td>- Block end (block advance)</td>
</tr>
<tr>
<td></td>
<td>- Block end (2nd event: Block search)</td>
</tr>
<tr>
<td></td>
<td>- WRTPR part program command (block advance)</td>
</tr>
<tr>
<td></td>
<td>- Tool change (block advance)</td>
</tr>
<tr>
<td></td>
<td>- Cutting edge (block advance)</td>
</tr>
<tr>
<td></td>
<td>- Activating and deactivating synchronized actions</td>
</tr>
<tr>
<td></td>
<td>- Synchronized action initiated (condition fulfilled)</td>
</tr>
<tr>
<td></td>
<td>- PLC cycle OB1</td>
</tr>
<tr>
<td></td>
<td>- Signaled alarm</td>
</tr>
</tbody>
</table>


### Attributes and Meaning

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cancel softkey pressed</td>
<td></td>
</tr>
<tr>
<td>Program level change</td>
<td></td>
</tr>
<tr>
<td>Block end (interpreter)</td>
<td></td>
</tr>
<tr>
<td>Trace end (last event!)</td>
<td></td>
</tr>
<tr>
<td>Start trace</td>
<td></td>
</tr>
<tr>
<td>OEM test event 1 (non-cyclic, block advance)</td>
<td></td>
</tr>
<tr>
<td>OEM test event 2 (non-cyclic, main run)</td>
<td></td>
</tr>
<tr>
<td>Position control clock cycle (servo clock cycle)</td>
<td></td>
</tr>
<tr>
<td>Event channel</td>
<td>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.</td>
</tr>
<tr>
<td>Bit mask</td>
<td>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.</td>
</tr>
<tr>
<td>Decimal places</td>
<td>This setting is used to define how many places to the right of the decimal point are displayed at the axis identifiers.</td>
</tr>
<tr>
<td>Coord. axis</td>
<td>The coordinate axes are displayed to the left or right in the graphic window or there is no display.</td>
</tr>
<tr>
<td>Display Y</td>
<td>Value input or 0</td>
</tr>
<tr>
<td>Scale factor</td>
<td>Defines the scale.</td>
</tr>
<tr>
<td>Units</td>
<td>Displays the measurement unit, e.g. mm/min. The system specifies this and it cannot be changed.</td>
</tr>
</tbody>
</table>

### 16.15.3 Displaying the details of a trace variable

You can display the most important information and settings of the display at a glance in the detail window, i.e. you do not have to use the scroll bar for example to get to the "Event" column.
Displayed information

- Variable address
- Comment with a description of the variables
- Events
- Channel, axis, protection level, mode group, etc.
- Smaller graphic display with the event; when this event occurs the characteristic graphs are recorded as well as their settings, such as color, line type, etc.

Procedure

1. You are in the "Select variables for trace: ..." window.
2. Position the cursor to the required variable.
3. 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.

Press the "Details" softkey again to display the subscreen.

16.15.4 Trace settings

16.15.4.1 Trace settings

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" check box in order to receive a confirmation prompt each time that a trace session is to be overwritten.
  - If the check box is deactivated, the trace session is overwritten without a confirmation prompt.
16.15 NC/PLC trace

Procedures

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 is opened.
3. Select the desired settings and press the "OK" softkey in order to accept the settings.

16.15.4.2 Setting-up the trigger

In the "Trace - Settings" window, you define the condition for the start and end of a trace session and the memory size.

<table>
<thead>
<tr>
<th>Settings</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Starting the trace</td>
<td></td>
</tr>
<tr>
<td>Using the Start Trace softkey</td>
<td>The session is activated by pressing the &quot;Start trace&quot; softkey.</td>
</tr>
<tr>
<td>Setting the trigger condition for recording.</td>
<td></td>
</tr>
<tr>
<td>Variable</td>
<td>The session is activated using a variable. The variable is selected from a list using the &quot;Insert variable&quot; softkey.</td>
</tr>
<tr>
<td>Relation and value</td>
<td>After the session has been activated, this defines at which value the trace recording is initiated. The following values are listed in a combo box: = =, ≠, &gt;, &gt; =, &lt;, &lt; =, ascending, descending, changed.</td>
</tr>
<tr>
<td>Editing data</td>
<td></td>
</tr>
<tr>
<td>Data is acquired</td>
<td>Defines whether the recorded data are saved on the CompactFlash Card or in the NC work memory. For &quot;NCK&quot;, the recorded data are saved on the NCU until the recording is stopped. Only then is the session file saved on the CompactFlash Card. For &quot;On hard drive&quot;, the trace unloads the data to the CompactFlash Card while recording. As a consequence, more signals can be processed.</td>
</tr>
<tr>
<td>Overwrite at memory limit</td>
<td>Defines from which memory limit the data is overwritten (ring buffer).</td>
</tr>
<tr>
<td>Exiting the trace</td>
<td></td>
</tr>
<tr>
<td>Using the Stop Trace softkey</td>
<td>The trace session is stopped by pressing the &quot;Stop trace&quot; softkey.</td>
</tr>
<tr>
<td>If the time has expired</td>
<td>Defines the time period which after it has expired, the trace recording is exited. You can select from the following time periods: Milliseconds, seconds, minutes, hours, days</td>
</tr>
<tr>
<td>If the memory is full</td>
<td>The trace session is exited if the specified data quantity (Kbytes) is reached.</td>
</tr>
</tbody>
</table>
Service and diagnostics

16.15 NC/PLC trace

<table>
<thead>
<tr>
<th>Settings</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Setting the trigger condition to exit the trace</strong></td>
<td></td>
</tr>
<tr>
<td>Variable</td>
<td>The session is deactivated using a variable. The variable is selected from a list using the &quot;Insert variable&quot; softkey.</td>
</tr>
<tr>
<td>Relation and value</td>
<td>After the session has been activated, this defines at which value the trace recording is exited. The following values are listed in a combo box: =, ≠, &gt;, &gt;=, &lt;, &lt;=, ascending, descending, changed.</td>
</tr>
<tr>
<td>Run-on time (in sec.)</td>
<td>This defines how long the trace still runs after the session has been exited.</td>
</tr>
<tr>
<td>Overwrite at memory limit (Kbyte)</td>
<td>Defines from which memory limit the data is overwritten (ring buffer).</td>
</tr>
</tbody>
</table>

**Procedure**

1. You are in the "Select variables for trace: ..." window and the variable of a trace session has been selected.
2. Press the "Settings" softkey. The "Trace settings" window is opened.
3. Select the desired settings and enter the values.
4. Press the "OK" softkey. The settings are saved.

16.15.4.3 Display 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).

**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.

16.15.5 Evaluate a trace

16.15.5.1 Changing the views of the variable curves

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 variable data are displayed as comment, numbered and in color.
  - Make a selection: You define which variables are displayed in the graphic window.

- Scale
  - Specify scaling factors for minimum and maximum X and Y value
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- 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.

Precondition

The "Trace" graphic window is opened and the trace has been recorded.

Editing curves

You jump from <TAB> one variable to the next using the <TAB> key.

You jump back using the <Ctrl> and <TAB> keys.

With the cursor keys, you select marks, move to individual values and can define a zoom range.
16.15.2 Selecting a variable

You have the option of displaying the selected variables as legend and to make a selection using a checkbox.

<table>
<thead>
<tr>
<th>Legend</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Numbering the variables</td>
<td></td>
</tr>
<tr>
<td>Axis identifier</td>
<td></td>
</tr>
<tr>
<td>Comment of the variables</td>
<td></td>
</tr>
</tbody>
</table>

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 lefthand 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.

16.15.5.3 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.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>X minimum or X maximum</td>
<td>Highest or lowest value of the X time axis. The values are used for recording when the trace is started again.</td>
</tr>
<tr>
<td></td>
<td>Fixed scale, X axis</td>
</tr>
<tr>
<td></td>
<td>Values of the X time axis are kept.</td>
</tr>
<tr>
<td>Y minimum or Y maximum</td>
<td>Defining the highest or lowest value of the Y value axis (amplitude).</td>
</tr>
<tr>
<td>Offset or resolution</td>
<td>Defining the rms values (mean values) of the amplitudes. The scale is changed by a factor of 10.</td>
</tr>
</tbody>
</table>
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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 input window "Select X-Y scaling" is opened 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.

16.15.5.4 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 -

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 -

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.

4. 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.

16.15.5.5 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.

16.15.5.6 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.

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.
16.16 PROFIBUS/PROFINET and AS-i bus diagnostics

16.16.1 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
16.16.2 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:

<table>
<thead>
<tr>
<th>Information for all versions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
</tr>
<tr>
<td>Module has a fault</td>
</tr>
<tr>
<td>Module has failed</td>
</tr>
<tr>
<td>Module is OK</td>
</tr>
<tr>
<td>Module is suppressed (this is only possible with HMI PRO RT)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PROFIBUS address</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROFIBUS address data</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Additional information for the 2nd version</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROFIBUS/PROFINET module or channel diagnostics</td>
</tr>
<tr>
<td>Device diagnostics</td>
</tr>
<tr>
<td>For Siemens DP/DP coupler and diagnostics repeater</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Additional diagnostic information for the 3rd version</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
</tr>
<tr>
<td>Module name from the HMI offline data</td>
</tr>
<tr>
<td>Name</td>
</tr>
<tr>
<td>Module name from HMI offline data</td>
</tr>
<tr>
<td>Order No.</td>
</tr>
<tr>
<td>Order No. of the module from HMI offline data</td>
</tr>
<tr>
<td>IP address</td>
</tr>
<tr>
<td>IP address of the module from HMI offline data (only for PROFINET)</td>
</tr>
<tr>
<td>Graphic display of the complete hardware configuration in a dedicated window</td>
</tr>
</tbody>
</table>
16.16 PROFIBUS/PROFINET and AS-i bus diagnostics

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 is opened.

3. Select the required DP master system. The complete diagnostics information is displayed.

4. Press the "Only available" softkey to display the diagnostics data of the available modules

   - OR -

   Press the "Only suppressed" softkey to display the diagnostics data of the suppressed modules

   - OR -

   Press the "Only failed" softkey to display the diagnostics data of the failed modules.

   - OR -

   Press the "Only faulted" softkey to display the diagnostics data of the faulted modules.

16.16.3 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 "sltlprodiaghmi.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 "sltlprodiaghmi.ini" configuration file.

<table>
<thead>
<tr>
<th>Entry</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[SK0] ComboCount=x</td>
<td>Number of entries (x) in the selection list</td>
</tr>
<tr>
<td>[SK0_Index0]</td>
<td>1st entry</td>
</tr>
<tr>
<td>DiagType= 6</td>
<td>Type ID of the AS-i component (refer above)</td>
</tr>
<tr>
<td>TypeSection=DP-AS-i-Link-Advanced 1</td>
<td>Designation of the AS-i component, which should be output in the selection list</td>
</tr>
<tr>
<td>Logical_Address=43</td>
<td>E address of the AS-i component from the hardware configuration</td>
</tr>
<tr>
<td>RequestDB=449</td>
<td>Instance DB of the function block &quot;FB_SL_COM&quot; being used</td>
</tr>
</tbody>
</table>

Example of the "sltlprodiaghmi.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 "sltlprodiaghmi.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.
16.16.4 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

<table>
<thead>
<tr>
<th>Flags acc. to the AS-i specification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offline</td>
<td>Offline operating state</td>
</tr>
<tr>
<td>Internal</td>
<td>Internal operating state</td>
</tr>
<tr>
<td>EEPROM o.k.</td>
<td>Internal EEPROM okay</td>
</tr>
<tr>
<td>Auto-Addr.progr. enabled</td>
<td>Automatic address assignment enabled</td>
</tr>
<tr>
<td>I/O fault</td>
<td>Peripheral fault present</td>
</tr>
<tr>
<td>Master Power On - Start</td>
<td>Starting after Master Power On</td>
</tr>
<tr>
<td>Offline ready</td>
<td>Offline phase completed</td>
</tr>
<tr>
<td>AS-i cable voltage too low</td>
<td>AS-i cable voltage too low</td>
</tr>
<tr>
<td>CP in normal operation</td>
<td>CP in normal operation</td>
</tr>
<tr>
<td>Operating mode</td>
<td>Operating mode state</td>
</tr>
<tr>
<td>Auto.-Addr.progr. executed</td>
<td>Automatic address assignment executed</td>
</tr>
<tr>
<td>Auto-Addr.progr. possible</td>
<td>Automatic address assignment possible</td>
</tr>
<tr>
<td>AS-i slave with addr.=0 available</td>
<td>Slave with address 0 available</td>
</tr>
<tr>
<td>Reference config. = Actual config.</td>
<td>Target configuration equal to actual configuration</td>
</tr>
</tbody>
</table>

State

<table>
<thead>
<tr>
<th>State</th>
<th>Marking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slave OK</td>
<td>Green</td>
</tr>
<tr>
<td>Slave fault</td>
<td>Red</td>
</tr>
<tr>
<td>Slave is available, but not configured</td>
<td>Yellow</td>
</tr>
</tbody>
</table>
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 is opened.

3. Select the required DP AS-interface. The complete diagnostics information is displayed. The values in italics indicate an error counter > 0.
17.1 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 lefthand 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.
17.2 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**

<table>
<thead>
<tr>
<th>Tag</th>
<th>Description</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>a</code></td>
<td>Anchor or link</td>
<td>Supported attributes: <code>href</code> and <code>name</code></td>
</tr>
<tr>
<td><code>address</code></td>
<td>Address</td>
<td></td>
</tr>
<tr>
<td><code>b</code></td>
<td>Bold</td>
<td></td>
</tr>
<tr>
<td><code>big</code></td>
<td>Larger font</td>
<td></td>
</tr>
<tr>
<td><code>blockquote</code></td>
<td>Indented paragraph</td>
<td></td>
</tr>
<tr>
<td><code>body</code></td>
<td>Document body</td>
<td>Supported attributes: <code>bgcolor (#RRGGBB)</code></td>
</tr>
<tr>
<td><code>br</code></td>
<td>Line break</td>
<td></td>
</tr>
<tr>
<td><code>center</code></td>
<td>Centered paragraph</td>
<td></td>
</tr>
<tr>
<td><code>cite</code></td>
<td>Inline citation</td>
<td>Same effect as tag <code>i</code></td>
</tr>
<tr>
<td><code>code</code></td>
<td>Code</td>
<td>Same effect as tag <code>tt</code></td>
</tr>
<tr>
<td><code>dd</code></td>
<td>Definition data</td>
<td></td>
</tr>
<tr>
<td><code>dfn</code></td>
<td>Definition</td>
<td>Same effect as tag <code>i</code></td>
</tr>
<tr>
<td><code>div</code></td>
<td>Document division</td>
<td>The standard block attributes are supported</td>
</tr>
<tr>
<td><code>dl</code></td>
<td>Definition list</td>
<td>The standard block attributes are supported</td>
</tr>
<tr>
<td><code>dt</code></td>
<td>Definition term</td>
<td>The standard block attributes are supported</td>
</tr>
<tr>
<td><code>em</code></td>
<td>Emphasized</td>
<td>Same effect as tag <code>i</code></td>
</tr>
<tr>
<td><code>font</code></td>
<td>Font size, family, color</td>
<td>Supported attributes: <code>size</code>, <code>face</code>, and <code>color (#RRGGBB)</code></td>
</tr>
<tr>
<td><code>h1</code></td>
<td>Level 1 heading</td>
<td>The standard block attributes are supported</td>
</tr>
<tr>
<td><code>h2</code></td>
<td>Level 2 heading</td>
<td>The standard block attributes are supported</td>
</tr>
<tr>
<td><code>h3</code></td>
<td>Level 3 heading</td>
<td>The standard block attributes are supported</td>
</tr>
<tr>
<td><code>h4</code></td>
<td>Level 4 heading</td>
<td>The standard block attributes are supported</td>
</tr>
<tr>
<td><code>h5</code></td>
<td>Level 5 heading</td>
<td>The standard block attributes are supported</td>
</tr>
<tr>
<td><code>h6</code></td>
<td>Level 6 heading</td>
<td>The standard block attributes are supported</td>
</tr>
</tbody>
</table>
## 17.2 Generating HTML files

<table>
<thead>
<tr>
<th>Tag</th>
<th>Description</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>head</td>
<td>Document header</td>
<td></td>
</tr>
<tr>
<td>hr</td>
<td>Horizontal line</td>
<td>Supported attributes: width (can be specified as absolute or relative value)</td>
</tr>
<tr>
<td>html</td>
<td>HTML document</td>
<td></td>
</tr>
<tr>
<td>i</td>
<td>Italic</td>
<td></td>
</tr>
<tr>
<td>img</td>
<td>Image</td>
<td>Supported attributes: src, width, height</td>
</tr>
<tr>
<td>kbd</td>
<td>User-entered text</td>
<td></td>
</tr>
<tr>
<td>meta</td>
<td>Meta-information</td>
<td></td>
</tr>
<tr>
<td>li</td>
<td>List item</td>
<td></td>
</tr>
<tr>
<td>nobr</td>
<td>Non-breakable text</td>
<td></td>
</tr>
<tr>
<td>ol</td>
<td>Ordered list</td>
<td>The standard attributes for lists are supported</td>
</tr>
<tr>
<td>p</td>
<td>Paragraph</td>
<td>The standard block attributes are supported (default setting: left-aligned)</td>
</tr>
<tr>
<td>pre</td>
<td>Preformatted text</td>
<td></td>
</tr>
<tr>
<td>s</td>
<td>Strikethrough</td>
<td></td>
</tr>
<tr>
<td>samp</td>
<td>Sample code</td>
<td>Same effect as tag tt</td>
</tr>
<tr>
<td>small</td>
<td>Small font</td>
<td></td>
</tr>
<tr>
<td>span</td>
<td>Grouped elements</td>
<td></td>
</tr>
<tr>
<td>strong</td>
<td>Strong</td>
<td>Same effect as tag b</td>
</tr>
<tr>
<td>sub</td>
<td>Subscript</td>
<td></td>
</tr>
<tr>
<td>sup</td>
<td>Superscript</td>
<td></td>
</tr>
<tr>
<td>table</td>
<td>Table</td>
<td>Supported attributes: border, bgcolor (#RRGGBB), cellspacing, cellpadding, width (absolute or relative), height</td>
</tr>
<tr>
<td>tbody</td>
<td>Table body</td>
<td>No effect</td>
</tr>
<tr>
<td>td</td>
<td>Table data cell</td>
<td>The standard attributes for table cells are supported</td>
</tr>
<tr>
<td>tfoot</td>
<td>Table footer</td>
<td>No effect</td>
</tr>
<tr>
<td>th</td>
<td>Table header cell</td>
<td>The standard attributes for table cells are supported</td>
</tr>
<tr>
<td>thead</td>
<td>Table header</td>
<td>This is used to print tables that extend over several pages</td>
</tr>
<tr>
<td>title</td>
<td>Document title</td>
<td></td>
</tr>
<tr>
<td>tr</td>
<td>Table row</td>
<td>Supported attributes: bgcolor (#RRGGBB)</td>
</tr>
<tr>
<td>tt</td>
<td>Typewrite font</td>
<td></td>
</tr>
<tr>
<td>u</td>
<td>Underlined</td>
<td></td>
</tr>
<tr>
<td>ul</td>
<td>Unordered list</td>
<td>The standard attributes for lists are supported</td>
</tr>
<tr>
<td>var</td>
<td>Variable</td>
<td>Same effect as tag tt</td>
</tr>
</tbody>
</table>
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:

<table>
<thead>
<tr>
<th>Property</th>
<th>Values</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>background-color</td>
<td>&lt;color&gt;</td>
<td>Background color for elements</td>
</tr>
<tr>
<td>background-image</td>
<td>&lt;uri&gt;</td>
<td>Background image for elements</td>
</tr>
<tr>
<td>color</td>
<td>&lt;color&gt;</td>
<td>Foreground color for text</td>
</tr>
<tr>
<td>text-indent</td>
<td>&lt;length&gt;px</td>
<td>Indent the first line of a paragraph in pixels</td>
</tr>
<tr>
<td>white-space</td>
<td>normal</td>
<td>pre</td>
</tr>
<tr>
<td>margin-top</td>
<td>&lt;length&gt;px</td>
<td>Width of the upper edge of the paragraph in pixels</td>
</tr>
<tr>
<td>margin-bottom</td>
<td>&lt;length&gt;px</td>
<td>Width of the lower edge of the paragraph in pixels</td>
</tr>
<tr>
<td>margin-left</td>
<td>&lt;length&gt;px</td>
<td>Length of the left hand edge of the paragraph in pixels</td>
</tr>
<tr>
<td>margin-right</td>
<td>&lt;length&gt;px</td>
<td>Width of the righthand edge of the paragraph in pixels</td>
</tr>
<tr>
<td>vertical-align</td>
<td>baseline</td>
<td>sub</td>
</tr>
<tr>
<td>border-color</td>
<td>&lt;color&gt;</td>
<td>Border color for text tables</td>
</tr>
</tbody>
</table>
### 17.2 Generating HTML files

#### Property Values Description

<table>
<thead>
<tr>
<th>Property</th>
<th>Values</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>border-style</td>
<td>none</td>
<td>dotted</td>
</tr>
<tr>
<td>background</td>
<td>[&lt;'background-color'&gt;]</td>
<td></td>
</tr>
<tr>
<td>page-break-before</td>
<td>[ auto</td>
<td>always ]</td>
</tr>
<tr>
<td>page-break-after</td>
<td>[ auto</td>
<td>always ]</td>
</tr>
<tr>
<td>background-image</td>
<td>&lt;uri&gt;</td>
<td>Background image for elements</td>
</tr>
</tbody>
</table>

### Supported CSS selectors

All CSS 2.1 selector classes are supported with the exception of so-called pseudo selector classes such as :first-child, :visited and :hover.
17.3 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

<table>
<thead>
<tr>
<th>Tag</th>
<th>Number</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>HMI_SL_HELP</td>
<td>1</td>
<td>Root element of the XML document</td>
</tr>
<tr>
<td>I-BOOK</td>
<td>+</td>
<td>Identifies a help book. The name can be freely selected. In the example, the text name is &quot;hmi_myhelp&quot;. Attributes:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ref Identifies the HTML document that is displayed as the entry page for the help book.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>title Title of the help book that is displayed in the table of contents.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>helpdir Directory that contains the online help of the help book.</td>
</tr>
<tr>
<td>I-ENTRY</td>
<td>*</td>
<td>Chapter of the online help Attributes:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ref Identifies the HTML document that is displayed as entry page for the chapter.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>title Title of the chapter that is displayed in the table of contents.</td>
</tr>
<tr>
<td>II-INDEX_ENTRY</td>
<td>*</td>
<td>Subject (keyword) to be displayed Attributes:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ref Identifies the HTML document that is jumped to for this subject index entry.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>title Title of the subject that is displayed in the subject index.</td>
</tr>
</tbody>
</table>

The following applies to the "Number" column:

* means 0 or several
+ means 1 or several
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
<?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="chapter_1.html" title="Chapter 1">
      <INDEX_ENTRY ref="chapter_1.html#Keyword_1" title="Keyword_1"/>
      <INDEX_ENTRY ref="chapter_1.html#Keyword_2" title="Keyword_2"/>
    </ENTRY>
    <ENTRY ref="chapter_2.html" title="Chapter 2">
      <INDEX_ENTRY ref="chapter_2.html#Keyword_3" title="Keyword_3"/>
    </ENTRY>
    <ENTRY ref="chapter_3.html" title="Chapter 3">
      <ENTRY ref="chapter_31.html" title="Chapter 31">
        <INDEX_ENTRY ref="chapter_31.html#test" title="test;chapter31"/>
      </ENTRY>
      <ENTRY ref="chapter_32.html" title="Chapter 32">
        <INDEX_ENTRY ref="chapter_32.html#test" title="test;chapter32"/>
      </ENTRY>
    </ENTRY>
  </BOOK>
</HMI_SL_HELP>
```

The book comprises three chapters, whereby the third chapter has two sub-chapters. The various subject words (keywords) are defined within the chapter.
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"/>"
17.4 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 "slhlp.xml" file.

Format description of the "slhlp.xml"

<table>
<thead>
<tr>
<th>Tag</th>
<th>Number</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONFIGURATION</td>
<td>1</td>
<td>Root element of the XML document. Designates that this involves a configuration file.</td>
</tr>
<tr>
<td>I-OnlineHelpFiles</td>
<td>1</td>
<td>Introduces the section about the online help books.</td>
</tr>
<tr>
<td>II-&lt;help_book&gt;</td>
<td>+</td>
<td>Introduces the section of a help book.</td>
</tr>
<tr>
<td>III-EntriesFile</td>
<td>1</td>
<td>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)</td>
</tr>
<tr>
<td>III-Technology</td>
<td>0,1</td>
<td>Specifies the technology that applies to the help book. &quot;All&quot; 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)</td>
</tr>
<tr>
<td>III-DisableSearch</td>
<td>0,1</td>
<td>Disable the subject (keyword) search for the help book. Attributes: value true, false Type data type of the value (bool)</td>
</tr>
<tr>
<td>III-DisableFullTextSearch</td>
<td>0,1</td>
<td>Disable the full text search for the help book. Attributes: value true, false Type data type of the value (bool)</td>
</tr>
<tr>
<td>III-DisableIndex</td>
<td>0,1</td>
<td>Disable the subject index for the help book. Attributes: value true, false Type data type of the value (bool)</td>
</tr>
<tr>
<td>III-DisableContent</td>
<td>0,1</td>
<td>Disable the table of contents for the help book. Attributes: value true, false Type data type of the value (bool)</td>
</tr>
</tbody>
</table>
17.4 Integrating the online help in SINUMERIK Operate

<table>
<thead>
<tr>
<th>Tag</th>
<th>Number</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>III DefaultLanguage</td>
<td>0,1</td>
<td>Abbreviation for the language that should be displayed if the actual country language is available for the help book. Attributes: value chs, deu, eng, esp, fra, ita, ... type Data type of the value (QString)</td>
</tr>
</tbody>
</table>

The following applies to the "Number" column:

* means 0 or several

Example of a file "sihlp.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
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<!DOCTYPE CONFIGURATION>
<CONFIGURATION>
  <OnlineHelpFiles>
    <hmi_myHelp>
      <EntriesFiles value="hmi_myhelp.xml" type="QString"/>
      <DisableIndex value="true" type="bool"/>
    </hmi_myHelp>
  </OnlineHelpFiles>
</CONFIGURATION>
```
17.5 Saving help files

Saving help files in the target system

1. Open the /oem/sinumerik/him/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/him/hlp/deu/hmi_myhelp for German and /oem/sinumerik/him/hlp/eng/hmi_myhelp for English help files.

4. Place the configuration file "sihlp.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 (sihlp_<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 502)
17.6 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>` stands for the language code, e.g. deu, eng, etc. When you create a language directory, use the language code from the table in Chapter Supported languages (Page 502).

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. Place the files in the corresponding language directories. For instance, place 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 HMI sl.

"sinumerik_alarm_oem_plc_pmc.html" file

<table>
<thead>
<tr>
<th>Entry</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>&lt;a name=&quot;AlarmNr&quot;&gt;AlarmNr&lt;/a&gt;</code></td>
<td>Hyperlink to the alarm number</td>
</tr>
<tr>
<td><code>&lt;b&gt;......&lt;/b&gt;</code></td>
<td>Help text for the corresponding alarm</td>
</tr>
<tr>
<td><code>&lt;td width=&quot;85%&quot;&gt;......&lt;/td&gt;</code></td>
<td>Text that is displayed after the &quot;Explanation&quot; or &quot;Remedy&quot; field.</td>
</tr>
</tbody>
</table>

Example

The alarm number is used as HTML anchor.

```xml
<?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><a name="510000">510000</a></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. Create 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 Chapter Supported languages (Page 502)

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, specified in the XML file, in the following directory: /oem/sinumerik/hmi/hlp/<lng>/sinumerik_alarm_plc_pmc or<br>   /user/sinumerik/hmi/hlp/<lng>/sinumerik_alarm_plc_pmc file

Example: Creating an XML file

<table>
<thead>
<tr>
<th>Entry</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;BOOK&gt;</td>
<td>Help book</td>
</tr>
<tr>
<td>&lt;NUM_AREAS&gt;</td>
<td>Number ranges of the alarms and the reference to the particular HTML file</td>
</tr>
</tbody>
</table>
In the following example are 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
<?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 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

<table>
<thead>
<tr>
<th>Area</th>
<th>Directory</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLC alarms</td>
<td>/oem/sinumerik/hmi/hlp/&lt;lng&gt;/sinumerik_alarm_plc_pmc/ or /user/sinumerik/hmi/hlp/&lt;lng&gt;/sinumerik_alarm_plc_pmc/</td>
</tr>
<tr>
<td>HMI alarms</td>
<td>/oem/sinumerik/hmi/hlp/&lt;lng&gt;/sinumerik_alarm_hmi/ or /user/sinumerik/hmi/hlp/&lt;lng&gt;/sinumerik_alarm_hmi/</td>
</tr>
<tr>
<td>NC MD</td>
<td>/oem/sinumerik/hmi/hlp/&lt;lng&gt;/sinumerik_md_nck/</td>
</tr>
<tr>
<td>Channel MD</td>
<td>/oem/sinumerik/hmi/hlp/&lt;lng&gt;/sinumerik_md_chan/</td>
</tr>
<tr>
<td>Axis MD</td>
<td>/oem/sinumerik/hmi/hlp/&lt;lng&gt;/sinumerik_md_axis/</td>
</tr>
</tbody>
</table>

<lng> stands for the language code, e.g. deu, eng, etc. Only use the language codes from the table in Chapter Supported languages (Page 502)
17.6 Generating online help for user alarms and machine data

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". If you create help texts for several languages, then create the corresponding number of HTML 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
- 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
17.7 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.

![Online help for user variables](image)

**Figure 17-1** Example: Online help for user variables

Structure of the online help

The following files are required for the online help:

<table>
<thead>
<tr>
<th>File</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>sldgvarviewhelp.ini</td>
<td>Configuration file to manage an HTML file or several HTML files</td>
</tr>
<tr>
<td>&lt;lng&gt;/&lt;name&gt;1.html</td>
<td>The contents of all HTML files of the online help are language-dependent and are saved in the relevant language directory &lt;lng&gt;.</td>
</tr>
</tbody>
</table>
17.7 Example: This is how you create an online help for NC/PLC variables

Structure of the configuration file

The file is independent of any language and is structured as follows:

```ini
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.
17.8 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 "slhelp.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">
```


17.8 Example: This is how you create a programming online help

- Language-dependent file "<prog_help_eng>.ts": this filename is permanently specified.

```xml
<?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 `hmi_prog_help.xml` file there.
   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/him/hlp/<lng>/hmi_prog_help/cycle<n>_help.html`

The settings become effective only after restarting the system.
OEM-specific online help

17.8 Example: This is how you create a programming online help
Activating ePS Network Services

Precondition
To start the "ePS Network Services" software, configure a softkey using a display machine data. To do this you require, as a minimum, authorization for access level 3 (password: Users).

Configuring a softkey

<table>
<thead>
<tr>
<th>MD9108 $MM_ENABLE_EPS_SERVICES</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 1 &quot;ePS Network Services&quot; softkey is displayed on the extended user interface bar.</td>
</tr>
</tbody>
</table>

References
Information on the software can be found in the following documentation:
Function Manual ePS Network Services
19.1 View of the axes

You can display the Safety Integrated axes in the "machine configuration" window.

Copying and confirming Safety Integrated data
You can copy and confirm Safety Integrated data.

Activating and deactivating the startup of the Safety Integrated drives
You have the possibility of activating and deactivating Safety Integrated drives.
The Safety commissioning mode in the drives is activated.

References
Further information is available in the Safety Integrated 840D sl Function Manual

Procedure

1. Select the "Startup" operating area.

2. Press the menu forward key and the "Safety" softkey.
The "Machine configuration safety axes" window is opened.

   All of the safety axes are displayed.

3. Press the "All axes" softkey if you wish to display all of the axes.
The "Machine configuration all axes" window is opened and the "All axes" softkey changes into "Safety axes".

4. Press the "Safety axes" softkey in order to return to the view of the safety axes.
See also

- Copying and confirming Safety Integrated data (Page 368)
- Activating/deactivating startup mode (Page 370)
- Displaying the Safety-Integrated settings (Page 372)
19.2 General machine data for Safety Integrated

The general machine data is listed in the "Selection of General MD" window and can be edited, copied and confirmed.

Note
Changes as well as copying and confirming are effective for all axes and the general machine data.

Screen view
The machine data display is split into two halves:

- In the upper part of the screen view, the machine data that are important for commissioning are displayed; however, they do not involve Safety Integrated machine data.
- Safety Integrated machine data are displayed in the lower part of the screen view.

Changing the screen view
1. Press the "MD selection" to change into the full screen view.
The selection of general machine data is displayed over the complete screen.
2. Press the "SI-MD" softkey.
The general safety integrated machine data are displayed over the full screen.
3. Press the "SI + MD selection" softkey.
You return to the common view split in two of the general machine data and the Safety Integrated machine data.

Searching for machine data
1. Press the "Search" softkey, enter the machine data number being searched for in the window that opens or a character string that is being searched for and press the "OK" softkey.
2. Press the "Continue search" softkey if the text position found does not correspond to the required machine data.
3. Press the "Go to start" or "Go to end" softkey to set the cursor to the beginning or to the end of the displayed data.

4. Press the "Search" softkey if you wish to change the search term.
19.3 Axis-specific machine data in Safety Integrated

The axis machine data is listed in the "Axis MD" window and can be changed.

Copying and confirming Safety Integrated data for certain axes

Select the desired axis using the "Axis +" or "Axis -" softkey for which the Safety Integrated data is to be copied and confirmed.

Screen view

The machine data display is split into two halves:
- In the upper part of the screen view, the machine data that are important for commissioning are displayed; however, they do not involve Safety Integrated machine data.
- Safety Integrated machine data are displayed in the lower part of the screen view.

Changing the screen view

1. Press the "MD selection" to change into the full screen view. The selection of Axis MD is displayed over the complete screen.
2. Press the "SI-MD" softkey. The Safety Integrated Axis MD are displayed over the complete screen.
3. Press the "SI + MD selection" softkey. You return to the common view split in two of the general machine data and the Safety Integrated machine data.

Searching for machine data

1. Press the "Search" softkey, enter the machine data number being searched for in the window that opens or a character string that is being searched for an press the "OK" softkey.
2. Press the "Continue search" softkey if the text position found does not correspond to the required machine data.
3. Press the "Go to start" or "Go to end" softkey to set the cursor to the beginning or to the end of the displayed data.

4. Press the "Search" softkey if you wish to change the search term.
19.4 Drive machine data in Safety Integrated

The drive machine data is listed in the "Selection of Drive MD" window and can be changed.

**Activating or deactivating the startup mode**

Use the "Drive +" or "Drive -" softkey to select the drive that you want to switch to startup mode.

**Searching for machine data**

1. Press the "Search" softkey, enter the machine data number being searched for in the window that opens or a character string that is being searched for and press the "OK" softkey.

2. Press the "Continue search" softkey if the text position found does not correspond to the required machine data.

3. Press the "Go to start" or "Go to end" softkey to set the cursor to the beginning or to the end of the displayed data.

4. Press the "Search" softkey if you wish to change the search term.
19.5 Copying and confirming Safety Integrated data

All the NC machine data relevant for the SI functions is transferred to the corresponding drive parameters.

The SI machine data or drive parameters to define the encoder mounting arrangement must be separately entered for the NCK and drive. These are not copied.

---

**Note**

Certain NCK machine data are not copied into the drive parameters.

When confirming the data, the actual check sum is saved in the reference check sum.

---

**Note**

The data is saved for all safety axes.

---

**Precondition**

The "Machine configuration" window is open.

**Procedure**

**Copying Safety Integrated data**

1. Press the "Copy SI data" and "OK" softkeys. Safety-oriented NCK machine data are copied into the drive parameters.

2. Press the "Axis MD" softkey and select an axis using the "Axis +" or "Axis -" softkey if you wish to copy axis-specific machine data and safety data.

3. Press the "Reset (po)" and "OK" softkeys. The control and the drives restart (warm restart).
Confirming Safety Integrated data

4. Press the "Confirm SI data" and "OK" softkeys. 
The correctness of the values is confirmed and the current checksum saved. 
The drive data is saved automatically.
19.6 Activating/deactivating startup mode

For the startup of the Safety Integrated drives, the drive parameter p0010 is switched to startup mode (p0010=95).

Value "0" is entered in drive parameter p0010 to exit the startup mode. Beforehand, the CRC in p9798 and p9898 are confirmed. The start-up state can be exited with or without saving.

At the same time, you can set the drive PROFIsafe address.

Procedure

1. Select the "Startup" operating area.

2. Press the menu forward key and the "Safety" softkey.

3. Press the "Drive MD" softkey and select the desired drive using the "Drive +" or "Drive -" softkey.

   - OR -

   ... Press the "View axes" softkey.

4. Press the "Activate dr. startup" softkey.

   A prompt is displayed.

5. Press the "OK" softkey to continue with the startup.

   A prompt is displayed whether you want to set the PROFIsafe address for the selected drive.

6. Press the "Yes" softkey.

   Already existing settings of parameter p9810 are overwritten and the drive parameter p0010 is switched to the startup mode.

   - OR -
Press the "No" softkey.
The existing settings of parameter p9810 are retained and the drive parameter p0010 is switched to the startup mode.

7. Press the "Deactivate dr. startup" softkey.
19.7 Displaying the Safety-Integrated settings

The following configured values can be displayed in the "Safety Integrated Settings" window:

- Safe operating stop and safely limited speed (SBH/SG)
- Safe software end position for software limit switches (SE)
- Safe cams (SN)

You can use the softkeys to scroll between the Safety Integrated axes.

Procedure

1. Select the "Startup" operating area.

2. Press the menu advance key and the "Safety" softkey.

3. Press the "View settings" softkey.
   The "Safety Integrated settings" window is opened.
   The configured limits for safe operating stop (SBH) and safely limited speed (SG) are displayed.

4. Press the "Show safe limit pos." softkey if you wish to display the configured directions and limits of the software limit switches (SE).

5. Press the "Show Safe Cams" softkey if you wish to display the positions and assignments of the safe cams (SN).

See also

View of the axes (Page 361)
20 Configuring cycles

20.1 Activating turning/milling/drilling technologies

The cycles are automatically loaded when the control boots (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

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.

<table>
<thead>
<tr>
<th>MD52200 $MCS_TECHNOLOGY</th>
<th>Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Setting for turning</td>
</tr>
<tr>
<td>2</td>
<td>Setting for milling</td>
</tr>
</tbody>
</table>

Setting the coordinate system

<table>
<thead>
<tr>
<th>MD52000 $MCS_DISP_COORDINATE_SYSTEM</th>
<th>Position of the coordinate system</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Default setting</td>
</tr>
</tbody>
</table>

With this machine data you adapt the position of the coordinate system to the machine. This change also automatically influences the following settings:

- Help screens
- Sequence graphics
- Simulation
- Input fields with circle direction data
The following settings can be selected for the coordinate system:

### Meaning of the axes

<table>
<thead>
<tr>
<th>MD52206 $MCS_AXIS_USAGE[0..19]$</th>
<th>Meaning of the axes in the channel</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 0</td>
<td>No special meaning</td>
</tr>
<tr>
<td>= 1</td>
<td>Tool spindle (driven tool)</td>
</tr>
<tr>
<td>= 2</td>
<td>Auxiliary spindle (driven tool)</td>
</tr>
<tr>
<td>= 3</td>
<td>Main spindle (turning)</td>
</tr>
<tr>
<td>= 4</td>
<td>Separate C axis of the main spindle (turning)</td>
</tr>
</tbody>
</table>
Configuring cycles

20.1 Activating turning/milling/drilling technologies

<table>
<thead>
<tr>
<th></th>
<th>Counterspindle (turning)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Separate C axis of the counterspindle (turning)</td>
</tr>
<tr>
<td>7</td>
<td>Linear axis of the counterspindle (turning)</td>
</tr>
<tr>
<td>8</td>
<td>Tailstock (turning)</td>
</tr>
<tr>
<td>9</td>
<td>Back rest (turning)</td>
</tr>
<tr>
<td>10</td>
<td>B axis (turning)</td>
</tr>
</tbody>
</table>

Defining the direction of rotation

Enter the direction of rotation for the rotary axes that are not configured in a tool carrier of 5-axis transformation via the following channel-specific machine data:

<table>
<thead>
<tr>
<th>MD52207</th>
<th>$MCS_USAGE_ATTRIB[0..19]</th>
<th>Attribute of the axes in the channel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit 0</td>
<td>Rotation around 1st geometry axis (for rotary axes)</td>
<td></td>
</tr>
<tr>
<td>Bit 1</td>
<td>Rotation around 2nd geometry axis (for rotary axes)</td>
<td></td>
</tr>
<tr>
<td>Bit 2</td>
<td>Rotation around the 3rd geometry axis (for rotary axes)</td>
<td></td>
</tr>
<tr>
<td>Bit 3</td>
<td>Direction of rotation is counter-clockwise (for rotary axis / C axis).</td>
<td></td>
</tr>
<tr>
<td>Bit 4</td>
<td>Displayed direction of rotation of the spindle/C axis for the M function M3 is counter-clockwise</td>
<td></td>
</tr>
<tr>
<td>Bit 5</td>
<td>Inverts M3 / M4 (for spindles)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>This bit must be set analog to PLC bit DBnn.DBX17.6! (nn = 31 + Machine axis index)</td>
<td></td>
</tr>
</tbody>
</table>

Additional settings

<table>
<thead>
<tr>
<th>MD52201</th>
<th>$MCS_TECHNOLOGY_EXTENSION</th>
<th>Technology extension for combined machines with several technologies</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Additional settings for turning</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Additional settings for turning, e.g. lathe with milling technology</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MD52200 $MCS_TECHNOLOGY = 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MD52201 $MCS_TECHNOLOGY_EXTENSION = 2</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD52005</th>
<th>$MCS_DISP_PLANE_MILL</th>
<th>Plane selection G17, G18, G19</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Milling: Plane selection in the cycle support when programming under &quot;programGUIDE G code&quot;</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>G17 plane (default value)</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>G18 plane</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>G19 plane</td>
<td></td>
</tr>
</tbody>
</table>
20.1 Activating turning/milling/drilling technologies

<table>
<thead>
<tr>
<th>MD52006</th>
<th>$MCS_DISP_PLANE_TURN</th>
<th>Plane selection G17, G18, G19</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 0</td>
<td>Turning: Plane selection in the cycle support when programming under &quot;programGUIDE G code&quot;</td>
<td></td>
</tr>
<tr>
<td>= 17</td>
<td>G17 plane</td>
<td></td>
</tr>
<tr>
<td>= 18</td>
<td>G18 plane (default value)</td>
<td></td>
</tr>
<tr>
<td>= 19</td>
<td>G19 plane</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD52212</th>
<th>$MCS_FUNCTION_MASK_TECH</th>
<th>Cross-technology function mask</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit 0</td>
<td>Enable swivel</td>
<td></td>
</tr>
<tr>
<td>= 0</td>
<td>Swivel plane, swivel tool not enabled</td>
<td></td>
</tr>
<tr>
<td>= 1</td>
<td>Swivel plane, swivel tool enabled</td>
<td></td>
</tr>
<tr>
<td>Bit 1</td>
<td>No optimized travel along software limit switches</td>
<td></td>
</tr>
<tr>
<td>= 0</td>
<td>No optimized travel along software limit switches</td>
<td></td>
</tr>
<tr>
<td>= 1</td>
<td>Optimized travel along software limit switches</td>
<td></td>
</tr>
<tr>
<td>Bit 2</td>
<td>Approach logic for stepped drill (ShopTurn)</td>
<td></td>
</tr>
<tr>
<td>= 0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>= 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bit 3</td>
<td>Call block search cycle for ShopMill/ShopTurn</td>
<td></td>
</tr>
<tr>
<td>= 0</td>
<td>The E_S_ASUP or F_S_ASUP cycles are not called in the block search cycle PROG(EVENT).SPF.</td>
<td></td>
</tr>
<tr>
<td>= 1</td>
<td>The E_S_ASUP (under ShopMill) or F_S_ASUP (under ShopTurn) cycles are called in the block search cycle PROG(EVENT).SPF.</td>
<td></td>
</tr>
<tr>
<td>Bit 4</td>
<td>Approach logic using the cycle (ShopTurn)</td>
<td></td>
</tr>
<tr>
<td>= 0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>= 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bit 5</td>
<td>The cycle for SERUPRO (CYCLE207) is called in the block search cycle PROG(EVENT).SPF.</td>
<td></td>
</tr>
<tr>
<td>Bit 6</td>
<td>Work offset value WO cannot be entered (ShopTurn)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD52240</th>
<th>$MCS_NAME_TOOL_CHANGE_PROG</th>
<th>Tool change program for G code steps</th>
</tr>
</thead>
<tbody>
<tr>
<td>= Program name</td>
<td>The associated program is called for tool change.</td>
<td></td>
</tr>
</tbody>
</table>

See also

Technology cycles for swiveling (Page 405)
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.

<table>
<thead>
<tr>
<th>MD52216 $MCS_FUNCTION_MASK_DRILL</th>
<th>Drilling function mask</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit 0</td>
<td>Tapping cycle CYCLE84, technology input fields</td>
</tr>
<tr>
<td>= 0</td>
<td>Hide input fields</td>
</tr>
<tr>
<td>= 1</td>
<td>Display input fields</td>
</tr>
<tr>
<td>Bit 1</td>
<td>Tapping cycle CYCLE840, technology input fields</td>
</tr>
<tr>
<td>= 0</td>
<td>Hide input fields</td>
</tr>
<tr>
<td>= 1</td>
<td>Display input fields</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SD55216 $SCS_FUNCTION_MASK_DRILL_SET</th>
<th>Drilling function mask</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit 0</td>
<td>Tapping CYCLE84, determine spindle direction of rotation in the cycle</td>
</tr>
<tr>
<td>= 0</td>
<td>Do not reverse spindle direction of rotation</td>
</tr>
<tr>
<td>= 1</td>
<td>Reverse spindle direction of rotation</td>
</tr>
<tr>
<td>Bit 1</td>
<td>Boring CYCLE86</td>
</tr>
<tr>
<td>Note:</td>
<td>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+).</td>
</tr>
<tr>
<td>= 0</td>
<td>Do not take into account the rotation of the tool plane when positioning the spindle (SPOS).</td>
</tr>
<tr>
<td>= 1</td>
<td>Take into account the rotation of the tool plane when positioning the spindle (SPOS).</td>
</tr>
<tr>
<td>Bit 2</td>
<td>Boring CYCLE86</td>
</tr>
<tr>
<td>= 0</td>
<td>When positioning the spindle, do not take into account the components of the swiveled table kinematics (swiveling with CYCLE800, tool carrier).</td>
</tr>
<tr>
<td>Note:</td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td>e.g. rotary axis C rotation around Z (for G17) rotary axis vector of the swivel data set V2xyz = 0 , 0 , -1.</td>
</tr>
<tr>
<td>= 1</td>
<td>When positioning the spindle, take into account the components of the swiveled table kinematics (swiveling with CYCLE800, tool carrier).</td>
</tr>
<tr>
<td>Bit 4</td>
<td>Tapping CYCLE840, set monitoring of the machine data</td>
</tr>
<tr>
<td>MD31050 $MA_DRIVE_AX_RATIO_DENOM and</td>
<td></td>
</tr>
<tr>
<td>MD31060 $MA_DRIVE_AX_RATIO_NUMERA of the spindle</td>
<td></td>
</tr>
<tr>
<td>= 0</td>
<td>No monitoring</td>
</tr>
<tr>
<td>= 1</td>
<td>Monitoring</td>
</tr>
<tr>
<td>Bit 5</td>
<td>Tapping CYCLE84: Calculation of the brake application point for G33</td>
</tr>
</tbody>
</table>
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:

<table>
<thead>
<tr>
<th>SD55481 $SCS_DRILL_TAPPING_SET_GG12[0]$</th>
<th>Exact stop response</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 0</td>
<td>Exact stop response as before the cycle call (default value).</td>
</tr>
<tr>
<td>= 1</td>
<td>G601</td>
</tr>
<tr>
<td>= 2</td>
<td>G602</td>
</tr>
<tr>
<td>= 3</td>
<td>G603</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SD55482 $SCS_DRILL_TAPPING_SET_GG21[0]$</th>
<th>Acceleration behavior</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 0</td>
<td>Acceleration behavior as before the cycle call (default value).</td>
</tr>
<tr>
<td>= 1</td>
<td>SOFT</td>
</tr>
<tr>
<td>= 2</td>
<td>BRISK</td>
</tr>
<tr>
<td>= 3</td>
<td>DRIVE</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SD55483 $SCS_DRILL_TAPPING_SET_GG24[0]$</th>
<th>Feedforward control</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 0</td>
<td>Precontrol, the same as before the cycle call (default value).</td>
</tr>
<tr>
<td>= 1</td>
<td>FFWON</td>
</tr>
<tr>
<td>= 2</td>
<td>FFWOF</td>
</tr>
</tbody>
</table>

For settings under ShopTurn, please refer to Chapter Drilling centered under ShopTurn (Page 492)

Tapping (CYCLE84)

<table>
<thead>
<tr>
<th>SD55484 $SCS_DRILL_TAPPING_SET_MC[0]$</th>
<th>Spindle operation for MCALL</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 0</td>
<td>For MCALL, reactivate spindle operation (default value).</td>
</tr>
<tr>
<td>= 1</td>
<td>For MCALL, remain in position controlled spindle operation.</td>
</tr>
</tbody>
</table>
20.3 Manufacturer cycles

20.3.1 Manufacturer cycles

The following cycles are also available in the cycle package for individual adaptation:

<table>
<thead>
<tr>
<th>Cycle Name</th>
<th>Function Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CUST_TECHCyc.SPF</td>
<td>Manufacturer cycle for the adaptation of technology cycles.</td>
</tr>
<tr>
<td>CUST_800.SPF</td>
<td>Manufacturer cycle for the adaptation of the Swivel plane and the</td>
</tr>
<tr>
<td></td>
<td>Swivel tool functions (CYCLE800).</td>
</tr>
<tr>
<td>CUST_832.SPF</td>
<td>Manufacturer cycle for the adaptation of the High Speed Settings function (CYCLE832).</td>
</tr>
<tr>
<td>CUST_MEACYC.SPF</td>
<td>Manufacturer cycle for the adaptation of the measuring functions.</td>
</tr>
<tr>
<td>PROG_EVENT.SPF</td>
<td>Standard cycle to support the following functions:</td>
</tr>
<tr>
<td></td>
<td>• Block search when milling or turning is activated</td>
</tr>
<tr>
<td></td>
<td>• Block search and swivel plane</td>
</tr>
<tr>
<td></td>
<td>• Block search and align / advance tool</td>
</tr>
<tr>
<td></td>
<td>Observe MD52212 $MCS_FUNCTION_MASK_TECH bit 3 and bit 5.</td>
</tr>
<tr>
<td>CUST_T</td>
<td>Cycle is used to track the T preparation after SERUPRO.</td>
</tr>
<tr>
<td>CUST_M6</td>
<td>Cycle is used to track the tool change after SERUPRO.</td>
</tr>
<tr>
<td>CUST_MULTICHAN</td>
<td>Manufacturer cycle for lathes with several channels</td>
</tr>
</tbody>
</table>

Copying manufacturer cycles

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.
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.

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.

20.3.2 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 toolholder, 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.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>_THnr</td>
<td>Toolholder or master spindle number that was programmed for the change or the preparation.</td>
</tr>
<tr>
<td>_MTHnr</td>
<td>Number of the active toolholder or master spindle at the time of programming.</td>
</tr>
</tbody>
</table>

The cycles themselves do not contain and "machine logic". Pure data operations are performed.

The active toolholder 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 toolholder, saved at the beginning, is reactivated.

The cycles have additionally commented jump-out positions for change or preparation cycles of the manufacturer. 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.

References

For more information, please refer to the Function Manual, Basic Functions, Chapter: SERUPRO-End-ASUB
20.3.3 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

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>_S_NR</td>
<td>Spindle number to which the master spindle is set.</td>
</tr>
<tr>
<td>_RET</td>
<td>Return value</td>
</tr>
<tr>
<td></td>
<td>= 0 The block is executed corresponding to the run-in mode.</td>
</tr>
<tr>
<td></td>
<td>= 1 The entire block is skipped.</td>
</tr>
</tbody>
</table>
20.4 Milling

20.4.1 Technology cycles for milling

Channel-specific cycle setting data

<table>
<thead>
<tr>
<th>SD55214 $SCS_FUNCTION_MASK_MILL_SET</th>
<th>Milling function screen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit 0</td>
<td>Basic setting, milling in climbing.</td>
</tr>
<tr>
<td>Bit 2</td>
<td>Depth calculation of the milling cycles, with or without safety clearance.</td>
</tr>
<tr>
<td>= 0</td>
<td>Depth calculation of the milling cycles is performed between the reference plane + safety clearance and the depth.</td>
</tr>
<tr>
<td>= 1</td>
<td>Depth calculation is performed without including the safety clearance.</td>
</tr>
</tbody>
</table>

Bit 2 is effective in the following milling cycles: CYCLE61, CYCLE71, CYCLE76, CYCLE77, CYCLE79, CYCLE899, LONGHOLE, SLOT1, SLOT2, POCKET3, POCKET4.

Contour milling (CYCLE63)

<table>
<thead>
<tr>
<th>SD55460 $SCS_MILL_CONT_INITIAL_RAD_FIN</th>
<th>Finishing approach circle radius</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The radius of the approach circle during the finishing of contour pockets is affected.</td>
</tr>
<tr>
<td>= –1</td>
<td>The radius is selected so that at the starting point the safety clearance to the finishing allowance is maintained (default value).</td>
</tr>
<tr>
<td>= &gt;0</td>
<td>The radius is selected so that at the starting point the value of this channel-specific setting data to the finishing allowance is maintained.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SD55461 $SCS_MILL_CONT_DIFF_TOOLRAD_MIN</th>
<th>Contour pocket milling</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 5</td>
<td>Smallest possible cutter radius deviation (default value).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SD55462 $SCS_MILL_CONT_DIFF_TOOLRAD_MAX</th>
<th>Contour pocket milling</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 0.01</td>
<td>Largest possible cutter radius deviation (default value).</td>
</tr>
</tbody>
</table>

Multiple edge (CYCLE79), circular position pattern (HOLES2), circumferential groove (SLOT2)

<table>
<thead>
<tr>
<th>SD55230 $SCS_CIRCLE_RAPID_FEED</th>
<th>Rapid feed in mm/min for positioning on a circular path between the circumferential grooves or the contour elements.</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 10000</td>
<td></td>
</tr>
</tbody>
</table>
20.4.2 Cylinder surface transformation (TRACYL)

Software option

You require the following software option in order 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 offset (ON)
2. without groove side offset (OFF)

![Diagram of grooves with and without groove side offset](image_url)

Figure 20-1 Grooves with and without groove side offset
20.4.3 Example: Milling machine with the XYZ-AC axis configuration

The following example illustrates how to set the axis configuration on a machine.

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 Working spindle

Figure 20-2  Machining slots on a cylinder surface with X-A-Z kinematics

You must configure two data records with the following machine data for the machine illustrated above:

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Machine axis number valid in channel</td>
</tr>
<tr>
<td></td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Number of channel axes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD20080 $MC_AXCONF_CHANAX_NAME_TAB[ ]</th>
<th>Name of channel axis in the channel</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 = XC</td>
<td>Channel axis XC, corresponds to channel axis 1</td>
</tr>
<tr>
<td>1 = YC</td>
<td>Channel axis YC, corresponds to channel axis 2</td>
</tr>
<tr>
<td>2 = ZC</td>
<td>Channel axis ZC, corresponds to channel axis 3</td>
</tr>
<tr>
<td>3 = A</td>
<td>Channel axis A, corresponds to channel axis 4</td>
</tr>
<tr>
<td>4 = C</td>
<td>Channel axis C, corresponds to channel axis 5</td>
</tr>
</tbody>
</table>
### General settings for the transformation

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MD10602 $MN_FRAME_GEOAX_CHANGE_MODE</td>
<td>Frames when switching over geometry screens</td>
</tr>
<tr>
<td>= 1</td>
<td>The actual total frame (work offsets) is recalculated when switching over geometry axes (selecting - deselecting TRACYL).</td>
</tr>
</tbody>
</table>

### Data set for the 1st transformation in the channel

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MD24100 $MC_TRAFO_TYPE_1</td>
<td>Definition of transformation 1 in the channel.</td>
</tr>
<tr>
<td>= 512</td>
<td>Transformer type (512 = cylinder surface transformation without groove side offset)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MD24110 $MC_TRAFO_AXES_IN_1</td>
<td>Axis assignment for the 1st transformation in the channel</td>
</tr>
<tr>
<td>[0] = 3</td>
<td>Channel axis: Infeed axis (tool axis) perpendicular (radial) to the rotary axis Z</td>
</tr>
<tr>
<td>[1] = 4</td>
<td>Channel axis: Rotary axis A</td>
</tr>
<tr>
<td>[2] = 1</td>
<td>Channel axis: 1st axis of the machining plane parallel to the rotary axis X</td>
</tr>
<tr>
<td>[3] = 2</td>
<td>Channel axis: 2nd axis of the machining plane Y</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MD24120 $MC_TRAFO_GEOAX_ASSIGN_TAB_1</td>
<td>Assignment of the geometry axes to channel axes for transformation 1.</td>
</tr>
<tr>
<td>[0] = 1</td>
<td>Channel axis: 1st geometry axis X</td>
</tr>
<tr>
<td>[1] = 4</td>
<td>Channel axis: 2nd geometry axis A</td>
</tr>
<tr>
<td>[2] = 3</td>
<td>Channel axis: 3rd geometry axis Z</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MD24800 $MC_TRACYL_ROT_AX_OFFSET_1</td>
<td>Offset of rotary axis for the 1st TRACYL transformation.</td>
</tr>
<tr>
<td>= 0</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MD24805 $MC_TRACYL_ROT_AX_FRAME_1</td>
<td>Axial offset of rotary axis for the 1st TRACYL transformation.</td>
</tr>
<tr>
<td>= 1</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MD24810 $MC_TRACYL_ROT_SIGN_IS_PLUS_1</td>
<td>Sign of the rotary axis for the 1st TRACYL transformation.</td>
</tr>
<tr>
<td>= 1</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MD24820 $MC_TRACYL_BASE_TOOL_1[]</td>
<td>Vector of basis tool for the 1st TRACYL transformation in XYZ</td>
</tr>
<tr>
<td>[0] = 0</td>
<td></td>
</tr>
<tr>
<td>[1] = 0</td>
<td></td>
</tr>
<tr>
<td>[2] = 0</td>
<td></td>
</tr>
</tbody>
</table>
Data set for the 2nd transformation in the channel

<table>
<thead>
<tr>
<th>MD24200 $MC_TRAFO_TYPE_2</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 513 Transformer type (513 = cylinder surface transformation with groove side offset)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD24210 $MC_TRAFO_AXES_IN_2</th>
</tr>
</thead>
<tbody>
<tr>
<td>[0] = 3 Channel axis: Infeed axis perpendicular (radial) to rotary axis</td>
</tr>
<tr>
<td>[1] = 4 Channel axis: Rotary axis</td>
</tr>
<tr>
<td>[2] = 1 Channel axis: 1st axis of the machining plane parallel to the rotary axis</td>
</tr>
<tr>
<td>[3] = 2 Channel axis: 2nd axis of the machining plane</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD24220 $MC_TRAFO_GEOAX_ASSIGN_TAB_1</th>
</tr>
</thead>
<tbody>
<tr>
<td>[0] = 1 Channel axis: 1st geometry axis</td>
</tr>
<tr>
<td>[1] = 4 Channel axis: 2nd geometry axis</td>
</tr>
<tr>
<td>[2] = 3 Channel axis: 3rd geometry axis</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD24850 $MC_TRACYL_ROT AX_OFFSET_2</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 0 Offset of rotary axis for the 2nd TRACYL transformation</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD24855 $MC_TRACYL_ROT_SIGN_IS:frame_2</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 1 Axial offset for the 1st TRACYL transformation</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD24860 $MC_TRACYL_ROT_SIGN_IS:PLUS_2</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 1 Sign of rotary axis for the 2nd TRACYL transformation</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD24870 $MC_TRACYL_BASE TOOL[]</th>
</tr>
</thead>
<tbody>
<tr>
<td>[0] = 0 Vector of basis tool for the 2nd TRACYL transformation in XYZ</td>
</tr>
<tr>
<td>[1] = 0</td>
</tr>
<tr>
<td>[2] = 0</td>
</tr>
</tbody>
</table>
**Note**

**Data records for transformations**

For both data records, you can use any transformations from all available transformations (MD24100 $MC_TRAFO_TYPE_1, MD24200 $MC_TRAFO_TYPE_2, etc.). The two data records need not be directly next to each other.

However, the 1st data record must always be used for "Cylinder surface transformation without groove side offset" (= 512) and the 2nd data record for "Cylinder surface transformation with groove side offset" (=513).
20.5 Turning

20.5.1 Technology cycles for turning

Thread-cutting (CYCLE99)

During program runtime, the master spindle can be the main spindle or the counterspindle. Bit 3 must be set accordingly in the array index [channel axis number]:

<table>
<thead>
<tr>
<th>MD52207 $MCS_AXIS_USAGE[0 ..19]</th>
<th>Direction of rotation of the master spindle [channel axis number]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit 3</td>
<td>Direction of rotation of the C axis (master spindle) normal or in the opposite direction</td>
</tr>
<tr>
<td>= 0</td>
<td>Normal (M3 is +C)</td>
</tr>
<tr>
<td>= 1</td>
<td>Opposite (M3 is -C)</td>
</tr>
</tbody>
</table>

Contour grooving CYCLE930, contour turning CYCLE950, stock removal at corner CYCLE951, contour turning CYCLE952

<table>
<thead>
<tr>
<th>SD55500 $SCS_TURN_FIN_FEED_PERCENT</th>
<th>Enter the finishing feedrate for complete machining, roughing and finishing. The percentage of the value corresponds to that entered under parameter F (feedrate).</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 100</td>
<td>100 % finishing feedrate</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SD55510 $SCS_TURN_GROOVE_DWELL_TIME</th>
<th>Dwell time, which is necessary between grooving and retracting for grooving technology. Tool clearance time during grooving at the base.</th>
</tr>
</thead>
<tbody>
<tr>
<td>= &gt; 0</td>
<td>Dwell time in seconds</td>
</tr>
<tr>
<td>= &lt; 0</td>
<td>Dwell time in spindle revolutions</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SD55580 $SCS_TURN_CONT_RELEASE_ANGLE</th>
<th>Angle, through which the tool is lifted from the contour for contour turning, roughing.</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 45</td>
<td>Retraction angle of 45 degrees</td>
</tr>
</tbody>
</table>
### Configuring cycles

#### 20.5 Turning

<table>
<thead>
<tr>
<th>SD55581 $SCS_TURN_CONT_RELEASE_DIST</th>
<th>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.</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 1</td>
<td>1 mm or 1 inch retraction distance</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SD55582 $SCS_TURN_CONT_TRACE_ANGLE</th>
<th>The angle between cutting edge and contour as of 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.</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 5</td>
<td>5 degree angle</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SD55583 $SCS_TURN_CONT_VARIABLE_DEPTH</th>
<th>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.</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 20</td>
<td>20 % variable cutting depth</td>
</tr>
</tbody>
</table>
### SD55584: $SCS\_TURN\_CONT\_BLANK\_OFFSET

Distance from the blank at which G0 is switched over to G1 during contour turning to compensate for any blank allowances. This also applies to stock removal, grooving and plunge turning.

<table>
<thead>
<tr>
<th>$SCS_TURN_CONT_BLANK_OFFSET</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥ 1 mm or 1 inch blank allowance</td>
<td></td>
</tr>
</tbody>
</table>

### SD55585: $SCS\_TURN\_CONT\_INTERUPT\_TIME

Time for the feedrate interruption for contour turning. This also applies to stock removal, grooving and plunge turning.

<table>
<thead>
<tr>
<th>$SCS_TURN_CONT_INTERUPT_TIME</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥ 0 Interruption time in seconds</td>
<td></td>
</tr>
<tr>
<td>&lt; 0 Interruption time in revolutions</td>
<td></td>
</tr>
<tr>
<td>= 0 No interruption</td>
<td></td>
</tr>
</tbody>
</table>

### 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.

<table>
<thead>
<tr>
<th>$SCS_TURN_CONT_INTER_RETRACTION</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 0 Retraction distance at feed interruption SD55585 $SCS_TURN_CONT_INTERUPT_TIME has no effect.</td>
<td></td>
</tr>
<tr>
<td>≥ 0 No retraction distance</td>
<td></td>
</tr>
</tbody>
</table>
20.5 Turning

**Example: Residual material machining, axis 1**

If the limit is set to 50% and the final machining allowance is 0.5 mm, any residual material thinner than 0.25 mm is not machined in a separate machining step but is removed during finishing.

<table>
<thead>
<tr>
<th>SD55587 $SCS_TURN_CONT_MIN_REST_MAT_AX1</th>
<th>Limit for removal of residual material in the direction of axis 1 (for G18 Z) min. This also applies to residual machining – stock removal, grooving and plunge turning.</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>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.</td>
</tr>
</tbody>
</table>

Explanation: With this SD, for contour turning, the limit value for residual material detection is defined in the direction of the 1st axis.

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 with the residual machining – but is removed during finishing.

**Example: Residual material machining, axis 2**

If the limit is set to 50% and the final machining allowance is 0.5 mm, any residual material thinner than 0.25 mm is not machined in a separate machining step but is removed during finishing.

<table>
<thead>
<tr>
<th>SD55588 $SCS_TURN_CONT_MIN_REST_MAT_AX2</th>
<th>Limit value for removing residual material in the direction of axis 2 (for G18 X). This also applies to residual machining – stock removal, grooving and plunge turning.</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>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.</td>
</tr>
</tbody>
</table>

Explanation: With this SD, for contour turning, the limit value for residual material detection is defined in the direction of the 2nd axis.

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 with the residual machining – but is removed during 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.
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:

<table>
<thead>
<tr>
<th>SD55596 $SCS_TURN_CONT_TURN_RETRACTION</th>
<th>Retraction depth before turning</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 0.1</td>
<td>0.1 mm or 0.1 inch retraction depth</td>
</tr>
</tbody>
</table>

Distance to the last cut, SD55595
Retraction between plunge-cutting and stock removal, SD55596
20.5.2 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) (Page 395)
- End face machining (TRANSMIT) (Page 398)

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:

<table>
<thead>
<tr>
<th>MD20080 $MC_AXCONF_CHANAX_NAME_TAB[]</th>
<th>Channel axis name in the channel</th>
</tr>
</thead>
<tbody>
<tr>
<td>[0] = XC</td>
<td>Channel axis XC</td>
</tr>
<tr>
<td>[1] = ZC</td>
<td>Channel axis ZC</td>
</tr>
<tr>
<td>[2] = C1</td>
<td>Main spindle C1</td>
</tr>
<tr>
<td>[3] = WZ</td>
<td>Tool spindle WZ</td>
</tr>
</tbody>
</table>

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:

<table>
<thead>
<tr>
<th>MD20080 $MC_AXCONF_CHANAX_NAME_TAB[]</th>
<th>Channel axis name in the channel</th>
</tr>
</thead>
<tbody>
<tr>
<td>[0] = XC</td>
<td>Channel axis XC</td>
</tr>
<tr>
<td>[1] = ZC</td>
<td>Channel axis ZC</td>
</tr>
<tr>
<td>[2] = C1</td>
<td>Main spindle C1</td>
</tr>
<tr>
<td>[3] = WZ</td>
<td>Tool spindle WZ</td>
</tr>
</tbody>
</table>

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:

<table>
<thead>
<tr>
<th>MD20080 $MC_AXCONF_CHANAX_NAME_TAB[]</th>
<th>Channel axis name in the channel</th>
</tr>
</thead>
<tbody>
<tr>
<td>[0] = XC</td>
<td>Channel axis XC</td>
</tr>
<tr>
<td>[1] = ZC</td>
<td>Channel axis ZC</td>
</tr>
<tr>
<td>[2] = C1</td>
<td>Main spindle C1</td>
</tr>
<tr>
<td>[3] = WZ</td>
<td>Tool spindle WZ</td>
</tr>
<tr>
<td>[5] = YC</td>
<td>Channel axis YC</td>
</tr>
</tbody>
</table>
20.5.3 Cylinder surface transformation (TRACYL)

Software option

You require the following software option in order 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

<table>
<thead>
<tr>
<th>MD10602 $MN_FRAME_GEOAX_CHANGE_MODE</th>
<th>Frames when switching over geometry axes.</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 1</td>
<td>The actual total frame (work offsets) and when switching over geometry axes (selecting - deselecting TRACYL) is recalculated.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD24040 $MC_FRAME_ADAPT_MODE</th>
<th>Adapting the active frames</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit 0 = 0</td>
<td></td>
</tr>
<tr>
<td>Bit 1 = 0</td>
<td></td>
</tr>
<tr>
<td>Bit 2 = 0</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD28082 $MC_MM_SYSTEM_FRAME_MASK</th>
<th>Configuration of channel-specific system frames, which are included in the channel calculation.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit 6 = 1</td>
<td></td>
</tr>
</tbody>
</table>

When setting up the functions, you can take the following channel-specific machine data into account:

<table>
<thead>
<tr>
<th>MD24300 $MC_TRAFO_TYPE_3</th>
<th>Cylinder surface transformation, main spindle: Transformation 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 512</td>
<td>Without groove side offset (without Y axis)</td>
</tr>
<tr>
<td>= 513</td>
<td>With groove side offset (with Y axis):</td>
</tr>
<tr>
<td>= 514</td>
<td>With groove side offset and Y offset</td>
</tr>
</tbody>
</table>
### 20.5 Turning

<table>
<thead>
<tr>
<th>MD24400 $MC_TRAFO_TYPE_4</th>
<th>Cylinder surface transformation, counterspindle: Transformation 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 512</td>
<td>Without groove side offset (without Y axis)</td>
</tr>
<tr>
<td>= 513</td>
<td>With groove side offset (with Y axis)</td>
</tr>
<tr>
<td>= 514</td>
<td>With groove side offset and Y offset</td>
</tr>
</tbody>
</table>

**Note**

You must also set up other machine data for each of the individual transformations.

### Cylinder surface transformation without groove side offset

<table>
<thead>
<tr>
<th>MD24300 $MC_TRAFO_TYPE_3</th>
<th>Definition of the 3rd transformation in the channel</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 512</td>
<td>TRACYL main spindle.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD24310 $MC_TRAFO_AXES_IN_3[]</th>
<th>Axis assignment for transformation 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>[0] = 1</td>
<td>Perpendicular to the rotary axis XC</td>
</tr>
<tr>
<td>[1] = 3</td>
<td>Rotary axis (main spindle) C1</td>
</tr>
<tr>
<td>[2] = 2</td>
<td>Parallel to the rotary axis ZC</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD24320 $MC_TRAFO_GEOAX_ASSIGN_TAB_3[]</th>
<th>Assignment of geometry axes to channel axes for transformation 3.</th>
</tr>
</thead>
<tbody>
<tr>
<td>[0] = 1</td>
<td>1st channel axis X</td>
</tr>
<tr>
<td>[1] = 3</td>
<td>2nd channel axis Y</td>
</tr>
<tr>
<td>[2] = 2</td>
<td>3rd channel axis Z</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD24800 $MC_TRACYL_ROT_AX_OFFSET_1</th>
<th>Offset of the rotary axis for the 1st TRACYL transformation.</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 0</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD24805 $MC_TRACYL_ROT_AX_FRAME_1</th>
<th>Axial offset of the rotary axis is taken into account during TRACYL.</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 2</td>
<td></td>
</tr>
</tbody>
</table>
Configuring cycles
20.5 Turning

<table>
<thead>
<tr>
<th>MD24810 $MC_TRACYL_ROT_SIGN_IS_PLUS_1</th>
<th>Sign of the rotary axis for the 1st TRACYL transformation.</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 1</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD24820 $MC_TRACYL_BASE_TOOL_1[]</th>
<th>Vector of the basis tool for the 1st TRACYL transformation.</th>
</tr>
</thead>
<tbody>
<tr>
<td>[0] = 0</td>
<td></td>
</tr>
<tr>
<td>[1] = 0</td>
<td></td>
</tr>
<tr>
<td>[2] = 0</td>
<td></td>
</tr>
</tbody>
</table>

Cylinder surface transformation with groove side offset

<table>
<thead>
<tr>
<th>MD24300 $MC_TRAFO_TYPE_3</th>
<th>Definition of the 3rd transformation in the channel</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 513</td>
<td>TRACYL main spindle</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD24310 $MC_TRAFO_AXES_IN_3[]</th>
<th>Axis assignment for transformation 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>[0] = 1</td>
<td>Perpendicular to the rotary axis XC</td>
</tr>
<tr>
<td>[1] = 3</td>
<td>Rotary axis (main spindle) C1</td>
</tr>
<tr>
<td>[2] = 2</td>
<td>Parallel to the rotary axis ZC</td>
</tr>
<tr>
<td>[3] = 6</td>
<td>Parallel to the cylinder surface and perpendicular to the rotary axis ZC</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD24320 $MC_TRAFO_GEOAX_ASSIGN_TAB_3[]</th>
<th>Assignment of geometry axes to channel axes for transformation 3.</th>
</tr>
</thead>
<tbody>
<tr>
<td>[0] = 1</td>
<td>1st channel axis X</td>
</tr>
<tr>
<td>[1] = 3</td>
<td>2nd channel axis Y</td>
</tr>
<tr>
<td>[2] = 2</td>
<td>3rd channel axis Z</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD24800 $MC_TRACYL_ROT_AX_OFFSET_1</th>
<th>Offset of the rotary axis for the 1st TRACYL transformation.</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 0</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD24805 $MC_TRACYL_ROT_AX_FRAME_1</th>
<th>Axial offset of the rotary axis is taken into account during TRACYL.</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 2</td>
<td></td>
</tr>
</tbody>
</table>
20.5 Turning

20.5.4 End face machining (TRANSMIT)

Software option

You require the following software option in order 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) (Page 395)".

You can make additional settings in the following channel-specific machine data:

<table>
<thead>
<tr>
<th>MD24100 $MC_TRAFO_TYPE_1</th>
<th>End face machining, main spindle:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Transformation 1</td>
</tr>
<tr>
<td>= 256</td>
<td>Machining without Y axis</td>
</tr>
<tr>
<td>= 257</td>
<td>Machining with Y axis</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD24200 $MC_TRAFO_TYPE_2</th>
<th>End face machining, counterspindle:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Transformation 2</td>
</tr>
<tr>
<td>= 256</td>
<td>Machining without Y axis</td>
</tr>
<tr>
<td>= 257</td>
<td>Machining with Y axis</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD24810 $MC_TRACYL_ROT_SIGN_IS_PLUS_1</th>
<th>Sign of the rotary axis for the 1st TRACYL transformation.</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 1</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD24820 $MC_TRACYL_BASE_TOOL_1</th>
<th>Vector of the basis tool for the 1st TRACYL transformation.</th>
</tr>
</thead>
<tbody>
<tr>
<td>[0] = 0</td>
<td></td>
</tr>
<tr>
<td>[1] = 0</td>
<td></td>
</tr>
<tr>
<td>[2] = 0</td>
<td></td>
</tr>
</tbody>
</table>
### MD24110 $MC\_TRAFO\_AXES\_IN\_1[]

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Perpendicular to the rotary axis XC</td>
</tr>
<tr>
<td>1</td>
<td>Rotary axis (main spindle) C1</td>
</tr>
<tr>
<td>2</td>
<td>Parallel to the rotary axis ZC</td>
</tr>
</tbody>
</table>

### MD24120 $MC\_TRAFO\_GEOAX\_ASSIGN\_TAB\_1[]

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1st channel axis X</td>
</tr>
<tr>
<td>1</td>
<td>2nd channel axis Y</td>
</tr>
<tr>
<td>2</td>
<td>3rd channel axis Z</td>
</tr>
</tbody>
</table>

### MD24900 $MC\_TRANSMIT\_ROT\_AX\_OFFSET\_1

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Offset of the rotary axis for the 1st TRANSMIT transformation.</td>
</tr>
</tbody>
</table>

### MD24905 $MC\_TRANSMIT\_ROT\_AX\_FRAME\_1

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Axial offset of the rotary axis is taken into account during TRANSMIT 1.</td>
</tr>
</tbody>
</table>

### MD24910 $MC\_TRANSMIT\_ROT\_SIGN\_IS\_PLUS\_1

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Sign of the rotary axis for the 1st TRANSMIT transformation.</td>
</tr>
</tbody>
</table>

### MD24911 $MC\_TRANSMIT\_POLE\_SIDE\_FIX\_1

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Limitation of working range in front of / behind the pole, 1st TRANSMIT.</td>
</tr>
</tbody>
</table>

### MD24920 $MC\_TRANSMIT\_BASE\_TOOL\_1[]

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Vector of the basis tool for the 1st TRANSMIT transformation.</td>
</tr>
</tbody>
</table>

### TRANSMIT with real Y axis

### MD24100 $MC\_TRAFO\_TYPE\_1

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>257</td>
<td>Definition of transformation 1 in the channel: TRANSMIT main spindle.</td>
</tr>
</tbody>
</table>
### References

Additional information on face end machining is provided in:

Function Manual, Extended Functions; Kinematic Transformation (M1): TRANSMIT

---

<table>
<thead>
<tr>
<th>MD24110 $MC_TRAFO_AXES_IN_1[]</th>
<th>Axis assignment for the 1st transformation in the channel.</th>
</tr>
</thead>
<tbody>
<tr>
<td>[0] = 1</td>
<td>Perpendicular to the rotary axis XC</td>
</tr>
<tr>
<td>[1] = 3</td>
<td>Rotary axis C1</td>
</tr>
<tr>
<td>[2] = 2</td>
<td>Parallel to the rotary axis ZC</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD24120 $MC_TRAFO_GEOAX_ASSIGN_TAB_1[]</th>
<th>Assignment of the geometry axes to channel axes for transformation 1.</th>
</tr>
</thead>
<tbody>
<tr>
<td>[0] = 1</td>
<td>1st channel axis X</td>
</tr>
<tr>
<td>[1] = 3</td>
<td>2nd channel axis Y</td>
</tr>
<tr>
<td>[2] = 2</td>
<td>3rd channel axis Z</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD24900 $MC_TRANSMIT_ROT_AX_OFFSET_1</th>
<th>Offset of the rotary axis for the 1st TRANSMIT transformation.</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 0</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD24905 $MC_TRANSMIT_ROT_AX_FRAME_1</th>
<th>Axial offset of the rotary axis is taken into account during TRANSMIT 1.</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 2</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD24910 $MC_TRANSMIT_ROT_SIGN_IS_PLUS_1</th>
<th>Sign of the rotary axis for the 1st TRANSMIT transformation.</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 0</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD24911 $MC_TRANSMIT_POLE_SIDE_FIX_1</th>
<th>Limitation of working range in front of / behind the pole, 1st TRANSMIT.</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 1</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD24920 $MC_TRANSMIT_BASE_TOOL_1[]</th>
<th>Vector of the basis tool for the 1st TRANSMIT transformation.</th>
</tr>
</thead>
<tbody>
<tr>
<td>[0] = 0</td>
<td></td>
</tr>
<tr>
<td>[1] = 0</td>
<td></td>
</tr>
<tr>
<td>[2] = 0</td>
<td></td>
</tr>
</tbody>
</table>
20.5.5 Inclined Y axis (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 lathe 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

You still have to set up the inclined axis function (TRAANG) via machine data.

References

Function Manual, Extended Functions; Kinematic Transformations (M1): TRAANG

Example

For example, for a turning machine with X and Z axes and inclined Y axis, main spindle (C) and tool spindle (WZ), you must configure the following machine data:

<table>
<thead>
<tr>
<th>MD20050 $MC_AXCONF_GEOAX_ASSIGN_TAB[]</th>
<th>Assignment of geometry axis to channel axis.</th>
</tr>
</thead>
<tbody>
<tr>
<td>[0] = 1</td>
<td>1st real geometry axis X axis.</td>
</tr>
<tr>
<td>[1] = 0</td>
<td>2nd real geometry axis, Y axis not available.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD20110 $MC_RESET_MODE_MASK</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit 0 = 1</td>
<td>TRAANG is retained after ramp-up.</td>
</tr>
<tr>
<td>Bit 7 = 0</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD20112 $MC_START_MODE_MASK</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit 7 = 1</td>
<td>TRAANG is retained after &quot;Cycle start&quot;.</td>
</tr>
</tbody>
</table>
### MD20118 $MC_GEOAX_CHANGE_RESET

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Allow automatic geometry axis change.</td>
</tr>
</tbody>
</table>

### MD20140 $MC_TRAFO_RESET_VALUE

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>TRAANG always active after reset.</td>
</tr>
</tbody>
</table>

### MD20144 $MC_TRAFO_MODE_MASK

<table>
<thead>
<tr>
<th>Bit 0</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TRAANG runs in the background (persistent) and is not shown on the user interface.</td>
</tr>
</tbody>
</table>

### MD20070 $MC_AXCONF_MACHAX_USED[4]

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Channel axis YC = 5th machine axis.</td>
</tr>
</tbody>
</table>

### MD20080 $MC_AXCONF_CHANAX_NAME_TAB[]

<table>
<thead>
<tr>
<th>Index</th>
<th>Name in the channel</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>XC</td>
</tr>
<tr>
<td>1</td>
<td>ZC</td>
</tr>
<tr>
<td>2</td>
<td>C</td>
</tr>
<tr>
<td>3</td>
<td>WZ</td>
</tr>
<tr>
<td>4</td>
<td>YC</td>
</tr>
</tbody>
</table>

### Data set for inclined axis:

### MD24430 $MC_TRAFO_TYPE_5

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1024</td>
<td>Transformation 5: TRAANG</td>
</tr>
</tbody>
</table>

### MD24432 $MC_TRAFO_AXES_IN_5[]

<table>
<thead>
<tr>
<th>Index</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1st transformation axis = channel axis, YC</td>
</tr>
<tr>
<td>1</td>
<td>2nd transformation axis = channel axis, XC</td>
</tr>
<tr>
<td>2</td>
<td>3rd transformation axis = channel axis, ZC</td>
</tr>
</tbody>
</table>

### MD24434 $MC_TRAFO_GEOAX_ASSIGN_TAB_5[]

<table>
<thead>
<tr>
<th>Index</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1st axis = channel axis, XC</td>
</tr>
<tr>
<td>1</td>
<td>2nd axis = channel axis, YC</td>
</tr>
<tr>
<td>2</td>
<td>3rd axis = channel axis, ZC</td>
</tr>
</tbody>
</table>
Configuring cycles
20.5 Turning

MD24436 $MC_TRAFO_INCLUDES_TOOL_5
= 0 Tool handling with active transformation 5.

MD24700 $MC_TRAANG_ANGLE_1
= 55 Angle between 1st and 2nd transformer axis. Data record for linking (TRACON) of end face machining on main spindle (TRANSMIT) and inclined axis (TRAANG).

Data record for linking (TRACON) of end face machining on main spindle (TRANSMIT) and inclined axis (TRAANG):

MD24440 $MC_TRAFO_TYPE_6
= 8192 Type of transformation that is available as sixth in the channel.

<table>
<thead>
<tr>
<th>MD24444 $MC_TRAFO_GEOAX_ASSIGN_TAB_6[ ]</th>
<th>Assignment of geometry axes to channel axes for transformation 6.</th>
</tr>
</thead>
<tbody>
<tr>
<td>[0] = 1 1st axis = channel axis, XC</td>
<td></td>
</tr>
<tr>
<td>[1] = 3 2nd axis = channel axis, YC</td>
<td></td>
</tr>
<tr>
<td>[2] = 2 3rd axis = channel axis, ZC</td>
<td></td>
</tr>
</tbody>
</table>

MD24995 $MC_TRACON_CHAIN_1[ ]
Transformation linking

[0] = 1 Number of the TRANSMIT transformation (main spindle) for linking.
[1] = 5 Number of the TRAANG transformation for linking. Data set for linking (TRACON) of cylinder surface transformation on main spindle (TRACYL) and inclined axis (TRAANG).

Data record for linking (TRACON) of cylinder surface transformation on main spindle (TRACYL) and inclined axis (TRAANG):

MD24450 $MC_TRAFO_TYPE_7
= 8192 Type of transformation 7 in the TRACON channel.

<table>
<thead>
<tr>
<th>MD24454 $MC_TRAFO_GEOAX_ASSIGN_TAB_7[ ]</th>
<th>Assignment of geometry axes to channel axes for transformation 7.</th>
</tr>
</thead>
<tbody>
<tr>
<td>[0] = 1 1st axis = channel axis, XC</td>
<td></td>
</tr>
<tr>
<td>[1] = 3 2nd axis = channel axis, YC</td>
<td></td>
</tr>
<tr>
<td>[2] = 2 3rd axis = channel axis, ZC</td>
<td></td>
</tr>
</tbody>
</table>
### Configuring cycles

#### 20.5 Turning

**MD24996 $MC_TRACON_CHAIN_2[ ]**

<table>
<thead>
<tr>
<th></th>
<th>Transformation linking</th>
</tr>
</thead>
<tbody>
<tr>
<td>[0] = 3</td>
<td>Number of the TRACYL transformation (main spindle) for linking.</td>
</tr>
<tr>
<td>[1] = 5</td>
<td>Number of the TRAANG transformation for linking.</td>
</tr>
</tbody>
</table>
20.6 Swiveling

20.6.1 Technology cycles for swiveling

Precondition

The commissioning of the kinematic chain of the machine is a mandatory requirement for correct swiveling functionality (CYCLE800). The kinematic chain is stored in the tool parameters $TC_CARR1$ to $TC_CARR65$.

Note

The vectors of the kinematic chain can be determined with the "Measure kinematics" measuring function (CYCLE996).

To activate the swivel function, there must at least one toolholder that can be oriented (swivel data set) in the NCK and the workpiece, tool and rotary table reference system frames must be activated:

<table>
<thead>
<tr>
<th>MD18088 $MN_MM_NUM_TOOL_CARRIER</th>
<th>Maximum number of definable toolholders</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 0</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD28082 $MC_MM_SYSTEM_FRAME_MASK</th>
<th>System frames (SRAM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 3DH</td>
<td></td>
</tr>
<tr>
<td>Bit 2 = 1 TCARR and PAROT</td>
<td></td>
</tr>
<tr>
<td>Bit 3 = 1 TAROT and TOFRAME</td>
<td></td>
</tr>
<tr>
<td>Bit 4 = 1 Workpiece reference points</td>
<td></td>
</tr>
</tbody>
</table>

NOTICE

Changing machine data MD18088 and MD28082 causes the buffered memory to be reorganized.

After changing the machine data, a series start-up 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 (password: Manufacturer).
Activating the swivel function

The swivel function is enabled on the user interface via the following channel-machine data:

<table>
<thead>
<tr>
<th>MD5221 $MCS_FUNCTION_MASK_TECH</th>
<th>Cross-technology function mask</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit 0 = 1</td>
<td>Enable swivel</td>
</tr>
</tbody>
</table>

Configuring input screens

You can configure the input screen for swiveling using the following channel-specific cycle setting data. The setting data is effective for all of the declared swivel data sets.

<table>
<thead>
<tr>
<th>SD55221 $SCS_FUNKTION_MASK_SWIVEL_SET</th>
<th>Function screen, swiveling CYCLE800</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit 0</td>
<td>Input field &quot;No swiveling&quot;</td>
</tr>
<tr>
<td>= 0</td>
<td>hide</td>
</tr>
<tr>
<td>= 1</td>
<td>display</td>
</tr>
<tr>
<td>Bit 1</td>
<td>Text displayed for retract the tool axis</td>
</tr>
<tr>
<td>= 0</td>
<td>Display text Z = &quot;Z&quot;, display text Z, XY = &quot;Z,XY&quot;</td>
</tr>
<tr>
<td>= 1</td>
<td>Display text Z = &quot;Fixed point 1&quot;, Display text Z, XY = &quot;Fixed point 2&quot;. If you wish to modify the retraction version &quot;Z&quot; or &quot;Z, XY&quot; via the manufacturer cycle CUST_800.SP, the neutral text &quot;Fixed point 1&quot; and &quot;Fixed point 2&quot; can be displayed.</td>
</tr>
<tr>
<td>Bit 2</td>
<td>Deselecting the active swivel set</td>
</tr>
<tr>
<td>= 0</td>
<td>If deselection is not permitted, the &quot;Swivel data set&quot; (TC) selection field is not displayed in the &quot;Swivel&quot; input screen.</td>
</tr>
<tr>
<td>= 1</td>
<td>Deselection permitted</td>
</tr>
<tr>
<td></td>
<td>see also swivel data set parameter $TC_CARR37</td>
</tr>
<tr>
<td></td>
<td>HUNDRED MILLIONS position</td>
</tr>
<tr>
<td>Bit 3</td>
<td>Displays the active swivel plane under swivel in JOG. The setting in the swivel function screen acts on all swivel data sets.</td>
</tr>
</tbody>
</table>
Additional settings

For the swivel function, set the following machine data as a minimum to the following - although this deviates from the default value:

<table>
<thead>
<tr>
<th>Machine Data</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MD10602 $MN_FRAME_GEOAX_CHANGE_MODE</td>
<td>$MN_FRAME_GEOAX_CHANGE_MODE = 1 The actual total frame (work offsets) is recalculated when switching over geometry axes (selecting/deselecting TRAORI).</td>
</tr>
<tr>
<td>MD11450 $MN_SEARCH_RUN_MODE</td>
<td>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.</td>
</tr>
<tr>
<td>MD11602 $MN_ASUP_START_MASK</td>
<td>Ignore stop conditions for ASUB Bit 0 = 1 ASUB, self-locking Used for the swivel function in JOG</td>
</tr>
<tr>
<td>MD11604 $MN_ASUP_START_PRIO_LEVEL</td>
<td>Priorities $MN_ASUP_START $MN_ASUP_START_PRIO_LEVEL = 64 Corresponds to 100 Used for the swivel function in JOG</td>
</tr>
</tbody>
</table>

Declare swivel data sets

For the swivel function, swivel data sets must be created in the NCK and declared in the following machine data.

<table>
<thead>
<tr>
<th>Machine Data</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MD18088 $MN_MM_NUM_TOOL_CARRIER</td>
<td>Maximum number of definable toolholders that can be oriented. Number of swivel data sets $MN_MM_NUM_TOOL_CARRIER = 0 Do not declare any swivel data sets $MN_MM_NUM_TOOL_CARRIER = 1 Declare swivel data sets</td>
</tr>
</tbody>
</table>

If several channels are declared in the NCU, the number of swivel data sets is split up, taking MD28085 $MN_MM_LINK_TOA_UNIT into account.

**Example:**

MD18088 $MN_MM_NUM_TOOL_CARRIER = 4
Number of channels = 2
Assignment of the TO areas: MD28085 $MN_MM_LINK_TOA_UNIT = 2, this results in two swivel data sets per channel.
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

<table>
<thead>
<tr>
<th>MD18114 $MM_ENABLE_TOOL_ORIENT</th>
<th>Assign orientation to cutting edges.</th>
</tr>
</thead>
<tbody>
<tr>
<td>( = 0 )</td>
<td>No basic tool orientation active</td>
</tr>
<tr>
<td>( = 2 )</td>
<td>Basic tool orientation active</td>
</tr>
<tr>
<td></td>
<td>Used for angular tools and swivelng</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD20110 $MC_RESET_MODE_MASK</th>
<th>Initial control setting for RESET and end of part program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit 14 = 1</td>
<td>Calculation of the basis and system frames, example: 4041H.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD20112 $MC_START_MODE_MASK</th>
<th>Basic control setting for START and part program.</th>
</tr>
</thead>
<tbody>
<tr>
<td>400H</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD20126 $MC_TOOL_CARRIER_RESET_VALUE</th>
<th>Active toolholder at RESET.</th>
</tr>
</thead>
<tbody>
<tr>
<td>( = 0 )</td>
<td>No active toolholder on RESET</td>
</tr>
<tr>
<td>( = &gt; 0 ) (n)</td>
<td>Toolholder with number ( n ) active at RESET.</td>
</tr>
<tr>
<td></td>
<td>MD20126 is written to in CYCLE800.</td>
</tr>
<tr>
<td></td>
<td>CYCLE800() corresponds to deselecting toolholder (MD20126 = 0).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD20150 $MC_GCODE_RESET_VALUES[]</th>
<th>Delete position, G group.</th>
</tr>
</thead>
<tbody>
<tr>
<td>[41] = 1</td>
<td>Delete position, G group 42 on TCOABS</td>
</tr>
<tr>
<td>[51] = 2</td>
<td>Delete position, G group 52 on PAROT</td>
</tr>
<tr>
<td>[52] = 1</td>
<td>Delete position, G group 53 on TOROTOF</td>
</tr>
<tr>
<td>[52] = &gt; 1</td>
<td>Delete position, G group 53 on TOROT, TOROTY or TOROTX</td>
</tr>
<tr>
<td></td>
<td>Used for machine kinematics, types &quot;T&quot; and &quot;M&quot;.</td>
</tr>
<tr>
<td></td>
<td>See parameter $TC_CARR34</td>
</tr>
</tbody>
</table>
Note on kinematics (swivel head / mixed kinematics) with Hirth tooth system

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 gearing system in CYCLE800. If the Hirth gearing causes 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:

<table>
<thead>
<tr>
<th>MD20150 $MC_GCODE_RESET_VALUES[52]</th>
<th>Reset behavior of G groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 2</td>
<td>For G17 (TOROT)</td>
</tr>
<tr>
<td>= 3</td>
<td>For G18 (TOROTY)</td>
</tr>
<tr>
<td>= 4</td>
<td>For G19 (TOROTX)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD20196 $MC_TOCARR_ROTAX_MODE</th>
<th>Rotary axis mode for toolholders with orientation capability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit 0 = 1</td>
<td>Swivel data set with a rotary axis used for a rotary table with C axis</td>
</tr>
<tr>
<td>Bit 1 = 1</td>
<td>Swivel data set with two rotary axes used for standard swiveling</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD20360 $MC_TOOL_PARAMETER_DEF_MASK</th>
<th>Tool parameter setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit 10 = 1</td>
<td>Orientation vector remains at T0 or D0 (no tool). Used for machine kinematics, types &quot;T&quot; and &quot;M&quot;. See parameter $TC_CARR34</td>
</tr>
</tbody>
</table>
Configuring cycles

20.6 Swiveling

<table>
<thead>
<tr>
<th>MD21186 $MC_TOCARR_ROT_OFFSET_FROM_FR</th>
<th>Offset of the rotary axes for a tool holder with orientation capability from the work offset of the rotary axis.</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 0</td>
<td>In CYCLE800, the Work is recalculated when there is a value in the work offset (WO) of the rotary axes.</td>
</tr>
<tr>
<td>= 1</td>
<td>A value in the WO of the rotary axes acts as offset of the tool holder that has orientation capability. The Work remains unchanged.</td>
</tr>
</tbody>
</table>

MD21186 may not be rewritten in a program with call CYCLE800.

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.

<table>
<thead>
<tr>
<th>MD22530 $MC_TOCARR_CHANGE_M_CODE</th>
<th>M code for swivel data set change</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 0</td>
<td>No swivel data set change</td>
</tr>
<tr>
<td>&lt; 0</td>
<td>M code + number of the swivel data set for the swivel data set change</td>
</tr>
</tbody>
</table>

**Example**

<table>
<thead>
<tr>
<th>Number of swivel data sets in channel 1</th>
<th>= 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>MD22530 $MC_TOCARR_CHANGE_M_CODE</td>
<td>= -800</td>
</tr>
<tr>
<td>Programming swivel data set 1 (TCARR=1)</td>
<td>= M801</td>
</tr>
<tr>
<td>Programming swivel data set 2 (TCARR=2)</td>
<td>= M802</td>
</tr>
</tbody>
</table>

With the output of the M commands, the PLC e.g. can limit or invert the spindle speed or clamp or release the rotary axes.

**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, e.g. to retract a drill from a swiveled position without causing a collision.

<table>
<thead>
<tr>
<th>MD24006 $MC_CHSFRAME_RESET_MASK</th>
<th>Active system frames after RESET</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit 4</td>
<td>System frame workpiece reference</td>
</tr>
<tr>
<td>= 0</td>
<td>Not active</td>
</tr>
<tr>
<td>= 1</td>
<td>Remains active</td>
</tr>
</tbody>
</table>
When used for measuring or swiveling in JOG, the workpiece reference must be active on RESET and not cleared (cascaded measuring).

<table>
<thead>
<tr>
<th>MD24007 $MC_CHSFRAME_RESET_CLEAR_MASK</th>
<th>Clear system frames after RESET</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit 4</td>
<td>System frame workpiece reference</td>
</tr>
<tr>
<td>= 0</td>
<td>Do not delete</td>
</tr>
<tr>
<td>= 1</td>
<td>Delete</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD24006 $MC_CHSFRAME_RESET_MASK</th>
<th>Active system frames after RESET</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit 4 = 1</td>
<td>System frame for workpiece reference remains active after RESET</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD24007 $MC_CHSFRAME_RESET_CLEAR_MASK</th>
<th>Clear system frames after RESET</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit 4 = 0</td>
<td>Do not clear system frame workpiece reference after RESET</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD24008 $MC_CHSFRAME_POWERON_MASK</th>
<th>Reset system frames after power on.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit 2</td>
<td>System frame rotary table reference (PAROT)</td>
</tr>
<tr>
<td>= 0</td>
<td>Do not reset</td>
</tr>
<tr>
<td>= 1</td>
<td>Reset</td>
</tr>
<tr>
<td>Bit 3</td>
<td>System frame tool reference (TOROT,...)</td>
</tr>
<tr>
<td>= 0</td>
<td>Do not reset</td>
</tr>
<tr>
<td>= 1</td>
<td>Reset</td>
</tr>
<tr>
<td>Bit 4</td>
<td>System frame workpiece reference</td>
</tr>
<tr>
<td>= 0</td>
<td>Do not reset</td>
</tr>
<tr>
<td>= 1</td>
<td>Reset</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD24080 $MC_USER_FRAME_POWERON_MASK</th>
<th>Settings for settable frames.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit 0</td>
<td>Settable work offset via power on not active.</td>
</tr>
<tr>
<td>= 0</td>
<td></td>
</tr>
<tr>
<td>= 1</td>
<td>Last active settable work offset remains active after power on if MD20152 $MC_GCODE_RESET_MODE[7] = 1.</td>
</tr>
</tbody>
</table>

Application: Work offset G5xx, including all rotations, should remain active after Power On.
### Configuring cycles

#### 20.6 Swiveling

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MD28082 $MC_MM_SYSTEM_FRAME_MASK</td>
<td>Setting-up system frames (SRAM)</td>
</tr>
<tr>
<td>Bit 2 = 1</td>
<td>Rotary table reference ($P_PARTFRAME)</td>
</tr>
<tr>
<td>Bit 3 = 1</td>
<td>Tool reference ($P_TOOLFRAME)</td>
</tr>
<tr>
<td>Bit 4 = 1</td>
<td>Workpiece reference ($P_WPFRAME)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MD28083 $MC_MM_SYSTEM_DATAFRAME_MASK</td>
<td>Setting-up data management, system frames (SRAM)</td>
</tr>
<tr>
<td>Bit 2 = 1</td>
<td>Rotary table reference ($P_PARTFRAME)</td>
</tr>
<tr>
<td>Bit 3 = 1</td>
<td>Tool reference ($P_TOOLFRAME)</td>
</tr>
<tr>
<td>Bit 4 = 1</td>
<td>Workpiece reference ($P_WPFRAME)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MD28085 $MC_MM_LINK_TOA_UNIT</td>
<td>Assigning a TO unit to a channel (SRAM)</td>
</tr>
</tbody>
</table>

If several channels are set-up, then the following can be set in the machine data:

1. The number of toolholders (see MD18088) on the TO unit per channel.
2. Assigning all of the set tool carriers to a channel.

---

### Axial machine data for the modulo rotary axes of the swivel data set

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MD30455 $MA_MISC_FUNCTION_MASK</td>
<td>Axis functions</td>
</tr>
<tr>
<td>Bit 0</td>
<td>Modulo rotary axis programming</td>
</tr>
<tr>
<td>= 0</td>
<td>No modulo rotary axis programming (e.g. 0 to 359.999 degrees)</td>
</tr>
<tr>
<td>= 1</td>
<td>Modulo rotary axis programming (e.g. -180 to 180 degrees)</td>
</tr>
<tr>
<td>Bit 2</td>
<td>Positioning, rotary axis</td>
</tr>
<tr>
<td>= 0</td>
<td>As programmed</td>
</tr>
<tr>
<td>= 1</td>
<td>Along the shortest path</td>
</tr>
</tbody>
</table>

Application: With the setting, bit 2=1 then e.g. for G90 with DC, rotary axis C travels along the shortest path. Additional information can be taken from the Chapter "Manufacturer cycle CUST_800.SPF". (Page 433)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MD32010 $MA_JOG_VELO_RAPID[AX]</td>
<td>Rapid traverse in JOG, Rotary and machine axes, that should travel for swiveling in JOG.</td>
</tr>
<tr>
<td>AX = axis name</td>
<td></td>
</tr>
<tr>
<td>= 10000</td>
<td>Rapid traverse in JOG mode for swivel in JOG</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD42980 $SC_TOFRAME_MODE</td>
<td>Setting, frame definition for TOROT, PAROT</td>
</tr>
<tr>
<td>= 2000</td>
<td>Swivel (default value)</td>
</tr>
</tbody>
</table>
Swiveling in the JOG mode

Cycle alarms 62186 and 62187 can be hidden or displayed using the following cycle machine data:

<table>
<thead>
<tr>
<th>MD55410 $MC_MILL_SWIVEL_ALARM_MASK</th>
<th>Activate fault evaluation CYCLE800</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit 0</td>
<td>Activates fault 61186</td>
</tr>
<tr>
<td>= 0</td>
<td>Hide fault 61186 &quot;Active work offset G%4 and base (base reference) contains rotations&quot; (default setting).</td>
</tr>
<tr>
<td>= 1</td>
<td>Display fault 61186</td>
</tr>
<tr>
<td>Bit 1</td>
<td>Activate fault 61187</td>
</tr>
<tr>
<td>= 0</td>
<td>Hide fault 61187 &quot;Active base and base reference (G500) contain rotations&quot; (default setting).</td>
</tr>
<tr>
<td>= 1</td>
<td>Display fault 61187</td>
</tr>
</tbody>
</table>

20.6.2 CYCLE800 checklist for the identification of the machine kinematics

Note

Identification of the machine kinematics (kinematic chain) according to DIN 66217 or ISO 841-2001

This checklist does not claim to be complete.

- Do the three 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 kinematics type is it?
  Swivel head, swivel table or mixed kinematics of swivel head and swivel table.
20.6 Swiveling

- **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 rotary axis of a swivel data set?**
  Rule: Rotary axis 2 is based on rotary axis 1. With mixed kinematics, rotary axis 1 is always the axis for the tool orientation.

- **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 V2xyz = 0,1,0

  **Example 2:**
  Table kinematics. Rotary axis 1 rotates around axis X → rotary axis vector V1xyz = -1,0,0

### 20.6.3 Commissioning of the kinematic chain (swivel data record)

**Swivel data set**

You must create a swivel data set for every swivel head, swivel table or each combination of both. Swivel data sets can be declared in several channels (see machine data).

A swivel data set comprises the parameters $TC_CARR1[n]$ to $TC_CARR65[n]$

n = number of the swivel data set.

The parameters of the swivel data set ($TC_CARR1[n]$ to $TC_CARR65[n]$) can be read-in and read-out in the startup operating area. Programming with appropriate value assignment is also possible in an NC program (manufacturer cycle). The parameters of the swivel data set are immediately effective after the program has started.

**References**

You can find additional information in:

- Function Manual Basic Functions; Tool Offset (W1)
- Function Manual Special Functions; Multiple Transformations (F2)
Offset vectors I1 to I4

The vectors always contain three components, which represent the reference to the X, Y and Z machine axes. The positions in the kinematic chain are measured by the machine manufacturer; they are always relevant with respect to a swivel head / swivel table (swivel data set). Offset vectors I1 to I4 refer to the non-swiveled state of the rotary axes (machine kinematics basic setting).

The machine kinematics used do not need to be fully implemented. 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.

<table>
<thead>
<tr>
<th>Offset vectors</th>
<th>Offset vectors</th>
<th>Offset vectors</th>
<th>Offset vectors</th>
</tr>
</thead>
</table>

Rotary axis vectors V1 and V2

<table>
<thead>
<tr>
<th>Rotary axis vectors</th>
<th>Rotary axis vectors</th>
<th>Rotary axis vectors</th>
</tr>
</thead>
</table>

Kinematic types $TC\_CARR23[n]$

Selection:
- Swivel head (type T)
- Swivel table (type P)
- Swivel head + swivel table (type M)

<table>
<thead>
<tr>
<th>Swivel head (type T)</th>
<th>Swivel table (type P)</th>
<th>Swivel head + swivel table (type M)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offset vector I1</td>
<td>Offset vector I2</td>
<td>Offset vector I1</td>
</tr>
<tr>
<td>Rotary axis vector V1</td>
<td>Rotary axis vector V1</td>
<td>Rotary axis vector V1</td>
</tr>
<tr>
<td>Offset vector I2</td>
<td>Offset vector I3</td>
<td>Offset vector I2</td>
</tr>
<tr>
<td>Rotary axis vector V2</td>
<td>Rotary axis vector V2</td>
<td>Offset vector I3</td>
</tr>
<tr>
<td>Offset vector I3</td>
<td>Offset vector I4</td>
<td>Rotary axis vector V2</td>
</tr>
<tr>
<td>Offset vector I4</td>
<td></td>
<td>Offset vector I4</td>
</tr>
</tbody>
</table>
Offset vectors I1 to I4 \$TC_CARR1[n] \ldots \$TC_CARR20[n]

The vectors always contain three components, which represent 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 (swivel data record).

Offset vectors I1 to I4 refer to the non-swiveled state of the rotary axes (basic setting: machine kinematics). The machine kinematics used do not need to be fully implemented. 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 "plain machines".

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

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.

**Note**

Interrelation of TOOLCARRIER ⇔ 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 TOOLCARRIER in MD24582: $MC\_TRAFO5\_TCARR\_NO\_1$ are used.
Name of swivel data record

If several swivel data records are declared in each NC channel, then a name is assigned to each swivel data set. No name needs to be specified if the swivel-mounted tool carrier is not exchangeable (i.e. one swivel data set per channel).

**Note**

The name of the swivel data set may only contain characters that are permissible for NC programming: A...Z, 0...9 and _ !
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 semi-automatic rotary axes, you can use any axis identifier (up to six letters or numbers).

Figure 20-4  Dialog to input parameters for the rotary axis

$TC_CARR35[n]$ Name of rotary axis 1
$TC_CARR36[n]$ Name of rotary axis 2

System variable $TC_CARR37[n]$

In the operating area "Program" → "Miscellaneous", the following softkeys are assigned to the swivel function:

<table>
<thead>
<tr>
<th>Milling technology</th>
<th>Turning technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Swivel plane&quot;</td>
<td>&quot;Swivel plane&quot;</td>
</tr>
<tr>
<td>&quot;Advance milling tool&quot;</td>
<td>&quot;Swivel tool&quot;</td>
</tr>
<tr>
<td></td>
<td>→ &quot;Align turning tool&quot;</td>
</tr>
<tr>
<td></td>
<td>→ &quot;Align milling tool&quot;</td>
</tr>
<tr>
<td></td>
<td>→ &quot;Advance milling tool&quot;</td>
</tr>
</tbody>
</table>

The "Align turning tool" and "Align milling tool" softkeys are only displayed if the "B-axis kinematics" function was activated (refer to the following table).
Significance of the decimal places:

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.

<table>
<thead>
<tr>
<th>$TC_CARR37[n]$</th>
<th>Display variants of the input screens for CYCLE800</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ONES</strong></td>
<td>Selects the swivel mode</td>
</tr>
<tr>
<td>0 =</td>
<td>Axis by axis</td>
</tr>
<tr>
<td>1 =</td>
<td>Axis-by-axis + projection angle</td>
</tr>
<tr>
<td>2 =</td>
<td>Axis-by-axis + projection angle + solid angle</td>
</tr>
<tr>
<td>3 =</td>
<td>Axis-by-axis + direct</td>
</tr>
<tr>
<td>4 =</td>
<td>Axis-by-axis + projection angle + direct</td>
</tr>
<tr>
<td>5 =</td>
<td>Axis-by-axis + projection angle + solid angle + direct</td>
</tr>
<tr>
<td><strong>TENS</strong></td>
<td>Rotary axis 1</td>
</tr>
<tr>
<td>0 =</td>
<td>Automatic</td>
</tr>
<tr>
<td>1 =</td>
<td>Manual</td>
</tr>
<tr>
<td>2 =</td>
<td>Semi-automatic</td>
</tr>
<tr>
<td><strong>HUNDREDS</strong></td>
<td>Rotary axis 2</td>
</tr>
<tr>
<td>0 =</td>
<td>Automatic</td>
</tr>
<tr>
<td>1 =</td>
<td>Manual</td>
</tr>
<tr>
<td>2 =</td>
<td>Semi-automatic</td>
</tr>
<tr>
<td><strong>THOUSANDS</strong></td>
<td>Selection field, direction: Direction selection of the rotary axes</td>
</tr>
<tr>
<td>0 =</td>
<td>No display of the direction reference for kinematics that only have one solution. Direction selection (_DIR) Minus is generated in the cycle call CYCLE800.</td>
</tr>
<tr>
<td>3 =</td>
<td>Direction reference, rotary axis 1, direction selection Minus in the basic setting of the kinematics.</td>
</tr>
<tr>
<td>4 =</td>
<td>Direction reference, rotary axis 2, direction selection Minus in the basic setting of the kinematics.</td>
</tr>
<tr>
<td>5 =</td>
<td>No display of the direction reference for kinematics that only have one solution. Direction selection (_DIR) Plus is generated in the cycle call CYCLE800.</td>
</tr>
<tr>
<td>8 =</td>
<td>Direction reference, rotary axis 1, direction selection Plus in the basic setting of the kinematics.</td>
</tr>
<tr>
<td>9 =</td>
<td>Direction reference, rotary axis 2, direction selection Plus in the basic setting of the kinematics.</td>
</tr>
<tr>
<td><strong>TEN THOUSANDS</strong></td>
<td>Selection field, correction of the tool tip or B axis kinematics</td>
</tr>
<tr>
<td>0 =</td>
<td>No display of the correction of the tool tip input field.</td>
</tr>
<tr>
<td>1 =</td>
<td>Correction of tool tip by means of TRAORI.</td>
</tr>
<tr>
<td>2 =</td>
<td>No correction of tool tip + B axis kinematics turning technology.</td>
</tr>
<tr>
<td>3 =</td>
<td>Correction of tool tip + B axis kinematics turning technology. The Correction of tool tip function requires the &quot;5-axis transformation (TRAORI)&quot; option.</td>
</tr>
<tr>
<td><strong>HUNDRED THOUSANDS</strong></td>
<td>Reserved</td>
</tr>
</tbody>
</table>

The values 1, 2, 6 and 7 are not permitted.
### 20.6 Swiveling

#### Configuring cycles

<table>
<thead>
<tr>
<th>$\text{TC_CARR37}[n]$</th>
<th>Display variants of the input screens for CYCLE800</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Decimal place</strong></td>
<td><strong>Meaning</strong></td>
</tr>
<tr>
<td>ONE MILLION TEN MILLION</td>
<td>Selection field, retraction</td>
</tr>
<tr>
<td>00</td>
<td>No retraction</td>
</tr>
<tr>
<td>01</td>
<td>Retraction Z</td>
</tr>
<tr>
<td>02</td>
<td>Retraction Z, XY</td>
</tr>
<tr>
<td>03</td>
<td>Retraction Z or Z, XY</td>
</tr>
<tr>
<td>04</td>
<td>Maximum retraction in tool direction</td>
</tr>
<tr>
<td>...</td>
<td></td>
</tr>
<tr>
<td>08</td>
<td>Incremental retraction in tool direction</td>
</tr>
<tr>
<td>...</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Retraction Z or Z, XY or in maximum tool direction or in incremental tool direction</td>
</tr>
</tbody>
</table>

$\text{TC\_CARR38}[n]$ Retraction position X

$\text{TC\_CARR39}[n]$ Retraction position Y

$\text{TC\_CARR40}[n]$ Retraction position Z

### HUNDRED MILLION

Swivel data set enabled

Setting swivel data set change

Automatic or manual tool change is only required for ShopMill or ShopTurn (→ See also: CUST_800.spf, markers _M2 to _M13). A swivel data set must be "enabled" in each case (value ≥ 4).

- 0 = Swivel data set not enabled
- 4 = Swivel data set enabled automatic swivel data set and tool change
- 5 = Swivel data set enabled automatic swivel data set change and manual tool change
- 6 = Swivel data set enabled manual swivel data set change and automatic tool change
- 7 = Swivel data set enabled manual swivel data set and tool change

### Retracting the geometry axes before swiveling

The type of retraction is modified in the manufacturer cycle CUST_800.SPF.

For further information on this, see Chapter Manufacturer cycle CUST_800.SPF (Page 433)

#### NOTICE

When traversing the tool axes, the following must be taken into account:
Retract the tool axis in such a way that the tool and workpiece cannot collide when swiveled.
The ONE MILLION and TEN MILLION positions of the system variable $TC_CARR37[n]$ define which retraction versions are displayed in the input mask:

- Retraction of axis Z
- Retract axes Z, XY
- Retract in the tool direction, maximum or incremental

Retracting axis Z or retracting axes Z, XY is realized as an absolute machine position at the values of parameters $TC_CARR38[n]$ to $TC_CARR40[n]$.

### Kinematic channel I

<table>
<thead>
<tr>
<th>Name:</th>
<th>Kinematics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retract:</td>
<td>2 or maximum in tool direction or incremental in tool direction</td>
</tr>
<tr>
<td></td>
<td>No retraction</td>
</tr>
<tr>
<td></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>2, XY</td>
</tr>
<tr>
<td></td>
<td>2 or 2, XY</td>
</tr>
<tr>
<td></td>
<td>Maximum in tool direction</td>
</tr>
<tr>
<td></td>
<td>2 or maximum in tool direction</td>
</tr>
<tr>
<td></td>
<td>2, XY or maximum in tool direction</td>
</tr>
<tr>
<td></td>
<td>2 or 2, XY or maximum in tool direction</td>
</tr>
<tr>
<td></td>
<td>Incremental in tool direction</td>
</tr>
<tr>
<td></td>
<td>2 or incremental in tool direction</td>
</tr>
<tr>
<td></td>
<td>2, XY or incremental in tool direction</td>
</tr>
<tr>
<td></td>
<td>2 or 2, XY or incremental in tool direction</td>
</tr>
<tr>
<td></td>
<td>maximum in tool direction or incremental in tool direction</td>
</tr>
<tr>
<td></td>
<td>2 or maximum in tool direction or incremental in tool direction</td>
</tr>
<tr>
<td></td>
<td>2, XY or max. in tool direction or inc. in tool direction</td>
</tr>
<tr>
<td></td>
<td>2 or 2, XY or max. in tool direction or inc. in tool direction</td>
</tr>
</tbody>
</table>

Figure 20-5  Dialog to select the type of retraction

<table>
<thead>
<tr>
<th>$TC_CARR38[n]$</th>
<th>Retraction position X</th>
</tr>
</thead>
<tbody>
<tr>
<td>$TC_CARR39[n]$</td>
<td>Retraction position Y</td>
</tr>
<tr>
<td>$TC_CARR40[n]$</td>
<td>Retraction position Z</td>
</tr>
</tbody>
</table>

### Fine offsets of offset vectors

|$TC_CARR41[n]$| to  $TC_CARR60[n]$ |

Assignment of base vectors to the fine offset vectors:

<table>
<thead>
<tr>
<th>I1 $TC_CARR1..3[n]$</th>
<th>to  $TC_CARR41..43[n]$</th>
</tr>
</thead>
<tbody>
<tr>
<td>I2 $TC_CARR4..6[n]$</td>
<td>to  $TC_CARR44..46[n]$</td>
</tr>
</tbody>
</table>
The fine offsets are activated by the following setting data:

SD42974 $SC_TOCARR_FINE_CORRECTION = 1

The fine offsets act in addition to the corresponding base vectors when the Swivel function CYCLE800 or the NC function TCARR=n is called.

20.6.4 Examples of machine kinematics for the commissioning of the Swivel function

Example 1: Swivel head 1 "HEAD_1"

- Rotary axis 1(C) (manual) around Z
- Rotary axis 2(A) (manual) around X
- Manually adjustable changeable swivel head (manual)

Vectors relate to the kinematics basic setting (drawing not true-to-scale)
Table 20- 1 Commissioning softkey "Swivel", Kinematics (Example 1)

<table>
<thead>
<tr>
<th>Kinematics</th>
<th>Swivel head</th>
<th>HEAD_1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retract</td>
<td>Z</td>
<td></td>
</tr>
<tr>
<td></td>
<td>X</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offset vector I1</td>
<td>0.000</td>
<td>0.030</td>
</tr>
<tr>
<td>Rotary axis vector V1</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>Offset vector I2</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>Rotary axis vector V2</td>
<td>1.000</td>
<td>0.000</td>
</tr>
<tr>
<td>Offset vector I3</td>
<td>0.000</td>
<td>-0.030</td>
</tr>
</tbody>
</table>

Display version
Swivel mode
Direction reference
Correct tool

Rotary axes

<table>
<thead>
<tr>
<th>Rotary axis 1</th>
<th>C</th>
<th>Mode</th>
<th>Manual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angular range</td>
<td>0.000</td>
<td>360.000</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Rotary axis 2</th>
<th>A</th>
<th>Mode</th>
<th>Manual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angular range</td>
<td>-15.000</td>
<td>100.000</td>
<td></td>
</tr>
</tbody>
</table>

Example 2: Swivel head 2 "HEAD_2"

- Rotary axis vector V1: Rotary axis B rotates around Y
- Rotary axis vector V2: Rotary axis C rotates around Y and around Z
- Offset vector I1: Closure of vector chain with fixed-mounted swivel head \( I_1 = -(I_2 + I_3) \)
- Offset vector I2: Distance between pivot point of rotary axis 1 and pivot point of rotary axis 2
- Offset vector I3: Distance between reference point of tool and pivot point of rotary axis 2

Cardanic swivel head (manually adjustable) with Hirth tooth system

**Vectors relate to the basic setting of the kinematics.**

If the swivel head is fixed-mounted, the vector chain is closed (see I1)
Table 20-2 Commissioning softkey “Swivel”, Kinematics (Example 2)

<table>
<thead>
<tr>
<th>Kinematics</th>
<th>Swivel head</th>
<th>HEAD_2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retract</td>
<td>Z</td>
<td>Tool direction</td>
</tr>
<tr>
<td>X</td>
<td>Y</td>
<td>Z</td>
</tr>
<tr>
<td>Offset vector I1</td>
<td>0.000</td>
<td>-172.000</td>
</tr>
<tr>
<td>Rotary axis vector V1</td>
<td>0.000</td>
<td>1.000</td>
</tr>
<tr>
<td>Offset vector I2</td>
<td>0.000</td>
<td>172.000</td>
</tr>
<tr>
<td>Rotary axis vector V2</td>
<td>0.000</td>
<td>1.000 (1)</td>
</tr>
<tr>
<td>Offset vector I3</td>
<td>0.000</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Display version
Swivel mode Axis by axis
Direction reference Rotary axis 2

Rotary axes
Rotary axis 1 B Mode Manual
Angular range 0.000 360.000
Kinematics offset 0.000
Hirth gearing Yes Angular grid 1.000
Rotary axis 2 C Mode Manual
The reference point of the pivot point of rotary axes 1 and 2 can be offset on the line of rotation and does not have to coincide with the mechanical pivot point.

1) Calculation of rotary axis vector V2: 45 degree angle
   \[ V_{2y} = \sin(45) = 0.7071 \]
   \[ V_{2z} = \cos(45) = 0.7071 \]
   V2Y and V2z can be normalized to 1.

**Example 3: Cardanic table "TABLE_45"**

Vectors relate to the basic setting of the kinematics.

- **Rotary axis vector V1**: Rotary axis B rotates around Y and around Z.
- **Rotary axis vector V2**: Rotary axis C rotates around Z.
- **Offset vector I2**: Distance from the reference point of the machine to the pivot point/intersection of **rotary axis 1**.
- **Offset vector I3**: Distance between pivot point/intersection of **rotary axis 1** and pivot point/intersection of **rotary axis 2**.
- **Offset vector I4**: Closure of vector chain \( I_4 = -(I_2 + I_3) \)
Side view of the machine

Spindle (tool adapter) is positioned on a block dimension above the top edge of the table (rotary axis C) or the center of the table.

A measuring rod in the spindle is used to determine the turning center of rotary axis C.

Table 20-3 Commissioning softkey "Swivel", Kinematics (Example 3)

<table>
<thead>
<tr>
<th>Kinematics</th>
<th>Swivel table</th>
<th>TABLE_45</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offset vector I2</td>
<td>0.000</td>
<td>100.000</td>
</tr>
<tr>
<td>Rotary axis vector V1</td>
<td>0.000</td>
<td>-1.000(^1)</td>
</tr>
<tr>
<td>Offset vector I3</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>Rotary axis vector V2</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>Offset vector I4</td>
<td>0.000</td>
<td>-100.000</td>
</tr>
</tbody>
</table>

Display version
Swivel mode Axis by axis
Direction reference Rotary axis 2
Correct tool No

Rotary axes

<table>
<thead>
<tr>
<th>Rotary axis 1</th>
<th>B</th>
<th>Mode</th>
<th>Auto</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angular range</td>
<td>0.000</td>
<td>180.000</td>
<td></td>
</tr>
<tr>
<td>Rotary axis 2</td>
<td>C</td>
<td>Mode</td>
<td>Auto</td>
</tr>
<tr>
<td>Angular range</td>
<td>0.000</td>
<td>360.000</td>
<td></td>
</tr>
</tbody>
</table>
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 4: Swivel head/rotary table "MIXED_45"

Vectors relate to the basic setting of the kinematics.

- **Rotary axis vector V1**: Rotary axis B rotates around Y and around Z.
- **Rotary axis vector V2**: Rotary axis C rotates around Z.
- **Offset vector I2**: Distance from the reference point of the tool adapter to the pivot point/intersection of rotary axis 1.
- **Offset vector I1**: Closure of vector chain \( l1 = -I2 \).
- **Offset vector I3**: Distance from the reference point of the machine to the pivot point/intersection of rotary axis 2.
- **Offset vector I4**: Closure of vector chain \( l4 = -I3 \).
Configuring cycles

20.6 Swiveling

Side view of the machine:
Spindle (tool adapter) is positioned on a block dimension above the top edge of the table (rotary axis C) or the center of the table.
A measuring rod in the spindle is used to determine the turning center of rotary axis C.

Table 20-4 Commissioning softkey "Swivel", Kinematics (Example 4)

<table>
<thead>
<tr>
<th>Kinematics</th>
<th>Mixed kinematics</th>
<th>MIXED_45</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offset vector I1</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>Rotary axis vector V1</td>
<td>0.000</td>
<td>1.000(1)</td>
</tr>
<tr>
<td>Offset vector I2</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>Offset vector I3</td>
<td>300.000</td>
<td>150.000</td>
</tr>
<tr>
<td>Rotary axis vector V2</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>Offset vector I4</td>
<td>-300.000</td>
<td>-150.000</td>
</tr>
</tbody>
</table>

Display version
Swivel mode Axis by axis
Direction Rotary axis 1
Correct tool yes

Rotary axes
Rotary axis 1 B Mode Auto
Angular range 0.000 180.000
Rotary axis 2 C Mode Auto
Angular range 0.000 360.000
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"

Vectors relate to the basic setting of the kinematics.

Rotary axis vector V1: Rotary axis A rotates around X.

Rotary axis vector V2: Rotary axis C rotates around Z.

Offset vector I2: Distance from the reference point of the machine to the pivot point/intersection of rotary axis 1

Offset vector I3: Distance from the pivot point of rotary axis 1 to the pivot point/intersection of rotary axis 2

Offset vector I4: Closure of vector chain $l4 = -(l2 + l3)$

Side view of the machine from the X direction

Spindle (tool adapter) is positioned on a block dimension above the top edge of the table (rotary axis C) or the center of the table. A measuring rod in the spindle is used to determine the turning center of rotary axis C.
Table 20-5 Commissioning softkey "Swivel", Kinematics (Example 5)

<table>
<thead>
<tr>
<th>Kinematics</th>
<th>Swivel table</th>
<th>TABLE_5</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>260.000</td>
<td>0.000</td>
</tr>
<tr>
<td>Y</td>
<td>200.000</td>
<td>0.000</td>
</tr>
<tr>
<td>Z</td>
<td>0.000</td>
<td>20.400</td>
</tr>
<tr>
<td>Offset vector I2</td>
<td>-1.000</td>
<td>0.000</td>
</tr>
<tr>
<td>Rotary axis vector V1</td>
<td>0.000</td>
<td>0.020</td>
</tr>
<tr>
<td>Offset vector I3</td>
<td>0.000</td>
<td>20.400</td>
</tr>
<tr>
<td>Rotary axis vector V2</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>Offset vector I4</td>
<td>-260.000</td>
<td>-200.020</td>
</tr>
<tr>
<td>Display version</td>
<td>Axis by axis</td>
<td></td>
</tr>
<tr>
<td>Swivel mode</td>
<td>Rotary axis 1</td>
<td></td>
</tr>
<tr>
<td>Correct tool</td>
<td>No</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Rotary axes</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Rotary axis 1</td>
<td>A</td>
<td>Mode</td>
</tr>
<tr>
<td>Angular range</td>
<td>-90.000</td>
<td>90.000</td>
</tr>
<tr>
<td>Rotary axis 2</td>
<td>C</td>
<td>Mode</td>
</tr>
<tr>
<td>Angular range</td>
<td>0.000</td>
<td>360.000</td>
</tr>
</tbody>
</table>
Example 6: Setting-up a lathe with B axis

For lathes with an additional rotary axis B, the tool can be aligned or swiveled on the X/Z plane. If your machine has a counterspindle, you can, for example, machine with a tool alternating between the main spindle and counterspindle.

You require the following swivel data sets to use the "Align tool" and "Swivel plane" functions:

- Swivel data set 1 for aligning and swiveling tools on the main spindle and counterspindle (Turning, Face Y/C, Surface Y/C).
- Swivel data set 2 for machining inclined surfaces when milling on the main spindle (face B).
- Swivel data set 3 for machining inclined surfaces when milling on the counterspindle (face B).

When commissioning the "B-axis kinematics turning technology" in parameter $TC_CARR37[n]$, the TEN THOUSANDS position 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 or milling tool" is listed for swivel data set 1.

See also: Selection box "B-axis kinematics" (Page 414) in the "Dialog to input parameters for the swivel data set"

Example 7: Configuring a 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.

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).

You require the following swivel data sets to use the "Align tool" and "Swivel plane" functions:

- Swivel data set 1 for "Swiveling in the plane" when milling. Mixed kinematics: Rotary axis 1: B-axis, rotary axis 2: C axis
- Swivel data set 2 for the "Swivel tool - align tool" when turning Swivel head: Rotary axis 1: B-axis, rotary axis 2: Spindle SP

When milling, the SP spindle is the master spindle. Rotary axis C is declared as the master spindle in rotational operation, e.g. SETMS(2).

When commissioning the "B-axis kinematics turning technology" in parameter $TC_CARR37[n]$, the TEN THOUSANDS position must be set to 2 or 3 in swivel data set 2. This is the reason why in the program editor "Swivel tool → align turning or milling tool" is listed for swivel data set 2.

See also: Selection box "B-axis kinematics" (Page 414) in the "Dialog to input parameters for the swivel data set"
References

Description of Functions, Basic Functions; Tool Offset (W1), Parameter CUTMOD:

- 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.

20.6.5 Manufacturer cycle CUST_800.SPF

Adaptations

During swiveling, all axis positions are approached using the CUST_800.SPF cycle. The call is exclusively made from the swivel cycle CYCLE800 for from the cycles E_TCARR (ShopMill) or F_TCARR (ShopTurn).

In cycle CUST_800.SPF, the function markers (_M2: to _M59) are prepared and documented. Also refer to the following "Structogram CYCLE800".

If you modify the cycle CUST_800.SPF, proceed as follows:

1. Copy cycle CUST_800.SPF from the directory /NC data/Cycles/Standard cycles
2. Insert cycle CUST_800.SPF into directory /NC data/Cycles/Manufacturer cycles.

Parameters of the CUST_800.SPF manufacturer cycle

CUST_800 (INT _MODE, INT _TC1, REAL _A1, REAL _A2, INT _TC2, REAL _T_POS)
SAVE DISPLOF

<table>
<thead>
<tr>
<th>_MODE</th>
<th>A jump is made to markers _M2 to _M59 are jumped to</th>
</tr>
</thead>
<tbody>
<tr>
<td>_TC1</td>
<td>Number of the swivel head/table</td>
</tr>
<tr>
<td>_A1</td>
<td>Angle of rotary axis 1</td>
</tr>
<tr>
<td>_A2</td>
<td>Angle of rotary axis 2</td>
</tr>
<tr>
<td>_TC2</td>
<td>1. Feed evaluation in percent (%) for swiveling in JOG mode</td>
</tr>
<tr>
<td></td>
<td>2. Number of the new swivel head/table replacement under ShopMill</td>
</tr>
<tr>
<td>_T_POS</td>
<td>Incremental position during retraction in the incremental tool direction (see marker _M44, _M45)</td>
</tr>
</tbody>
</table>
Retract prior to swiveling

If the CUST_800_SPF cycle is not modified, the Z axis (marker _M41) or the Z axis followed by the X, Y axes (marker _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 had 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.

![Figure 20-6 Structure (coarse) of swivel cycles](image)

Figure 20-6  Structure (coarse) of swivel cycles
CYCLE800 structured chart

Sequence in AUTOMATIC mode

- Structure of CYCLE800.SPF
- Input parameters:
  - Name of swivel data record
  - Mode
  - Offsets
  - Rotations
  - Retraction
- Calculation of valid swivel data record
- Swivel data record invalid
- Error messages
- Marker: _M40 Init
- Marker: _M41 Z axis
- Marker: _M42 Z, XY axis
- Marker: _M44 Max. tool direction
- Marker: _M45 Incremental tool direction
- Marker: _M20 Rotary axes 1, 2 automatic swiveling
- Marker: _M21 Rotary axis 2 automatic, Rotary axis 1 manual swiveling
- Marker: _M22 Rotary axis 1 automatic swiveling
- Marker: _M23 Rotary axis 1 manual swiveling
- Marker: _M30 Rotary axis 1 automatic, Rotary axis 2 manual swiveling
- Marker: _M31 Rotary axes 1, 2 manual swiveling
- Marker: _M57, _M58, _M59 Swivel in JOG mode with TRAOR

Init: Rewriting of the vectors
Kinematic chain is possible, e.g. temperature compensation
Vectors of consideration of the W axis for boring machines.
20.6 Swiveling

Figure 20-8 Structure: E_TCARR.SPFI

Structure E_TCARR.SPFI (F_TCARR.SPFI)  CUST_800.SPFI

- Tool name
- Input data for swiveling

Old SDS = New SDS?
- yes
- Old SDS = swivel head?
  - no
  - Automatically change old/new SDS?
    - no
    - Manually change old/new SDS?
      - no
      - Automatically change old/new SDS, manually change new SDS?
        - no
        - Change old SDS manually and new SDS automatically?
          - no
          - Tool change?
            - yes
              - Marker: _M2: Change magazine tool
              - _M3: Change manual tool
            - no
              - Marker: _M12: Swivel after tool change (AUTO)
              - _M13: Swivel after tool change (JOG)
        - yes
          - Marker: _M7: Manually change swivel head/table?
            - no
            - Marker: _M8: Automatically change swivel head/table?
              - no
              - End of cycle
            - yes
              - Marker: _M9: Manually change swivel head/table
              - Marker: _M6: Automatically change swivel head/table

SDS → swivel data set

The following structure relates to the swivel data record change and the associated tool change in milling/turning.
Note on markers _M2 to _M13

If the swivel data set (SDS) or tool is changed, the linear axes are retracted 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 markers _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 of 1st rotary axis
- Par3: Angle of 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 markers. 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 markers _M14 to _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, marker _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 marker _M15.

Note on markers _M20 to _M31

Markers _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 marker for swiveling with the active swivel data set.

Note on marker _M35

Run through _M35 for block search and a swivel data set with manual rotary axes.
20.6 Swiveling

**Note on marker _M46**
Retraction before swiveling after a block search can be set at marker _M46. Variable _E_VER is 1 if it is a milling technology program.

**Note on markers _M57 to _M59**
Markers _M57 to _M59 are used for swiveling in JOG mode and active 5-axis transformation (TRAORI).

**Note on "Correct tool"**
“Correct tool” requires that a 5-axis transformation is set up, which is equivalent to the corresponding swivel data set. The programming section for "Correct tool" is integrated in the markers _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:

```plaintext
_<M40:
  IF ((NOT $P_TOOL) AND _TC1)
    LOOP
      MSG ("no tool cutting edge active")
      M0
      STOPRE
      ENDDNLOOP
  ENDF
  GOTOF_MEND
```

---

**Configuring cycles**

SINUMERiK Operate (IM9)

Commissioning Manual, 02/2011, 6FC5397-1DP40-0BA0

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20.6.6 CYCLE996 measure workpiece kinematics

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.

The measurement is essentially carried out by means of workpiece probes, which scan three positions of a measuring ball on each rotary axis. 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.

Aside from the basic mechanics of the machine, no specific knowledge is required to use CYCLE996. No dimension drawings or machine location diagrams are necessary to carry out measuring.

Application range

The measure kinematics function (CYCLE996) can be used to determine the data that is relevant to transformations in the case of kinematic transformations that involve rotary axes (TRAORI, TCARR).

Options:

- Redetermination of swivel data sets
  - Machine startup
  - Use of swivel-mounted workholders as TCARR
- Checking swivel data sets
  - 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 CYCLE996 is started, a swivel data set with basic data (for kinematics type) must be parameterized. The measurement itself must be carried out without an active kinematic transformation.

Preconditions

The following requirements must be met in order to use CYCLE996 (Measure kinematics):

- SIEMENS measuring cycles package is installed
- Workpiece probe is calibrated
- Calibration ball is mounted
- Oriented tool carrier is set up (MD18088 MM_NUM_TOOL_CARRIER > 0)
Configuring cycles

20.6 Swiveling

- 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).

The precise procedure when measuring and programming, including examples, is described in the following manual:

References

Programming Manual, Measuring Cycles: CYCLE996
20.7 High-speed machining

20.7.1 High speed settings: Configuring CYCLE832

Function

The High Speed Settings function (CYCLE832) is used to preset data for the machining of sculptured surfaces so that optimum machining is possible. The call of CYCLE832 contains three parameters:

- Tolerance
- Machining type
- Version ID (always 1)

The High Speed Setting (CYCLE832) cycle is also in conjunction with the "Advanced Surface" function.

Software option

You require the software option in order to use this function:

"Advanced Surface"

Tolerance

The tolerance value for the linear axes (geometry axes) is transferred to the CNC with the NC command CTOL. CTOL = root(3) * tolerance value.

If rotary axes are involved in the machining (multi-axis transformation), the tolerance value is transferred to the CNC with a factor on the NC command OTOL. This factor can be set in the following channel-specific setting data for each machining type:

<table>
<thead>
<tr>
<th>Setting Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD55441 $SCS_MILL_TOL_FACTOR_ROUGH</td>
<td>Factor, tolerance of the rotary axes for roughing of the G group 59.</td>
</tr>
<tr>
<td>= 10</td>
<td></td>
</tr>
<tr>
<td>SD55442 $SCS_MILL_TOL_FACTOR_SEMIFIN</td>
<td>Factor, tolerance of the rotary axes for roughing-finishing of the G group 59.</td>
</tr>
<tr>
<td>= 10</td>
<td></td>
</tr>
<tr>
<td>SD55443 $SCS_MILL_TOL_FACTOR_FINISH</td>
<td>Factor, tolerance of the rotary axes for finishing of the G group 59.</td>
</tr>
<tr>
<td>= 10</td>
<td></td>
</tr>
</tbody>
</table>
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:

<table>
<thead>
<tr>
<th>Machining type</th>
<th>Technology G group 59</th>
<th>Field index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deselection</td>
<td>DYNNORM</td>
<td>0</td>
</tr>
<tr>
<td>Roughing</td>
<td>DYNROUGH</td>
<td>2</td>
</tr>
<tr>
<td>Rough-finishing</td>
<td>DYNSEMFIFIN</td>
<td>3</td>
</tr>
<tr>
<td>Finishing</td>
<td>DYNFINISH</td>
<td>4</td>
</tr>
</tbody>
</table>

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 the following channel and axis-specific machine data is activated using the corresponding field index:

| MD20600 $MC_MAX_PATH_JERK[0..4] | Path dependent maximum jerk. |
| MD20602 $MC_CURV_EFFECT_ON_PATH_ACCEL[0..4] | Influence of path curvature on path dynamic response. |
| MD20603 $MC_CURV_EFFECT_ON_PATH_JERK[0..4] | Influence of path curvature on path jerk. |
| MD32300 $MA_MAX_AX_ACCEL[0..4] | Maximum axis acceleration |
| MD32310 $MA_MAX_ACCEL_OVL_FACTOR[0..4] | Overload factor for axial velocity jumps. |
| MD32431 $MA_MAX_AX_JERK[0..4] | Maximum axial jerk for path motion. |
| MD32432 $MA_PATH_TRANS_JERK_LIM[0..4] | Maximum axial jerk at the block transition in continuous-path mode. |
| MD32433 $MA_SOFT_ACCEL_FACTOR[0..4] | Scaling of acceleration limitation for SOFT. |

Note

During the optimization of the machine axes, the values (note array index) of the specified machine data must be set correctly.

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 MD2150 $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).
Manufacturer cycle CUST_832.SPF

In contrast to the settings (G commands) by CYCLE832.SPF, these settings can be modified in the manufacturer cycle CUST_832.SPF. Please proceed as follows:

1. Copy cycle CUST_832.SPF from the directory /NC data/Cycles/Standard cycles.
2. Insert cycle CUST_832.SPF into directory /NC data/Cycles/Manufacturer cycles.
3. Open the cycle

The following settings are programmed in CUST_832.SPF:

SOFT
COMPCAD
G645
FIFOCTRL
UPATH
;FFWON
;ORISON
;OST
DYNNorm, DYNFinish, DYNSemifin, DYNRough depending on the machining type.

Corresponding markers are prepared in CUST_832.SPF:

_M_NORM:
_M_FINISH:
_M_SEMIFINISH:
_M_ROUGH:

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.

Take into account more than three rotary axes (orientation axes) in CYCLE832

In CYCLE832, a maximum of three rotary axes of the orientation transformation (TRAORI) are taken into account for FGREF. If more than three 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:
20.7 High-speed machining

Example

FGREF[AA]=$AA_FGREF[C].

C = rotary axis 1 (axis is taken into account by CYCLE832)
AA = rotary axis 4

20.7.2 Configuring CYCLE_HSC

Function

The CYCLE_HSC.spf cycle calls CYCLE832 internally. This allows the machine manufacturer to make appropriate adaptations to the CUST_832.spf manufacturer cycle.

In addition, following the call of CYCLE832, the orientation tolerance is still programmed with OTOL=value. The CYCLE832 settings in relation to the orientation tolerance are thereby overwritten. This shall also apply if the machine manufacturer has programmed the orientation tolerance with OTOL=value in the manufacturer cycle CUST_832.spf. If the CYCLE_HSC.spf cycle does not overwrite the orientation tolerance (OTOL), the "Rotary axis tolerance" parameter must not be programmed.

Example:

```
G710
CYCLE_HSC("FINISH",0.01) ; Machining type FINISH (DYN_FINISH G group 59) with an axis tolerance of 0.01 mm
```

All adjustments by the machine manufacturer to CUST_800.spf - except the orientation tolerance (OTOL) - are not overwritten by CYCLE_HSC.spf and are therefore effective.

References

Programming Manual, Job Planning
20.8 Measuring cycles and functions

20.8.1 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 7xx.y.

The electronic probe is only called probe in the following document.

References

Manual SINUMERIK 840D sl, NCU, Digital Inputs / Outputs

Setting the switching behavior

You set the electrical polarity of the connected probe using the following general machine data:

<table>
<thead>
<tr>
<th>MD13200 $MN_MEAS_PROBE_LOW_ACTIVE</th>
<th>Polarity change of the probe</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 0</td>
<td>Probe in the non-deflected state 0 V, default value</td>
</tr>
<tr>
<td></td>
<td>Probe in the deflected state, 24 V</td>
</tr>
<tr>
<td>= 1</td>
<td>Probe in the non-deflected state 24 V</td>
</tr>
<tr>
<td></td>
<td>Probe in the deflected state, 0 V</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD13210 $MN_MEAS_TYPE</th>
<th>Measuring type for distributed drives</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 0</td>
<td>Default value</td>
</tr>
</tbody>
</table>

Testing the probe function

You can test the switching function of the probe by manually deflecting it and checking the following PLC interface signals:

<table>
<thead>
<tr>
<th>DB 10</th>
<th>Bit 7</th>
<th>Bit 6</th>
<th>Bit 5</th>
<th>Bit 4</th>
<th>Bit 3</th>
<th>Bit 2</th>
<th>Bit 1</th>
<th>Bit 0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Probe actuated</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

  Probe 2  Probe 1
To test the switching behavior and the measured value transfer, use an NC test program with, for example, the following NC commands:

<table>
<thead>
<tr>
<th>MEAS</th>
<th>Measurement with deletion of distance-to-go</th>
</tr>
</thead>
<tbody>
<tr>
<td>$AC_MEA[n]</td>
<td>Check the switching operation, n = measurement input number</td>
</tr>
<tr>
<td>$AA_MW[axis name]</td>
<td>Measured value of the axes in workpiece coordinates</td>
</tr>
<tr>
<td>$AA_MM[axis name]</td>
<td>Measured value of the axes in machine coordinates</td>
</tr>
</tbody>
</table>

**Example of a test program**

```
%_N_PRUEF_MESSTASTER_MPF ;
$PATH=/_N_MPF_DIR ; Test program, probe connection
N00 DEF INT MTSIGNAL ; Bit memory to check the switching status
N05 G17 G54 T="3D_Taster" D1 ; Select tool geometry for probe
N10 M06 ; Activate tool
N15 G0 G90 X0 F150 ; Starting position and measuring speed
N20 MEAS=1 G1 X100 ; Measurement at measuring input 1 in the X axis
N30 MTSIGNAL=$AC_MEA[1] ; Switching operation at the 1st measuring input completed, YES / NO
N35 IF MTSIGNAL == 0 GOTOF _FEHL1 ; Signal evaluation
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
```

**Precondition**

You require, as a minimum, the access rights: Protection level 1 (password: machine manufacturer).

From the following general machine data, check the specified minimum assignment:

<table>
<thead>
<tr>
<th>MD18120 $MN_MM_NUM_GUD_NAMES_NCK</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>≥ 50</td>
<td>Number of global user variable names (SRAM)</td>
</tr>
</tbody>
</table>
### Manufacturer and user cycle CUST_MEACYC.SPF

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).

| MD18130 $MN_MM_NUM_GUD_NAMES_CHAN | = 350 | Number of channel-specific user variable names (SRAM) |
| MD18150 $MN_MM_GUD_VALUES_MEM     | = 128 | Memory space of the global user variable values (SRAM), across all channels |
| MD18160 $MN_MM_NUM_USER_MACROS    | = 50  | Number of macros (DRAM) |
| MD18170 $MN_MM_NUM_MAX_FUNC_NAMES | = 400 | No. of supplementary functions (cycles, DRAM) |
| MD18180 $MN_MM_NUM_MAX_FUNC_PARAM | = 6000| Number of additional parameters for cycles according MD18170 |
| MD18235 $MN_MM_INCOA_MEM_SIZE     | = 20480 | Size of the DRAM memory for INCOA applications (kB) |
| MD18280 $MN_MM_NUM_FILES_PER_DIR  | = 512  | Number of files per directory (DRAM) |
| MD18320 $MN_MM_NUM_FILES_IN_FILESYSTEM | = 750 | Number of files in passive file system (SRAM) |
### 20.8 Measuring cycles and functions

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Meaning</th>
</tr>
</thead>
</table>
| _MODE     | Mode of the manufacturer cycle CUST_MEACYC.SPF  
1 = at the beginning of a measuring cycle  
2 = at the end of a measuring cycle  
3 = deactivates function section to the user-specific, activates workpiece probes in conjunction with positioning (SPOS) of the working spindle.  
• see parameters _SPOS_POS and _SPOS_MOD  
• see the comment at the marker _MEACYC_MTOFFON in the CUST_MEACYC |
| _SPOS_POS | Position value of the spindle for _MODE=3  
Value range: 0 to 360 degrees |
| _SPOS_MOD | Spindle positioning mode for _MODE=3  
0 = starting the spindle position with SPOS=DC()  
1 = starting the spindle position with SPOS=ACP()  
2 = starting the spindle position with SPOS=ACN()  
3 = starting the spindle position with SPOS=AC()  
4 = starting the spindle position with SPOS=IC()  
5 = starting the spindle position with SPOS= |

**Note**

MODE = 3 is only effective, if SD55740 $SCS_MEA_FUNCTION_MASK bit6 is set to 1.

If you modify the cycle CUST_MEACYC.SPF, then proceed as follows:

1. Copy the cycle CUST_MEACYC.SPF from the directory NC data/cycles/standard cycles  
2. Insert the cycle CUST_MEACYC.SPF into the directory NC data/cycles/manufacturer cycles.

**General function settings for measuring cycles**

**Note**

After changing this machine data, the probe must be re-calibrated.
20.8.2 Measuring in JOG mode

Preconditions

You have already made the settings from the previous chapter "Measuring cycles and measurement functions, general (Page 445)".

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).
- Probe is activated as tool in the actual NC channel.

Setting the general cycle setting data:

<table>
<thead>
<tr>
<th>SD54780 $SNS_J_MEA_FUNCTION_MASK_PIECE</th>
<th>Settings for the input screen, measuring in JOG, workpiece measurement.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit 2 = 1</td>
<td>Activate the functionality &quot;Measuring with electronic workpiece probe&quot;.</td>
</tr>
</tbody>
</table>

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 technology: Tool types 1xx and 2xx
- Turning technology: Tool type 5xx, 1xx, 2xx

For the specified tool types, the tool lengths and the tool radii can be measured.

Setting general cycle setting data

<table>
<thead>
<tr>
<th>SD54782 $SNS_J_MEA_FUNCTION_MASK_TOOL</th>
<th>Settings for the input screen, measuring in JOG, tool measurement.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit 2 = 1</td>
<td>Activating the &quot;Enable automatic tool measuring&quot; function.</td>
</tr>
<tr>
<td>Bit 3 = 1</td>
<td>Selects the tool probe calibration data field, enable.</td>
</tr>
</tbody>
</table>

Checking and setting the general machine data

<table>
<thead>
<tr>
<th>MD11450 $MN_SEARCH_RUN_MODE</th>
<th>Programming search.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit 1 = 1</td>
<td>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.</td>
</tr>
</tbody>
</table>

## Configuring cycles

### 20.8 Measuring cycles and functions

<table>
<thead>
<tr>
<th>MD11604 $MN_ASUP_START_PRIO_LEVEL</th>
<th>Priorities from which ASUP_START_MASK is effective.</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 1 - 64 Priorities for ASUP_START_MASK.</td>
<td></td>
</tr>
</tbody>
</table>

Setting channelspecific machine data

<table>
<thead>
<tr>
<th>MD20050 $MC_AXCONF_GEOAX_ASIGN_TAB[ ]</th>
<th>Assignment, geometry axis to channel axis.</th>
</tr>
</thead>
<tbody>
<tr>
<td>[0]</td>
<td>For measuring in the JOG mode all of the geometry axes must be available. Preferably, XYZ.</td>
</tr>
<tr>
<td>[1]</td>
<td></td>
</tr>
<tr>
<td>[2]</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD20110 $MC_RESET_MODE_MASK</th>
<th>Defines the basic control settings after reset / TP end.</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 4045H Minimum value</td>
<td></td>
</tr>
<tr>
<td>Bit 0 = 1</td>
<td>Basic control setting after power on and reset.</td>
</tr>
<tr>
<td>Bit 2 = 1</td>
<td></td>
</tr>
<tr>
<td>Bit 6 = 1</td>
<td></td>
</tr>
<tr>
<td>Bit 14 = 1</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD20112 $MC_START_MODE_MASK</th>
<th>Definition of the basic control setting after part program start.</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 400H Minimum value</td>
<td></td>
</tr>
<tr>
<td>Bit 6 = 0</td>
<td>Definition of the basic control setting after NC start.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD20310 $MC_TOOL_MANAGEMENT_MASK</th>
<th>Activating tool manager functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 4002H Minimum value</td>
<td></td>
</tr>
<tr>
<td>Bit 1 = 1</td>
<td>Tool manager and monitoring functions active</td>
</tr>
<tr>
<td>Bit 14 = 1</td>
<td>Automatic tool change for RESET and Start.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD28082 $MC_SYSTEM_FRAME_MASK</th>
<th>System frames (SRAM).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit 0 = 0 Do not set-up system frames for actual value setting and scratching.</td>
<td></td>
</tr>
<tr>
<td>Bit 0 = 1 Set-up system frames for actual value setting and scratching.</td>
<td></td>
</tr>
</tbody>
</table>

The following channel-specific machine data are 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.
20.8 Measuring cycles and functions

### Measuring workpieces in milling

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

<table>
<thead>
<tr>
<th>SD55630 $SCS_MEA_FEED_MEASURE</th>
<th>Calibrating the measuring feedrate for the workpiece probe and measuring the workpiece</th>
</tr>
</thead>
<tbody>
<tr>
<td>300</td>
<td>Default value</td>
</tr>
</tbody>
</table>

#### 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 when calibrating. To do this, SD54760 $SNS_MEA_FUNCTION_MASK_PIECE bit 4 must be set to 1.
## Configuring cycles

### 20.8 Measuring cycles and functions

<table>
<thead>
<tr>
<th>MD52207 $MCS_AXIS_USAGE_ATTRIB[0..19]</th>
<th>Attributes of the axes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit 6 Request rotary axis as offset target for measuring.</td>
<td></td>
</tr>
<tr>
<td>[1 .. 19] = Number of the rotary axis</td>
<td></td>
</tr>
<tr>
<td>= 0 Default value</td>
<td></td>
</tr>
<tr>
<td>=1 Rotary axis is displayed as correction target in the &quot;Measuring in JOG&quot; window.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD51751 $MNS_J_MEA_M_DIST_MANUELL</th>
<th>Measuring path in mm, before and after the measuring point.</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 10 Default value</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD51757 $MNS_J_MEA_COLL_MONIT_FEED</th>
<th>Position feedrate in mm/min, in the working plane for active collision monitoring.</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 1000 Default value</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD51758 $MNS_J_MEA_COLL_MONIT_POS_FEED</th>
<th>Position feedrate in mm/min, in the infeed axis for active collision monitoring.</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 1000 Default value</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD51770 $MNS_J_MEA_CAL_RING_DIAM[n]</th>
<th>Pre-assignment of the calibration diameter in mm specifically for the calibration data sets.</th>
</tr>
</thead>
<tbody>
<tr>
<td>= -1 Default value</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD51772 $MNS_J_MEA_CAL_HEIGHT_FEEDAX[n]</th>
<th>Pre-assignment of the calibration height in mm, in the infeed axis, specific for the calibration data sets.</th>
</tr>
</thead>
<tbody>
<tr>
<td>= -99999 Default value</td>
<td></td>
</tr>
</tbody>
</table>

### General cycle setting data

<table>
<thead>
<tr>
<th>SD54780 $SNS_J_MEA_FUNCTION_MASK_PIECE</th>
<th>Configuration of the input screens for measuring in the &quot;Machine&quot; operating area in the JOG operating mode.</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 512 Default value</td>
<td></td>
</tr>
<tr>
<td>Bit 2 = 1 Activates measurements with an electronic probe.</td>
<td></td>
</tr>
<tr>
<td>Bit 3 = 1 Selects the probe calibration data, enable.</td>
<td></td>
</tr>
<tr>
<td>Bit 6 = 1 Selects WO offset in the basis reference (SETFRAME), enable.</td>
<td></td>
</tr>
</tbody>
</table>
20.8.2.2 Measuring tools in milling

Measuring feedrate for tool measurement in JOG and AUTOMATIC

<table>
<thead>
<tr>
<th>SD55628 $SCS_MEA_TP_FEED_MEASURE</th>
<th>Calibrate measuring feedrate for tool probe and tool measurement with stationary spindle.</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 300</td>
<td>Default value</td>
</tr>
</tbody>
</table>

Note

Measuring feedrate for tool measuring

All measuring cycles use the value saved in SD54636 or SD54651 as the 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 SD55628 SCS_MEA_TP_FEED_MEASURE is used, or the measuring feedrate can be overwritten in the input screen when calibrating. To do this, SD54762 $SNS_MEA_FUNCTION_MASK_TOOL bit 4 must be set to 1.

In the following setting data, index [k] stands for the number of the current data field (probe number -1) of the probe.

<table>
<thead>
<tr>
<th>SD54633 $SNS_MEA_TP_TYPE[k]</th>
<th>Probe type, cube/disk</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 0</td>
<td>Cube (default value)</td>
</tr>
<tr>
<td>= 101</td>
<td>Disk in XY, working plane G17</td>
</tr>
<tr>
<td>= 201</td>
<td>Disk in ZX, working plane G18</td>
</tr>
<tr>
<td>= 301</td>
<td>Disk in YZ, working plane G19</td>
</tr>
</tbody>
</table>

The following setting data is used to define in which axes and directions it is possible to calibrate a tool probe.

<table>
<thead>
<tr>
<th>SD54632 $SNS_MEA_T_PROBE_ALLOW_AX_DIR[k]</th>
<th>Axes and directions for “calibration”</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 133</td>
<td>Default value</td>
</tr>
</tbody>
</table>
### Decimals place

<table>
<thead>
<tr>
<th>Decimal place</th>
<th>1st axis</th>
</tr>
</thead>
<tbody>
<tr>
<td>ONES</td>
<td></td>
</tr>
<tr>
<td>= 0</td>
<td>axis not possible</td>
</tr>
<tr>
<td>= 1</td>
<td>only minus direction</td>
</tr>
<tr>
<td>= 2</td>
<td>only plus direction</td>
</tr>
<tr>
<td>= 3</td>
<td>both directions</td>
</tr>
<tr>
<td>TENS</td>
<td>2nd axis</td>
</tr>
<tr>
<td>= 0</td>
<td>axis not possible</td>
</tr>
<tr>
<td>= 1</td>
<td>only minus direction</td>
</tr>
<tr>
<td>= 2</td>
<td>only plus direction</td>
</tr>
<tr>
<td>= 3</td>
<td>both directions</td>
</tr>
<tr>
<td>HUNDREDS</td>
<td>3rd axis</td>
</tr>
<tr>
<td>= 0</td>
<td>axis not possible</td>
</tr>
<tr>
<td>= 1</td>
<td>only minus direction</td>
</tr>
<tr>
<td>= 2</td>
<td>only plus direction</td>
</tr>
<tr>
<td>= 3</td>
<td>both directions</td>
</tr>
</tbody>
</table>

### 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

<table>
<thead>
<tr>
<th>SD54631</th>
<th>$MNS_MEA_T_PROBE_DIAM_LENGTH[k]$</th>
<th>Effective diameter of the tool probe for length measurement.</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 0</td>
<td>Default value</td>
<td></td>
</tr>
</tbody>
</table>

### General cycle machine data for tool probe

<table>
<thead>
<tr>
<th>MD51780</th>
<th>$MNS_J_MEA_T_PROBE_DIAM_RAD[k]$</th>
<th>Effective diameter of the tool probe for radius measurement.</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 0</td>
<td>Default value</td>
<td></td>
</tr>
</tbody>
</table>
20.8 Measuring cycles and functions

**MD51782 $MNS_J_MEA_T_PROBE_T_EDGE_DIST[k]**
Distance between the upper edge of the tool probe and lower edge of the tool (= depth of calibration, measuring depth when measuring milling cutter radius).

| = 2 | Default value |

**MD51752 $MNS_J_MEA_M_DIST_TOOL_LENGTH**
Measuring path to measure the tool length.

| = 2 | Default value |

**MD51753 $MNS_J_MEA_M_DIST_TOOL_RADIUS**
Measuring path to measure the tool radius.

| = 1 | Default value |

**MD51786 $MNS_J_MEA_T_PROBE_MEASURE_DIST**
Measuring path to calibrate the probe or for measurements with stationary spindle.

| = 10 | Default value |

**General cycle setting data monitoring 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 |
## Configuring cycles

### 20.8 Measuring cycles and functions

<table>
<thead>
<tr>
<th>SD54673 SNS_MEA_CM_MIN_FEEDRATE[0]</th>
<th>Minimum feedrate for the first probing of the tool to be measured at the probe. The avoids excessively small feedrates for large tool radii.</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 1 Default value</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SD54674 $SNS_MEA_CM_SPIND_ROT_DIR[0]</th>
<th>Spindle direction of rotation to measure tools.</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 4 Spindle rotation the same as M4 (default value)</td>
<td></td>
</tr>
</tbody>
</table>

**NOTICE**

If the spindle is already rotating when the measuring cycle is called, this direction of rotation remains independent of the setting of this data.

<table>
<thead>
<tr>
<th>SD54675 $SNS_MEA_CM_FEEDFACTOR_1[0]</th>
<th>Feedrate factor 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 10 Default value</td>
<td>Only single probing with the feedrate calculated by the cycle. However, as a minimum, the value from SD54673[0] $SNS_MEA_CM_MIN_FEEDRATE.</td>
</tr>
<tr>
<td>= 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.</td>
<td></td>
</tr>
<tr>
<td>&gt;= 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</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SD54676 $SNS_MEA_CM_FEEDFACTOR_2[0]</th>
<th>Feedrate factor 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 0 Second probing with the feedrate calculated by the measuring cycle. This is only effective for SD54673[0] $SNS_MEA_CM_FEEDFACTOR_1 &gt; 0, default value</td>
<td></td>
</tr>
<tr>
<td>&gt;= 1 Second probing with the feedrate from SD54673[0] $SNS_MEA_CM_MIN_FEEDRATE feedrate factor 2. Third probing with the calculated feedrate.</td>
<td></td>
</tr>
</tbody>
</table>

**NOTICE**

Feedrate factor 2 should be less than feedrate factor 1.

<table>
<thead>
<tr>
<th>SD54677 $SNS_MEA_CM_MEASURING_ACCURACY[0]</th>
<th>Specified measuring accuracy. The value of this parameter always refers to the last probing of the tool at the probe!</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 0.005 Default value</td>
<td>--------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
### General cycle setting data for correction using the correction tables when forming measurements with rotating spindle

<table>
<thead>
<tr>
<th>SD54691 $SNS_MEAT_PROBE_OFFSET</th>
<th>Activate the measuring result compensation</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 0</td>
<td>No data, default value</td>
</tr>
<tr>
<td>= 1</td>
<td>Correction in the cycle. This is only effective if SD54689 $SNS_MEAT_PROBE_MANUFACTURER&gt;0.</td>
</tr>
<tr>
<td>= 2</td>
<td>Correction using user-defined correction table</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SD54689 $SNS_MEAT_PROBE_MANUFACTURER</th>
<th>Activates pre-configured compensation tables for several tool probe models (customer-specific)</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 0</td>
<td>No data, default value</td>
</tr>
<tr>
<td>= 1</td>
<td>TT130 (Heidenhain)</td>
</tr>
<tr>
<td>= 2</td>
<td>TS27R (Renishaw)</td>
</tr>
</tbody>
</table>

### General cycle setting data of the compensation tables

<table>
<thead>
<tr>
<th>SD54691 $SNS_MEAT_PROBE_OFFSET</th>
<th>Measuring result compensation for tool measurement.</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 2</td>
<td>Correction using user-defined correction table</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SD54695 to SD54700</th>
<th>Compensation value for radius measurement</th>
<th>See the subsequent general cycle setting data.</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD54705 to SD54710</td>
<td>Compensation values for length measurement</td>
<td>See the subsequent general cycle setting data.</td>
</tr>
</tbody>
</table>

| SD54695 $SNS_MEAT_RESULT_OFFSET_TAB_RAD1[n] | Radius measurement |
| SD54705 $SNS_MEAT_RESULT_OFFSET_TAB_LEN1[n] | Length measurement |
| = 0                                          | 0                   |
| = 1                                          | 1st radius          |
| = 2                                          | 2nd radius          |
| = 3                                          | 3rd radius          |
| = 4                                          | 4th radius          |

| SD54696 $SNS_MEAT_RESULT_OFFSET_TAB_RAD2[n] | Radius measurement |
| SD54706 $SNS_MEAT_RESULT_OFFSET_TAB_LEN2[n] | Length measurement |
| = 0                                          | 1st peripheral velocity |
| = 1                                          | Correction value for 1st radius/ length measurement |
### Configuring cycles

#### 20.8 Measuring cycles and functions

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>2nd peripheral velocity</td>
</tr>
<tr>
<td>1</td>
<td>Correction value for 1st radius/length measurement</td>
</tr>
<tr>
<td>2</td>
<td>Correction value for 2nd radius/length measurement</td>
</tr>
<tr>
<td>3</td>
<td>Correction value for 3rd radius/length measurement</td>
</tr>
<tr>
<td>4</td>
<td>Correction value for 4th radius/length measurement</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SD54697</th>
<th>$SNS_MEA_RESULT_OFFSET_TAB_RAD3[n]$</th>
<th>Radius measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD54707</td>
<td>$SNS_MEA_RESULT_OFFSET_TAB_LEN3[n]$</td>
<td>Length measurement</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>3rd peripheral velocity</td>
</tr>
<tr>
<td>1</td>
<td>Correction value for 1st radius/length measurement</td>
</tr>
<tr>
<td>2</td>
<td>Correction value for 2nd radius/length measurement</td>
</tr>
<tr>
<td>3</td>
<td>Correction value for 3rd radius/length measurement</td>
</tr>
<tr>
<td>4</td>
<td>Correction value for 4th radius/length measurement</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SD54698</th>
<th>$SNS_MEA_RESULT_OFFSET_TAB_RAD4[n]$</th>
<th>Radius measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD54708</td>
<td>$SNS_MEA_RESULT_OFFSET_TAB_LEN4[n]$</td>
<td>Length measurement</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>4th peripheral velocity</td>
</tr>
<tr>
<td>1</td>
<td>Correction value for 1st radius/length measurement</td>
</tr>
<tr>
<td>2</td>
<td>Correction value for 2nd radius/length measurement</td>
</tr>
<tr>
<td>3</td>
<td>Correction value for 3rd radius/length measurement</td>
</tr>
<tr>
<td>4</td>
<td>Correction value for 4th radius/length measurement</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SD54699</th>
<th>$SNS_MEA_RESULT_OFFSET_TAB_RAD5[n]$</th>
<th>Radius measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD54709</td>
<td>$SNS_MEA_RESULT_OFFSET_TAB_LEN5[n]$</td>
<td>Length measurement</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>5th peripheral velocity</td>
</tr>
<tr>
<td>1</td>
<td>Correction value for 1st radius/length measurement</td>
</tr>
<tr>
<td>2</td>
<td>Correction value for 2nd radius/length measurement</td>
</tr>
<tr>
<td>3</td>
<td>Correction value for 3rd radius/length measurement</td>
</tr>
<tr>
<td>4</td>
<td>Correction value for 4th radius/length measurement</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SD54700</th>
<th>$SNS_MEA_RESULT_OFFSET_TAB_RAD6[n]$</th>
<th>Radius measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD54710</td>
<td>$SNS_MEA_RESULT_OFFSET_TAB_LEN6[n]$</td>
<td>Length measurement</td>
</tr>
</tbody>
</table>
20.8.2.3 Measuring tools for turning

Measuring feedrate for tool measurement in turning operation

<table>
<thead>
<tr>
<th>SD55628 $SCS_MEA_TP_FEED_MEASURE</th>
<th>Calibrate measuring feedrate for tool probe and tool measurement with stationary spindle.</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 300</td>
<td>Default value</td>
</tr>
</tbody>
</table>

Note
Measuring feedrate for tool measuring

All measuring cycles use the value saved in SD54636 or SD54651 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 SD55628 SCS_MEA_TP_FEED_MEASURE is used, or the measuring feedrate can be overwritten in the input screen when calibrating. To do this, SD54762 $SNS_MEA_FUNCTION_MASK_TOOL bit 4 must be set to 1.

General cycle machine data for measuring path/measuring feedrate

<table>
<thead>
<tr>
<th>SD42950 $SC_TOOL_LENGTH_TYP</th>
<th>Assignment of the tool length offset independent of tool type.</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 0</td>
<td>Measuring turning tools, type 5xx (default value)</td>
</tr>
<tr>
<td>= 2</td>
<td>Measuring turning tools, type 5xx, drilling and milling tools, type 1xx, 2xx</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD51786 $MNS_J_MEA_T_PROBE_MEASURE_DIST</th>
<th>Measuring path to calibrate the probe or for measurements with stationary spindle.</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 10</td>
<td>Default value</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD51787 $MNS_J_MEA_T_PROBE_MEASURE_FEED</th>
<th>Calibrate measuring feedrate for tool probe and tool measurement with stationary spindle.</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 100</td>
<td>Default value</td>
</tr>
</tbody>
</table>
Calibrating tool probes

Using the following general cycle machine data, set the access rights from which the protection level the "Calibrate probe" softkey is displayed. In this case, the automatic tool measurement must have been enabled using setting data SD54799.

<table>
<thead>
<tr>
<th>MD51070 $MNS_ACCESS_CAL_TOOL_PROBE</th>
<th>Protection level, calibrate tool probe.</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 7 Access rights: Protection level 7 (key switch 0), default value</td>
<td></td>
</tr>
<tr>
<td>= 4 Read access rights: Protection level 4 (key switch 3)</td>
<td></td>
</tr>
<tr>
<td>= 3 Write access: Protection level 3 (password End user)</td>
<td></td>
</tr>
</tbody>
</table>

Note

Measuring feedrate for tool measuring

All measuring cycles use the value saved in SD54636 or SD54651 as the 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 SD55628 $SCS_MEA_TP_PROBE_FEED_MEASURE is used, or the measuring feedrate can be overwritten in the input screen when calibrating. To do this, SD54762 MEA_FUNCTION_MASK_TOOL bit 4 must be set to 1.

20.8.2.4 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:

<table>
<thead>
<tr>
<th>Setting the machine data</th>
<th>Setting data to be initialized</th>
</tr>
</thead>
<tbody>
<tr>
<td>MD10709 $MN_PROG_SD_POWERON_INIT_TAB [0] = 0</td>
<td>Setting data to be initialized</td>
</tr>
<tr>
<td>MD35035 $MA_SPIND_FUNCTION_MASK Bit 4=0 Bit 5=1</td>
<td>Spindle functions</td>
</tr>
<tr>
<td>SD43200 $SA_SPIND_S</td>
<td>Speed setting value</td>
</tr>
</tbody>
</table>
20.8.3 Measuring in AUTOMATIC mode

Precondition

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 445)".

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. 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 measure tool:

- Milling technology: Tool types 1xx and 2xx
- Turning technology: Tool type 5xx, 1xx, 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.

<table>
<thead>
<tr>
<th>SD55613 $SCS_MEA_RESULT_DISPLAY</th>
<th>Selects the screen display of the measuring result</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 0</td>
<td>No screen display of the measuring result (default value).</td>
</tr>
<tr>
<td>= 1</td>
<td>Screen display of the measuring result is displayed for 8 seconds.</td>
</tr>
<tr>
<td>= 3</td>
<td>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.</td>
</tr>
<tr>
<td>= 4</td>
<td>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.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SD55623 $SCS_MEA_EMPIRIC_VALUE[n]</th>
<th>Empirical values</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 0</td>
<td>Default value</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SD55618 $SCS_MEA_SIM_ENABLE</th>
<th>Measuring cycle simulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 0</td>
<td>When calling measuring cycles in conjunction with SINUMERIK Operate, ShopMill or ShopTurn simulation, the measuring cycles are skipped, default value.</td>
</tr>
<tr>
<td>= 1</td>
<td>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.</td>
</tr>
</tbody>
</table>

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
- SD54762 $SNS_MEA_FUNCTION_MASK TOOL measure tool: Measuring cycles in the milling area

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 lathe, then additional settings are required. Refer to the Chapter "Measuring workpieces in turning (Page 473)" 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 the Chapters "Measuring tools for turning (Page 474)" or "Tool measurement in milling (Page 465)" 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.

**20.8.3.1 Workpiece measurement, 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.

**Precondition**

You have already made the settings from the following chapter:

See also: Measuring cycles and measurement functions, general (Page 445)

**Settings**

General cycle setting data

Channel-specific cycle setting data

<table>
<thead>
<tr>
<th>SD55630 $SCS_MEA_FEED_MEASURE</th>
<th>Measuring feedrate $[mm/rev]$</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥ 300</td>
<td>Measuring feedrate when calibrating the workpiece probe</td>
</tr>
</tbody>
</table>

**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.
### 20.8 Measuring cycles and functions

#### 20.8.3.2 Workpiece measurement in milling

Measuring in the "Program" operating area can be adapted corresponding to the specific requirements using the channel-specific cycle setting data.

**Settings**

<table>
<thead>
<tr>
<th>Setting Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD55625 $SCS_MEA_AVERAGE_VALUE[n]</td>
<td>Number of mean values.</td>
</tr>
<tr>
<td>= 0</td>
<td>Default value</td>
</tr>
</tbody>
</table>
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. |
| SD54610 $SNS_MEA_WP_STATUS_GEN[n] | Calibration status |
| SD54611 $SNS_MEA_WP_FEED[n] | Measuring feedrate when calibrating |

### 20.8.3.3 Tool measurement in milling

**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 have already been correctly entered in: SD54632 $SNS_MEA_TP_AX_DIR_AUTO_CAL[k]

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 during calibration |

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

<table>
<thead>
<tr>
<th>ONES</th>
<th>1st axis</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>axis not possible</td>
</tr>
<tr>
<td>1</td>
<td>only minus direction</td>
</tr>
<tr>
<td>2</td>
<td>only plus direction</td>
</tr>
<tr>
<td>3</td>
<td>both directions</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TENS</th>
<th>2nd axis</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>axis not possible</td>
</tr>
<tr>
<td>1</td>
<td>only minus direction</td>
</tr>
<tr>
<td>2</td>
<td>only plus direction</td>
</tr>
<tr>
<td>3</td>
<td>both directions</td>
</tr>
</tbody>
</table>
20.8 Measuring cycles and functions

### Decimal place

<table>
<thead>
<tr>
<th>HUNDREADS</th>
<th>3rd axis</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>axis not possible</td>
</tr>
<tr>
<td>1</td>
<td>only minus direction</td>
</tr>
<tr>
<td>2</td>
<td>only plus direction</td>
</tr>
<tr>
<td>3</td>
<td>both directions</td>
</tr>
</tbody>
</table>

#### 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

<table>
<thead>
<tr>
<th>SD54633 $SNS_MEA_TP_TYPE[k]</th>
<th>Probe version</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 0</td>
<td>Cube, default value.</td>
</tr>
<tr>
<td>= 101</td>
<td>Disk in XY, working plane G17.</td>
</tr>
<tr>
<td>= 201</td>
<td>Disk in ZX, working plane G18.</td>
</tr>
<tr>
<td>= 301</td>
<td>Disk in YZ, working plane G19.</td>
</tr>
</tbody>
</table>

#### 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.
Configuring cycles

20.8 Measuring cycles and functions

| 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 Cube (default value) |
| = 101 Disk in XY, working plane G17. |
| = 201 Disk in ZX, working plane G18. |
| = 301 Disk in YZ, working plane G19. |
| 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 during calibration |

The following general cycle setting data SD5467 $SNS_MEA_TPW_AX_DIR_AUTO_CAL is used to define in which axes and directions it is possible to calibrate a tool probe.

<table>
<thead>
<tr>
<th>Decimal place</th>
</tr>
</thead>
<tbody>
<tr>
<td>ONES</td>
</tr>
<tr>
<td>= 0</td>
</tr>
<tr>
<td>= 1</td>
</tr>
<tr>
<td>= 2</td>
</tr>
<tr>
<td>= 3</td>
</tr>
<tr>
<td>TENS</td>
</tr>
<tr>
<td>= 0</td>
</tr>
<tr>
<td>= 1</td>
</tr>
<tr>
<td>= 2</td>
</tr>
<tr>
<td>= 3</td>
</tr>
<tr>
<td>HUNDREDS</td>
</tr>
<tr>
<td>= 0</td>
</tr>
<tr>
<td>= 1</td>
</tr>
<tr>
<td>= 2</td>
</tr>
<tr>
<td>= 3</td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>SD54670 $SNS_MEA_CM_MAX_PERI_SPEED[0]</th>
<th>Maximum permissible peripheral speed of the tool to be measured.</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 100 Default value</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SD54671 $SNS_MEA_CM_MAX_REVOLUTIONS[0]</th>
<th>Maximum permissible tool speed of the tool to be measured. The speed is automatically reduced when exceeded.</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 1000 Default value</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SD54672 $SNS_MEA_CM_MAX_FEEDRATE[0]</th>
<th>Maximum permissible feedrate to probe the tool to be measured at the probe.</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 20 Default value</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SD54673 $SNS_MEA_CM_MIN_FEEDRATE[0]</th>
<th>Minimum feedrate for the first probing of the tool to be measured at the probe. The avoids excessively small feedrates for large tool radii.</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 1 Default value</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SD54674 $SNS_MEA_CM_SPIND_ROT_DIR[0]</th>
<th>Spindle direction of rotation to measure tools.</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 = M4 Default value</td>
<td></td>
</tr>
</tbody>
</table>
NOTICE
If the spindle is already rotating when the measuring cycle is called, this direction of rotation remains independent of the setting of this data.

<table>
<thead>
<tr>
<th>SD54675 $SNS_MEA_CM_FEEDFACTOR_1[0]</th>
<th>Feedrate factor 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 10</td>
<td>Default value</td>
</tr>
<tr>
<td>= 0</td>
<td>Only single probing with the feedrate calculated by the cycle. However, as a minimum, the value from SD54673[0] $SNS_MEA_CM_MIN_FEEDRATE.</td>
</tr>
<tr>
<td>≥ 1</td>
<td>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</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SD54676 $SNS_MEA_CM_FEEDFACTOR_2[0]</th>
<th>Feedrate factor 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 0</td>
<td>Second probing with the feedrate calculated by the cycle. This is only effective for SD54673 $SNS_MEA_CM_FEEDFACTOR_1[0] &gt; 0, default value.</td>
</tr>
<tr>
<td>≥ 1</td>
<td>Second probing with the calculated feedrate from SD54673 $SNS_MEA_CM_MIN_FEEDRATE[0] feedrate factor 2. Third probing with the calculated feedrate.</td>
</tr>
</tbody>
</table>

NOTICE
Feedrate factor 2 should be less than feedrate factor 1.

<table>
<thead>
<tr>
<th>SD54677 $SNS_MEA_CM_MEASURING_ACCURACY[0]</th>
<th>Specified measuring accuracy. The value of this parameter always refers to the last probing of the tool at the probe.</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 0.005</td>
<td>Default value</td>
</tr>
</tbody>
</table>

Measurement with rotating spindle: Measured value correction using correction tables

<table>
<thead>
<tr>
<th>SD54691 $SNS_MEA_T_PROBE_OFFSET</th>
<th>Activates the measuring result correction</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 0</td>
<td>No data, default value</td>
</tr>
<tr>
<td>= 1</td>
<td>Correction in the cycle. This is only effective if SD54690 $SNS_MEA_T_PROBE_MANUFACTURER&gt;0.</td>
</tr>
<tr>
<td>= 2</td>
<td>Correction using user-defined correction table</td>
</tr>
</tbody>
</table>
20.8 Measuring cycles and functions

### SD54689 $SNS\_MEA\_T\_PROBE\_MANUFACTURER

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No data, default value</td>
</tr>
<tr>
<td>1</td>
<td>TT130 (Heidenhain)</td>
</tr>
<tr>
<td>2</td>
<td>TS27R (Renishaw)</td>
</tr>
</tbody>
</table>

**Correction values for users**

If the general cycle setting data SD54691 $SNS\_MEA\_T\_PROBE\_OFFSET= 2, the following settings apply:

<table>
<thead>
<tr>
<th>SD54695 to SD54700</th>
<th>Correction values for radius measurement.</th>
<th>See the subsequent general cycle setting data.</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD54705 to SD54710</td>
<td>Correction values for length measurement.</td>
<td>See the subsequent general cycle setting data.</td>
</tr>
</tbody>
</table>

<p>| SD54695 $SNS_MEA_RESULT_OFFSET_TAB_RAD1[n] | Radius measurement |</p>
<table>
<thead>
<tr>
<th>SD54705 $SNS_MEA_RESULT_OFFSET_TAB_LEN1[n]</th>
<th>Length measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>1st radius</td>
</tr>
<tr>
<td>2</td>
<td>2nd radius</td>
</tr>
<tr>
<td>3</td>
<td>3rd radius</td>
</tr>
<tr>
<td>4</td>
<td>4th radius</td>
</tr>
</tbody>
</table>

<p>| SD54696 $SNS_MEA_RESULT_OFFSET_TAB_RAD2[n] | Radius measurement |</p>
<table>
<thead>
<tr>
<th>SD54706 $SNS_MEA_RESULT_OFFSET_TAB_LEN2[n]</th>
<th>Length measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1st peripheral speed.</td>
</tr>
<tr>
<td>1</td>
<td>Correction value for 1st radius/length measurement.</td>
</tr>
<tr>
<td>2</td>
<td>Correction value for 2nd radius/length measurement.</td>
</tr>
<tr>
<td>3</td>
<td>Correction value for 3rd radius/length measurement.</td>
</tr>
<tr>
<td>4</td>
<td>Correction value for 4th radius/ length measurement.</td>
</tr>
</tbody>
</table>
## Configuring Cycles

### 20.8 Measuring Cycles and Functions

<table>
<thead>
<tr>
<th>SD54697 $SNS_MEA_RESULT_OFFSET_TAB_RAD3[n]</th>
<th>SD54707 $SNS_MEA_RESULT_OFFSET_TAB_LEN3[n]</th>
<th>Radius Measurement</th>
<th>Length Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>$= 0$</td>
<td></td>
<td>$2^{nd}$ peripheral speed.</td>
<td></td>
</tr>
<tr>
<td>$= 1$</td>
<td></td>
<td>Correction value for 1st radius/length measurement.</td>
<td></td>
</tr>
<tr>
<td>$= 2$</td>
<td></td>
<td>Correction value for 2nd radius/length measurement.</td>
<td></td>
</tr>
<tr>
<td>$= 3$</td>
<td></td>
<td>Correction value for 3rd radius/length measurement.</td>
<td></td>
</tr>
<tr>
<td>$= 4$</td>
<td></td>
<td>Correction value for 4th radius/length measurement.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SD54698 $SNS_MEA_RESULT_OFFSET_TAB_RAD4[n]</th>
<th>SD54708 $SNS_MEA_RESULT_OFFSET_TAB_LEN4[n]</th>
<th>Radius Measurement</th>
<th>Length Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>$= 0$</td>
<td></td>
<td>$3^{rd}$ peripheral speed.</td>
<td></td>
</tr>
<tr>
<td>$= 1$</td>
<td></td>
<td>Correction value for 1st radius/length measurement.</td>
<td></td>
</tr>
<tr>
<td>$= 2$</td>
<td></td>
<td>Correction value for 2nd radius/length measurement.</td>
<td></td>
</tr>
<tr>
<td>$= 3$</td>
<td></td>
<td>Correction value for 3rd radius/length measurement.</td>
<td></td>
</tr>
<tr>
<td>$= 4$</td>
<td></td>
<td>Correction value for 4th radius/length measurement.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SD54699 $SNS_MEA_RESULT_OFFSET_TAB_RAD5[n]</th>
<th>SD54709 $SNS_MEA_RESULT_OFFSET_TAB_LEN5[n]</th>
<th>Radius Measurement</th>
<th>Length Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>$= 0$</td>
<td></td>
<td>$4^{th}$ peripheral speed.</td>
<td></td>
</tr>
<tr>
<td>$= 1$</td>
<td></td>
<td>Correction value for 1st radius/length measurement.</td>
<td></td>
</tr>
<tr>
<td>$= 2$</td>
<td></td>
<td>Correction value for 2nd radius/length measurement.</td>
<td></td>
</tr>
<tr>
<td>$= 3$</td>
<td></td>
<td>Correction value for 3rd radius/length measurement.</td>
<td></td>
</tr>
<tr>
<td>$= 4$</td>
<td></td>
<td>Correction value for 4th radius/length measurement.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SD54700 $SNS_MEA_RESULT_OFFSET_TAB_RAD6[n]</th>
<th>SD54710 $SNS_MEA_RESULT_OFFSET_TAB_LEN6[n]</th>
<th>Radius Measurement</th>
<th>Length Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>$= 0$</td>
<td></td>
<td>$5^{th}$ peripheral speed.</td>
<td></td>
</tr>
<tr>
<td>$= 1$</td>
<td></td>
<td>Correction value for 1st radius/length measurement.</td>
<td></td>
</tr>
<tr>
<td>$= 2$</td>
<td></td>
<td>Correction value for 2nd radius/length measurement.</td>
<td></td>
</tr>
<tr>
<td>$= 3$</td>
<td></td>
<td>Correction value for 3rd radius/length measurement.</td>
<td></td>
</tr>
<tr>
<td>$= 4$</td>
<td></td>
<td>Correction value for 4th radius/length measurement.</td>
<td></td>
</tr>
</tbody>
</table>
20.8.3.4 Measuring workpieces in turning

General settings for turning

<table>
<thead>
<tr>
<th>MD52740 $MNS_MEA_FUNCTION_MASK</th>
<th>Turning technology: Behavior of the 3rd geometry axis (Y)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit 1 Measure workpiece</td>
<td></td>
</tr>
<tr>
<td>Bit 2</td>
<td></td>
</tr>
<tr>
<td>Bit 16 Tool probe measuring input</td>
<td></td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>SD54615 $SNS_MEA_CAL_EDGE_BASE_AX1[n]</th>
<th>Calibration slot base referred to the 1st measuring axis.</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 0</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SD54617 $SNS_MEA_CAL_EDGE_PLUS_DIR_AX1[n]</th>
<th>Calibration slot edge in the positive direction of the first measuring axis.</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 0</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SD54618 $SNS_MEA_CAL_EDGE_MINUS_DIR_AX1[n]</th>
<th>Calibration slot edge in the negative direction of the first measuring axis.</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 0</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SD54619 $SNS_MEA_CAL_EDGE_BASE_AX2[n]</th>
<th>Calibration slot base referred to the 2nd measuring axis.</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 0</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SD54620 $SNS_MEA_CAL_EDGE_UPPERE_AX2[n]</th>
<th>Upper calibration slot edge referred to the 2nd measuring axis.</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 0</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SD54621 $SNS_MEA_CAL_EDGE_PLUS_DIR_AX2[n]</th>
<th>Calibration slot edge in the positive direction of the 2nd measuring axis.</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 0</td>
<td></td>
</tr>
</tbody>
</table>
20.8 Measuring cycles and functions

20.8.3.5 Measuring tools for turning

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) |
| = 0 |

| SD54626 $SNS_MEA_TP_TRIG_PLUS_DIR_AX1[k] | Trigger point in plus direction of the 1st measuring axis (for G18 Z) |
| = 0 |

| SD54627 $SNS_MEA_TP_TRIG_MINUS_DIR_AX2[k] | Trigger point in minus direction of the 2nd measuring axis (for G18 X) |
| = 0 |

| SD54628 $SNS_MEA_TP_TRIG_PLUS_DIR_AX2[k] | Trigger point in plus direction of the 2nd measuring axis (for G18 X) |
| = 0 |

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.
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).

<table>
<thead>
<tr>
<th>SD54640 $SNS_MEA_TPW_TRIG_MINUS_DIR_AX1[k]</th>
<th>Trigger point minus direction of the 1st measuring axis (for G18 Z).</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 0</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SD54641 $SNS_MEA_TPW_TRIG_PLUS_DIR_AX1[k]</th>
<th>Trigger point plus direction of the 1st measuring axis (for G18 Z).</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 0</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SD54642 $SNS_MEA_TPW_TRIG_MINUS_DIR_AX2[k]</th>
<th>Trigger point minus direction of the 2nd measuring axis (for G18 X).</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 0</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SD54643 $SNS_MEA_TPW_TRIG_PLUS_DIR_AX2[k]</th>
<th>Trigger point plus direction of the 2nd measuring axis (for G18 X).</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 0</td>
<td></td>
</tr>
</tbody>
</table>

Tool measurement using the "Orientable toolholder" or "Swivel tool" function

If the general cycle machine data MD52740 $MNS_MEA_FUNCTION_MASK, bit 16 = 1, then the following setting applies:

<table>
<thead>
<tr>
<th>MD51618 $MNS_MEA_CM_ROT_AX_POS_TOL</th>
<th>Tolerance parameter for rotary axis settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 0.5</td>
<td>Default value</td>
</tr>
</tbody>
</table>

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 - "Toolholder not parallel to the geometry axes".
20.9  Milling with ShopMill

20.9.1  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

Adapt manufacturer cycle CUST_TECHCYC.SPF

In cycle CUST_TECHCYC.SPF, the function markers (_M1: to _M142) are prepared and
documented. If you wish to adapt the cycle, proceed as follows:

1. Copy the cycle CUST_TECHCYC.SPF from the directory
   NC data/cycles/standard cycles.
2. Insert cycle CUST_TECHCYC.SPF into the following directory:
   /NC data/Cycles/Manufacturer cycles

The manufacturer cycle CYC_TECHCUST.SPF is called by the ShopTurn cycles.

You can perform the following actions:

- Switch between spindle and C axis mode of the main spindle or counter-spindle.
  Marks _M1, _M2, _M21, _M22
- Clamp or release rotary axes (main spindle/counterspindle).
  Markers _M3, _M4, _M23, _M24
- Open, close, flush chuck (main spindle /counterspindle).
  Markers _M5 to _M8, _M25 to _M29
- Connect or disconnect the driven tool (establish/release the connection to the drive).
  Markers _M41, _M42
- Configuring special functions when switching over between the machining levels.
  (You do not have to make any settings here for cylinder surface transformation or face
  end machining with the C axis.)
  Markers _M61 to _M68
- Positioning receptacle for cut-off, move out or in.
  Markers _M100, _M101, _M102
- Configuring special functions for tool changing. (These special functions are called after
  the T command is output.)
  Markers _M110, _M111, _M112
- Changing default settings for the coupling of the main spindle and counterspindle.
  Marker _M120
- Setting special properties for program start or program end.
  Markers _M131, _M135, _M13
## Setting the coordinate system

### Examples:
- 0 for vertical milling machines
- 16 for horizontal milling machines, boring mill

A detailed description of the MD52000 is provided in Chapter: **Activating turning/milling/drilling technologies** (Page 373)

For plane selection when milling, appropriately set the following machine data:

<table>
<thead>
<tr>
<th>MD52005 $MCS_DISP_PLANE_MILL</th>
<th>Plane selection for milling</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 17</td>
<td></td>
</tr>
<tr>
<td>= 0</td>
<td>In the cycle support</td>
</tr>
<tr>
<td>= 17</td>
<td>G17 (default value)</td>
</tr>
<tr>
<td>= 18</td>
<td>G18</td>
</tr>
<tr>
<td>= 19</td>
<td>G19</td>
</tr>
</tbody>
</table>

## 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:

**Simulation and simultaneous recording** (Page 101)

## 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.

<table>
<thead>
<tr>
<th>MD52207 $MCS_USAGE_ATTRIB[0..19]</th>
<th>Attribute of the axes in the channel [0..19] spindle number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit 4</td>
<td>Displayed direction of rotation for M3 is counter-clockwise (for spindles)</td>
</tr>
</tbody>
</table>
| Bit 5                            | Direction of rotation M3 corresponds to rotary axis minus (for spindles)  
This bit must be set analog to PLC bit DBnn.DBX17.6!
Additional channel-specific machine data

<table>
<thead>
<tr>
<th>MD52229 $MCS_ENABLE_QUICK_M_CODES</th>
<th>Enable quick M commands</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 0</td>
<td>Bit 0</td>
</tr>
<tr>
<td></td>
<td>Bit 1</td>
</tr>
<tr>
<td></td>
<td>Bit 2</td>
</tr>
<tr>
<td></td>
<td>Bit 3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD52230 $MCS_M_CODE_ALL_COOLANTS_OFF</th>
<th>M code for all coolants Off</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 9</td>
<td>You define the M function to switch off the coolant that is output when the tool is changed.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD52231 $MCS_M_CODE_COOLANT_1_ON</th>
<th>M code for coolant 1 On</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 8</td>
<td>You define the M function for coolant 1 that is output when the tool is changed.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD52232 $MCS_M_CODE_COOLANT_2_ON</th>
<th>M code for coolant 2 On</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 7</td>
<td>You define the M function for coolant 2 that is output when the tool is changed.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD52233 $MCS_M_CODE_COOLANT_1_AND_2_ON</th>
<th>M code for both coolants On</th>
</tr>
</thead>
<tbody>
<tr>
<td>= -1</td>
<td>You define the M function for coolant 1 and 2 that is output when the tool is changed.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD52281 $MCS_TOOL_MCODE_FUNC_ON[]</th>
<th>M code for tool-specific function ON</th>
</tr>
</thead>
<tbody>
<tr>
<td>= -1</td>
<td>M function is not output. If both M commands of a function &quot;= -1&quot;, the corresponding field is not displayed on the interface.</td>
</tr>
<tr>
<td>[0]</td>
<td>M code for tool-specific function 1 ON</td>
</tr>
<tr>
<td>[1]</td>
<td>M code for tool-specific function 2 ON</td>
</tr>
</tbody>
</table>
MD52282 $MCS_TOOL_MCODE_FUNC_OFF[] M code for tool-specific function OFF

<table>
<thead>
<tr>
<th></th>
<th>M code for tool-specific function OFF</th>
</tr>
</thead>
<tbody>
<tr>
<td>= -1</td>
<td>M function is output.</td>
</tr>
<tr>
<td></td>
<td>If both M commands of a function &quot;= -1&quot;, the corresponding field is displayed on the interface.</td>
</tr>
<tr>
<td>[0]</td>
<td>M code for tool-specific function 1 OFF</td>
</tr>
<tr>
<td>[1]</td>
<td>M code for tool-specific function 2 OFF</td>
</tr>
</tbody>
</table>

## Channel-specific cycle setting data

<table>
<thead>
<tr>
<th>SD55212 $SCS_FUNCTION_MASK_TECH_SET</th>
<th>Cross-technology function screen</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 6</td>
<td></td>
</tr>
<tr>
<td>Bit 0</td>
<td>Tool preselection active.</td>
</tr>
<tr>
<td></td>
<td>The next tool is prepared directly after a tool change.</td>
</tr>
<tr>
<td></td>
<td>Note: For a revolver, the setting data must be set to &quot;0&quot;.</td>
</tr>
<tr>
<td>Bit 1</td>
<td>Automatic calculation of the thread depth for metric threads.</td>
</tr>
<tr>
<td>Bit 2</td>
<td>Take the thread diameter and thread depth from the table.</td>
</tr>
</tbody>
</table>

### 20.9.2 Cylinder surface transformation in ShopMill

#### Software options

You require the following software option in order 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 slots is programmed with reference to the flattened, plane cylinder surface. The programming can be performed using straight line / circle, drilling or milling cycles or contour milling (free contour programming).

Setting up

In addition, set the following channel-specific configuration machine data in ShopMill:

<table>
<thead>
<tr>
<th>MD52214 $MCS_FUNCTION_MASK_MILL</th>
<th>ShopMill function screen</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 1H</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bit 0</th>
<th>Enable cylinder surface transformation for milling in ShopMill</th>
</tr>
</thead>
</table>
20.10 Turning with ShopTurn

20.10.1 Setting-up ShopTurn cycles for turning

Loading ShopTurn cycles

When the control boots, the ShopMill cycles are automatically loaded to the following directory: card/siemens/sinumerik/cycles/st/prog

Adapt manufacturer cycle CUST_TECHCYC.SPF

In cycle CUST_TECHCYC.SPF, the function markers (_M1: to _M142) are prepared and documented. If you wish to adapt the cycle, proceed as follows:

1. Copy the cycle CUST_TECHCYC.SPF from the directory /NC data/cycles/standard cycles.
2. Insert CUST_TECHCYC.SPF cycle into the following directory: /NC data/cycles/manufacturer cycles

The manufacturer cycle CYC_TECHCUST.SPF is called by the ShopTurn cycles.

You can perform the following actions:

- Switch between spindle and C axis mode of the main spindle or counter-spindle.
  Marks _M1, _M2, _M21, _M22
- Clamp or release rotary axes (main spindle/counterspindle).
  Marks _M3, _M4, _M23, _M24
- Open, close, flush chuck (main spindle/counterspindle).
  Marks _M5 to _M8, _M25 to _M29
- Connect or disconnect the driven tool (establish/release the connection to the drive).
  Marks _M41, _M42
- Configuring special functions when switching over between the machining levels. (You do not have to make any settings here for cylinder surface transformation or face end machining with the C axis.)
  Marks _M61 to _M68
- Positioning receptacle for cut-off, move out or in.
  Marks _M100, _M101, _M102
- Configuring special functions for tool changing. (These special functions are called after the T command is output.)
  Marks _M110, _M111, _M112
- Changing default settings for the coupling of the main spindle and counterspindle.
  Marker _M120
- Setting special properties for program start or program end.
  Marks _M131, _M135, _M13
### Meaning of the axes

You set the meaning of the axes in machine data MD52206 $MCS_AXIS_USAGE[0..19].

<table>
<thead>
<tr>
<th>MD52206 $MCS_AXIS_USAGE[0..19]</th>
<th>Meaning of the axes in the channel</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Main spindle (turning)</td>
</tr>
<tr>
<td>4</td>
<td>C axis of the main spindle (turning)</td>
</tr>
<tr>
<td>5</td>
<td>Counterspindle (turning)</td>
</tr>
<tr>
<td>6</td>
<td>C axis of the counterspindle (turning)</td>
</tr>
<tr>
<td>7</td>
<td>Linear axis of the counterspindle (turning)</td>
</tr>
</tbody>
</table>

### 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.

<table>
<thead>
<tr>
<th>MD32100 $MA_AX_MOTION_DIR</th>
<th>Traversing direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1</td>
<td>Direction reversal</td>
</tr>
<tr>
<td>0, 1</td>
<td>No direction reversal</td>
</tr>
</tbody>
</table>

### Defining the direction of rotation

In order to ensure that the rotational direction of the spindle and C axis is correctly displayed on the ShopTurn user interface and when programming ShopTurn functions, 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:

<table>
<thead>
<tr>
<th>MD52207 $MCS_AXIS_USAGE_ATTRIB[0..19]</th>
<th>Attributes of the axes</th>
</tr>
</thead>
<tbody>
<tr>
<td>[0..19] spindle number</td>
<td></td>
</tr>
<tr>
<td>Bit 4</td>
<td>Displayed direction of rotation for M3 is counter-clockwise (for spindles)</td>
</tr>
<tr>
<td>Bit 5</td>
<td>Direction of rotation for M3 corresponds to minus rotary axis (for spindles) This bit must be set analog to PLC bit DBnn.DBX17.6!</td>
</tr>
</tbody>
</table>

The direction of spindle rotation (M3 / M4) is assigned to the positive rotational direction of the C axis via interface signal DB3n.DBX17.6 (where n = index of the relevant C axis).

Bit 4 defines whether M3 and C+ rotate in the same direction (=0) or in opposite directions (=1). Under all circumstances, ensure that bit 5 is identical to DB3n.DBX17.6!
As a result, the following setting options are obtained for the main spindle. However, the settings for the machine data depend on the direction from which the coordinate axis is viewed. The settings for the direction of rotation as well as the interface signal DB3n.DBX17.6 must be observed under all circumstances.

<table>
<thead>
<tr>
<th>Main spindle direction of rotation</th>
<th>52207[C-Ax] Bit 3 =</th>
<th>52207[Spnd] Bit 4 =</th>
<th>52207[Spnd] Bit 5 =</th>
<th>DB3n. DBX17.6</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="M3" /> 0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><img src="image2" alt="M4" /> 1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><img src="image3" alt="M3" /> 1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><img src="image4" alt="M4" /> 0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

The setting of MD52207 assumes that the viewing direction is towards the negative coordinate axis. If, on the other hand, you are looking towards the positive coordinate axis, you need to reverse the values, i.e. swap "0" and "1".

**Note**

The setting of MD52207[Spnd] is only relevant for the display in the ShopTurn user interface, not for correct machining on the machine.
Additional settings

**MD52210 $MCS_FUNCTION_MASK_DISP**
Function mask display

<table>
<thead>
<tr>
<th>Bit</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Face view when turning (default setting)</td>
</tr>
</tbody>
</table>

**MD52000 $MCS_DISP_COORDINATE_SYSTEM**
Position of the coordinate system

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Default setting</td>
</tr>
</tbody>
</table>

Examples:
- 0: Vertical lathe (carousel-type lathe)
- 19: Horizontal lathe, machining in front of the turning center
- 34: Horizontal lathe, machining in front of the turning center (inclined bed lathe)

A detailed description of MD52000 is provided in Chapter:

**MD52241 $MCS_SPINDLE_CHUCK_TYPES[ ]**
Spindle, jaw type

<table>
<thead>
<tr>
<th>Index</th>
<th>Type</th>
<th>Clamping</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Main spindle</td>
<td>Clamping, outer</td>
</tr>
<tr>
<td>1</td>
<td>Counterspindle</td>
<td>Clamping, inner</td>
</tr>
</tbody>
</table>

**MD52242 $MCS_MAIN_SPINDLE_PARAMETER[ ]**
Main spindle parameters

<table>
<thead>
<tr>
<th>Index</th>
<th>Parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Chuck dimensions</td>
</tr>
<tr>
<td>1</td>
<td>Stop dimensions</td>
</tr>
<tr>
<td>2</td>
<td>Jaw dimensions</td>
</tr>
</tbody>
</table>

**MD52246 $MCS_TAILSTOCK_DIAMETER**
Tailstock diameter

= 0

**MD52247 $MCS_TAILSTOCK_LEGTH**
Tailstock length

= 0

The M code, e.g. M34 or M1 = 34 for the spindle chuck is defined in the following machine data. The manufacturer cycle CUST_TECHCYC.SPF takes the M functions from the following machine data:
### 20.10 Turning with ShopTurn

#### MD52250 $MCS_M_CODE_CHUCK_OPEN[]

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[0] = 0</td>
<td>Main spindle</td>
</tr>
<tr>
<td>[1] = 0</td>
<td>Counterspindle</td>
</tr>
</tbody>
</table>

M code for open chuck with stationary spindle

#### MD52251 $MCS_M_CODE_CHUCK_CLOSE_OPEN_ROT[]

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[0] = 0</td>
<td>Main spindle</td>
</tr>
<tr>
<td>[1] = 0</td>
<td>Counterspindle</td>
</tr>
</tbody>
</table>

M code for open chuck with spindle rotating

#### MD52252 $MCS_M_CODE_CHUCK_CLOSE[]

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[0] = 0</td>
<td>Main spindle</td>
</tr>
<tr>
<td>[1] = 0</td>
<td>Counterspindle</td>
</tr>
</tbody>
</table>

M code for close chuck

#### MD52214 $MCS_FUNCTION_MASK_MILL

<table>
<thead>
<tr>
<th>Bit</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>&quot;Inner/rear&quot; machining is enabled in the ShopTurn screens which themselves define the machining plane.</td>
</tr>
<tr>
<td>1</td>
<td>Enable zoom under manual for tool measurement</td>
</tr>
<tr>
<td>2</td>
<td>Enable tailstock</td>
</tr>
</tbody>
</table>

#### MD52218 $MCS_FUNCTION_MASK_TURN

<table>
<thead>
<tr>
<th>Bit</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Enable zoom under manual for tool measurement</td>
</tr>
<tr>
<td>1</td>
<td>Enable receptacle for cut-off: NC responds to PLC via auxiliary function(s) by means of the CUST_TECHCYC.SPF and the markers _M100, _M101, _M102 (see above)</td>
</tr>
<tr>
<td>2</td>
<td>Enable tailstock</td>
</tr>
<tr>
<td>3</td>
<td>Reserved</td>
</tr>
<tr>
<td>4</td>
<td>Enable spindle control of main spindle via user interface</td>
</tr>
<tr>
<td>5</td>
<td>Enable spindle control of tool spindle via user interface</td>
</tr>
<tr>
<td>6</td>
<td>Enable taper angle mask</td>
</tr>
</tbody>
</table>

Enable various functions under the Turning function mask in the following channel-specific configuration machine data.
### Configuring cycles

#### 20.10 Turning with ShopTurn

<table>
<thead>
<tr>
<th>MD5229 $MCS_ENABLE_QUICK_M_CODES</th>
<th>Enable quick M commands</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 0</td>
<td></td>
</tr>
<tr>
<td>Bit 0 Coolant OFF</td>
<td></td>
</tr>
<tr>
<td>Bit 1 Coolant 1 ON</td>
<td></td>
</tr>
<tr>
<td>Bit 2 Coolant 2 ON</td>
<td></td>
</tr>
<tr>
<td>Bit 3 Coolants 1 and 2 ON</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD52230 $MCS_M_CODE_ALL_COOLANTS_OFF</th>
<th>M code for all coolants off</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 9</td>
<td>This machine data is used to define the M function for switching off the coolant; which is output when the tool is changed.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD52231 $MCS_M_CODE_COOLANT_1.ON</th>
<th>M code for coolant 1 on</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 8</td>
<td>This machine data is used to define the M function for coolant 1, which is output when the tool is changed.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD52232 $MCS_M_CODE_COOLANT_2.ON</th>
<th>M code for coolant 2 on</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 7</td>
<td>This machine data is used to define the M function for coolant 2, which is output when the tool is changed.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD52233 $MCS_M_CODE_COOLANT_1_AND_2.ON</th>
<th>M code for both coolants on</th>
</tr>
</thead>
<tbody>
<tr>
<td>= -1</td>
<td>This machine data is used to define the M function for coolant 1 and 2, which is output when the tool is changed.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD52281 $MCS_TOOL_MCODE_FUNC.ON[ ]</th>
<th>M code for tool-specific function ON</th>
</tr>
</thead>
<tbody>
<tr>
<td>[0] M code for tool-specific function 1 ON</td>
<td></td>
</tr>
<tr>
<td>[1] M code for tool-specific function 2 ON</td>
<td></td>
</tr>
<tr>
<td>= -1 M function is not output.</td>
<td></td>
</tr>
<tr>
<td>If both M commands of a function &quot;= -1&quot;, the corresponding field is not displayed on the interface.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD52282 $MCS_TOOL_MCODE_FUNC.OFF[ ]</th>
<th>M code for tool-specific function OFF</th>
</tr>
</thead>
<tbody>
<tr>
<td>[0] M code for tool-specific function 1 OFF</td>
<td></td>
</tr>
<tr>
<td>[1] M code for tool-specific function 2 OFF</td>
<td></td>
</tr>
</tbody>
</table>


\[= -1\] M function is output.
If both M commands of a function \("= -1\"\), the corresponding field is displayed on the interface.

### Rounding the contour

<table>
<thead>
<tr>
<th>SD55582 $SCS_TURN_CONT_TRACE_ANGLE</th>
<th>Contour turning: Minimum angle for rounding on the contour</th>
</tr>
</thead>
<tbody>
<tr>
<td>[= 5]</td>
<td>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).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SD55505 $SCS_TURN_ROUGH_O_RELEASE_DIST</th>
<th>Retraction distance for stock removal during external machining</th>
</tr>
</thead>
<tbody>
<tr>
<td>[= 1]</td>
<td>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).</td>
</tr>
<tr>
<td>[= -1]</td>
<td>The distance is internally defined.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SD55506 $SCS_TURN_ROUGH_I_RELEASE_DIST</th>
<th>Retraction distance for stock removal during internal machining</th>
</tr>
</thead>
<tbody>
<tr>
<td>[= 0.5]</td>
<td>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).</td>
</tr>
<tr>
<td>[= -1]</td>
<td>The distance is internally defined.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SD55515 $SCS_TURN_THREAD_RELEASE_DIST</th>
<th>Return distance during thread cutting</th>
</tr>
</thead>
<tbody>
<tr>
<td>[= 2]</td>
<td>Specifies the distance to the workpiece that is retracted between the infeeds when cutting threads (default value).</td>
</tr>
</tbody>
</table>

### See also

Activating turning/milling/drilling technologies (Page 373)
20.10.2 Counterspindle under ShopTurn

Software option

You require the following software options in order to use the counterspindle on your machine:
- "Travel to fixed stop with Force Control"
- "Synchronous spindle/multi-edge turning"

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

<table>
<thead>
<tr>
<th>MD52206 $MCS_AXIS_USAGE[0..19]</th>
<th>Meaning of the axes in the channel.</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Counterspindle (turning).</td>
</tr>
<tr>
<td>6</td>
<td>C axis of the counterspindle (turning).</td>
</tr>
<tr>
<td>7</td>
<td>Linear axis of the counterspindle (turning).</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>MD32100 $MA_AX_MOTION_DIR</th>
<th>Traversing direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1</td>
<td>Direction reversal</td>
</tr>
<tr>
<td>0, 1</td>
<td>No direction reversal</td>
</tr>
</tbody>
</table>

Defining the direction of rotation

You set the directions of rotation for the user interface in the following machine data:

<table>
<thead>
<tr>
<th>MD52207 $MCS_AXIS_USAGE_ATTRIB[0..19]</th>
<th>Attributes of the axes in the channel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit 3</td>
<td>Direction of rotation is counter-clockwise (for rotary axes)</td>
</tr>
<tr>
<td>Bit 4</td>
<td>Displayed direction of rotation for M3 is counter-clockwise (for spindles)</td>
</tr>
<tr>
<td>Bit 5</td>
<td>Direction of rotation M3 corresponds to rotary axis minus (for spindles)</td>
</tr>
<tr>
<td></td>
<td>This bit must be set analog to PLC bit DBnn.DBX17.6!</td>
</tr>
</tbody>
</table>
As a result, the following setting options are obtained for the counterspindle. However, the settings for the machine data depend on the direction from which the coordinate axis is viewed. The settings for the direction of rotation as well as the interface signal DB3n.DBX17.6 must be observed under all circumstances.

<table>
<thead>
<tr>
<th>Counter-spindle direction of rotation</th>
<th>52207[C-Ax]</th>
<th>52207[Spnd]</th>
<th>52207[Spnd]</th>
<th>DB3n. DBX17.6</th>
</tr>
</thead>
<tbody>
<tr>
<td>M3</td>
<td>Bit 3 = 1</td>
<td>Bit 4 = 0</td>
<td>Bit 5 = 0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>M4</td>
<td>Bit 3 = 0</td>
<td>Bit 4 = 0</td>
<td>Bit 5 = 1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

The setting of MD52207 assumes that the viewing direction is towards the negative coordinate axis. If, on the other hand, you are looking towards the positive coordinate axis, you need to reverse the values, i.e. swap "0" and "1".

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. |

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The following channel-specific setting data become effective when traveling to the fixed stop:

<table>
<thead>
<tr>
<th>Setting Code</th>
<th>Setting Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD55550 $SCS_TURN_FIXED_STOP_DIST</td>
<td>Distance for travel to fixed stop.</td>
</tr>
<tr>
<td>SD55551 $SCS_TURN_FIXED_STOP_FEED</td>
<td>Feedrate for travel to fixed stop.</td>
</tr>
<tr>
<td>SD55552 $SCS_TURN_FIXED_STOP_FORCE</td>
<td>Force for travel to fixed stop in %.</td>
</tr>
</tbody>
</table>

Between traveling to the fixed stop and gripping, the counterspindle can retract a short distance to counteract compressive stress in the workpiece.

<table>
<thead>
<tr>
<th>Setting Code</th>
<th>Setting Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD55553 $SCS_TURN_FIXED_STOP_RETRACTION</td>
<td>Retraction distance before clamping after fixed stop.</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Setting Code</th>
<th>Setting Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD55543 $SCS_TURN_PART_OFF_RETRACTION</td>
<td>Retraction distance before parting.</td>
</tr>
</tbody>
</table>

After the part, you can carry out a cutting-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:

<table>
<thead>
<tr>
<th>Setting Code</th>
<th>Setting Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD55540 $SCS_TURN_PART_OFF_CTRL_DIST</td>
<td>Distance for cut-off check.</td>
</tr>
<tr>
<td>SD55541 $SCS_TURN_PART_OFF_CTRL_FEED</td>
<td>Feedrate for cut-off check.</td>
</tr>
<tr>
<td>SD55542 $SCS_TURN_PART_OFF_CTRL_FORCE</td>
<td>Force for cut-off check in %.</td>
</tr>
</tbody>
</table>

The cut-off is successful when travel to fixed stop fails. The following alarms are output:

<table>
<thead>
<tr>
<th>Alarm</th>
<th>Alarm Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>20091</td>
<td>Axis %1 has not reached the fixed stop.</td>
</tr>
<tr>
<td>20094</td>
<td>Axis %1 end stop has been aborted.</td>
</tr>
</tbody>
</table>

You can switch off the alarm display using the following machine data:

<table>
<thead>
<tr>
<th>Machine Data Code</th>
<th>Machine Data Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MD37050 $MA_FIXED_STOP_ALARM_MASK</td>
<td>Enabling the fixed stop alarms.</td>
</tr>
<tr>
<td>= 2</td>
<td>Suppressing alarms 20091 and 20094.</td>
</tr>
</tbody>
</table>
You can set this machine data axis-specifically in the "Machine Data" window in the "Tool zero" operating area.

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 also be issued. Instead of alarms 20091 and 20094, the alarm 61254 "Error during travel to fixed stop" will be issued.

**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 channel-specific cycle machine data or in the menu "Tools - zero offset" → "->" → "Spindles". Changes to the machine data are automatically accepted in the menu and vice versa.

<table>
<thead>
<tr>
<th>MD52241 $MCS_SPINDLE_CHUCK_TYPES[]</th>
<th>Spindle, jaw type.</th>
</tr>
</thead>
<tbody>
<tr>
<td>[0] Main spindle</td>
<td></td>
</tr>
<tr>
<td>[1] Counterspindle</td>
<td></td>
</tr>
<tr>
<td>= 0 Clamping, outer</td>
<td></td>
</tr>
<tr>
<td>= 1 Clamping, inner</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD52242 $MCS_MM_MAIN_SPINDLE_PARAMETER[]</th>
<th>Main spindle parameters.</th>
</tr>
</thead>
<tbody>
<tr>
<td>[0] Chuck dimensions</td>
<td></td>
</tr>
<tr>
<td>[1] Stop dimensions</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD52243 $MCS_MM_SUB_SPINDLE_PARAMETER[]</th>
<th>Main spindle parameters.</th>
</tr>
</thead>
<tbody>
<tr>
<td>[0] Chuck dimensions</td>
<td></td>
</tr>
<tr>
<td>[1] Stop dimensions</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MD52244 $MCS_SUB_SPINDLE_PARK_POS_Y</th>
<th>Parking position of Y axis for counterspindle.</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 0</td>
<td></td>
</tr>
</tbody>
</table>
20.10 Turning with ShopTurn

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 chapter for the procedure:

Setting-up ShopTurn cycles for turning (Page 481)

See also

Activating turning/milling/drilling technologies (Page 373)

20.10.3 Drilling centered under ShopTurn

Precondition

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.

Tapping centered (CYCLE84)

<table>
<thead>
<tr>
<th>SD55481 $SCS_DRILL_TAPPING_SET_GG12[1]</th>
<th>Exact stop response</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 0</td>
<td>Exact stop response as before the cycle call (default value).</td>
</tr>
<tr>
<td>= 1</td>
<td>G601</td>
</tr>
<tr>
<td>= 2</td>
<td>G602</td>
</tr>
<tr>
<td>= 3</td>
<td>G603</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SD55482 $SCS_DRILL_TAPPING_SET_GG21[1]</th>
<th>Acceleration behavior</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 0</td>
<td>Acceleration behavior as before the cycle call (default value).</td>
</tr>
<tr>
<td>= 1</td>
<td>SOFT</td>
</tr>
<tr>
<td>= 2</td>
<td>BRISK</td>
</tr>
<tr>
<td>= 3</td>
<td>DRIVE</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SD55483 $SCS_DRILL_TAPPING_SET_GG24[1]</th>
<th>Feedforward control</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 0</td>
<td>Precontrol, the same as before the cycle call (default value).</td>
</tr>
<tr>
<td>= 1</td>
<td>FFWON</td>
</tr>
<tr>
<td>= 2</td>
<td>FFWOF</td>
</tr>
</tbody>
</table>
20.10 Turning with ShopTurn

20.10.4 Cylinder surface transformation (TRACYL) under ShopTurn

**Software option**

You require the following software option in order to use this function:

"Transmit and peripheral surface transformation"

**Function**

If you wish to use the function cylinder surface transformation (TRACYL) under ShopTurn, please take the settings from Chapter:

Cylinder surface transformation (TRACYL) (Page 384)

**Setting up**

In addition, set the following channel-specific configuration machine data:

<table>
<thead>
<tr>
<th>MD52214 $MCS_FUNCTION_MASK_MILL</th>
<th>Milling function masks (screens).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit 3</td>
<td>Enable &quot;internal / rear&quot; machining in ShopTurn masks (screens) that define the machining plane themselves.</td>
</tr>
<tr>
<td>Bit 4</td>
<td>If you have implemented the &quot;Clamp/release spindle&quot; function using the machine manufacturer cycle CUST_TECHCYC.SPF, then using this machine data, you can activate the &quot;Clamp/release spindle&quot; parameter in the drilling and milling screens.</td>
</tr>
<tr>
<td></td>
<td>= 0 The &quot;Clamp/release spindle&quot; parameter is not displayed in the drilling and milling screens. ShopTurn automatically clamps the spindle if it makes sense for the particular machining operation.</td>
</tr>
<tr>
<td></td>
<td>= 1 The &quot;Clamp/release spindle&quot; parameter is displayed in the drilling and milling screens. The operator decides for which machining operation the spindle should be clamped.</td>
</tr>
</tbody>
</table>

**References**

Additional information on cylinder surface transformation is provided in:

840D sl Programming Manual Job Planning: Cylinder surface transformation
20.10.5 Face end machining (TRANSMIT) under ShopTurn

Software option

You require the following software option in order to use this function:
"Transmit and peripheral surface transformation"

Function

If you wish to use the end face machining function under ShopTurn, please proceed as described in Chapter End face machining (TRANSMIT) (Page 398).

Setting up

In addition, set the following channel-specific configuration machine data:

<table>
<thead>
<tr>
<th>MD52214 $MCS_FUNCTION_MASK_MILL</th>
<th>Function screens, ShopTurn.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit 3</td>
<td>Enable &quot;internal / rear&quot; machining in ShopTurn masks (screens) that define the machining plane themselves.</td>
</tr>
<tr>
<td>Bit 4</td>
<td>If you have implemented the &quot;Clamp/release spindle&quot; function using the machine manufacturer cycle CUST_TECHCYC.SPF, then using this machine data, you can activate the &quot;Clamp/release spindle&quot; parameter in the drilling and milling screens.</td>
</tr>
</tbody>
</table>

- **Bit 3**
  - **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 screens. 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".

References

Additional information on face end machining is provided in:

Function Manual, Extended Functions; Kinematic Transformation (M1): TRANSMIT
20.10.6 Inclined Y axis (TRAANG) under ShopTurn

**Software option**

You require the following software option in order to use the inclined Y axis function on your machine:
"Inclined axis"

**Function**

If you wish to use the inclined Y axis function under ShopTurn, please first make the settings from Chapter Inclined Y axis (TRAANG) (Page 401).

**Note**

Once the inclined axis function has been set up in the user interface, it is automatically integrated in the cycles. This means that for machining with inclined axis, you can select "Face Y" or "Surface Y" in the machining plane screens and enter Cartesian coordinates.

**References**

You will find additional information on the inclined Y axis function in:
840D sl Programming Manual Job Planning: Inclined axis (TRAANG)
20.11 Spindle control

For a detailed description to configure the spindle, see References.

References

Function Manual Basic Machine: Spindles (S1)

End of program

The following M functions are used for the end of program:

<table>
<thead>
<tr>
<th>M function from MD10714 $MN_M_NO_FCT_EOP</th>
<th>Main program end</th>
<th>Spindle continues to run</th>
</tr>
</thead>
<tbody>
<tr>
<td>M2, M30</td>
<td>End of main program and return jump to beginning of program</td>
<td>Spindle stops</td>
</tr>
<tr>
<td>M17</td>
<td>End of subprogram and return jump into the main program</td>
<td>Spindle continues to run</td>
</tr>
</tbody>
</table>

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 "MDA" 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:

<table>
<thead>
<tr>
<th>Signal</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DB3x.DBX30.0</td>
<td>Spindle stop</td>
</tr>
<tr>
<td>DB3x.DBX30.1</td>
<td>Spindle start clockwise rotation</td>
</tr>
<tr>
<td>DB3x.DBX30.2</td>
<td>Spindle start, counter-clockwise rotation</td>
</tr>
</tbody>
</table>

The spindle can be started and stopped in the following state:

<table>
<thead>
<tr>
<th>Signal</th>
<th>State</th>
</tr>
</thead>
<tbody>
<tr>
<td>DB21.DBX35.7 = 1</td>
<td>Channel in reset state</td>
</tr>
<tr>
<td>DB21.DBX35.6 = 1</td>
<td>Channel state interrupted</td>
</tr>
<tr>
<td>DB21.DBX35.3 = 1</td>
<td>Program state interrupted</td>
</tr>
</tbody>
</table>
Note
If the spindle must be stopped when the program is running, then set the interface signal DB3x.DBX4.3, "Feed stop/spindle stop" in the user PLC.

Additional settings:

<table>
<thead>
<tr>
<th>MD11450 $MN_SEARCH_RUN_MODE</th>
<th>Search run parameterization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit 1 = 1</td>
<td>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.</td>
</tr>
</tbody>
</table>

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) under ShopTurn (Page 493)
- 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 Chapter: Setting-up ShopTurn cycles for turning (Page 481)
- The spindle direction of rotation (M3/ M4) is assigned to the positive direction of rotation of the C axis via the interface signal DB3n.DBX17.6. The bit defines whether M3 and C+ rotate in the same direction (= 0) or in opposite directions (= 1). Refer to the following chapters for the corresponding setting options: See direction of rotation of the counterspindle Counterspindle under ShopTurn (Page 488) See direction of rotation of the main spindle Setting-up ShopTurn cycles for turning (Page 481)
### 20.12 Analog spindle

For a spindle, which is not assigned to any drive (FD, MSD, SLM), the power display can be controlled via 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).
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 the following chapter for the languages that are available for the user interface: Supported languages (Page 502)

Precondition
- After the installation, approx. 256 MB memory must be available on the CompactFlash Card.
- Language extension software "hmi_sl_language_xxx_02.06.00.00.00y.tgz".
  xxx = language code, y = internal version ID
  Is supplied on the language extension DVD.

Installing a language
Two options of how you can install a language are subsequently described:
1. Via USB FlashDrive
2. Via PC with WinSCP

Installing a language via USB FlashDrive
1. Copy the language extension software "hmi_sl_language_xxx_02.06.00.00.00y.tgz" from the DVD under Windows to the main directory (root) of a USB FlashDrive.
2. Insert the USB FlashDrive (with installed NC service system) into the NCU that is switched-off.
3. Switch-on the NCU.
   The service menu is displayed.

4. Select "5/F5: Update NCU Software and Data".
   – Select "1/F1: Update System Software from USB memory stick".
     The data are displayed on the USB FlashDrive.
   – Select "1/F1: Update System software by selected file" and select the required
     language extension software "hmi_sl_language_xxx_02.06.00.00.00y.tgz".
   – Select "8/F8: ok, continue".
     The data are unzipped and loaded.

- OR -

1. Select "8/F8: Service Shell".
   – Log on as user "manufact". Ensure that the user name and the login are written in
     lower-case letters and, if required, use an external keyboard.
   – After the prompt "$" enter the command "cd /data" and press the return key.
   – Enter "ls".
     The files are displayed.
   – Now enter the following:
     "sc restore -update /hmi_sl_language_xxx_02.06.00.00.00y.tgz"
     Press the Return key.
     The language extension data are unzipped and when successfully completed, you
     obtain a message.

2. Switch-off the NCU off.

3. Withdraw the USB FlashDrive.

4. Restart the NCU.

Installing a language via PC with WinSCP

1. Insert the language extension DVD in the PC.
   If there is no connection to the DVD drive from the "WinSCP" program, copy the required
   data ".tgz" into a temporary directory of the PC.

2. Open the "WinSCP" program. Select the PC directory and on the CompactFlash Card,
   the directory /card/user/system/home/manufact.

3. Drag the language extension software "hmi_sl_language_xxx_02.06.00.00.00y.tgz" from
   the DVD or from the temporary directory and drop in the directory of the CompactFlash
   Card.

4. Open the "Input prompts" window via the tab "Commands", "Open terminal".

5. Enter the following command: "sc restore -update -force"

6. Press the "Execute" button. The language extension is installed.
7. Press the "Close" button after you have obtained the message that the operation was successfully completed.

8. Delete the language extension software "hmi_sl_language_xxx_02.06.00.00.00y.tgz" from the directory of the CompactFlash Card in order to save memory space.

9. Exit the "WinSCP" program.

10. Switch-off the NCU off.

11. Restart the NCU.

---

**Note**

If the installed language is not visible after switching-off and switching-on the first time, completely switch-off the NCU again and switch-on again.
### 21.2 Supported languages

Table 21- 1 Supported languages

<table>
<thead>
<tr>
<th>Language</th>
<th>Language code</th>
<th>Standard languages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chinese (simplified)</td>
<td>chs</td>
<td>X</td>
</tr>
<tr>
<td>Chinese (traditional)</td>
<td>cht</td>
<td></td>
</tr>
<tr>
<td>Danish</td>
<td>dan</td>
<td></td>
</tr>
<tr>
<td>German</td>
<td>deu</td>
<td>X</td>
</tr>
<tr>
<td>English</td>
<td>eng</td>
<td>X</td>
</tr>
<tr>
<td>Finnish</td>
<td>fin</td>
<td></td>
</tr>
<tr>
<td>French</td>
<td>fra</td>
<td>X</td>
</tr>
<tr>
<td>Italian</td>
<td>ita</td>
<td>X</td>
</tr>
<tr>
<td>Japanese</td>
<td>jpn</td>
<td></td>
</tr>
<tr>
<td>Korean</td>
<td>kor</td>
<td></td>
</tr>
<tr>
<td>Dutch</td>
<td>ndl</td>
<td></td>
</tr>
<tr>
<td>Polish</td>
<td>plk</td>
<td></td>
</tr>
<tr>
<td>Portuguese</td>
<td>ptb</td>
<td></td>
</tr>
<tr>
<td>Romanian</td>
<td>rom</td>
<td></td>
</tr>
<tr>
<td>Russian</td>
<td>rus</td>
<td></td>
</tr>
<tr>
<td>Swedish</td>
<td>sve</td>
<td></td>
</tr>
<tr>
<td>Slovakian</td>
<td>sky</td>
<td></td>
</tr>
<tr>
<td>Spanish</td>
<td>esp</td>
<td>X</td>
</tr>
<tr>
<td>Czech</td>
<td>csy</td>
<td></td>
</tr>
<tr>
<td>Turkish</td>
<td>trk</td>
<td></td>
</tr>
<tr>
<td>Hungarian</td>
<td>hun</td>
<td></td>
</tr>
</tbody>
</table>
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.

<table>
<thead>
<tr>
<th>Value</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>process</td>
<td>Symbolic name of the OEMFrame application. This is required to configure the operating areas.</td>
</tr>
<tr>
<td>cmdline</td>
<td>Command line which is transferred to the &quot;oemframe.exe&quot; process when starting.</td>
</tr>
<tr>
<td>oemframe</td>
<td>For OEMFrame applications, always set to &quot;true&quot;.</td>
</tr>
<tr>
<td>windowname</td>
<td>Window name of the OEMFrame application - should be determined with &quot;findwindow.exe&quot; or &quot;spy++.exe&quot;.</td>
</tr>
</tbody>
</table>
## Link OEMFrame application

### Value | Meaning
---|---
classname | Class name of the OEMFrame application - should be determined with "findwindow.exe" or "spy++.exe".
deferred | true: OEMFrame application is not started when SINUMERIK Operate powers up, but only when selected for the first time.

### Example

In the following example, the two Windows applications "notepad.exe" and "calc.exe" are configured as OEMFrame applications.

```
[processes]
PROC601= process:=calcOEM, cmdline:="calc.exe" oemframe:=true, windowname:="calculator"
```

### Section [areas]

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].

### Note

**Permissible number range**

In the "processes" and "areas" sections, the number range 500-999 is reserved for OEM customers. If you use numbers less than 500, then it is possible that Siemens basis components will be overwritten!

### Example

```
[areas]
AREA600= name:=AreaOEM, process:=notepadOEM
AREA601= name:=AreaCalc, process:=calcOEM
```

### Note

Only OEMFrame applications are supported that do not use any of the programming interfaces of SINUMERIK Operate.
Section [miscellaneous]

You can make various settings in this section. Generally, only the start operating area is changed.

<table>
<thead>
<tr>
<th>Key</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>startuparea</td>
<td>Name of the start operating area</td>
</tr>
</tbody>
</table>

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.
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" symbol is displayed on the softkey.
- The softkey is located at position 7 in the operating area menu.
- The softkey is visible with access authorization: Protection level 5 (key switch, position 2).

```
[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,
; 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 customers.
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:

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>context</td>
<td>Context within the text file. Each file must have at least one context.</td>
</tr>
<tr>
<td>name</td>
<td>Name of the context.</td>
</tr>
<tr>
<td>message</td>
<td>Text translation. There must be at least one message per context.</td>
</tr>
<tr>
<td>source</td>
<td>Text identifier.</td>
</tr>
<tr>
<td>translation</td>
<td>Translated text.</td>
</tr>
<tr>
<td>remark</td>
<td>Text comment (optional).</td>
</tr>
<tr>
<td>chars</td>
<td>Maximum possible length of the text in characters. If nothing is specified, the text can have any length (optional).</td>
</tr>
<tr>
<td>lines</td>
<td>Maximum number of lines available for display. If nothing is specified, the number of lines is unlimited (optional).</td>
</tr>
</tbody>
</table>

Structure of the language-dependent ts file that contains the labeling text for the softkey:

```
<?xml version="1.0" encoding="utf-8" standalone="yes"?>
<!DOCTYPE TS>
<TS>
  <context>
    <name>mycontext</name>
    <message>
      <source>MY_AREA</source>
      <translation>Text, which is displayed on the softkey</translation>
      <remark>Remark (optional)</remark>
      <chars>20</chars>
      <lines>2</lines>
    </message>
  </context>
</TS>
```

<lng> stands for the language code.
22.2 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 is opened.
   Enter the IP address of the NCU into the input field.

3. Press the "OK" softkey to confirm the data.
22.3 Exit HMI sl

Procedure:

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

2. Press the menu forward key.

3. Press the "EXIT" softkey.

SINUMERIK Operate and PCU 50.3 are exited on the PCU 50.3.
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.
22.3 Exit HMI sl
23.1 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.
23.2 Configuring the 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:

<table>
<thead>
<tr>
<th>File</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;sljkconfig.ini&quot; configuration file</td>
<td>File in which the traversing keys are configured.</td>
</tr>
<tr>
<td>Text file &quot;oem_sljk_xxx.ts&quot;</td>
<td>File for labeling traversing keys in a foreign language, xxx = language code</td>
</tr>
</tbody>
</table>

"sljkconfig.ini" configuration file

<table>
<thead>
<tr>
<th>Entries</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>[State_1]</td>
<td>Labeling type - changed via the PLC.</td>
</tr>
<tr>
<td>ParamText_x_y</td>
<td>Text of the traversing key that is made up of parameters. Two-line labeling is possible, whereby max. five characters is possible per line. x: Specifies the position of the key within the row (2 to 7). y: Specifies the key row (1 or 2).</td>
</tr>
<tr>
<td>%m1</td>
<td>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.</td>
</tr>
<tr>
<td>%n</td>
<td>Defines the position in the text for the line break.</td>
</tr>
<tr>
<td>%a1</td>
<td>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 &quot;oem_sljk_eng.ts&quot; text file is determined via this index.</td>
</tr>
</tbody>
</table>
23.2 Configuring the traversing keys

<table>
<thead>
<tr>
<th>Entries</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>TextId_x_y</td>
<td>Text of the traversing key that is read from the text file (target language text).</td>
</tr>
</tbody>
</table>
| 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 of the 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+
```
23.2 Configuring the traversing keys

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

<table>
<thead>
<tr>
<th>Entries</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>name</td>
<td>Freely selectable name of the text context. In the text file template, the name of the text context is &quot;SIJKLabels&quot; and stands for the traversing key labeling (solution line jog key labels). This identifier is already stored in the configuration file.</td>
</tr>
<tr>
<td>source</td>
<td>Traversing key identifier of the respective axis. This text ID is referenced in the &quot;sljkconfig.ini&quot; configuration file with the &quot;TextId_2_1&quot;. The text IDs for the alias names (JK_AXISNAME_2 to JK_AXISNAME_7) may not be changed.</td>
</tr>
<tr>
<td>translation</td>
<td>Input of the foreign language text for the axis specified in &lt;source&gt;.</td>
</tr>
</tbody>
</table>

Language code in file names "xxx"

<table>
<thead>
<tr>
<th>Language</th>
<th>Language code</th>
</tr>
</thead>
<tbody>
<tr>
<td>German</td>
<td>deu</td>
</tr>
<tr>
<td>English</td>
<td>eng</td>
</tr>
<tr>
<td>French</td>
<td>fra</td>
</tr>
<tr>
<td>Spanish</td>
<td>esp</td>
</tr>
<tr>
<td>Italian</td>
<td>ita</td>
</tr>
<tr>
<td>Chinese</td>
<td>chs</td>
</tr>
</tbody>
</table>

Procedure

1. You can copy the sample file "oem_sljk_deu.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.
3. Give 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
<?xml version="1.0" encoding="utf-8"?>
<![DOCTYPE TS]>
<context>
  <name>SlJkLabels</name>
  <!-- Alias names for machine axis (%a1, %a2, etc.) -->
  <!-- Don't 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>
</context>
```
23.2 Configuring the traversing keys

见参阅

Supported languages (Page 502)
23.3 Configuring user-specific key labeling

Labeling the keys for the HT 8

The texts of the CPF menu (CPF: Control Panel Function) for the HT 8 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 the HMI 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"

<table>
<thead>
<tr>
<th>Language</th>
<th>Language code</th>
</tr>
</thead>
<tbody>
<tr>
<td>German</td>
<td>deu</td>
</tr>
<tr>
<td>English</td>
<td>eng</td>
</tr>
<tr>
<td>French</td>
<td>fra</td>
</tr>
<tr>
<td>Spanish</td>
<td>esp</td>
</tr>
<tr>
<td>Italian</td>
<td>ita</td>
</tr>
<tr>
<td>Chinese</td>
<td>chs</td>
</tr>
</tbody>
</table>

Creating key labeling

<table>
<thead>
<tr>
<th>Tag</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>source</td>
<td>Designation for the user softkey. &quot;SK_USERKEY1&quot; to &quot;SK_USERKEY16&quot; are possible, whereby the names may not be changed.</td>
</tr>
<tr>
<td>comment</td>
<td>User-specific description of the key assignment.</td>
</tr>
<tr>
<td>translation</td>
<td>Text that should be shown on the key.</td>
</tr>
<tr>
<td></td>
<td>• A maximum of 10 characters are possible per line.</td>
</tr>
<tr>
<td></td>
<td>• 2-line labeling is possible, whereby the line break is set using &quot;%n&quot;.</td>
</tr>
<tr>
<td>remark</td>
<td>Remark for key assignment.</td>
</tr>
<tr>
<td>chars</td>
<td>Number of characters. A maximum of 10 characters per line are possible.</td>
</tr>
<tr>
<td>lines</td>
<td>Number of lines. 2 lines are possible.</td>
</tr>
</tbody>
</table>
23.3 Configuring user-specific key labeling

Procedure

1. You can copy the sample file "oem_slck_deu.ts" from the following directory: 
   /siemens/sinumerik/hmi/template/Ing.
2. Store or create the file in the /oem/sinumerik/hmi/Ing or 
   /user/sinumerik/hmi/Ing directory.
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 HMI.
   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 executed when the HMI powers 
   up.
Example of a key label

```xml
<!DOCTYPE TS><TS>
<context>
  <name>SlcKDialog</name>
  <message>
    <source>SK_USERKEY1</source>
    <translation>U1</translation>
    <remark>User key 1</remark>
    <languageIndependent>true</languageIndependent>
  </message>
  <message>
    <source>SK_USERKEY2</source>
    <translation>U2</translation>
    <remark>User key 2</remark>
    <languageIndependent>true</languageIndependent>
  </message>
  ...... 
</context>
</TS>
```

See also

Range of alarms (Page 194)
23.4 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 interface and are analog to those in the input image.

<table>
<thead>
<tr>
<th>Signals to the MCP1 (or MCP2)</th>
<th>Interface PLC → HT 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Byte</td>
<td>Bit 7</td>
</tr>
<tr>
<td>AB n + 1</td>
<td>U4</td>
</tr>
<tr>
<td>AB n + 4</td>
<td>U9</td>
</tr>
<tr>
<td>AB n + 5</td>
<td>U8</td>
</tr>
</tbody>
</table>

Adapt the display in the "slckcpf.ini" file

<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>UserKeyLEDIcon</td>
<td>Name of the icon file. Standard entry: led_green.png</td>
</tr>
<tr>
<td>OFF</td>
<td>Deactivates the icon display.</td>
</tr>
<tr>
<td>PRESSED</td>
<td>Displays the active functions by pressing down the softkey.</td>
</tr>
<tr>
<td>UserKeyLEDIconAlignment</td>
<td>Specifies the position of the icon. Standard position: AlignLeft</td>
</tr>
<tr>
<td>Horizontal and vertical alignments can be combined. The two names are separated by the &quot;</td>
<td>&quot; character. The following alignments are possible:</td>
</tr>
<tr>
<td>AlignLeft</td>
<td>Left</td>
</tr>
<tr>
<td>AlignRight</td>
<td>Right</td>
</tr>
<tr>
<td>AlignHCenter</td>
<td>Horizontal, center</td>
</tr>
<tr>
<td>AlignTop</td>
<td>Top</td>
</tr>
<tr>
<td>AlignBottom</td>
<td>Bottom</td>
</tr>
<tr>
<td>AlignVCenter</td>
<td>Vertical, center</td>
</tr>
</tbody>
</table>
### Section Description

**UserKeyLEDMap**

Specifies the start address of the output image. Entries can be made in the following form: "DBx.DBY", "Abx", "MbY".

Default setting: The start address is determined using DB7 MCP1Out (or MCP2Out).

**U1LED ... U16LED**

The status bit address can be defined - different from the output image - using these entries.

**VarIncLED**

Note: The offsets from the HT 8 output image, for one or several softkeys, are not taken into consideration.

**SBLLED**

**WCSLED**

**showVarIncLED**

<table>
<thead>
<tr>
<th>true</th>
<th>When the increment mode is active, the icon is also displayed on the &quot;[VAR]&quot; softkey.</th>
</tr>
</thead>
<tbody>
<tr>
<td>false</td>
<td>The icon is not displayed.</td>
</tr>
</tbody>
</table>

**showSBLLED**

<table>
<thead>
<tr>
<th>true</th>
<th>When the SingleBlock mode is active, then the icon is also displayed on the &quot;Single Block&quot; softkey.</th>
</tr>
</thead>
<tbody>
<tr>
<td>false</td>
<td>The icon is not displayed.</td>
</tr>
</tbody>
</table>

**showWCSLED**

<table>
<thead>
<tr>
<th>true</th>
<th>When the SingleBlock mode is active, then the icon is also displayed on the &quot;Single Block&quot; softkey.</th>
</tr>
</thead>
<tbody>
<tr>
<td>false</td>
<td>The icon is not displayed.</td>
</tr>
</tbody>
</table>

1. You can copy the sample file "slickcpf.ini" from the following directory:
   /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 directory: /oem/sinumerik/hmi/ico/ico640 or /user/sinumerik/hmi/ico/ico640.
4. Open the file and make the appropriate settings.

### Sample file "slickcpf.ini"

```
; Template for the configuration of the HT8 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
```
23.4 Configuring the function display at user-specific keys (U keys)

; Use following led map start address instead of calculating DB7.MCP1Out
;UserKeyLEDMap = AB0
; 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
List of abbreviations/acronyms

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASCII</td>
<td>American Standard Code for Information Interchange</td>
</tr>
<tr>
<td>BAG</td>
<td>Mode group</td>
</tr>
<tr>
<td>CEC</td>
<td>Cross Error Compensation: Sag compensation</td>
</tr>
<tr>
<td>CNC</td>
<td>Computerized Numerical Control</td>
</tr>
<tr>
<td>DIN</td>
<td>Deutsche Industrie Norm (German Industry Standard)</td>
</tr>
<tr>
<td>DIR</td>
<td>Directory</td>
</tr>
<tr>
<td>DRAM</td>
<td>Dynamic Random Access Memory</td>
</tr>
<tr>
<td>ESR</td>
<td>Extended Stop and Retract</td>
</tr>
<tr>
<td>FD</td>
<td>Feed Drive</td>
</tr>
<tr>
<td>FIFO</td>
<td>First In - First Out: Method of storing/retrieving data in/from a memory.</td>
</tr>
<tr>
<td>FRAME</td>
<td>Data block (FRAME)</td>
</tr>
<tr>
<td>GUD</td>
<td>Global User Data</td>
</tr>
<tr>
<td>HSC</td>
<td>High Speed Cutting: High-speed machining</td>
</tr>
<tr>
<td>INC</td>
<td>Increment: Incremental dimension</td>
</tr>
<tr>
<td>INI</td>
<td>Initializing Data</td>
</tr>
<tr>
<td>IPO</td>
<td>Interpolator</td>
</tr>
<tr>
<td>ISO</td>
<td>International Standard Organization</td>
</tr>
<tr>
<td>JOG</td>
<td>Jogging: Setup mode</td>
</tr>
<tr>
<td>LED</td>
<td>Light Emitting Diode</td>
</tr>
<tr>
<td>LUD</td>
<td>Local User Data</td>
</tr>
<tr>
<td>MB</td>
<td>Megabyte</td>
</tr>
<tr>
<td>MCP</td>
<td>Machine Control Panel</td>
</tr>
<tr>
<td>MCS</td>
<td>Machine coordinate system</td>
</tr>
<tr>
<td>MD</td>
<td>Machine data</td>
</tr>
<tr>
<td>MDA</td>
<td>Manual Data Automatic: Manual input</td>
</tr>
<tr>
<td>MLFB</td>
<td>Machine-readable product designation</td>
</tr>
<tr>
<td>MPF</td>
<td>Main Program File: NC part program (main program)</td>
</tr>
<tr>
<td>MPI</td>
<td>Multi Port Interface</td>
</tr>
<tr>
<td>MSD</td>
<td>Main Spindle Drive</td>
</tr>
<tr>
<td>NC</td>
<td>Numerical Control</td>
</tr>
<tr>
<td>NCK</td>
<td>Numerical Control Kernel: NC kernel with block preparation, traversing range, etc.</td>
</tr>
<tr>
<td>NCU</td>
<td>Numerical Control Unit: NCK hardware unit</td>
</tr>
<tr>
<td>OEM</td>
<td>Original Equipment Manufacturer</td>
</tr>
<tr>
<td>OP</td>
<td>Operator Panel</td>
</tr>
<tr>
<td>OPI</td>
<td>Operator Panel Interface</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Meaning</td>
</tr>
<tr>
<td>--------------</td>
<td>---------</td>
</tr>
<tr>
<td>PCU</td>
<td>Programmable Control Unit</td>
</tr>
<tr>
<td>PG</td>
<td>Programming device</td>
</tr>
<tr>
<td>PI service</td>
<td>Program Invocation Services</td>
</tr>
<tr>
<td>PLC</td>
<td>Programmable Logic Control</td>
</tr>
<tr>
<td>REF</td>
<td>REFerence point approach function</td>
</tr>
<tr>
<td>REPOS</td>
<td>REPOSiton function</td>
</tr>
<tr>
<td>ROV</td>
<td>Rapid Override: Input correction</td>
</tr>
<tr>
<td>RPA</td>
<td>R-Parameter Active: Memory area in NCK for R- NCK for R parameter numbers</td>
</tr>
<tr>
<td>SBL</td>
<td>Single Block</td>
</tr>
<tr>
<td>SD</td>
<td>Setting Data</td>
</tr>
<tr>
<td>SDB</td>
<td>System Data Block</td>
</tr>
<tr>
<td>SEA</td>
<td>Setting Data Active: Identifier (file type) for setting data</td>
</tr>
<tr>
<td>SK</td>
<td>Softkey</td>
</tr>
<tr>
<td>SPF</td>
<td>Sub Program File: Subroutines</td>
</tr>
<tr>
<td>SRAM</td>
<td>Static Random Access Memory: Static RAM (non-volatile)</td>
</tr>
<tr>
<td>SW</td>
<td>Software</td>
</tr>
<tr>
<td>SYF</td>
<td>System Files</td>
</tr>
<tr>
<td>TEA</td>
<td>Testing Data Active: Identifier for machine data</td>
</tr>
<tr>
<td>the TM</td>
<td>Tool management</td>
</tr>
<tr>
<td>TMA</td>
<td>Tool Magazine Active: Magazine data</td>
</tr>
<tr>
<td>TO</td>
<td>Tool Offset</td>
</tr>
<tr>
<td>TOA</td>
<td>Tool Offset Active: Identifier (file type) for tool offsets</td>
</tr>
<tr>
<td>UFR</td>
<td>User frame</td>
</tr>
<tr>
<td>WCS</td>
<td>Workpiece coordinate system</td>
</tr>
<tr>
<td>ZO</td>
<td>Zero point shift</td>
</tr>
</tbody>
</table>
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Legal information

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</tr>
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<td>Glossary</td>
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</tr>
<tr>
<td>Index</td>
<td>179</td>
<td></td>
</tr>
</tbody>
</table>
Introduction

1.1 "Easy Screen" range of functions

Overview

"Easy Screen" is implemented with an interpreter and configuration files containing descriptions of the user interfaces.

"Easy Screen" is configured using ASCII files: These configuration files contain the description of the user interface. The syntax that must be applied in creating these files is described in the following chapters.

The "Easy Screen" interpreter can be used to create user interfaces that display functional expansions designed by the machine manufacturer or user, or simply to implement your own layout on the HMI. Preconfigured user interfaces supplied by Siemens or the machine manufacturer can be modified or replaced.

Part programs, for example, can be edited on user interfaces created by users. Dialogs can be created directly on the control system.

Basic configuration

The "Easy Screen" function enables machine manufacturers to configure their own dialogs. Even with the basic configuration, it is possible to configure 5 screens in the operator menu tree or for customer-specific cycle dialogs.

Software option

To expand the number of dialogs, you require the following Software option:
"SINUMERIK Operate Runtime license OA Easy Screen"

Supplementary Conditions

The following conditions must be met:

- It is only possible to switch between dialogs within a single operating area.
- User, setting, and machine data are initialized on request.
- User variables may not have the same names as system or PLC variables.
- The dialogs activated by the PLC form a separate operating area (similar to measuring cycle screens).
- The cycle support (/C ...) is no longer supported by the software.
Introduction

1.1 "Easy Screen" range of functions

Tools

An additional graphics program is needed to produce graphics/display images.

Use

You can implement the following functions:

1. Display dialogs containing the following elements:
   - Softkeys
   - Variables
   - Texts and Help texts
   - Graphics and Help displays
2. Open dialogs by:
   - Pressing the (start) softkeys
   - Selection from the PLC
3. Restructure dialogs dynamically:
   - Edit and delete softkeys
   - Define and design variable fields
   - Insert, exchange and delete display texts (language-dependent or independent)
   - Insert, exchange and delete graphics
4. Initiate operations in response to the following actions:
   - Displaying dialogs
   - Input values (variables)
   - Select a softkey
   - Exiting dialogs
5. Data exchange between dialogs
6. Variables
   - Read (NC, PLC and user variables)
   - Write (NC, PLC and user variables)
   - Combine with mathematical, comparison or logic operators
7. Execute functions:
   - Subroutines
   - File functions
   - PI services
8. Apply protection levels according to user classes
1.2 Fundamentals of Configuration

Configuration files

The defining data for new user interfaces are stored in configuration files. These files are automatically interpreted and the result displayed on the screen. Configuration files are not stored in the software supplied and must be set up by the user.

---

**Note**

The description can also be explained using comments. A ";" is inserted as comment character before every explanation.

---

An ASCII editor (e.g. Notepad or the HMI editor) is used to create configuration files.

---

**Note**

If you create or edit the files, use an editor that supports UTF-8 coding.

---

Menu tree principle

Several interlinked dialogs create a menu tree. A link exists if you can switch from one dialog to another. You can use the newly defined horizontal/vertical softkeys in this dialog to call the preceding or any other dialog.

A menu tree can be created behind each start softkey:

![Menu tree diagram](image.png)

Figure 1-1 Menu tree
**1.2 Fundamentals of Configuration**

### Start softkeys

One or more softkeys (start softkeys), which are used to initiate your own operating sequences, are defined in one of the specified configuration files.

The loading of a dedicated dialog is associated with a softkey definition or another softkey menu. These are then used to perform the subsequent actions.

Pressing the start softkey loads the assigned dialog. This will also activate the softkeys associated with the dialog. Variables will be output to the standard positions unless specific positions have been configured.

### Reverting to the standard application

You can exit the newly created user interfaces and return to the standard application.

You can use the `<RECALL>` key to close new user interfaces if you have not configured this key for any other task.

---

**Note**

**Calling dialogs in the PLC user program**

Dialogs can be selected from the PLC as well as via softkeys: An interface signal is available in DB19.DBB10 for signal exchange between the PLC → HMI.

---

### Creating a configuration file as ASCII file

Dialogs can contain, for example, the following elements:

- Input/output fields (variables) with
  - Short text
  - Graphic text
  - Text for units
- Screens
- Softkey menus
- Tables
1.3 Structure of configuration file

Overview

Each HMI application has permanent start softkeys, which can be used to access newly generated dialogs.

Other files:

In the event of "Load a screen form" (LM) or a "Load softkey menu" (LS) call in a configuration file, a new file name containing the object called can be specified. This makes it possible to structure the configuration, e.g., all functions in one operating level in a separate configuration file.

Converting texts from other HMI applications

Procedure to convert a text file with code page coding to text-coding UTF-8:

1. Open the text file on a PG/PC in a text editor.

2. When saving, set the UTF-8 coding (see above "Formatting text files"

The read-in mechanism via code page code is still supported. In order to activate this mechanism in the easyscreen.ini file, the following entry is required:

[Compatibility]
UseTextCodecs = true

---

Note

Constraint

In the supplied version of easyscreen.ini, this entry is not available, therefore, text files with UTF-8 coding are expected.

If the entry is supplemented, the old mechanism becomes effective again with the following restriction: It does not function correctly for Asian languages.

---

Storage location for configuration files

The configuration files are located on the CF card in the /user/sinumerik/hmi/proj directory and in the add_on and oem directories accordingly.
Structure of the configuration file

A configuration file consists of the following elements:

1. Description of the start softkeys
2. Definition of dialogs
3. Definition of variables
4. Description of the blocks
5. Definition of a softkey menu

Note

Sequence

The specified sequence in the configuration file must be maintained.

Example:

```plaintext
//S (START) ; Definition of the start softkey (optional)
....
//END
//M (.....) ; Definition of the dialog
DEF ..... ; Definition of variables
LOAD ; Description of the blocks
...
END_LOAD
UNLOAD
...
END_UNLOAD
...
//END
//S (...) ; Definition of a softkey menu
//END
```
1.4 Troubleshooting (log book)

Overview

The log book is the easyscreen_log.txt file to which error messages generated by syntax interpretation are written.

The file easyscreen_log.txt is supplied in the following directory:

```
/user/sinumerik/hmi/log/
```

Example:

```
DEF VAR1 = (R)
DEF VAR2 = (R)
LOAD
VAR1 = VAR2 + 1 ; Error message in log book, as VAR2 has no value
```

Syntax

The system does not start to interpret syntax until the start softkey has been defined and a dialog with start and end identifiers as well as a definition line has been configured.

```
//S(Start)
HS6=("1st screen")
PRESS(HS6)
   LM("Maske1")
END_PRESS
//END

//M(Maske1)
   DEF Var1=(R)
//END
```

Contents of easyscreen_log.txt

If "Easy Screen" detects errors when interpreting the configuration files, these errors will be written to the easyscreen_log.txt ASCII file. The file will be deleted each time the HMI is restarted.

The file indicates:

- The action during which an error occurred
- The line and column number of the first faulty character
- The entire faulty line of the configuration file
Introduction

1.4 Troubleshooting (log book)
How do I create a configuration?

2.1 Defining start softkeys

Dialog-independent softkey

Start softkeys are dialog-independent softkeys which are not called from a dialog, but which have been configured before the first new dialog. In order to access the start dialog or a start softkey menu, the start softkey must be defined.

Programming

The definition block for a start softkey is structured as follows:

```plaintext
//S(Start) ;start identifier of start softkey
HS1=(...) ; defining the start softkey: horizontal SK 1
PRESS(HS1) ;method
IM... ;LM or LS function
END_PRESS ;end of method
//END ;end identifier of start softkey
```

Permissible positions for start softkeys

The following positions for Easy Screen start softkeys are permissible in the operating areas:

<table>
<thead>
<tr>
<th>Operating area</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Machine</td>
<td>HSK6</td>
</tr>
<tr>
<td>Parameter</td>
<td>HSK7</td>
</tr>
<tr>
<td>Program</td>
<td>HSK6</td>
</tr>
<tr>
<td></td>
<td>Measuring cycles: HSK13 and HSK14</td>
</tr>
<tr>
<td>Program manager</td>
<td>HSK2-8 and HSK12-16, if not assigned to drives.</td>
</tr>
<tr>
<td>Diagnostics</td>
<td>HSK7</td>
</tr>
<tr>
<td>Commissioning</td>
<td>HSK7</td>
</tr>
</tbody>
</table>

Start softkeys are configured in special files. The names of these files are stated in the easyscreen.ini file. They usually have a name which is specific to an operating area (e.g. startup.com for the Startup area). This does not apply to the machine operating area, where there are a number of files specific to operating modes (ma_jog.com, ma_auto.com).
How do I create a configuration?

2.1 Defining start softkeys

The softkey menu with the start softkeys is called "Start". Existing configurations for start softkeys can still be used. The function whereby start softkeys are merged with the softkeys for the respective HMI application (operating area) in the start softkey menu is not supported. This means that until the first dialog call is made - in other words, the time at which full functionality becomes available (e.g. execution of PRESS blocks) - menus or softkey menus can only be replaced by others in their entirety.

Menus for standard applications are given the "easyscreenmode" menu property as part of their XML configuration. This indicates whether the menu involved permits the use of Easy Screen start softkeys (= easyscreen) or not (= off):

```
<SCREEN name="SlEasyScreenTest">
  <FORM ... >
    <PROPERTY ... > ... </PROPERTY>
  </FORM>
  <MENU name="menu_horiz" softkeybar="hu" easyscreenmode="easyscreen" />
  <MENU name="menu_vert" softkeybar="vr" easyscreenmode="off" />
</SCREEN>
```

Example

Separate start softkey menus can be defined for horizontal and vertical menus. The "MENU" attribute is used for this purpose.

If a new menu is displayed in an HMI application and this menu permits the use of start softkeys in accordance with the configuration (easyscreenmode = "easyscreen"), a search will first be performed for the "MENU" attribute in the configuration of the start softkey menu:

- If a configuration for a start softkey menu with the "MENU" attribute is found and if the "MENU" attribute contains the name of the menu that is currently being displayed (in the example: "menu_horiz"), then this start softkey menu is displayed.
  
  Only the horizontal softkeys are taken into account here, as the "menu_horiz" menu involves a horizontal menu bar.

- Where there is no menu-specific softkey menu for a particular menu (i.e. the "MENU" attribute is not available), the default start softkey menu will be loaded.

```
//S(Start)
MENU="menu_horiz"
HS2=("Contour",ac6,se3)
PRESS(HS2)
  LS("Contour")
  END_PRESS
...
//END
```
Template for configurations

A detailed description of all permissible positions for start softkeys and their configuration is located in the easyscreen.ini file in the following directory:

/card/siemens/sinumerik/hmi/cfg

This file is used as a template for your own configurations.

See also

Lists of start softkeys (Page 167)

2.1.1 Functions for start softkeys

Functions for dialog-independent softkeys

Only certain functions can be initiated with start softkeys.

The following functions are permitted:

- The **LM function** can be used to load another dialog: `LM("Identifier","File")`
- The **LS function** can be used to display another softkey menu: `LS("Identifier", ["File"], Merge)`
- You can use the **"EXIT" function** to exit newly configured user interfaces and return to the standard application.
- You can use the **"EXITLS" function** to exit the current user interface and load a defined softkey menu.
How do I create a configuration?

2.1 Defining start softkeys

PRESS method

The softkey is defined within the definition block and the "LM" or "LS" function is assigned in the PRESS method.

If the start softkey definition is designated as a comment (semicolon (;) at beginning of line) or the configuration file removed, the start softkey will not function.

Example

```
//S(Start) ; Start identifier
HS6="1st screen form" ; horizontal SK 6 labeled "1st screen form"
PRESS(HS6) ; PRESS method for horizontal SK 6
    LM("Screen form1") ; Load screen form1 function, where screen form 1 must be defined within the same file.
END_PRESS ; End of PRESS method

HS7="2nd screen form" ; horizontal SK 7 labeled "2nd screen form"
PRESS(HS7) ; PRESS method for horizontal SK 7
    LM("Screen form2") ; Load screen form2 function, where screen form 2 must be defined within the same file.
END_PRESS ; End of PRESS method
//END ; End identifier of entry block

Example

HS1 = "new softkey menu"
HS2="no function"
PRESS(HS1)
    LS("Menu1") ; load new softkey menu
END_PRESS
PRESS (HS2) ; empty PRESS method
END_PRESS
```
Configuration

The names of the files containing the configuration for the start softkey menus are given in the easyscreen.ini file. The entry can be specific to the operating area, the dialog, or the screen. For example:

StartFile01 = area := SlGfwTest,  
dialog := SlGfwTestDialog,  
screen := SlEasyScreenTest,  
startfile := test.com

StartFile02 = area := AreaMachine,  
dialog := SlMachine,  
screen := Jog,  
startfile := ma_jog.com

StartFile03 = area := AreaMachine,  
dialog := SlMachine,  
screen := Auto,  
startfile := ma_auto.com

StartFile04 = area := AreaProgramManager,  
dialog := ,  
screen := ,  
startfile := progman.com

StartFile05 = area := AreaProgramEdit,  
dialog := ,  
screen := ,  
startfile := aeditor.com

StartFile06 = area := AreaStartup,  
dialog := SlSuDialog,  
screen := ,  
startfile := test.com

The names given in the systemconfiguration.ini file should be used for "area" and "dialog". The screen identifiers in the dialog configuration should be used for "screen"; "startfile" refers to the file in which the start softkey menu (default or menu-specific) is configured.

If a menu-specific start softkey menu is required, an additional name is provided by the attribute "menu", e.g.:

StartFile01 = area := SlGfwTest,  
dialog := SlGfwTestDialog,  
screen := SlEasyScreenTest,  
menu := menu_horiz,  
startfile := test.com
Various configurations of the start softkeys

Various configurations of the start softkeys are merged. In this case, initially the name of the file to be interpreted is read-out of easyscreen.ini. A search is made for files with the .com extension in the following directories:

- /user/sinumerik/hmi/proj/
- /oem/sinumerik/hmi/proj/
- /addon/sinumerik/hmi/proj/
- /siemens/sinumerik/hmi/proj/

The configurations included for the start softkeys are now merged to form a configuration, i.e. the individual softkeys are compared. If there are two or more configurations for a softkey, the higher order is always transferred into the merge version.

Softkey menus or dialogs that are possibly included are ignored. If a softkey has a command without file information e.g. LM ("test"), as the required softkey menu or dialog is contained in the same file, then the corresponding file name is supplemented in the internal merge version so that in this case, no changes are required. The merge configuration contained is then subsequently displayed.

"System" parameter in the easyscreen.ini file

Dialogs can be displayed on different systems.

Default setting: System = 1

If dialogs are based on a value of 0, the value can be adapted by entering the following in easyscreen.ini:

```
[SYSTEM]
System = 0
```
2.2 Structure and elements of a dialog

2.2.1 Defining a dialog

Definition

A dialog is part of a user interface consisting of a display line, dialog elements and/or graphics, an output line for messages and 8 horizontal and 8 vertical softkeys.

Dialog elements are:

- Variables
  - Limits/toggle field
  - Default setting of variables
- Help display
- Texts
- Attributes
- System or user variable
- Position of short text
- Position of input/output field
- Colors

Dialog properties:

- Header
- Graphic
- Dimension
- System or user variable
- Graphic position
- Attributes
How do I create a configuration?

2.2 Structure and elements of a dialog

Easy Screen (BE2)
Programming Manual, 02/2011, 6FC5397-1DP40-0BA0

Overview

The definition of a dialog (definition block) is basically structured as follows:

<table>
<thead>
<tr>
<th>Definition block</th>
<th>Comment</th>
<th>Chapter reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>//M...</td>
<td>;Dialog start identifier</td>
<td></td>
</tr>
<tr>
<td>DEF Var1=...</td>
<td>;Variables</td>
<td>See chapter &quot;Variables&quot;</td>
</tr>
<tr>
<td>H51=(...)</td>
<td>;Softkeys</td>
<td>See chapter &quot;Softkey menus&quot;</td>
</tr>
<tr>
<td>PRESS(H51)</td>
<td>;Method start identifier</td>
<td></td>
</tr>
<tr>
<td></td>
<td>;Actions</td>
<td>See chapter &quot;Methods&quot;</td>
</tr>
<tr>
<td>END_PRESS</td>
<td>;Method end identifier</td>
<td></td>
</tr>
<tr>
<td>//END</td>
<td>;Dialog end identifier</td>
<td></td>
</tr>
</tbody>
</table>

Within the dialog definition block, various variables that appear as dialog elements in the dialog, as well as horizontal and vertical softkeys, are defined first. Different types of actions are then configured in methods.
2.2.2 Defining dialog properties

Description

The properties of the dialog are defined in the start identifier line of the dialog.

Figure 2-2 Dialog properties
## 2.2 Structure and elements of a dialog

### Programming

**Syntax:**

```
/M([Identifier]/[Header]/[Graphic]/[Dimension]/[System or user variable]/[Graphic position]/[Attributes])
```

**Description:** Defines a dialog

**Parameters:**

- **Identifier**
  - Name of the dialog
- **Header**
  - Dialog header as text or call for text (e.g. $85011) from a language-specific text file.
- **Graphic**
  - Graphics file with path in double quotation marks
- **Dimension**
  - Position and size of the dialog in pixels (distance from left-hand side, distance from right-hand side, width, height), in relation to the upper left-hand corner of the screen. The entries are separated by a comma.
- **System or user variable**
  - System or user variable to which the current cursor position is assigned. The NC or PLC can be provided with the cursor position via the system or user variable. The first variable has the index 1. The order corresponds to the configuration order of the variables.
- **Graphic position**
  - Position of the graphic in pixels (distance from left-hand side, distance from right-hand side), in relation to the upper left-hand corner of the dialog. The minimum clearance from the top is 18 pixels. The entries are separated by a comma.
- **Attributes**
  - The specifications of the attributes are separated by a comma.
  - Possible attributes are:
    - **CMx**
      - Column mode: Column alignment
        - **CM0** Default setting: The column distribution is carried out separately for each line.
        - **CM1** The column distribution of the line with the most columns applies to all lines.
    - **CB**
      - CHANGE block: Response when dialog is opened: cb attributes specified for a variable in a variables definition take priority over the default setting in the dialog definition.
        - **CB0** Default setting: All CHANGE blocks associated with the dialog are processed when it is opened.
        - **CB1** CHANGE blocks are then only processed if the relevant value changes.
Accessing the dialog properties

Read and write access to the following dialog properties is permitted within methods (e.g. PRESS block).

- Hd = Header
- Hlp = Help display
- Var = System or user variable

Example

Figure 2-3  “Example 2: showing graphic”
How do I create a configuration?

2.2 Structure and elements of a dialog

//S(Start)
HS7=("Example", sel, ac7)

PRESS(HS7)
  LM("Mask2")
END_PRESS

//END
//M(Mask2/"Example 2 : showing graphic"/"example.png")
HS1=("new\nHeader")
HS2=("")
HS3=("")
HS4=("")
HS5=("")
HS6=("")
HS7=("")
HS8=("")
VS1=("")
VS2=("")
VS3=("")
VS4=("")
VS5=("")
VS6=("")
VS7=("")
VS8=("")

PRESS(HS1)
  Hd= "new Header"
END_PRESS
...
//END

See also

Programming example for the “Custom” area (Page 161)
2.2.3 Defining dialog elements

Dialog element

The term "dialog element" refers to the visible part of a variable, i.e., short text, graphics text, input/output field and unit text. Dialog elements fill lines in the main body of the dialog. One or more dialog elements can be defined for each line.

Variable properties

All variables are valid in the active dialog only. Properties are assigned to a variable when it is defined. The values of dialog properties can be accessed within methods (e.g. a PRESS block).

---

Figure 2-4 Elements of a dialog
Programming - Overview

The single parameters to be separated by commas are enclosed in round parentheses:

<table>
<thead>
<tr>
<th>DEF Identifier =</th>
<th>Identifier = Name of variable</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Variable type</td>
</tr>
<tr>
<td></td>
<td>[Limit values or toggle field]</td>
</tr>
<tr>
<td></td>
<td>[Default]</td>
</tr>
<tr>
<td></td>
<td>[Texts (Long text, Short text</td>
</tr>
<tr>
<td></td>
<td>[Attributes]</td>
</tr>
<tr>
<td></td>
<td>[Help display]</td>
</tr>
<tr>
<td></td>
<td>[System or user variable]</td>
</tr>
<tr>
<td></td>
<td>[Position of short text]</td>
</tr>
<tr>
<td></td>
<td>[Position of I/O field(Left, Top, Width, Height)]</td>
</tr>
<tr>
<td></td>
<td>[Colors]</td>
</tr>
<tr>
<td></td>
<td>[Online help] (Page 41)</td>
</tr>
</tbody>
</table>

See also

Variable parameters (Page 52)
2.2.4 Example Opening the Dialog

Programming

The new "Example" dialog is called via the "Example" start softkey from the "Startup" operating area:

![Diagram of Easy Screen (BE2) showing how to call a new dialog via the "Example" start softkey from the "Startup" operating area.]

Figure 2-5 Example: Calling a new dialog
2.2 Structure and elements of a dialog

2.2.5 Defining dialogs with multiple columns

Overview

Multiple variables can also be represented in a dialog on one line. In this case, the variables are all defined in the configuration file on a single definition line.

```
DEF VAR11 = (S///"Var11"), VAR12 = (I///"Var12")
```

To make individual variables in the configuration file more legible, the definition lines can be wrapped after every variables definition and following comma.
The key word "DEF" always indicates the beginning of a new line:

```
DEF Tnr1=(I///","T ","/wr1///,,10/20,,50),
TOP1=(I///,"Type="/WR2//"$TC_DP1[1,1]"/80,,30/120,,50),
TOP2=(R3///,"L1="/WR2//"$TC_DP3[1,1]"/170,,30/210,,70),
TOP3=(R3///,"L2="/WR2//"$TC_DP4[1,1]"/280,,30/320,,70),
TOP4=(R3///,"L3="/WR2//"$TC_DP5[1,1]"/390,,30/420,,70)
```

DEF Tnr2=(I///","T ","/wr1///,,10/20,,50),
TOP21=(I///,"Typ="/WR2//"$TC_DP1[2,1]"/80,,30/120,,50),
TOP22=(R3///,"L1="/WR2//"$TC_DP3[2,1]"/170,,30/210,,70),
TOP23=(R3///,"L2="/WR2//"$TC_DP4[2,1]"/280,,30/320,,70),
TOP24=(R3///,"L3="/WR2//"$TC_DP5[2,1]"/390,,30/420,,70)

...  

**NOTICE**

When creating dialogs with multiple columns, the options and limits of the hardware being used should be taken into consideration in terms of the number of columns and DEF instructions. A lot of columns can slow down the system.

### 2.2.6 Using display images/graphics

**Use of graphics**

There are two display categories:

- Display images/graphics in the graphic area
- Help displays illustrating, for example, individual variables, which are superimposed in the graphic area.
- More Help displays can be configured instead of short text or an input/output field, which you position where you like.
**How do I create a configuration?**

### 2.2 Structure and elements of a dialog

**Storage locations**

First, the relevant resolution directory is searched for the display image corresponding to the resolution of the connected monitor. If it is not found there, a search is performed for the display image in the next smaller resolution directory until – if the display image is not found earlier – directory ico640 is reached:

**Search sequence:**

- `/user/sinumerik/hmi/ico/<Resolution>`
- `/oem/sinumerik/hmi/ico/<Resolution>`
- `/addon/sinumerik/hmi/ico/<Resolution>`

**Note**

Graphics are proportionally positioned for resolutions 640 x 480, 800 x 600 and 1024 x 768 pixels.
2.3 Defining softkey menus

Definition

The term softkey menu is used to refer to all the horizontal and vertical softkeys displayed on a screen form. In addition to the existing softkey menus, it is possible to define other menus, which partially or completely overwrite the existing menus.

The names of the softkeys are predefined. Not all softkeys need to be assigned.

| HSx   | 1 - 8, Horizontal softkeys 1 to 8 |
| VSy   | 1 - 8, Vertical softkeys 1 to 8  |

The definition of a softkey menu (softkey menu definition block) is basically structured as follows:

<table>
<thead>
<tr>
<th>Definition block</th>
<th>Comment</th>
<th>Chapter reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>//S...</td>
<td>;Start identifier of softkey menu</td>
<td></td>
</tr>
<tr>
<td>HSx=...</td>
<td>;Define softkeys</td>
<td></td>
</tr>
<tr>
<td>PRESS(HSx)</td>
<td>;Method start identifier</td>
<td>See chapter &quot;Methods&quot;</td>
</tr>
<tr>
<td>LM...</td>
<td>;Actions</td>
<td></td>
</tr>
<tr>
<td>END_PRESS</td>
<td>;Method end identifier</td>
<td></td>
</tr>
<tr>
<td>//END</td>
<td>;End identifier of softkey menu</td>
<td></td>
</tr>
</tbody>
</table>

Description

Properties are assigned to softkeys during definition of the softkey menu.
How do I create a configuration?

2.3 Defining softkey menus

Programming

Syntax:  

```plaintext
//S(Identifier)
...
//END
```

;Start identifier of softkey menu

;End identifier of softkey menu

Description: Defines softkey menu

Parameters: Identifier Name of softkey menu

Syntax:  

```plaintext
SK = (Text[, Access level][, Status])
```

Define softkey

Description: Softkey, e.g. HS1 to HS8, VS1 to VS8

Parameters: SK Softkey, e.g. HS1 to HS8, VS1 to VS8

Text Enter text

Display file name "\my_pic.png"

or via separate text file $85199, e.g. with the following text in the (language-specific) text file: 85100 0 0 "\my_pic.png".

The size of image which can be displayed on a softkey depends on the OP used:

- OP 010: 640 X 480 mm → 25 x 25 pixels
- OP 012: 800 X 600 mm → 30 x 30 pixels
- OP 015: 1024 X 768 mm → 40 x 40 pixels

Access level ac0 to ac7 (ac7: default)

Status se1: visible (default)

se2: disabled (gray text)

se3: displayed (last softkey used)

Note

Enter %n in the softkey text to create a line break.

A maximum of 2 lines with 9 characters each are available.
Assigning access level

Operators can only access information on this and lower access levels. The meanings of the different access levels are as follows: ac0 is the highest access level and ac7 the lowest.

<table>
<thead>
<tr>
<th>Security level</th>
<th>Locked by</th>
<th>range</th>
</tr>
</thead>
<tbody>
<tr>
<td>ac0</td>
<td>Password</td>
<td>Siemens</td>
</tr>
<tr>
<td>ac1</td>
<td>Password</td>
<td>Machine manufacturer</td>
</tr>
<tr>
<td>ac2</td>
<td>Password</td>
<td>Service</td>
</tr>
<tr>
<td>ac3</td>
<td>Password</td>
<td>User</td>
</tr>
<tr>
<td>ac4</td>
<td>Keylock switch position 3</td>
<td>Programmer, machine setter</td>
</tr>
<tr>
<td>ac5</td>
<td>Keylock switch position 2</td>
<td>Qualified operator</td>
</tr>
<tr>
<td>ac6</td>
<td>Keylock switch position 1</td>
<td>Trained operator</td>
</tr>
<tr>
<td>ac7</td>
<td>Keylock switch position 0</td>
<td>Semi-skilled operator</td>
</tr>
</tbody>
</table>

Example

```plaintext
//S(Menu1) ; Start identifier of softkey menu
HS1=("NEW", ac6, se2) ; Define softkey HS1, assign the label "NEW", protection level 6, and the status "disabled"
HS2=("\image1.png") ; Assign a graphic to the softkey
HS3=("Exit")

VS1=("sub screen form")
VS2=($85011, ac7, se2) ; Define softkey VS2, assign the text from the language file, protection level 1, and the status "disabled".
VS3=("Cancel", ac1, se3) ; Define softkey VS3, assign the label "Cancel", protection level 1 and the status "highlighted".
VS4=("OK", ac6, se1) ; Define softkey VS4, assign the label "OK", protection level 6 and the status "visible"
VS5=(SOFTKEY_CANCEL,,se1) ; Define cancel standard softkey VS5 and assign the status "visible"
VS6=(SOFTKEY_OK,,se1) ; Define OK standard softkey VS6 and assign the status "visible"
VS7=("\image1.png","OEM text"),,se1) ; Define softkey VS7, assign an image, assign the label "OEM Text" and the status "visible"
VS8=("\image1.png", $83533),,se1) ; Define softkey VS8, assign an image, assign text from language file and the status "visible"
```
2.3 Defining softkey menus

2.3.1 Changing softkey properties during runtime

Description
The softkey properties Text, Access Level and Status can be changed in the methods during runtime.

Programming

Syntax:

```
SK.st = "Text" ; Softkey with label
SK.ac = Access level ; Softkey with security level
SK.se = Status ; Softkey with status
```

Description: Assign properties

Parameters:

- **Text**: Label text in inverted commas
- **Access level**: Range of values: 0 ... 7
- **Status**:
  1:visible and operator-controllable
  2:disabled (gray text)
  3:displayed (last softkey used)
Example

Figure 2-6   Example 3: Graphics and softkeys

```plaintext
//S(Start)
HS7=("Example", ac7, sel)

PRESS(HS7)
  LM("Maske3")
END_PRESS

//END

//M(Maske3/"Example 2: showing graphic"/"example.png")
HS1= ("")
HS2= ("")
HS3= ("")
HS4= ("")
HS5= ("")
HS6= ("")
HS7= ("")
HS8= ("")
```
How do I create a configuration?

2.3 Defining softkey menus

```plaintext
VS1=""
VS2=""
VS3=""
VS4="\sp_ok.png",SE1
VS5=["\sp_ok_small.png","OEM Text"],SE1
VS6=""
VS7=SOFTKEY_OK,SE1
VS8=SOFTKEY_CANCEL,SE1
PRESS(VS4)
  EXIT
END_PRESS
PRESS(VS5)
  EXIT
END_PRESS
PRESS(VS7)
  EXIT
END_PRESS
PRESS(VS8)
  EXIT
END_PRESS
//END
```

2.3.2 Language-dependent text

Overview

Language-dependent texts are used for:

- Softkey labels
- Headings
- Help texts
- Any other texts

The language-dependent texts for dialogs are stored in text files.

The text files are stored in the following directories:

- `/user/sinumerik/hmi/lng/`
- `/oem/sinumerik/hmi/lng/`
- `/addon/sinumerik/hmi/lng/`
alsc.txt Contains the language-dependent texts for the Siemens standard cycles
almc.txt Contains the language-dependent texts for the manufacturer cycles
aluc.txt Language-dependent user texts

The text files used during program runtime are specified in the easyscreen.ini file:

```
[LANGUAGEFILES]
LngFile01 = alsc.txt ;->alsc_xxx.txt (e.g. alsc_eng.txt)
LngFile02 = user.txt
```

In this instance, the user.txt file has been chosen as an example of a text file. Any name can be selected, in principle. Depending on the language of the texts within the file, the relevant language code must be added using the following syntax:

```
user.txt -> user_xxx.txt (e.g. user_eng.txt)
```

An underscore followed by the relevant language identifier are added after the name.

See also

List of language codes used in file names (Page 172)

Format of text files

The text files must be saved in UTF-8 format.

If, for example, you use Notepad to generate text files, select "File" -> "Save As" and choose UTF-8 encoding.
### Format of a text entry

<table>
<thead>
<tr>
<th>Syntax</th>
<th>8xxxx 0 0 &quot;Text&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>Assignment between text number and text in the file</td>
</tr>
<tr>
<td>Parameters</td>
<td>xxxx  5000 to 9899</td>
</tr>
</tbody>
</table>

Parameters 2 and 3 are separated by blanks and act as control characters for alarm text output. To ensure that the text format is identical to that of the alarm texts, these two parameters must always be set to zero.

**Examples of alarms:**

85000 0 0 "Retraction plane"
85001 0 0 "Drilling depth"
85002 0 0 "Pitch"
85003 0 0 "Pocket radius"
2.4 Configuring the online help

Online help

An online help for the configured dialogs and elements can be created in the HTML format. The syntax and procedure for the online help is essentially the same as for SINUMERIK Operate, e.g.:

```plaintext
DEF VAR14 = (I///,"\ein.png"/all,cbl,wr2//"DB1.DBB0"///"sinumerik_md_1.html", "9100")
```

References

Commissioning Manual "Base software and operating software" (IM9), Chapter "OEM-specific online help"

See also

Defining dialog elements (Page 27)
How do I create a configuration?

2.4 Configuring the online help
Variables

3.1 Defining variables

Variable value

The most basic property of a variable is its value.

The value of variables can be assigned by means of:

- Default settings when defining variables
- Assignment to a system or user variable
- A method

Programming

Syntax: Identifier.val = Variable value
Identifier = Variable value

Description: Variable value val (value)
Parameters: Identifier: Name of variable
Variable value: Value of variable

Example:

VAR3 = VAR4 + SIN(VAR5)
VAR3.VAL = VAR4 + SIN(VAR5)

Variable status

The "Variable status" property can be used to scan a variable for valid content during runtime. This property can be read and written with the value FALSE = 0.

Programming

Syntax: Identifier.vld

Description: Variable status vld (validation)
Parameters: Identifier: Name of variable

The result of the scan can be:

FALSE = invalid value
TRUE = valid value

Example:

IF VAR1.VLD == FALSE
VAR1 = 84
ENDIF
Variables

3.1 Defining variables

Variable: Changing properties

The variables are assigned a new value in the notation Identifier.Property = Value when a change is made. The expression to the right of the equality sign is evaluated and assigned to the variable or variable property.

Examples:

Identifier.ac = Access level
Identifier.al = Text alignment
Identifier.bc = Background color
Identifier.fc = Foreground color
Identifier.fs = Font size
Identifier.gt = Graphic text
Identifier.hp = Help display
Identifier.li = Limit
Identifier.lt = long text
Identifier.max = MAX limits
Identifier.min = MIN limits
Identifier.st = short text
Identifier.typ = Variable type
Identifier.ut = Unit text
Identifier.val = Variable value
Identifier.var = System or user variable
Identifier.vld = Variable status
Identifier.wr = Input mode

3.2 Application examples

Help variables

Help variables are internal arithmetic variables. Arithmetic variables are defined like other variables, but have no other properties apart from variable value and status, i.e. Help variables are not visible in the dialog. Help variables are of the VARIANT type.

Programming

Syntax: DEF Identifier
Description: Internal arithmetic variables of the VARIANT type
Parameters: Identifier: Name of Help variables

Example

DEF OTTO ;Definition of a Help variable

Syntax: Identifier.val = Help variable value
Identifier = Help variable value
Description: A value is assigned to a Help variable in a method.
Parameters: Identifier: Name of Help variables
Help variable value: Content of the Help variables

Example:

LOAD
OTTO = "Test" ; Assign the value "Test" to the Otto Help variable.
END_LOAD
LOAD
OTTO = REG[9].VAL ; Assign the value of the register to the Otto Help variable.
END_LOAD

Calculation with variables

Variables are calculated every time you exit an IO field (by pressing the ENTER or TOGGLE key). The calculation is configured in a CHANGE method that is processed every time the value changes.

You can scan the variable status to ascertain the validity of the value of the variable, e.g.,

Var1 = Var5 + SIN(Var2)
Otto = PI * Var4
3.2 Application examples

Addressing system variables indirectly

A system variable can also be addressed indirectly, i.e., as a function of another variable:

```plaintext
PRESS(HS1)
AXIS=AXIS+1
WEG.VAR="$AA_DTBW["<<AXIS<<"]" ;Address axis address via variable
END_PRESS
```

Changing softkey labels

Example

```plaintext
HS3.st = "New Text" ;Change softkey label
```
3.3 Example 1: Assigning the variable type, texts, help display, colors, tooltips

Example 1a

Assigning the Variable type, Texts, Help display, and Colors properties

```
DEF Var1 = (R///,"Actual value","mm"//"Var1.png"///8,2)
```

<table>
<thead>
<tr>
<th>Variable Type:</th>
<th>REAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limits or entry in the toggle field:</td>
<td>none</td>
</tr>
<tr>
<td>Default setting:</td>
<td>None</td>
</tr>
<tr>
<td>Texts:</td>
<td></td>
</tr>
<tr>
<td>Long text:</td>
<td>None</td>
</tr>
<tr>
<td>Short text:</td>
<td>Actual value</td>
</tr>
<tr>
<td>Graphic text:</td>
<td>none</td>
</tr>
<tr>
<td>Unit text:</td>
<td>mm</td>
</tr>
<tr>
<td>Attributes:</td>
<td>None</td>
</tr>
<tr>
<td>Help display:</td>
<td>Var1.png</td>
</tr>
<tr>
<td>System or user variable:</td>
<td>None</td>
</tr>
<tr>
<td>Position of short text:</td>
<td>No data, i.e., default position</td>
</tr>
<tr>
<td>Position of input/output field:</td>
<td>No data, i.e., default position</td>
</tr>
<tr>
<td>Colors:</td>
<td></td>
</tr>
<tr>
<td>Foreground color:</td>
<td>8</td>
</tr>
<tr>
<td>Background color:</td>
<td>2</td>
</tr>
</tbody>
</table>
Example 1b

Assigning tooltips

\[
\text{DEF Var2 = (I//5//}}
\text{"value"}, 
\text{""}, 
\text{"" Tooltiptext"}/w\text{r2}///20,250,50)
\]

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable type:</td>
<td>INTEGER</td>
</tr>
<tr>
<td>Limits or entry in the toggle field:</td>
<td>None</td>
</tr>
<tr>
<td>Default setting:</td>
<td>5</td>
</tr>
<tr>
<td>Texts:</td>
<td></td>
</tr>
<tr>
<td>Short text:</td>
<td>Value (possible language text ID)</td>
</tr>
<tr>
<td>Tooltip:</td>
<td>Tooltip text</td>
</tr>
<tr>
<td>Attributes:</td>
<td></td>
</tr>
<tr>
<td>Input mode</td>
<td>Reading and writing</td>
</tr>
<tr>
<td>Help display:</td>
<td>None</td>
</tr>
<tr>
<td>Position of short text:</td>
<td></td>
</tr>
<tr>
<td>Distance from left:</td>
<td>20</td>
</tr>
<tr>
<td>Distance from top:</td>
<td>250</td>
</tr>
<tr>
<td>Width:</td>
<td>50</td>
</tr>
<tr>
<td>Colors:</td>
<td>No data, i.e. default</td>
</tr>
</tbody>
</table>

See also

Variable parameters (Page 52)
3.4 Example 2: Assigning the Variable Type, Limits, Attributes, Short Text Position properties

Example 2
Assigning the Variable Type, Limits, Attributes, Short Text Position properties

DEF Var2 = (I/0,10///wr1,al1///,,300)

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable Type</td>
<td>INTEGER</td>
</tr>
<tr>
<td>Limits or toggle field entries</td>
<td>MIN: 0</td>
</tr>
<tr>
<td></td>
<td>MAX: 10</td>
</tr>
<tr>
<td>Default</td>
<td>none</td>
</tr>
<tr>
<td>Texts</td>
<td>none</td>
</tr>
<tr>
<td>Attributes</td>
<td></td>
</tr>
<tr>
<td>Input mode</td>
<td>read-only</td>
</tr>
<tr>
<td>Alignment of short text</td>
<td>Right-justified</td>
</tr>
<tr>
<td>Help display</td>
<td>none</td>
</tr>
<tr>
<td>System or user variable</td>
<td>none</td>
</tr>
<tr>
<td>Position of short text:</td>
<td></td>
</tr>
<tr>
<td>Distance from left</td>
<td>None</td>
</tr>
<tr>
<td>Distance from top</td>
<td>None, i.e., default distance from top left</td>
</tr>
<tr>
<td>Width</td>
<td>300</td>
</tr>
<tr>
<td>Position of input/output field</td>
<td>No data, i.e., default position</td>
</tr>
<tr>
<td>Colors</td>
<td>No data, i.e., default</td>
</tr>
<tr>
<td>Help</td>
<td>none</td>
</tr>
</tbody>
</table>

See also
Variable parameters (Page 52)
Example 3: Assigning the Variable Type, Default, System or User Variable, Input/Output Field Position properties

Example 3

Assigning the Variable Type, Default, System or User Variable, Input/Output Field Position properties

DEF Var3 = (R/10///"$R[1]"//300,10,200/)

<table>
<thead>
<tr>
<th>Variable Type:</th>
<th>REAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limits or toggle field entries:</td>
<td>none</td>
</tr>
<tr>
<td>Default setting:</td>
<td>10</td>
</tr>
<tr>
<td>Texts:</td>
<td>none</td>
</tr>
<tr>
<td>Attributes:</td>
<td>None</td>
</tr>
<tr>
<td>Help display:</td>
<td>none</td>
</tr>
<tr>
<td>System or user variable:</td>
<td>$R[1]$ (R-Parameter 1)</td>
</tr>
<tr>
<td>Position of short text:</td>
<td>Default position in relation to input/output field</td>
</tr>
<tr>
<td>Position of input/output field:</td>
<td></td>
</tr>
<tr>
<td>Distance from left</td>
<td>300</td>
</tr>
<tr>
<td>Distance from top</td>
<td>10</td>
</tr>
<tr>
<td>Width:</td>
<td>200</td>
</tr>
<tr>
<td>Colors:</td>
<td>No data, i.e. default</td>
</tr>
</tbody>
</table>

See also

Variable parameters (Page 52)
3.6 Examples relating to toggle field and image display

Example 4

Various entries in the toggle field:

Limits or toggle field entries:
```
DEF Var1 = (I/* 0,1,2,3)
DEF Var2 = (S/* "In", "Out")
DEF Var3 = (B/* 1="In", 0="Out")  ;1 and 0 are values, "In" and "Out" are displayed.
DEF Var4 = (R/* ARR1)  ;ARR1 is the name of an array.
```

Example 5

Displaying an image instead of a short text: The size and position of the image is defined under "Position of IO field (left, top, width, height)".

```
DEF VAR6= (V///,"\image1.png" ///160,40,50,50)
```

<table>
<thead>
<tr>
<th>Variable type:</th>
<th>VARIANT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limits or entries in the toggle field:</td>
<td>None</td>
</tr>
<tr>
<td>Default setting:</td>
<td>None</td>
</tr>
<tr>
<td>Texts:</td>
<td></td>
</tr>
<tr>
<td>Short text:</td>
<td>image1.png</td>
</tr>
<tr>
<td>Attributes:</td>
<td>None</td>
</tr>
<tr>
<td>Help display:</td>
<td>none</td>
</tr>
<tr>
<td>System or user variable:</td>
<td>None</td>
</tr>
<tr>
<td>Position of short text:</td>
<td></td>
</tr>
<tr>
<td>Distance from left:</td>
<td>160</td>
</tr>
<tr>
<td>Distance from the top:</td>
<td>40</td>
</tr>
<tr>
<td>Width:</td>
<td>50</td>
</tr>
<tr>
<td>Height:</td>
<td>50</td>
</tr>
<tr>
<td>Position of input/output field:</td>
<td>No details</td>
</tr>
<tr>
<td>Colors:</td>
<td>No data, i.e. default</td>
</tr>
</tbody>
</table>
3.7 Variable parameters

Parameter overview

The following overview provides a brief explanation of the variable parameters. Subsequent chapters contain a more detailed description.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable type (Page 55)</td>
<td>The variable type must be specified.</td>
</tr>
</tbody>
</table>
|                                  | R[x]: REAL (+ digit for the decimal place)  
|                                  | I: INTEGER                                                                                                                                  |
|                                  | S[x]: STRING (+ digit for string length)  
|                                  | C: CHARACTER (individual character)  
|                                  | B: BOOL                                                                                                                                     |
|                                  | V: VARIANT                                                                                                                                  |
| Limits (Page 49)                 | Limit value MIN, limit value MAX  
|                                  | Default setting: Empty  
|                                  | The limit values are separated by a comma. Limits can be specified for types I, C and R in decimal formats or as characters in the form "A", "F". |
| Default setting (Page 61)        | If no default setting has been configured and no system or user variable has been assigned to the variable, the first element of the toggle field is assigned. If no toggle field has been defined, there is no default setting, which means the status of the variable is "not calculated".  
|                                  | Default setting: No default                                                                                                                   |
| Toggle field (Page 59)           | List with predetermined entries in the IO field: The list is initiated by a *; the entries are separated by a comma. The entries can be assigned a value.  
|                                  | For the toggle field, the entry for the limit is interpreted as a list. If only one * is entered, a variable toggle field is created.  
|                                  | Default setting: None                                                                                                                        |
| Texts (Page 47)                  | The sequence is specified. Instead of a short text, an image can also be displayed.  
|                                  | Default setting: Empty  
|                                  | Long text: Text in the display line  
|                                  | Short text: Name of the dialog element  
|                                  | Graphic text: Text refers to the terms in the graphics  
|                                  | Unit text: Unit of the dialog element                                                                                                           |
| Tooltips (Page 47)               | Serve as brief information in a screen form configuration for the display and toggle fields. The information is configured via plain text and language text ID. |
### 3.7 Variable parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Attributes (Page 49)</strong></td>
<td>The attributes influence the following properties:</td>
</tr>
<tr>
<td></td>
<td>- Input mode</td>
</tr>
<tr>
<td></td>
<td>- Access level</td>
</tr>
<tr>
<td></td>
<td>- Alignment of short text</td>
</tr>
<tr>
<td></td>
<td>- Font size</td>
</tr>
<tr>
<td></td>
<td>- Limits</td>
</tr>
<tr>
<td></td>
<td>- Response when dialog is opened in terms of CHANGE block</td>
</tr>
<tr>
<td></td>
<td>The attributes are separated by commas and appear in any order. The attributes are not valid for toggle fields. A definition can be made for each component.</td>
</tr>
<tr>
<td><strong>Input mode</strong></td>
<td>wr0: IO field invisible, short text visible</td>
</tr>
<tr>
<td></td>
<td>wr1: Read (no focus possible for input)</td>
</tr>
<tr>
<td></td>
<td>wr2: Read and write (line appears in white)</td>
</tr>
<tr>
<td></td>
<td>wr3: wr1 with focus</td>
</tr>
<tr>
<td></td>
<td>wr4: All variable elements invisible, no focus possible</td>
</tr>
<tr>
<td></td>
<td>wr5: The value entered is saved immediately on every keystroke (in contrast to wr2, where it is only saved when the field is exited or RETURN is pressed).</td>
</tr>
<tr>
<td></td>
<td>Default setting: wr2</td>
</tr>
<tr>
<td><strong>Access level</strong></td>
<td>Empty: Can always be written</td>
</tr>
<tr>
<td></td>
<td>ac0...ac7: Protection levels</td>
</tr>
<tr>
<td></td>
<td>If the access level is not adequate, then the first line is displayed in gray, default setting: ac7</td>
</tr>
<tr>
<td><strong>Alignment of short text</strong></td>
<td>al0: Left-justified</td>
</tr>
<tr>
<td></td>
<td>al1: Right-justified</td>
</tr>
<tr>
<td></td>
<td>al2: centered</td>
</tr>
<tr>
<td></td>
<td>Default setting: al0</td>
</tr>
<tr>
<td><strong>Font size</strong></td>
<td>fs1: Default font size (8 pt.)</td>
</tr>
<tr>
<td></td>
<td>fs2: Double font size</td>
</tr>
<tr>
<td></td>
<td>Default setting: fs1</td>
</tr>
<tr>
<td></td>
<td>The clearances between the lines is defined. With the default font size, 16 lines will fit into the dialog. Graphics and unit text can only be configured in the default font size.</td>
</tr>
<tr>
<td><strong>Limits</strong></td>
<td>Consequently, it is possible to check whether the values of the variable are within the MIN and MAX limits specified.</td>
</tr>
<tr>
<td></td>
<td>Default setting: Determined by specified limits</td>
</tr>
<tr>
<td></td>
<td>li0: No check</td>
</tr>
<tr>
<td></td>
<td>li1: Check with respect to min.</td>
</tr>
<tr>
<td></td>
<td>li2: Check with respect to max.</td>
</tr>
<tr>
<td></td>
<td>li3: Check with respect to min. and max.</td>
</tr>
<tr>
<td><strong>Behavior when opening</strong></td>
<td>cb attributes specified for a variable in a variables definition take priority over the cb default setting in the dialog definition. Multiple attributes are separated by commas.</td>
</tr>
</tbody>
</table>
### 3.7 Variable parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>cb0</td>
<td>The CHANGE block defined for this variable is edited when the dialog is opened (default setting). Multiple attributes are separated by commas.</td>
</tr>
<tr>
<td>cb1</td>
<td>The CHANGE block defined for this variable is then only processed if the value of the variable changes.</td>
</tr>
<tr>
<td>Help display (Page 47)</td>
<td>Help display file: Name of the png file Default setting: Empty [Help display (Page 47)]  [Help display (Page 47)]  [Help display (Page 47)]  [Help display (Page 47)]  [Help display (Page 47)]</td>
</tr>
<tr>
<td></td>
<td>The name of the Help display file appears in double quotation marks. The display appears automatically (instead of the previous graphic) if the cursor is positioned on this variable.</td>
</tr>
<tr>
<td>System or user variable (Page 50)</td>
<td>System or user data from the NC/PLC can be assigned to the variable. The system or user variable appears in double quotation marks.</td>
</tr>
<tr>
<td></td>
<td>Reference: List Manual System Variables, /PGAsl/</td>
</tr>
<tr>
<td>Position of short text (Page 62)</td>
<td>Position of short text (distance from left, distance from top, width) The positions are entered in pixels and relate to the upper left-hand corner of the main body of the dialog. The entries are separated by commas.</td>
</tr>
<tr>
<td>Position of input/output field (Page 62)</td>
<td>Position of input/output field (distance from left, distance from top, width, height) The positions are entered in pixels and relate to the upper left-hand corner of the main body of the dialog. The entries are separated by commas. If this position changes, the positions of the short text, graphic text and unit text also change.</td>
</tr>
<tr>
<td>Colors (Page 47)</td>
<td>Foreground color, background color: The colors are separated by a comma. Color settings are only relevant to the input/output field; colors cannot be specified for the other texts. Range of values: 1...10 Default setting: Foreground color: Black, background color: white The default colors of the input/output field are determined by the Write mode: &quot;wr&quot; indicates write mode.</td>
</tr>
</tbody>
</table>
3.8 Details on the variable type

Variable type INTEGER

The following extensions for determining the display in the input/output field and the memory utilization are possible for the "INTEGER" type:

2nd character in the extension data type

<table>
<thead>
<tr>
<th>Display format</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>Binary</td>
</tr>
<tr>
<td>D</td>
<td>Decimal signed</td>
</tr>
<tr>
<td>H</td>
<td>hexadecimal</td>
</tr>
<tr>
<td>No data</td>
<td>Decimal signed</td>
</tr>
</tbody>
</table>

3rd and/or 4th character in the extension data type

<table>
<thead>
<tr>
<th>Memory utilization</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>Byte</td>
</tr>
<tr>
<td>W</td>
<td>Word</td>
</tr>
<tr>
<td>D</td>
<td>Double Word</td>
</tr>
<tr>
<td>BU</td>
<td>Byte, Unsigned</td>
</tr>
<tr>
<td>WU</td>
<td>Word, Unsigned</td>
</tr>
<tr>
<td>DU</td>
<td>Double word, Unsigned</td>
</tr>
</tbody>
</table>
3.8 Details on the variable type

Sequence of characters in the INTEGER data type

1. "I" Basic INTEGER designation
2. Display format
3. Memory utilization
4. "U" Unsigned

<table>
<thead>
<tr>
<th>Valid INTEGER type specifications:</th>
</tr>
</thead>
<tbody>
<tr>
<td>IB</td>
</tr>
<tr>
<td>IBD</td>
</tr>
<tr>
<td>IBW</td>
</tr>
<tr>
<td>IBB</td>
</tr>
<tr>
<td>I</td>
</tr>
<tr>
<td>IDD</td>
</tr>
<tr>
<td>IDW</td>
</tr>
<tr>
<td>IDB</td>
</tr>
<tr>
<td>IDDU</td>
</tr>
<tr>
<td>IDWU</td>
</tr>
<tr>
<td>IDBU</td>
</tr>
<tr>
<td>IH</td>
</tr>
<tr>
<td>IHDU</td>
</tr>
<tr>
<td>IHWU</td>
</tr>
<tr>
<td>IHBU</td>
</tr>
</tbody>
</table>

VARIANT variable type

The VARIANT variable type is determined by the data type of the last value assignment. It can be scanned using the ISNUM or ISSTR functions. The VARIANT type is mainly suited to the purpose of writing either variable names or numerical values to the NC code.
Programming

The data type of variables can be checked:

Syntax: \texttt{ISNUM(VAR)}
Parameters: VAR Name of the variable whose data type is to be checked.

The result of the scan can be:
- FALSE = not a numerical variable (data type = STRING)
- TRUE = numerical variable (data type = REAL)

Syntax: \texttt{ISSTR(VAR)}
Parameters: VAR Name of the variable whose data type is to be checked.

The result of the scan can be:
- FALSE = numerical variable (data type = REAL)
- TRUE = not a numerical variable (data type = STRING)

Example:
\begin{verbatim}
IF ISNUM(VAR1) == TRUE
IF ISSTR(REG[4]+2) == TRUE
\end{verbatim}

The display mode of variables can be changed:

- For INTEGER, the display type can be changed.
  
  B Binary
  D Decimal signed
  H hexadecimal
  unsigned

  With the addition of U for Unsigned

- For REAL data types, only the number of places after the decimal point can be changed.

  Changing the type is illegal and generates an error message in the easyscreen_log.txt.
  file.

  Example:
  \begin{verbatim}
  Var1.typ = "IBW"
  Var2.typ = "R3"
  \end{verbatim}
**Variables**

3.8 Details on the variable type

**Numerical formats**

Numbers can be represented in either binary, decimal, hexadecimal or exponential notation:

<table>
<thead>
<tr>
<th>Format</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Binary</td>
<td>B01110110</td>
</tr>
<tr>
<td>Decimal</td>
<td>123.45</td>
</tr>
<tr>
<td>Hexadecimal</td>
<td>HF1A9</td>
</tr>
<tr>
<td>Exponential</td>
<td>-1.23E-3</td>
</tr>
</tbody>
</table>

Examples:

```
VAR1 = HF1A9
REG[0]= B01110110
DEF VAR7 = (R/-1.23E-3)
```

**Note**

When codes are generated with the "GC" function, only numerical values in decimal or exponential notation are evaluated, but not those in binary or hexadecimal notation.

**See also**

Variable parameters (Page 52)
3.9 Details on the toggle field

Description
The toggle field extension function can be used to display texts (entries in toggle field) as a function of NC/PLC variables. A variable, which makes use of a toggle field extension, is read-only.

Programming

Syntax: DEF identifier = (variable type / + $text number | * value="\image",value="\image2.png",[...]) / [Default] / [Texts(Long text, Short text, Graphic text, Units text)] / [Attributes] / [Help display] / [System or user variable] / [Position of short text] / [Position input/output field(Left, Top, Width, Height)] / [Colors]

Description: When the dialog is opened, the content of text number $85015 is displayed in the IO field. Default value 15 is entered in system variable DB90.DBB5. If the value saved in system variable DB90.DBB5 changes, the displayed text number $(85000 + <DB90.DBB5>) is recalculated in response to every change.

Parameters: Variable type Type of variables specified in the system or user variable
Text number Number (basis) of the language-specific text valid as the basis number.
System or user variable System or user variable (offset) via which the final text number (basis + offset) is displayed.

Example: DEF VAR1=(IB/+ $85000/15///"DB90.DBB5")
Variables

3.9 Details on the toggle field

Variable toggle field

It is possible to assign a variable toggle field to a dialog element, i.e., when the toggle key is pressed, a value configured in a CHANGE method is assigned to the variable.

An asterisk * is entered in the Limits or Toggle Field property to identify a variable toggle field when a variable is defined.

Example: DEF VAR1=(S/*)

Toggle-field-dependent displays

The toggle field is overlaid with graphics, which change depending on the value of the memory byte. If the value of the memory byte is 1, “image1.png” will appear. If it is 2, “image2.png” will appear.

DEF VAR1=(IDB/*1="\image1.png",
2="\image2.png"/,$85000/wrl/"MB[0]"/160,40,50,50)

The size and position of the image is defined under “Position of IO field (left, top, width, height)”. 

See also

Variable parameters (Page 52)
3.10 Details on the default setting

Overview

A variable can assume various states depending on whether a default value, or a system or user variable, or both, has been assigned to the variable field (I/O field or toggle field). (Not calculated: Toggling is not possible until a valid value is assigned to the variable).

Scope of the default settings

<table>
<thead>
<tr>
<th>If...</th>
<th>Then...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field type</td>
<td>Default setting</td>
</tr>
<tr>
<td>I/O field</td>
<td>yes</td>
</tr>
<tr>
<td>No</td>
<td>yes</td>
</tr>
<tr>
<td>Error</td>
<td>yes</td>
</tr>
<tr>
<td>yes</td>
<td>No</td>
</tr>
<tr>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Error</td>
<td>No</td>
</tr>
<tr>
<td>yes</td>
<td>Error</td>
</tr>
<tr>
<td>No</td>
<td>Error</td>
</tr>
<tr>
<td>Error</td>
<td>Error</td>
</tr>
<tr>
<td>Toggle</td>
<td>yes</td>
</tr>
<tr>
<td>No</td>
<td>yes</td>
</tr>
<tr>
<td>Error</td>
<td>yes</td>
</tr>
<tr>
<td>yes</td>
<td>No</td>
</tr>
<tr>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Error</td>
<td>No</td>
</tr>
<tr>
<td>yes</td>
<td>Error</td>
</tr>
<tr>
<td>No</td>
<td>Error</td>
</tr>
<tr>
<td>Error</td>
<td>Error</td>
</tr>
</tbody>
</table>

See also

Variable parameters (Page 52)
3.11 Details on the position of the short text, position of the input/output field

Overview

The short text and graphic text, as well as the input/output field and unit text, are each treated like a unit, i.e., position settings for short text apply to the graphic text and settings for the input/output field and to unit text.

Programming

The configured position entry overwrites the default value, i.e., only one value can be changed. If no position settings have been configured for subsequent screen form elements, then the position settings for the preceding screen form element are applied.

If no positions have been specified for any dialog elements, the default setting is applied. By default, the column width for the short text and input/output field is calculated for each line based on the number of columns and maximum line width, i.e., column width = maximum line width/number of columns.

The width of the graphics and unit text is predefined and optimized to suit the requirements of programming support. If graphics or unit text has been configured, the width of the short text or I/O field is reduced accordingly.

The order of short text and I/O field can be reversed by position settings.

See also

Variable parameters (Page 52)
3.12 Use of strings

Strings

Strings can be used as part of the configuration. These allow text to be displayed dynamically or different texts to be chained for the purpose of code generation.

Rules

The following rules must be observed with regard to string variables:

- Logic operations are processed from left to right.
- Nested expressions are solved from the inside outwards.
- No distinction is made between uppercase and lowercase type.
- String variables are generally displayed left justified.

Strings can be deleted simply by assigning a blank string.

Strings can be appended after the equality sign using the operator "<<". Quotation marks (") in the string are represented by two successive quotation mark symbols. Strings can be checked for equality in IF instructions.
3.12 Use of strings

Example

Default settings for the following examples:

VAR1.VAL = "This is an"
VAR8.VAL = 4
VAR14.VAL = 15
VAR2.VAL = "Error"
$85001 = "This is an"
$85002 = "Alarm text"

Editing strings:

- Chaining of strings:
  VAR12.VAL = VAR1 << " Error." ;Result: "This is an error"

- Deleting a variable:
  VAR10.VAL = "" ;Result: Blank string

- Setting a variable with a text variable:
  VAR11.VAL = VAR1.VAL ;Result: "This is an"

- Data type matching:
  VAR13.VAL = "This is the " << (VAR14 - VAR8) << ". error"
  ;Result: "This is the 11th error"

- Treatment of numerical values:
  VAR13.VAL = "Error" << VAR14.VAL << " : " << $85001 << $85002
  ;Result: "Error 15: "This is an alarm text"
  IF VAR15 == "Error" ;Strings in IF statement
  VAR16 = 18.1234
  ;Result: VAR16 equals 18.1234,
  ;if VAR15 equals "Error".
  ENDIF

- Quotation marks within a string:
  VAR2="Hello, this is a " Test"
  ;Result: Hello, this is a " Test"

- System or user-variable strings dependent on variable content:
  VAR2.Var = "$R[" << VAR8 << "]" ;Result: $R[4]

See also

STRING functions (Page 130)
3.13 CURPOS variable

Description
Using the CURPOS variable, it is possible to display or manipulate the position of the cursor in the active input field of the current dialog. The variable indicates how many characters are located in front of the cursor. If the cursor is located at the start of the input field, then CURPOS assumes the value of 0. If the value of CURPOS is changed, then the cursor is positioned at the appropriate location in the input field.

In order to be able to respond to changes in the variable value, it is possible to monitor for changes using a CHANGE block. If the value of CURPOS changes, then a jump is made to the CHANGE block and the instructions contained there are executed.
3.14 CURVER variable

Description

The CURVER (CURrent VERsion) property allows the programming to be adapted in order to handle different versions. The CURVER variable is read-only.

Note

Even if previously recompiled with an older version, the code is automatically generated with the most recent version. The "GC" command always generates the most recent version. An additional identifier indicating the generated version is inserted in the user comment of the generated code in versions > 0.

Rules

The most recent dialog with all its variables is always displayed.

- Variables used previously may not be changed.
- New variables are inserted in the existing (cycle) programming in arbitrary order.
- It is not permissible to delete variables from a dialog from one version to the next.
- The dialog must contain all variables of all versions.

Example

(IF CURVER==1 ...) ; When the code is recompiled, CURVER is automatically assigned the version of the recompiled code.
3.15 ENTRY variable

Description
The ENTRY variable can be used to check by what method a dialog has been called.

Programming
Syntax: ENTRY
Description: The ENTRY variable is a read only variable.
Return Value: The result of the scan can be:
0 = No programming support
1 = Programming support (the dialog was called by programming support)
2 = Programming support + default setting from the previous dialog (sub-dialog)
3 = Programming support + recompilation
4 = Programming support + recompilation with generated comments, with # sign
5 = Programming support + recompilation with generated comments, without # sign

Example

IF ENTRY == 0
  DLGL("The dialog was not called during programming")
ELSE
  DLGL("The dialog was called during programming")
ENDIF
### 3.16 ERR variable

**Description**

Variable ERR can be used to check whether the preceding lines have been executed correctly.

**Programming**

Syntax: `ERR`

Description: The ERR variable is read-only.

Return Value: The result of the scan can be:

- FALSE = previous line was executed error-free
- TRUE = previous line was not executed error-free

**Example**

```plaintext
VAR4 = Thread[VAR1,"CDM",3] ; Output value from array
IF ERR == TRUE ; Scan to check whether value has been found
    VAR5 = "Error accessing array" ; If the value has not been found in the
                                    ; array, the value "Error accessing array" is
                                    ; assigned to the variables.
ELSE
    VAR5 = "All OK" ; If the value has been found in the array,
                    ; the value "All OK" is assigned to the variables.
ENDIF
```
3.17 FILE_ERR variable

Description

Variable FILE_ERR can be used to check whether the preceding GC or CP command has been executed correctly.

Programming

Syntax: FILE_ERR
Description: The FILE_ERR variable is read-only.
Return Value: Possible results are:
0 = Operation okay
1 = Drive/path not available
2 = Path/file access error
3 = Drive not ready
4 = Incorrect file name
5 = File is already open
6 = Access denied
7 = Target path not available or not permitted
8 = Copy source same as target
10 = Internal error: FILE_ERR = 10 means that the error cannot be classified in the other categories.
Example

```plaintext
CP("D:\source.mpf","E:\target.mpf")

IF FILE_ERR > 0
    ; Scan to ascertain whether error has occurred
    IF FILE_ERR == 1
        ; Scan specific error numbers and output
        associated error text
        VAR5 = "Drive/path not available"
    ELSE
        IF FILE_ERR == 2
            VAR5 = "Path/file access error"
        ELSE
            IF FILE_ERR == 3
                VAR5 = "Wrong file name"
        ENDIF
    ENDIF
ELSE
    VAR5 = "All OK" ; If no errors have occurred in CP (or GC),
                   "All OK" is output
ENDIF
```
### 3.18 FOC variable

#### Description

The FOC variable can be used to control the input focus (the current active input/output field) in a dialog. Responses to cursor left, right, up and down movements, as well as PGUP, PGDN, are predefined and cannot be modified.

#### Note

The FOC function may not be initiated as a result of a navigation event. The cursor position may only be changed in softkey PRESS blocks, CHANGE blocks, etc. The FOC function cannot be applied to variables with input mode wr = 0 and wr = 4 or to Help variables.

#### Programming

**Syntax:**

FOC

**Description:**

The variable can be read and written.

**Return Value:**

- **Read**
  - The result is the name of the variable to which the FOC function has been applied.
- **Write**
  - It is possible to assign either a string or a numerical value. A string is interpreted as a variable name and a numerical value as a variable index.

**Example**

```plaintext
IF FOC == "Var1" ; Read focus
  REG[1] = Var1
ELSE
  REG[1] = Var2
ENDIF

FOC = "Var1" ; The input focus will be assigned to Variable 1.
FOC = 3 ; The input focus will be assigned to the 3rd dialog element with WR ≥ 2.
```
3.19 S_CHAN variable

Description

The S_CHAN variable can be used to determine the number of the current channel for display or evaluation purposes.
4.1 Operators

Overview

The following operators can be used when programming:

- Mathematical operators
- Relational operators
- Logic (Boolean) operators
- Bit operators
- Trigonometric functions

4.1.1 Mathematical operators

Overview

<table>
<thead>
<tr>
<th>Mathematical operators</th>
<th>Identifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td>Addition</td>
</tr>
<tr>
<td>-</td>
<td>Subtraction</td>
</tr>
<tr>
<td>*</td>
<td>Multiplication</td>
</tr>
<tr>
<td>/</td>
<td>Division</td>
</tr>
<tr>
<td>MOD</td>
<td>Modulo operation</td>
</tr>
<tr>
<td>()</td>
<td>Parentheses</td>
</tr>
<tr>
<td>AND</td>
<td>AND operator</td>
</tr>
<tr>
<td>OR</td>
<td>OR operator</td>
</tr>
<tr>
<td>NOT</td>
<td>NOT operator</td>
</tr>
<tr>
<td>ROUND</td>
<td>Round off numbers with decimal places</td>
</tr>
</tbody>
</table>

Example: VAR1.VAL = 45 * (4 + 3)
4.1 Operators

ROUND

The ROUND operator is used to round off numbers with up to 12 decimal places during execution of a dialog configuration. The variable fields cannot accept the decimal places in the display.

Use

ROUND is controlled by the user with two parameters:

VAR1 = 5.2328543
VAR2 = ROUND( VAR1, 4 )

Result: VAR2 = 5.2339

VAR1 contains the number to be rounded. The parameter “4” indicates the number of decimal places in the result, which is placed in VAR2.

Trigonometric functions

<table>
<thead>
<tr>
<th>Trigonometric functions</th>
<th>Identifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIN(x)</td>
<td>Sine of x</td>
</tr>
<tr>
<td>COS(x)</td>
<td>Cosine of x</td>
</tr>
<tr>
<td>TAN(x)</td>
<td>Tangent of x</td>
</tr>
<tr>
<td>ATAN(x, y)</td>
<td>Arc tangent of x/y</td>
</tr>
<tr>
<td>SQRT(x)</td>
<td>Square root of x</td>
</tr>
<tr>
<td>ABS(x)</td>
<td>Absolute value of x</td>
</tr>
<tr>
<td>SDEG(x)</td>
<td>Conversion to degrees</td>
</tr>
<tr>
<td>SRAD(x)</td>
<td>Conversion to radian</td>
</tr>
</tbody>
</table>

Note

The functions operate with radian measure. The functions SDEG() and SRAD() can be used for conversion.

Example: VAR1.VAL = SQRT(2)

Constants

<table>
<thead>
<tr>
<th>Constants</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>PI</td>
<td>3.14159265358979323846</td>
</tr>
<tr>
<td>FALSE</td>
<td>0</td>
</tr>
<tr>
<td>TRUE</td>
<td>1</td>
</tr>
</tbody>
</table>

Example: VAR1.VAL = PI
Relational operators

<table>
<thead>
<tr>
<th>Relational operators</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>==</td>
<td>Equal to</td>
</tr>
<tr>
<td>&lt;&gt;</td>
<td>Not equal to</td>
</tr>
<tr>
<td>&gt;</td>
<td>Greater than</td>
</tr>
<tr>
<td>&lt;</td>
<td>Less than</td>
</tr>
<tr>
<td>&gt;=</td>
<td>Greater than or equal to</td>
</tr>
<tr>
<td>&lt;=</td>
<td>Less than or equal to</td>
</tr>
</tbody>
</table>

**Example**

```plaintext
IF VAR1.VAL == 1
    VAR2.VAL = TRUE
ENDIF
```

**Conditions**

The nesting depth is unlimited.

Condition with a command:

```plaintext
IF 
... 
ENDIF
```

Condition with two commands:

```plaintext
IF 
... 
ELSE 
...  
ENDIF
```
4.1 Operators

4.1.2 Bit operators

Overview

<table>
<thead>
<tr>
<th>Bit operators</th>
<th>Identifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOR</td>
<td>Bit-serial OR</td>
</tr>
<tr>
<td>BXOR</td>
<td>Bit-serial XOR</td>
</tr>
<tr>
<td>BAND</td>
<td>Bit-serial AND</td>
</tr>
<tr>
<td>BNOT</td>
<td>Bit-serial NOT</td>
</tr>
<tr>
<td>SHL</td>
<td>Shift bits to left</td>
</tr>
<tr>
<td>SHR</td>
<td>Shift bits to right</td>
</tr>
</tbody>
</table>

SHL operator

Bits are shifted to the left using the SHL (SHIFT LEFT) operator. You can specify both the value to be shifted and the number of shift increments directly or via a variable. If the limit of the data format is reached, the bits are shifted beyond the limit without displaying an error message.

Use

Syntax: \( \text{variable} = \text{value} \text{ SHL} \text{increment} \)

Description: Shift Left

Parameters: value value to be shifted
increment number of shift increments

Example

PRESS(VS1)

VAR01 = 16 SHL 2 ; Result = 64
VAR02 = VAR02 SHL VAR04 ; Convert content of VAR02 to 32-bit unsigned, and shift content to left by number of bits specified in VAR04. Then convert 32-bit value back to format of variable VAR02.

END_PRESS
SHR operator

Bits are shifted to the RIGHT using the SHR (SHIFT RIGHT) function. You can specify both the value to be shifted and the number of shift increments directly or via a variable. If the limit of the data format is reached, the bits are shifted beyond the limit without displaying an error message.

Use

Syntax: \( \text{variable} = \text{value SHR increment} \)

Description: Shift Right

Parameters:
- \( \text{value} \) value to be shifted
- \( \text{increment} \) number of shift increments

Example

```
PRESS(VS1)

VAR01 = 16 SHR 2 ; Result = 4
VAR02 = VAR02 SHR VAR04 ; Convert content of VAR02 to 32-bit unsigned, and shift content to left by number of bits specified in VAR04. Then convert 32-bit value back to format of variable VAR02.

END_PRESS
```
4.2 Methods

Overview

Various types of event (exit input field, actuate softkey) can initiate specific actions in dialogs and dialog-dependent softkey menus (softkey menus that are called from a newly configured dialog). These actions are configured in methods.

The following table shows the basic principle used to program a method:

<table>
<thead>
<tr>
<th>Definition block</th>
<th>Comment</th>
<th>Chapter reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRESS(HS1)</td>
<td>;Method start identifier</td>
<td></td>
</tr>
<tr>
<td>IM... LS...</td>
<td>;Functions</td>
<td>See chapter &quot;Functions&quot;</td>
</tr>
<tr>
<td>Var1.st = ...</td>
<td>;Changing properties</td>
<td>see chapter &quot;Softkey menu&quot; and chapter &quot;Dialog elements&quot;</td>
</tr>
<tr>
<td>Var2 = Var3 + Var4 ... EXIT</td>
<td>;Calculation with variables</td>
<td>See chapter &quot;Defining variables&quot;</td>
</tr>
<tr>
<td>END_PRESS</td>
<td>;Method end identifier</td>
<td></td>
</tr>
</tbody>
</table>

4.2.1 CHANGE

Description

CHANGE methods are executed if a variable value changes, i.e., variable calculations that are performed as soon as a variable value changes are configured within a CHANGE method.

There are two types of CHANGE method, i.e., element-specific and global:

- The element-specific CHANGE method is executed if the value of a specified variable changes. If a system or user variable is assigned to a variable, cyclic updating of the variable value can be configured in a CHANGE method.
- The global CHANGE method is executed if the value of any variable changes and no element-specific CHANGE method has been configured.

"Element-specific" programming

Syntax: CHANGE(Identifier)

... END_CHANGE

Description: Changes the value of a specific variable

Parameters: Identifier Name of the variable
Programming commands

4.2 Methods

Example

```plaintext
DEF VAR1=(I/////(DB20.DBB1)) ; A system variable is assigned to Var1
CHANGE(VAR1)
  IF VAR1.Val <> 1
    VAR1.st="Tool OK!" ; If the value of the system variable ≠ 1,
    otto=1
    ELSE
      VAR1.st="Attention: Error!" ; If the value of the system variable = 1,
      otto=2
      ENDIF
    ENDIF
  VAR2.Var=2
END_CHANGE
```

"Global" programming

Syntax: CHANGE()

Description: Changes any variable value

Parameters: - None -

Example

```plaintext
CHANGE()
  EXIT ; If any of the variable values change, the dialog will
  be terminated.
END_CHANGE
```
4.2 Methods

4.2.2 FOCUS

Description

The FOCUS method is executed if the focus (cursor) is positioned on another field in the dialog.

The FOCUS method must not be initiated as a result of a navigation event. The cursor may only be moved in softkey PRESS blocks, CHANGE blocks, etc. Responses to cursor movements are predefined and cannot be modified.

Note

Within the FOCUS block, it is not possible to select a different variable, nor can a new dialog be loaded.

Programming

Syntax: FOCUS

... END_FOCUS

Description: Positions the cursor

Parameters: - None -

Example

FOCUS
    DLGL("The focus has been placed on variable" << FOC << ").
END_FOCUS
4.2.3 LOAD

Description
The LOAD method is executed after the variable and softkey definitions (DEF Var1= ..., HS1= ...) have been interpreted. At this time, the dialog is not yet displayed.

Programming
Syntax: LOAD

```
... 
END_LOAD
```

Description: Download
Parameters: - None -

Example
```
LOAD ; Start identifier
Screen form1.Hd = $85111 ; Assign text for dialog header from language file
VAR1.Min = 0 ; Assign MIN variable limit
VAR1.Max = 1000 ; Assign MAX variable limit
END_LOAD ; End code
```

See also
Line and rectangle (Page 137)
4.2 Methods

4.2.4 LOAD GRID

Description
The table description can be made available dynamically within the LOAD block using the LG method.

In order to assign a table using the LG method, the variable must have already been defined as a grid variable and cross-referenced to an existing, valid table.

Programming

Syntax: LG (Grid name, Variable name [,File name])
Description: Loads a table
Parameters:
- Grid name: Name of the table (grid) in inverted commas
- Variable name: Name of the variable to which the table is to be assigned, in inverted commas
- File name: Name of the file in which the table (grid) is defined, in inverted commas. Only needs to be specified if the table is not defined within the file that also contains the definition of the variable.
4.2.5 UNLOAD

Description
The UNLOAD method is executed before a dialog is unloaded.

Programming
Syntax:

```plaintext
UNLOAD

... 

END_UNLOAD
```

Description: Unload
Parameters: - None -

Example

```plaintext
UNLOAD
REG[1] = VAR1 ; Save variable in register
END_UNLOAD
```
4.2 Methods

4.2.6 OUTPUT

Description

The OUTPUT method is executed if the "GC" function is called. Variables and Help variables are configured as an NC code in an OUTPUT method. The individual elements in a code line are linked by means of blanks.

Note

The NC code can be generated in an extra file by means of file functions and transferred to the NC.

Programming

Syntax: OUTPUT (Identifier)

```
... END_OUTPUT
```

Description: Outputs variables in the NC program.

Parameters: Identifier Name of OUTPUT method

Block numbers and skip identifiers

The OUTPUT block must not contain line numbers or skip identifiers if you wish to keep the line numbers and hide markings directly set with active program support in the parts program in case of recompilations.

Editor changes in the parts program produce the following response:

<table>
<thead>
<tr>
<th>Condition</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of blocks remains unchanged.</td>
<td>Block numbers are retained.</td>
</tr>
<tr>
<td>Number of blocks is reduced.</td>
<td>The highest block numbers are canceled.</td>
</tr>
<tr>
<td>Number of blocks is increased.</td>
<td>New blocks are not numbered.</td>
</tr>
</tbody>
</table>

Example

```
OUTPUT(CODE1)
  "CYCLE82(" Var1.val "," Var2.val "," Var3.val "," Var4.val "," Var5.val "," Var6.val ")"
END_OUTPUT
```
4.2.7 PRESS

Description
The PRESS method is executed when the corresponding softkey is pressed.

Programming

Syntax: \text{PRESS}(\text{softkey})

Identifiers: Pressing a softkey
Parameters:

- Softkey: Name of softkey: HS1 - HS8 and VS1 - VS8
- RECALL: <RECALL> key
- PU: Page Up Screen up
- PD: Page Down Screen down
- SL: Scroll left Cursor left
- SR: Scroll right Cursor right
- SU: Scroll up Cursor up
- SD: Scroll down Cursor down

Example

\begin{verbatim}
HS1 = ("another softkey menu")
HS2 = ("no function")
PRESS(HS1)
  LS("Menu1") ; load another softkey menu
  Var2 = Var3 + Var1
END_PRESS
PRESS(HS2)
END_PRESS
PRESS(PU)
  INDEX = INDEX -7
  CALL("UP1")
END_PRESS
\end{verbatim}
4.2.8 Example Version management with OUTPUT blocks

Overview

Additional variables can be added to existing dialogs when expanding the user interface. A version identifier in parentheses is appended to the additional variables in the definition following the variable name: (0 = Original, is not written), 1 = Version 1, 2 = Version 2, etc.

Example

```
DEF var100=(R//1) ; Original, corresponds to Version 0
DEF var101(1)=(S//"Hello") ; Expansion with effect from Version 1
```

When writing the OUTPUT block, you can specify which variables are written, with reference to a particular version identifier.

Example

```
OUTPUT(NC1) ; Only the variables of the original version are made available in the OUTPUT block.
OUTPUT(NC1,1) ; The variables of the original version and the expansions with version identifier 1 are made available in the OUTPUT block
```

The OUTPUT block for the original version does not need a version identifier, however you can specify it with 0. OUTPUT(NC1) is equivalent to OUTPUT(NC1,0). Version identifier n in the OUTPUT block includes all variables of the originals 0, 1, 2, ... up to and including n.
Programming with version identifier

//M(XXX) ; Version 0 (default)
DEF var100=(R//1)
DEF var101=(S//"Hello")
DEF TMP
VS8=("GC")
PRESS(VS8)
  GC("NC1")
END_PRESS

OUTPUT(NC1)
var100","var101
END_OUTPUT

; ************** Version 1, extended definition **************
//M(XXX)
DEF var100=(R//1)
DEF var101=(S//"Hello")
DEF var102(1)=(V//"HUGO")
DEF TMP
VS8=("GC")
PRESS(VS8)
  GC("NC1")
END_PRESS
...

OUTPUT(NC1) ; Original and the new version in addition
var100","var101
END_OUTPUT
...

OUTPUT(NC1,1) ; Version 1
var100","var101"," var102
END_OUTPUT
4.3 Functions

Overview

A variety of functions are available in dialogs and dialog-dependent softkey menus. These can be activated by specific events (exit input field, actuate softkey) and configured in methods.

Subroutines

Repeatedly used configuring instructions or others, which define the process for a particular operation can be configured in subprograms. Subprograms can be loaded into the main program or other subprograms at any time and executed as often as necessary, i.e., the instructions they contain do not need to be configured repeatedly. The definition blocks of the dialogs/softkey menu constitute a main program.

External functions

Additional, user-specific functions can be integrated by means of external functions. The external functions are stored in a DLL file and identified by an entry in the definition lines of the configuration file.

PI services

The PI_SERVICE function can be used to start PI Services (Program Invocation Services) from the PLC in the NC area.

See also

Function (FCT) (Page 104)
PI services (Page 134)

4.3.1 Define block (//B)

Description

In the program file, subprograms are identified by the block identifier //B and terminated with //END. Several subprograms can be defined under each block identifier.

Note

The variables used in the subprogram must be defined in the dialog in which the subprogram is called.
Programming

A block is structured in the following way:

Syntax: \[//B(Block \ name)\]

\[SUB(Identifier)\]

END_SUB

[SUB(Identifier)

...]

END_SUB]

...

//END

Description: Defines a subprogram

Parameters:

Block name  Name of block identifier

Identifier  Name of subprogram

Example

//B(PROG1) ; Block start
SUB(UP1) ; Start of subprogram
...
REG[0] = 5 ; Assign value 5 to register 0
...
END_SUB ; End of subprogram
SUB(UP2) ; Start of subprogram
IF VAR1.val=="Otto"
VAR1.val="Hans"
RETURN
ENDIF
VAR1.val="Otto"
END_SUB ; End of subprogram
//END ; Block end
4.3 Functions

4.3.2 Subprogram call (CALL)

Description
The CALL function can be used to call a loaded subprogram from any point in a method. Subprogram nesting is supported, i.e., you can call a subprogram from another subprogram.

Programming

Syntax: CALL("Identifier")
Description: Subroutine call
Parameters: Identifier Name of subprogram

Example

```plaintext
//M(SCREEN FORM1)
VAR1 = ...
VAR2 = ...
LOAD
...
LB("PROG1") ; Load block
...
END_LOAD
CHANGE()
...
CALL("UP1") ; Call subroutine and execute
...
END_CHANGE
...
//END
```

4.3.3 Check Variable (CVAR)

Description
You can use the CVAR (CheckVariable) function to run a scan to ascertain whether all or only certain variables or Help variables in a screen form are error-free.

It may be useful to check if variables contain a valid value before an NC code with the GC function.

A variable is error-free if the state of the variable Identifier.vld = 1.
Programming

Syntax: \texttt{CVAR(VarN)}

Description: Checks variables for valid content

Parameters: VarN

List of variables to be checked.

- Up to 29 variables, each separated by a comma, can be checked. A character length of 500 must not be exceeded.
- The result of the scan can be:
  - 1 = TRUE (all variables have valid content)
  - 0 = FALSE (at least one variable has invalid content)

Example

```
IF CVAR == TRUE ; Check all variables
    VS8.SE = 1 ; If all variables are error-free, softkey VS8 is visible
ELSE
    VS8.SE = 2 ; If a variable has an invalid value, softkey VS8 is disabled
ENDIF

IF CVAR("VAR1", "VAR2") == TRUE
    ; Check variables VAR1 and VAR2
    DLGL ("VAR1 and VAR2 are OK") ; If the values of VAR1 and VAR2 are error-free, "VAR1 and VAR2 are OK" appears in the dialog line
ELSE
    DLGL ("VAR1 and VAR2 are not OK") ; If the values of VAR1 and VAR2 are invalid, "VAR1 and VAR2 are not OK" appears in the dialog line
ENDIF
```
4.3.4 Copy Program file function (CP)

Description
The CP (Copy Program) function copies files within the HMI file system or within the NC file system.

Programming
Syntax: \[ CP("Source\ file", \"Target\ file\") \]
Description: Copies a file
Parameters: Source file Complete path to the source file Target file Complete path data of the target file

The return value can be used to query whether the function was successful:
\[ CP(\"MPF.DIR\CFI.MPF\",\"WKS.DIR\123.WPD\CFI.MPF\",VAR1) \]

Example
Application with return value:

\[ CP(\"NC/MPF.DIR/ASLAN.MPF\",\"NC/MPF.DIR/HOHO.MPF\",VAR3) \]
\[ CP(\"NC/MPF.DIR/hoho.MPF\",VAR0,VAR3) \]
\[ CP(VAR4,VAR0,VAR3) \]
\[ CP("CF_CARD:/mpf.dir/myprog.mdf","NC/MPF.DIR/HOHO.MPF",VAR3) \]
\[ CP("NC/MPF.DIR/HOHO.MPF","CF_CARD:/xyz/123.mpf",VAR3) ; xyz must exist \]

Application without return value:

\[ CP("NC/MPF.DIR/HOHO.MPF","NC/MPF.DIR/ASLAN.MPF") \]
\[ CP("NC/MPF.DIR/hoho.MPF",VAR0) \]
\[ CP(VAR4,VAR0) \]
\[ CP("CF_CARD:/mpf.dir/myprog.mdf","NC/MPF.DIR/HOHO.MPF") \]
\[ CP("NC/MPF.DIR/HOHO.MPF","CF_CARD:/xyz/123.mpf") ; xyz must exist \]

See also
Support of FILE_ERR: FILE_ERR variable (Page 69)
4.3.5 Delete Program file function (DP)

Description

The DP (Delete Program) function deletes a file from the passive HMI or active NC file system.

Programming

Syntax: \texttt{DP("File")}

Description: Delete file

Parameters: File Complete path name of file to be deleted

Example

The following data management syntax is used for this function:

- with return value
  \begin{verbatim}
  DP("//NC/MPF.DIR/XYZ.DIR ", VAR1)
  \end{verbatim}
  \begin{itemize}
  \item VAR1 = 0 File was deleted.
  \item VAR1 = 1 File was not deleted.
  \end{itemize}

- Without return value:
  \begin{verbatim}
  DP("//NC/MPF.DIR/XYZ.DIR ")
  \end{verbatim}

  \begin{verbatim}
  DP("\MPF.DIR\CFI.MPF")
  \end{verbatim}
4.3.6 Exist Program file function (EP)

Description
The EP (Exist Program) function checks whether a particular NC program is stored on the specified path in the NC or HMI file system.

Programming
Syntax: EP("File")
Description: Checks the existence of the NC program
Parameters: File Complete path to the file in the NC or HMI file system
Return Value: Name of a variable to which the result of the scan should be assigned.

The result of the scan can be:
- M = File is stored on HMI
- N = file is stored on NC
- Blank string = The file neither exists on the HMI nor on the NC

The EP function can handle the new syntax and the old logic (with adapted Syntax).
The file is directly addressed using a qualifying name:

//NC/MPF.DIR/XYZ.DIR
or
CF_CARD: /MPF.DIR/XYZ.DIR
or
LOC: /MPF.DIR/XYZ.DIR
New syntax:

EP("/NC/MPF.DIR/XYZ.DIR ", VAR1)
EP("CF_CARD:/MPF.DIR/XYZ.DIR ", VAR1)
EP("LOC:/MPF.DIR/XYZ.DIR ", VAR1)
; with return value:
; VAR1 = 0  File exists.
; VAR1 = 1  File does not exist.

Old syntax:

EP("/MPF.DIR/CFI.MPF", VAR1)
; with return value:
; VAR1 = M  File is located in the HMI file system.
; VAR1 = N  File is located in the NC file directory.
; VAR1 = B  File is located in the HMI and NC file system.

Example

EP("\MPF.DIR\CFI.MPF", VAR1) ; Check whether file CFI.MPF exists in the HMI file system.

IF VAR1 == "M"
  DLGL("File is located in the HMI file system")
ELSE
  IF VAR1 == "N"
    DLGL("File is located in the NC file directory")
  ELSE
    DLGL("File is located neither in the HMI nor in the NC file directory")
  ENDIF
ENDIF
4.3.7 Move Program file function (MP)

Description

The MP (Move Program) function copies files within the HMI file system or within the NC file system.

Programming

Syntax: MP("source", "target")

Description: Move file

Parameters: Source file Complete path data
Target file Complete path data

Examples

MP("/NC/MPF.DIR/123.MPF","/NC/MPF.DIR/ASLAN.MPF",VAR3)  // full paths
MP("/NC/MPF.DIR/123.MPF","/NC/MPF.DIR",VAR3)  // target without file names
MP("/NC/MPF.DIR/123.MPF",VAR0,VAR3)  // target via variable
MP(VAR4,VAR0,VAR3)  // source and target via variable
MP("CF_CARD:/mpf.dir/myprog.mdf","/NC/MPF.DIR/123.MPF",VAR3)  // from CF card in NC
MP("/NC/MPF.DIR/HOHO.MPF","CF_CARD:/xyz/123.mpf",VAR3)  // from NC in CF card
MP("USB:/mpf.dir/myprog.mdE","/NC/MPF.DIR",VAR3)  // from USB to NC
4.3.8 Select Program file function (SP)

Description

The SP (Select Program) function selects a file in the active NC file system for execution, i.e., the file must be loaded into the NC beforehand.

Programming

Syntax: \texttt{SP("File")}

Identifiers: Selecting a program

Parameters: "File" Complete path name of NC file

Example

The following data management syntax is used for this function:

- with return value
  \[
  \text{SP("//NC/MPF.DIR/MYPROG.MPF", VAR1)}
  \]
  \[
  \text{VAR1} = 0 \quad \text{File was loaded.}
  \]
  \[
  \text{VAR1} = 1 \quad \text{File was not loaded without return value}
  \]

- Without return value:
  \[
  \text{SP("//NC/MPF.DIR/MYPROG.MPF")}
  \]
//M(TestGC/"Code generation:"

DEF VAR1 = (R//1)
DEF VAR2 = (R//2)
DEF D_NAME

LOAD
VAR1 = 123
VAR2 = -6
END_LOAD

OUTPUT (CODE1)
"Cycle123( VAR1 ,, VAR2 ")"
"M30"
END_OUTPUT

PRESS(VS1)
D_NAME = "CF_CARD:/MPF.DIR/MESSEN.MPF"
GC("CODE1",D_NAME) ; Write code from the OUTPUT method to file
CF_CARD:/MPF.DIR/MESSEN.MPF
END_PRESS

PRESS(HS8)
MP("CF_CARD:/MPF.DIR/MESSEN.MPF","/NC/MPF.DIR") ; Load file into NC
SP("\MPF.DIR\MESSEN.MPF") ; Select file
END_PRESS
4.3.9 Dialog line (DLGL)

Description

It is possible to configure short texts (messages or input tips) for output in the dialog line of
the dialog in response to certain situations.

Possible number of characters in the default font size: approx. 50

Programming

Syntax: DLGL("String")
Description: Outputs text in the dialog line
Parameters: String Text, which is displayed in the dialog line

Example

```
IF Var1 > Var2
  DLGL("Value too large!"); The text "Value too large!" appears in the dialog
  line if variable1 > variable2.
ENDIF
```
4.3.10 Evaluate (EVAL)

Description
The EVAL function evaluates a transferred expression and then executes it. With this function, expressions can be programmed during runtime. This can be useful, for example, for indexed access operations to variables.

Programming
Syntax: \texttt{EVAL(exp)}
Description: Evaluates an expression
Parameters: \texttt{exp} Logic expression

Example

\begin{verbatim}
VAR1=(S)
VAR2=(S)
VAR3=(S)
VAR4=(S)
CHANGE()

REG[7] = EVAL("VAR3<REG[5]") ; The expression in parentheses produces
  VAR3 if the value of REG[5] is equal to 3.
  The value of VAR3 is, therefore, assigned
  to REG[7].

  IF REG[5] == 1
  REG[7] = VAR1
  ELSE
  IF REG[5] == 2
  REG[7] = VAR2
  ELSE
  IF REG[5] == 3
  REG[7] = VAR3
  ELSE
  IF REG[5] == 4
  REG[7] = VAR4
  ENDIF
  ENDIF
  ENDIF
  END_CHANGE
\end{verbatim}
4.3 Functions

4.3.11 Exit dialog (EXIT)

Description
The EXIT function is used to exit a dialog and return to the master dialog. If no master dialog is found, you will exit the newly configured user interfaces and return to the standard application.

Programming (without parameters)

Syntax: EXIT
Description: Exits a dialog
Parameters: - None -

Example

PRESS(HS1)
EXIT
END_PRESS

Description
If the current dialog has been called with a transfer variable, the value of the variables can be changed and transferred to the output dialog.

The variable values are each assigned to the variables transferred from the output dialog to the subsequent dialog using the "LM" function. Up to 20 variable values, each separated by a comma, can be transferred.

Note
The sequence of variables or variable values must be the same as the sequence of transfer values programmed for the LM function to preclude assignment errors. Any unspecified variable values will not be changed when the transfer is made. The modified transfer variables are immediately valid in the output dialog on execution of the LM function.
Programming commands

4.3 Functions

Programming with a transfer variable

Syntax: \texttt{EXIT[(VARx)]}

Description: Exits dialog and transfers one or more variables

Parameters: \texttt{VARx} Label variables

Example

\begin{verbatim}
//M(Screen form1)
...
PRESS(HS1)
LM("SCREEN FORM2","CFI.COM",1, POSX, POSY, DIAMETER)
\hspace{1em} ; Interrupt screen form1 and open screen form2.
\hspace{1em} Transfer variables POSX, POSY and DIAMETER in
doing this.
DLGL("Screen form2 ended")
\hspace{1em} ; On returning from screen form2, the following
text appears in the dialog line of screen form
1: Screen form2 ended.
END_PRESS
...
//END

//M(Screen form2)
...
PRESS(HS1)
EXIT(5, , CALCULATED_DIAMETER)
\hspace{1em} ; Exit screen form2 and return to screen form1 in
the line after LM. In doing this, assign the
value 5 to the variable POSX and the value of
the CALCULATED_DIAMETER variable to the DIAMETER
variable. The variable POSY retains its current
value.
END_PRESS
...
//END
\end{verbatim}
4.3 Functions

4.3.12 Exit Loading Softkey (EXITLS)

Description

You can use the EXITLS function to exit the current user interface and load a defined softkey menu.

Programming

Syntax: \texttt{EXITLS("Softkey menu", "Path")}

Description: Exits dialog and loads a softkey menu

Parameters:

- \texttt{Softkey menu} \hspace{1cm} Name of the softkey menu to be loaded
- \texttt{Path name} \hspace{1cm} Directory path of the softkey menu to be loaded

Example

\begin{verbatim}
PRESS(HS1)
    EXITLS( "Menu1", "AEDITOR.COM" )
END_PRESS
\end{verbatim}
4.3.13  Function (FCT)

Description

The external functions are stored in a DLL file and identified by an entry in the definition lines of the configuration file.

Note

The external function must have at least one return parameter.

Programming

Syntax:  

FCT Function name = ("File*/Type of return/Types of permanent parameters/Types of variable parameters)

FCT InitConnection = ("c:\tmp\xyz.dll"/I/R,I,S/I,S)

Description:  

An external function can e.g. be called in the LOAD block or in the PRESS block.

Parameters:  

<table>
<thead>
<tr>
<th>Function name</th>
<th>Name of external function</th>
</tr>
</thead>
<tbody>
<tr>
<td>File</td>
<td>Complete path to DLL file</td>
</tr>
<tr>
<td>Type of return</td>
<td>Data type of the return value</td>
</tr>
<tr>
<td>Type of fixed parameter</td>
<td>Value parameter</td>
</tr>
<tr>
<td>Type of variable parameter</td>
<td>Reference parameter</td>
</tr>
</tbody>
</table>

The data types are separated by commas.

The external function can e.g. be called in the LOAD block or in the PRESS block.

Example:

press(vs4)

RET = InitConnection(VAR1,13,"Servus",VAR2,VAR17)

end_press
Structure of the external function

The external function must take into account a certain, specific signature:

Syntax: \texttt{external "C" \textbf{dllexport} void InitConnection (ExtFctStructPtr FctRet, ExtFctStructPtr FctPar, char cNrFctPar)}

Description: DLL export, only when implemented in Windows

Specified and transfer parameters are strictly defined. The actual call parameters are transferred using the transferred structures.

Parameters:
- \texttt{cNrFctPar} Number of call parameters = number of structure elements in FctPar
- \texttt{FctPar} Pointer to a field of structure elements, which contain the particular call parameter with data type.
- \texttt{FctRet} Pointer to a structure for the function value return with data type.

Definition of the transfer structure

```c
union CFI_VARIANT
{
    char b;
    short int i;
    double r;
    char* s;
}

typedef struct ExtFctStructTag
{
    char cTyp;
    union CFI_VARIANT value;
} ExtFctStruct;

typedef struct ExtFct* ExtFctStructPtr;
```
If the external function is to be developed independently of the platform (Windows, Linux), then it is not permissible to use the keyword __declspec(dllexport). This keyword is only required under Windows. For instance, the following macro can be used under Qt.

```c
#ifdef Q_WS_WIN
    #define MY_EXPORT __declspec(dllexport)
#else
    #define MY_EXPORT
#endif
```

The function is declared as follows:

```c
extern "C" MY_EXPORT void InitConnection
    (ExtFctStructPtr FctRet, ExtFctStructPtr FctPar, char cNrFctPar)
```

If the screens, configured with Easy Screen, are used on the NCU and PCU/PC, then the extension of the binary file must be omitted:

```c
FCT InitConnection = ("xyz"/I/R,I,S/I,S)
```

When the absolute path information is omitted, Easy Screen first searches for the binary file in the proj directory.
4.3.14 Generate code (GC)

Description

The GC (Generate Code) function generates NC code from the OUTPUT method.

Programming

Syntax: \texttt{GC("Identifier","Target file"),[Opt],[Append])}

Description: Generate an NC code

Parameters:

- **Identifier**: Name of OUTPUT block from which code is generated
- **Target file**: Path name of target file for HMI or NC file system
  - If the target file is not specified (only possible within programming support system), the code will be written to the location of the cursor within the file that is currently open.

- **Opt**: Option for generating comments
  - 0: (Default setting) Generate code with comment for the purpose of recompilability.
  - 1: Do not create comments in the generated code.
  - \textbf{Note}: This code cannot be recompiled (see also Recompile without comment (Page 126)).

- **Append**: This parameter is only relevant if a target file is specified.
  - 0: (Default setting) If the file already exists, the old content is deleted.
  - 1: If the file already exists, the new code is written at the start of the file.
  - 2: If the file already exists, the new code is written at the end of the file.
Example

```plaintext
//M(TestGC/"Code generation:"
DEF VAR1 = (R//1)
DEF VAR2 = (R//2)
DEF D_NAME
LOAD
  VAR1 = 123
  VAR2 = -6
END_LOAD
OUTPUT(CODE1)
  "Cycle123(" VAR1 "," VAR2 ")"
  "M30"
END_OUTPUT

PRESS(VS1)
  D_NAME = "\MPF.DIR\MESSEN.MPF"
  GC("CODE1",D_NAME) ;Write code from OUTPUT method to file \MPF.DIR\MESSEN.MPF:
  Cycle123(123, -6)
  M30
END_PRESS
```

Recompile

- **No entry for target file:**

  The GC function can only be used in the Programming Support system and writes the NC code to the file currently open in the Editor. Recompilation of the NC code is possible. If the GC function is configured without a target file being specified under "Easy Screen", an error message is output when it is executed.

- **Entry for target file:**

  The code generated from the OUTPUT block is transferred to the target file. If the target file does not already exist, it is set up in the NC file system. If the target file is stored in the HMI file system, it is stored on the hard disk. User comment lines (information required to recompile code) are not set up, i.e. the code cannot be recompiled.
Special considerations for target file specification

In principle, there are two different ways of specifying a target file:

- **NC notation**: `/_N_MPF_DIR/_N_MY_FILE_MPF`
  The file is created in the MPF directory on the NC.

- **DOS notation**: `d:\abc\my_file.txt` or `\RemoteRechner\files\my_file.txt`
  The file is written to the specified directory on the hard disk or on the specified PC, provided that the directory is available on the hard disk or on a remote PC.

**Note**
Invalid variables generate a blank string in generated NC code and an error message in the log book when they are read.

Special features of recompilation

The GC function cannot be called in sub-dialogs because variables originating from master dialogs can be used in sub-dialogs. These variables would not, however, be available in response to a direct call.

When generated code is processed manually with the Editor, the number of characters for values created by the code generation program must not be changed. Changing these values would make it impossible to recompile the code.

Remedy:
1. Recompile
2. Make change using the configured dialog. (e.g., 99 → 101)
3. GC

See also

Recompile (Page 124)
4.3.15 Load Array (LA)

Description

The LA (Load Array) function can be used to load an array from another file.

Programming

Syntax: \texttt{LA(Identifier[, File])}

Description: Loads array from file

Parameters:

- \texttt{Identifier}: Name of array to be loaded
- \texttt{File}: File in which the array is defined

Note

If an array in the current configuration file must be replaced by an array from another configuration file, then both arrays must have the same name.
Example

```
; Extract from file maske.com

DEF VAR2 = {S/*ARR5/"Out"/,"Toggle field")
PRESS(HS5)
   LA("ARR5","arrayext.com") ; Load array ARR5 from file arrayext.com
   VAR2 = ARR5[0] ; "Above"/"Below"/"Right"/"Left" appears in the
                   VAR2 toggle field
                   instead of "Out/In"
END_PRESS

//A(ARR5)
("Out"/"In")
//END

; Extract from file arrayext.com

//A(ARR5)
("Above"/"Below"/"Right"/"Left")
}
//END
```

Note

Please note that a valid value must be assigned to a variable after the LA function has been used to assign another array to the toggle field of the variable.
4.3.16 Load Block (LB)

Description
The LB (Load Block) function can be used to load blocks containing subprograms during runtime. LB should be configured in a LOAD method so that the loaded subprograms can be called at any time.

Note
Subprograms can also be defined directly in a dialog so that they do not have to be loaded.

Programming
Syntax: \texttt{LB("Block name","File")}
Description: Loads subprogram during runtime
Parameters:
\begin{itemize}
\item Block name: Name of block identifier
\item File: Path name of configuration file
\end{itemize}
Default setting = Current configuration file

Example
\begin{verbatim}
LOAD
LB("PROG1") ; Block "PROG1" is searched for in the current configuration file and then loaded.
LB("PROG2","XY.COM") ; Block "PROG2" is searched for in the configuration file XY.COM and then loaded.
END_LOAD
\end{verbatim}
4.3.17 Load Mask (LM)

Description
The LM function can be used to load a new dialog.

Master dialog/Sub-dialog
A dialog, which calls another dialog, but is not ended itself, is referred to as a master dialog. A dialog that is called by a master dialog is referred to as a sub-dialog.

Programming

Syntax: \texttt{LM(Identifier","File"),MSx [, VARx ] )}

Description: Loads dialog

Parameters:
- Identifier: Name of the dialog to be loaded
- File: Path name (HMI file system or NC file system) of the configuration file, default setting: Current configuration file
- MSx: Mode of dialog change
  - 0: (Default setting) The current dialog disappears; the new dialog is loaded and displayed. EXIT will send you back to the standard application. You can use the MSx parameter to determine whether or not the current dialog should be terminated when changing dialogs. If the current dialog is retained, variables can be transferred to the new dialog. The advantage of the MSx parameter is that the dialogs do not always need to be reinitialized when they are changed; instead, the data and layout of the current dialog are retained and data transfer is made easier.
  - 1: The current master dialog is interrupted when the LM function is initiated; the new sub-dialog is loaded and displayed. EXIT will end the sub-dialog and return to the point at which the master dialog was interrupted. In the master dialog, the UNLOAD block is not processed during the interruption.

- VARx: Requirement: MS1
  - List of variables, which can be transferred from the master dialog to the sub-dialog. Up to 20 variables, each separated by a comma, can be transferred.
Note

Parameter VARx transfers only the value of the variable in each case, i.e., variables can be read and written in the sub-dialog, but are not visible in it. Variables can be returned from the sub-dialog to the master dialog by means of the EXIT function.

Example

```plaintext
PRESS(HS1)
LM("SCREEN FORM2","CFI.COM",1, POSX, POSY, DIAMETER)
    ; Interrupt screen form1 and open screen form2:
    ; Variables POSX, POSY and DIAMETER are transferred in doing this.
DLGL("Screen form2 ended")  ; On returning from screen form2, the following text appears in the dialog line of screen form 1:
    ; Screen form2 ended.
END_PRESS
```
4.3.18 Load Softkey (LS)

Description

The LS function can be used to display another softkey menu.

Programming

Syntax: \texttt{LS("Identifier", "File", [Merge])}

Description: Displays softkey menu

Parameters:

- \texttt{Identifier}: Name of softkey menu
- \texttt{File}: Path (HMI file system or NC file system) to the configuration file
  - Default: Current configuration file
- \texttt{Merge}:
  - 0: All existing softkeys are deleted; the newly configured softkeys are entered.
  - 1: Default
    - Only the newly configured softkeys overwrite the available softkeys. The other softkeys (= softkeys of the HMI application) are kept with their functionality and text.

Example

\begin{verbatim}
PRESS(HS4)
  LS("Menu2", 0) ; Menu2 overwrites the existing softkey menu, the softkeys that are displayed are deleted.
END_PRESS
\end{verbatim}

NOTICE

As long as the interpreter has not displayed a dialog, i.e., no LM function has yet been processed, only one LS or one LM command, but no other action, can be configured in the PRESS method of the definition block for the start softkey and the softkey menu.

The LS and LM functions may only be called within a softkey PRESS block and will not react if navigation keys are pressed (PU, PD, SL, SR, SU, SD).
4.3 Functions

4.3.19 Read NC/PLC (RNP), Write NC/PLC (WNP)

Description

The RNP (Read NC PLC) command can be used to read NC or PLC variables or machine data.

Programming

Syntax: `RNP ("System or user variable", value)`

Description: Reads NC or PLC variable or machine data

Parameters:
- `System or user variable`: Name of NC or PLC variable
- `Value`: Value that is to be written to the system or user variable.
  - If the value is a String type, it must be written in double quotation marks.

Example

```
VAR2=RNP("$AA_IN[2]") ; Read NC variable
```

Description

The WNP (Write NC PLC) command can be used to write NC or PLC variables or machine data.

NC/PLC variables are accessed anew every time the WNP function is executed, i.e., NC/PLC access is always executed in a CHANGE method. It is advisable to use this option in cases where a system or user variable changes value frequently. If an NC/PLC variable is to be accessed only once, then it must be configured in a LOAD or UNLOAD method.
Programming

Syntax: \[ \text{WNP}("\text{System or user variable}\), \text{value}) \]
Description: Writes NC or PLC variable or machine data
Parameters: System or user variable Name of NC or PLC variable Value Value that is to be written to the system or user variable.
If the value is a String type, it must be written in double quotation marks.

Example

\[ \text{WNP}("DB20.DBB1",1) \] ; Write PLC variable
4.3.20 Multiple Read NC PLC (MRNP)

Description

This MRNP command can be used to transfer several system or OPI variables in a single register access. This access method is significantly faster than reading via individual access attempts. The system or OPI variables must be included within an MRNP command of the same area.

The areas of the system or OPI variables are organized as follows:

- General NC data ($MN..., $SN.., /nck/...)
- Channel-specific NC data ($MC..., $SC.., /channel/...)
- PLC data (DB..., MB.., /plc/...)
- Axis-specific NC data on the same axis ($MA..., $SA..)

Programming

Syntax: \text{MRNP}(\text{Variable name } 1*\text{Variable name } 2[*...], \text{Register index})

Description: Reads several variables

Parameters: In the variable names, "]*" is the separator. The values are transferred to register \text{REG}[Register index] and those following in the order that the variable names appear in the command.

The following therefore applies:

The value of the first variable is located in \text{REG}[Register index].

The value of the second variable is located in \text{REG}[Register index + 1], etc.

\begin{tabular}{|l|}
\hline
\textbf{NOTICE} \\
\hline
It should be noted that the number of registers is restricted and the list of variables cannot exceed 500 characters. \\
\hline
\end{tabular}
Example

\[ \text{NRNP}(*\text{SR}[0] \cdot \text{SR}[1] \cdot \text{SR}[2] \cdot \text{SR}[3], 1) \quad ; \text{The values of variables } \text{SR}[0] \text{ to } \text{SR}[3] \text{ are written to } \text{REG}[1] \text{ to } \text{REG}[4]. \]

Reading display machine data:
Display machine data can be read with RNP ($\text{MM...}$) within the LOAD block.
General read/write access to display machine data is not possible using the "Easy Screen" function.

Note
User variables may not have the same names as system or PLC variables.

NC variable

All machine data, setting data and R parameters are available, but only certain system variables (see also: List of accessible system variables (Page 173)).
All global and channel-specific user variables (GUDs) can be accessed. However, local and program-global user variables cannot be processed.

<table>
<thead>
<tr>
<th>Machine data</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Global machine data</td>
<td>$\text{MN}_{...}$</td>
</tr>
<tr>
<td>Axis-specific machine data</td>
<td>$\text{MA}_{...}$</td>
</tr>
<tr>
<td>Channel-specific machine data</td>
<td>$\text{MC}_{...}$</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Setting data</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Global setting data</td>
<td>$\text{SN}_{...}$</td>
</tr>
<tr>
<td>Axis-specific setting data</td>
<td>$\text{SA}_{...}$</td>
</tr>
<tr>
<td>Channel-specific setting data</td>
<td>$\text{SC}_{...}$</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>System variables</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>R parameter 1</td>
<td>$\text{SR}[1]$</td>
</tr>
</tbody>
</table>
### PLC variable

All PLC data are available.

<table>
<thead>
<tr>
<th>PLC data</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Byte y bit z of data block x</td>
<td>DBx.DBXy.z</td>
</tr>
<tr>
<td>Byte y of data block x</td>
<td>DBx.DBBy</td>
</tr>
<tr>
<td>Word y of data block x</td>
<td>DBx.DBWy</td>
</tr>
<tr>
<td>Double word y v. of data block x</td>
<td>DBx.DBDy</td>
</tr>
<tr>
<td>Real y of data block x</td>
<td>DBx.DBRy</td>
</tr>
<tr>
<td>Flag byte x bit y</td>
<td>Mx.y</td>
</tr>
<tr>
<td>Flag byte x</td>
<td>MBx</td>
</tr>
<tr>
<td>Flag word x</td>
<td>MWx</td>
</tr>
<tr>
<td>Flag double word x</td>
<td>MDx</td>
</tr>
<tr>
<td>Input byte x bit y</td>
<td>Ix.y or Ex.y</td>
</tr>
<tr>
<td>Input byte x</td>
<td>IBx or EBx</td>
</tr>
<tr>
<td>Input word x</td>
<td>IWx or EWx</td>
</tr>
<tr>
<td>Input double word x</td>
<td>IDx or EDx</td>
</tr>
<tr>
<td>Output byte x bit y</td>
<td>Qx.y or Ax.y</td>
</tr>
<tr>
<td>Output byte x</td>
<td>QBx or ABx</td>
</tr>
<tr>
<td>Output word x</td>
<td>QWx or AWx</td>
</tr>
<tr>
<td>Output double word x</td>
<td>QDx or ADx</td>
</tr>
<tr>
<td>String y with length z from data block x</td>
<td>DBx.DBSy.z</td>
</tr>
</tbody>
</table>
4.3.21 Register (REG)

Register description
Registers are needed in order to exchange data between different dialogs. Registers are assigned to each dialog. These are created when the first dialog is loaded and assigned the value 0 or a blank string.

Note
Registers may not be used directly in OUTPUT blocks for generating NC code.

Programming
Syntax: \texttt{REG/x}
Description: Defines register
Parameters: x Register index with \(x = 0...19\);
Type: REAL or STRING = VARIANT
Registers with \(x \geq 20\) have already been assigned by Siemens.

Description of register value
The assignment of values to registers is configured in a method.

Note
If a new dialog is generated from an existing dialog by means of the LM function, register content is automatically transferred to the new dialog at the same time and is available for further calculations in the second dialog.

Programming
Syntax: \(\texttt{Identifier.val = Register value}\)
\texttt{or}
\(\texttt{Identifier = Register value}\)
Description:
Parameters: Identifier Name of register
Register value Value of register
Example

```
UNLOAD
  REG[0] = VAR1 ; Assign value of variable 1 to register 0
END_UNLOAD

UNLOAD
  REG[9].VAL = 84 ; Assign value 84 to register 9
END_UNLOAD

; These registers can then be assigned to local
variables again in a method in the next
dialog.

LOAD
  VAR2 = REG[0]
END_LOAD
```

Description of register status

The Status property can be used to scan a register for valid content.

One possible use for the register scan function is to ensure that a value is written to a
register only if the relevant dialog is a "master dialog".

Programming

Syntax: \textit{Identifier.vld}

Description: Status is a read-only property.

Parameters: \textit{Identifier} Name of register

Return Value: The result of the scan can be:

\text{FALSE} = invalid value
\text{TRUE} = valid value

Example

```
IF REG[15].VLD == FALSE ; Scan validity of register value
  REG[15] = 84
ENDIF
VAR1 = REG[9].VLD ; Assign the value of the REG[9] status
  request to Var1.
```
4.3.22 RETURN

Description

The RETURN function can be used to prematurely terminate execution of the current subprogram and to return to the branch point of the last CALL command.

If no RETURN command is configured in the subprogram, the subprogram will run to the end before returning to the branch point.

Programming

Syntax: RETURN
Description: Returns to the branch point
Parameters: - None -

Example

```
//B(PROG1) ; Block start
SUB(UP2) ; Start of subprogram
IF VAR1.val="Otto"
  VAR1.val="Hans"
  RETURN ; If the variable value = Otto, the value "Hans"
           ; is assigned to the variable, and the subprogram
           ; ends at this point.
ENDIF
VAR1.val="Otto" ; If the variable value ≠ Otto, the value "Otto"
                ; is assigned to the variable.
END_SUB ; End of subroutine
//END ; Block end
```
4.3.23 Recompile

Description

In the programming support system, it is possible to **recompile** NC code that has been generated with the GC function and to display the variable values in the input/output field of the associated entry dialog again.

Programming

Variables from the NC code are transferred to the dialog. At the same time, the variable values from the NC code are compared with the calculated variable values from the configuration file. If the values do not coincide, an error message is written to the log book because values have been changed during NC code generation.

If the NC code contains the same variable several times, it is evaluated at the point where it last occurs during recompilation. A warning is also written to the log book.

Variables not utilized in NC code during code generation are stored as user comment. The term "user comment" refers to all information required to recompile codes. User comment must not be altered.

Note

The block consisting of NC code and user comment can be recompiled only if it starts at the beginning of a line.

Examples:

The programm contains the following NC code:

```plaintext
DEF VAR1=(I//101)
OUTPUT(CODE1)
"X" VAR1 " Y200"
"X" VAR1 " Y0"
END_OUTPUT
```
The following code is then stored in the parts program:

```plaintext
;NCG#TestGC\cus.dir\editor.com#CODE1#1#3#
X101 Y200
X101 Y0
;#END#
```

The Editor reads the following during recompilation:

```plaintext
X101 Y200
X222 Y0 ; The value for X has been changed in the parts program
          (X101 → X222)
```

The following value is displayed for VAR1 in the input dialog: \[ \text{VAR1} = 222 \]

See also

Generate code (GC) (Page 107)
Recompile without comment

Description
In the programming support system, it is possible to recompile without comments the NC code that has been generated with the GC function and to display the variable values in the input/output field of the associated entry dialog again.

Programming
The GC command can be executed in the following way in order to suppress comment lines that are generated for standard code generation:

\[
\text{GC("CODE1", D\_NAME, 1)}
\]

Normally, the resulting code cannot be recompiled. The following steps are required in order to be able to recompile the cycle calls generated in this way:

- **Expanding the easyscreen.ini**
  Section [RECOMPILE\_INFO\_FILES] will be introduced into the easyscreen.ini file. In this section, all ini files are listed that contain descriptions for cycles recompiled without comment:

  \[
  [\text{RECOMPILE\_INFO\_FILES}]
  \text{IniFile01} = \text{cycles1.ini}
  \text{IniFile02} = \text{cycles2.ini}
  \]

  Several ini files can be specified, whose names can be freely selected.

- **Creating an ini file for a cycle description**
  The ini file with the cycle descriptions is stored under /user or /oem in the directory /sinumerik/hmi/cfg. A separate section is required for each cycle. The section name corresponds to the name of the cycle:

  \[
  [\text{Cycle123}]
  \text{Mname} = \text{TestGC}
  \text{Dname} = \text{testgc.com}
  \text{OUTPUT} = \text{Code1}
  \text{Anzp} = 3
  \text{Version} = 0
  \text{Code\_type} = 1
  \text{Icon} = \text{cycle123.png}
  \text{Desc\_Text} = \text{This is describing text}
  \]
Programming commands

4.3 Functions

<table>
<thead>
<tr>
<th>Mname</th>
<th>Screen form name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dname</td>
<td>Name of the file in which the screen is defined</td>
</tr>
<tr>
<td>OUTPUT</td>
<td>Name of the respective output block</td>
</tr>
<tr>
<td>Anzp</td>
<td>Number of parameters of the screen to be recompiled (all with DEF-created variables, also help variables)</td>
</tr>
<tr>
<td>Version</td>
<td>(optional) version specification for cycle</td>
</tr>
<tr>
<td>Icon</td>
<td>(optional) icon for display in the machining step program, format *.png</td>
</tr>
</tbody>
</table>

Screen size for corresponding resolution:
- 640 X 480 mm → 16 x 16 pixels
- 800 X 600 mm → 20 x 20 pixels
- 1024 X 768 mm → 26 x 26 pixels
- 1280 X 1024 mm → 26 x 26 pixels
- 1280 X 768 mm → 26 x 26 pixels

File loc.: /sinumerik/hmi/ico/ico<resolution>

**Note:** For resolutions of 1280, the folder for 1024 x 768 mm used (only suitable for machining step programs).

| Desc_Text | (optional) Explanation text for display in the machining step program, max. length of 17 character string (only suitable for machining step programs) |
Example

```
REM(TestGC/"Code generation:"
DEF VAR1 = (R//1)
DEF VAR2 = (R//2)
DEF D_NAME
LOAD
  VAR1 = 123
  VAR2 = -6
END_LOAD
OUTPUT(CODE1)
  "Cycle123(\ VAR1 \," VAR2 ")"
  "M30"
END_OUTPUT

PRESS(VS1)
  D_NAME = "\MPF.DIR\MESSEN.MPF"
  GC("CODE1",D_NAME) ;Write code from OUTPUT method to file \MPF.DIR\MESSEN.MPF:
                    Cycle123(123, -6)
                    M30
END_PRESS
```

See also

[Generate code (GC) (Page 107)]

4.3.25 Search Forward, Search Backward (SF, SB)

Description

The SF, SB (Search Forward, Search Backward) function is used to search for a string from the current cursor position in the NC program currently selected in the Editor and to output its value.
Programming

Syntax: \texttt{SF("String")}

Identifiers: \textbf{Search Forward:} Search forward from the current cursor position

Syntax: \texttt{SB("String")}

Identifiers: \textbf{Search Backward:} Search backward from the current cursor position

Parameters: String Text to be found

Rules governing text search

- A blank must be inserted before and after the search concept unit, consisting of search string and its value, in the currently selected NC program.
- The system does not search for concepts within comment text or other strings.
- The value to be output must be a numerical expression. Expressions in the form of "X1=4+5" are not recognized.
- The system recognizes hexadecimal constants in the form of X1='HFFFF', binary constants in the form of X1='B10010' and exponential components in the form of X1='-.5EX-4'.
- The value of a string can be output if it contains the following between string and value:
  - Nothing
  - Blanks
  - Equality sign

Example

The following notations are possible:

\begin{verbatim}
X100 Y=200 ; The variable Abc is assigned the value 200
Abc = SB("Y")
\end{verbatim}
### 4.3.26 STRING functions

#### Overview

The following functions enable strings to be processed:
- Determine length of string
- Find a character in a string
- Extract substring from left
- Extract substring from right
- Extract substring from mid-string
- Replace substring

#### LEN function: Length of a string

**Syntax:** \[ \text{LEN}(\text{string} / \text{varname}) \]

**Description:** Determines the number of characters in a string

**Parameters:**
- string Every valid string expression. NULL is output if string is blank.
- varname Any valid declared variable name

Only one of the two parameters is allowed.

#### Example

```
DEF VAR01
DEF VAR02

LOAD
  VAR01="HALLO"
  VAR02=LEN(VAR01) ; Result = 5
END_LOAD
```
INSTR function: Search for character in string

Syntax: \texttt{INSTR(Start, String1, String2 [Direction])}

Description: Searches for characters

Parameters:
- \texttt{Start} Starting position for searching from string1 into string2. Enter 0 to start searching at the beginning of string2.
- \texttt{String1} Character that is being searched for.
- \texttt{String2} Chain of characters in which the search is being made
- \texttt{Direction} (optional) Direction in which the search is being made
  - 0: From left to right (default setting)
  - 1: From right to left

0 is returned if string1 does not occur in string2.

Example

\begin{verbatim}
DEF VAR01
DEF VAR02

LOAD
  VAR01="HELLO/WORLD"
  VAR02=INSTR(1,"/",VAR01) ; Result = 6
END_LOAD
\end{verbatim}

LEFT Function: String from left

Syntax: \texttt{LEFT(string, length)}

Description: LEFT returns a string containing the specified number of characters starting from the left-hand side of a string.

Parameters:
- \texttt{string} Character string or variable with the string to be processed
- \texttt{length} Number of characters that are to be read out
Example

DEF VAR01
DEF VAR02
LOAD
  VAR01="HELLO/WORLD"
  VAR02=LEFT(VAR01,5) ; Result = "HELLO"
END_LOAD

RIGHT function: String from right

Syntax: $\text{RIGHT} (\text{string}, \text{length})$

Description: RIGHT returns a string containing the specified number of characters starting from the right-hand side of a string.

Parameters:
- string: Character string or variable with the string to be processed
- length: Number of characters that are to be read out

Example

DEF VAR01
DEF VAR02
LOAD
  VAR01="HELLO/WORLD"
  VAR02=LEFT(VAR01,4) ; Result = "WORLD"
END_LOAD

MIDS function: String from mid-string

Syntax: $\text{MIDS} (\text{string}, \text{start}, \text{length})$

Description: MIDS returns a string containing the specified number of characters starting at the specified position in the string.

Parameters:
- string: Character string or variable with the string to be processed
- start: Start from where characters are to be read in the string
- length: Number of characters that are to be read out
Example

```
DEF VAR01
DEF VAR02
LOAD
VAR01="HELLO/WORLD"
VAR02=LEFT(VAR01,4,4) ; Result = "LO/W"
END_LOAD
```

REPLACE Function: Replacing characters

**Syntax:**

```
REPLACE( string, FindString, ReplaceString [, start [, count ] ] )
```

**Description:**
The REPLACE function replaces a character/string in a string with another character/string.

**Parameters:**
- `string`: String in which `FindString` is to be replaced with `ReplaceString`.
- `FindString`: String to be replaced.
- `ReplaceString`: Replacement string (is used instead of the `FindString`).
- `start`: Starting position for search and replace operations.
- `count`: Number of characters that are to be searched from the starting position after the `FindString`.

**Return Value:**
- `string` = Blank string: Copy of string
- `FindString` = Blank string: Copy of string
- `ReplaceString` = Blank string: Copy of string, in which all occurrences of `FindString` are deleted
- `start > Len(String)`: Blank string
- `count = 0`: Copy of string

**See also**

Use of strings (Page 63)
4.3.27 PI services

Description

The PI_SERVICE function can be used to start PI Services (Program Invocation Services) from the PLC in the NC area.

General programming

**Syntax:**

```
PI_SERVICE (service, n parameters)
```

**Description:** Executes PI service

**Parameters:**

- **Service:** PI service identifier
- **n parameters:** List of n parameters of PI Service.
  Individual parameters are separated by commas.

**Example**

```
PRESS (HS2)
  PI_SERVICE ("_N_CREAT0", 55)
END_PRESS
PRESS (VS4)
  PI_SERVICE ("_N_CRCEDN", 17, 3)
END_PRESS
```

Starting OEM services

The PI_START command executes a PI service based on OEM documentation.
Programming

Syntax: PI_START("Transfer string")
Description: Executes PI service
Parameters: "Transfer string" Unlike the OEM documentation, the transfer string should be entered in inverted commas.

Example

PI_START("/NC,001,_N_LOGOUT")

Note
Channel-dependent PI Services always refer to the current channel.
PI services of the tool functions (TO area) always refer to the TO area that is assigned to the current channel.
5.1 Line and rectangle

Description

Lines and rectangles are configured in the LOAD block:

- Lines are first drawn, then the rectangles and finally the configured control fields or graphics.
- Transparent rectangles are created by setting the fill color to the system background color.

LINE element

Programming:

Syntax: LINE (x1,y1,x2,y2,f,s)

Description: Defining a line

Parameters:

- x1: Start point x-coordinate
- y1: Start point y-coordinate
- x2: End point x-coordinate
- y2: End point y-coordinate
- f: Color of the line
- s: Line style:
  - 1 = solid
  - 2 = dashed
  - 3 = dotted
  - 4 = dashed and dotted
5.1 Line and rectangle

RECT element

Programming:

Syntax:    RECT (x,y,w,h,f1,f2,s)
Description: Define a rectangle
Parameters: x  x-coordinate, top left
            y  y-coordinate, top left
            w  Width
            h  Height
            f1  Color of the border
            f2  Fill color
            s  Border style:
               1 = solid
               2 = dashed
               3 = dotted
               4 = dashed and dotted

See also

LOAD (Page 81)
5.2 Defining an array

Definition

An array can be used to organize data of the same data type stored in the memory in such a 
way that it is possible to access the data via an index.

Description

Arrays can be one- or two-dimensional. A one-dimensional array is treated like a two-
dimensional array with just one line or column.

Arrays have start identifier //A and end identifier //END. The number of lines and columns is 
optional. An array is structured in the following way:

Programming

Syntax:   //A(Identifier)
          (a/b...)
          (c/d...)
          ...
          //END

Description: Defines array

Parameters: Identifier Name of array
            a, b, c, d Values of array

Values of the STRING type must be enclosed in double 
quotation marks.

Example

//A(Thread) ; Size/lead/core diameter
(0.3 / 0.075 / 0.202)
(0.4 / 0.1   / 0.270)
(0.5 / 0.125 / 0.338)
(0.6 / 0.15  / 0.406)
(0.8 / 0.2   / 0.540)
(1.0 / 0.25  / 0.676)
(1.2 / 0.25  / 0.676)
(1.4 / 0.3   / 1.010)
(1.7 / 0.35  / 1.246)
//END
5.2 Defining an array

5.2.1 Accessing the value of an array element

Description

The value of an array access operation can be transferred with property Value (identifier.val).
The line index (line number of the array) and the column index (column number of the array) each begin at 0. If a line index or column index is outside the array, the value 0 or a blank string is output and the ERR variable is set to TRUE. The ERR variable is also set to TRUE if a search concept cannot be found.

Programming

Syntax:  Identifier [Z,[M,[C]]].val or
Identifier [Z,[M,[C]]]
Description:  Access to one-dimensional array with only one column
Syntax:  Identifier [S,[M,[C]]].val or
Identifier [S,[M,[C]]]
Description:  Access to one-dimensional array with only one line
Syntax:  Identifier [Z,S,[M,[C]]].val or
Identifier [Z,S,[M,[C]]]
Description:  Access to two-dimensional array
Parameters:  Identifier:  Name of array
Z: Line value (line index or search concept)
S: Column value (column index or search concept)
M:  Access mode
  0  Direct
  1  Searches the line, column directly
  2  Searches the column, line directly
  3  Searches
  4  Searches line index
  5  Searches column index
C:  Compare mode
  0  Search concept must be located in the range of values of the line or column.
  1  Search concept must be located exactly.

Example

VAR1 = MET_G[REG[3],1,0].VAL ; Assign Var1 a value from array MET_G
Access mode

- **"Direct" access mode**
  With "Direct" access mode (M = 0), the array is accessed with the line index in Z and the column index in S. Compare mode C is not evaluated.

- **"Search" access mode**
  In the case of access mode M = 1, 2 or 3, the search always commences in line 0 or column 0.

<table>
<thead>
<tr>
<th>Mode M</th>
<th>Line value Z</th>
<th>Column value S</th>
<th>Output value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Line index</td>
<td>Column index</td>
<td>Value from line Z and column S</td>
</tr>
<tr>
<td>1</td>
<td>Search concept:</td>
<td>Column index of column from which value is read</td>
<td>Value from line found and column S</td>
</tr>
<tr>
<td></td>
<td>Search in column 0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Line index of line from which return value is read</td>
<td>Search concept: Search in line 0</td>
<td>Value from line Z and column found</td>
</tr>
<tr>
<td>3</td>
<td>Search concept:</td>
<td>Search concept: Search in line 0</td>
<td>Value from line and column found</td>
</tr>
<tr>
<td></td>
<td>Search in column 0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Search concept:</td>
<td>Column index of search column</td>
<td>Line index</td>
</tr>
<tr>
<td></td>
<td>Search in column S</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Line index of search line</td>
<td>Search concept: Search in line Z</td>
<td>Column index</td>
</tr>
</tbody>
</table>

Compare mode

When compare mode C = 0 is used, the content of the search line or search column must be sorted in ascending order. If the search concept is smaller than the first element or larger than the last, the value 0 or a blank string is output and the error variable ERR is set to TRUE.

When compare mode C = 1 is used, the search concept must be found in the search line or search column. If the search concept cannot be found, the value 0 or an empty string is output and the error variable ERR is set to TRUE.
5.2 Defining an array

5.2.2 Example Access to an array element

Prerequisite

Two arrays are defined below. These are the basis for the following examples:

//A(Thread)

(0.3 / 0.075 / 0.202)
(0.4 / 0.1 / 0.270)
(0.5 / 0.125 / 0.338)
(0.6 / 0.15 / 0.406)
(0.8 / 0.2 / 0.540)
(1.0 / 0.25 / 0.676)
(1.2 / 0.25 / 0.676)
(1.4 / 0.3 / 1.010)
(1.7 / 0.35 / 1.246)

//END

//A(Array2)

{"DES" / "PTCH" / "CDM" }
{0.3 / 0.075 / 0.202 }
{0.4 / 0.1 / 0.270 }
{0.5 / 0.125 / 0.338 }
{0.6 / 0.15 / 0.406 }
{0.8 / 0.2 / 0.540 }
{1.0 / 0.25 / 0.676 }
{1.2 / 0.25 / 0.676 }
{1.4 / 0.3 / 1.010 }
{1.7 / 0.35 / 1.246 }

//END
Examples

- **Access mode example 1:**
  The search concept is in Z. This key is always sought in column 0. The value from column S is output with the line index of the concept found.

  \[ \text{VAR1} = \text{Thread}[0.5, 1, 1] \quad ; \text{VAR1 has the value 0.125} \]

  Explanation:
  Search for value 0.5 in column 0 of "Thread" array and output the value found in column 1 of the same line.

- **Access mode example 2:**
  The search concept is in S. This concept is always searched for in line 0. The value from line Z is output with the column index of the concept found:

  \[ \text{VAR1} = \text{ARRAY2}[3, "PTCH", 2] \quad ; \text{VAR1 has the value 0.125} \]

  Explanation:
  Search for column containing "PTCH" in line 0 of array "Array2". Output the value from the column found and the line with index 3.

- **Access mode example 3:**
  A search concept is in each of Z and S. The line index is searched for in column 0 with the concept in Z and the column index in line 0 with the concept in S. The value from the array is output with the line index and column index found:

  \[ \text{VAR1} = \text{ARRAY2}[0.6, "PTCH", 3] \quad ; \text{VAR1 has the value 0.15} \]

  Explanation:
  Search for the line with the content 0.6 in column 0 of array "Array2", search for the column with the content "STG" in line 0 of Array2. Transfer the value from the line and column found to VAR1.

- **Access mode example 4:**
  The search concept is in Z. S contains the column index of the column in which concept is being searched for. The line index of the concept found is output:

  \[ \text{VAR1} = \text{Thread}[0.125, 1, 4] \quad ; \text{VAR1 has the value 2} \]

  Explanation:
  Search for value 0.125 in column 1 of array "Thread" and transfer the line index of the value found to VAR1.

- **Access mode example 5:**
  Z contains the line index of line in which concept is being searched for. The search concept is in S. The column index of the concept found is output:

  \[ \text{VAR1} = \text{Thread}[4, 0.2, 5, 1] \quad ; \text{VAR1 has the value 1} \]

  Explanation:
  Search in line 4 of the "Thread" array for the value 0.2 and transfer the column index of the value found to VAR1. Comparison mode 1 was selected because the values of line 4 are not sorted in ascending order.
5.2.3 Scanning the status of an array element

Description

The Status property can be used to run a scan to find out whether an array access operation is supplying a valid value.

Programming

Syntax: \textit{Identifier} \{Z, S, \{M, C\}\}.\textit{vld}

Description: Status is a read-only property.

Parameters: Identifier Name of array

Return Value: FALSE = invalid value

TRUE = valid value

Example

\begin{verbatim}
DEF MPIT = (R/""MPIT",""MPIT",""/wr3)
DEF PIT  = (R/""PIT",""PIT",""/wr3)
PRESS(VS1)
   MPIT = 0.6
   IF MET_G[MPIT,0,4,1].VLD == TRUE
      PIT = MET_G[MPIT,1,0].VAL
      REG[4] = PIT
      REG[1] = "OK"
   ELSE
      REG[1] = "ERROR"
   ENDIF
END_PRESS
\end{verbatim}
5.3 Table grid (grid)

Definition

In contrast to the array, the values of a table grid (grid) are continually updated. This involves a tabular representation of the values of system variables that can be addressed using one block in one channel.

Assignment

A variables definition is assigned to the table-elements definition via a table identifier:

- The variables definition determines the values to be displayed and the definition of table elements determines the appearance and arrangement on the screen window. The table grid takes the properties of the IO fields from the variables definition line.
- The visible area of the grid is determined by the width and height of the I/O field. Any lines or columns than cannot be seen can be displayed by scrolling horizontally and vertically.

Table identifiers

Identifiers of a table containing NCK/PLC values of the same type, which can be addressed via a channel block. The table identifier is differentiated from limits or toggle fields by the addition of a % sign in front of it. The file containing the table description can be specified by adding a comma after the identifier and then inserting the name of the file.

System or user variable

This parameter remains empty for table grids, because the column definition lines contain detailed information about the variables to be displayed. The table description can be provided in a dynamic format.
5.3 Table grid (grid)

Description

The variables definition will contain a reference to a table description:

<table>
<thead>
<tr>
<th>DEF Identifier =</th>
<th>Identifier = Name of variable</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Variable type</td>
</tr>
<tr>
<td></td>
<td>/Limits or toggle field or table identifier</td>
</tr>
<tr>
<td></td>
<td>/Default</td>
</tr>
<tr>
<td></td>
<td>/Texts (Long text, Short text</td>
</tr>
<tr>
<td></td>
<td>/Attributes</td>
</tr>
<tr>
<td></td>
<td>/Help display</td>
</tr>
<tr>
<td></td>
<td>/System or user variable</td>
</tr>
<tr>
<td></td>
<td>/Position of short text</td>
</tr>
<tr>
<td></td>
<td>/Position input/output field(Left, Top, Width, Height)</td>
</tr>
<tr>
<td></td>
<td>/Colors</td>
</tr>
</tbody>
</table>

See also

Variable parameters (Page 52)
5.3 Table grid (grid)

5.3.1 Defining table grids

Description
The table block comprises:
- Header
- 1 to n column descriptions

Programming
Syntax: \( \text{G(Table identifier/Table type/Number of lines/}
\text{[Fixed line attribute],[Fixed column attribute])} \)
Description: Defines table grids
Parameters:
- **Table identifiers**: The table identifier is used without a leading % sign. It can only be used once in a dialog.
- **Table type**: 0 (default) Table for PLC or user data (NCK- and channel-specific data)
  1 and others, reserved
- **No. of lines**: Number of lines including header
  The fixed line or fixed column is not scrolled. The number of columns is the number of columns configured.
- **Fixed line attribute**: 1:Active
  0:Not active
- **Fixed column attribute**: 1:Active
  0:Not active
5.3 Table grid (grid)

5.3.2 Defining columns

Description

For table grids, it is advisable to use variables with an index. For PLC or NC variables, the index number with one or more indices is of significance.

The values displayed in a grid can be modified directly by the end user within the restrictions of the rights granted by the attributes and within any defined limits.

Programming

Syntax: (Type/Limits/Empty/Long text,column header/Attributes/Help display/System or user variable/Column width/Offset1, Offset2, Offset3)

Description: Defines columns
Parameters: Similar to variables
Type Data type
Limits Limit value MIN, limit value MAX
Long text, column header
Attributes
Help display
System or user variable As variable, PLC or NC variables should be entered in double quotation marks.
Column width Entry in pixels.
Offset The increment sizes to increment each index in order to fill the column are specified in the assigned offset parameter:
- Offset1: Step width for the 1st index
- Offset2: Step width for the 2nd index
- Offset3: Step width for the 3rd index

Variable of type STRING

If the variable is a STRING type, then the length must be specified in the type, e.g.:

DEF CHAN STRING [16] TEXT[41]

The column definition for the CHAN variable, therefore, starts, e.g. (S16/... ).

Variable of type STRING
Column header from text file

The column header can be entered as text or text numbers ($8xxxx) and is not scrolled.

Modifying column properties

The column properties, which can be modified dynamically (written) are:

- Limits (min, max),
- Column header (st),
- Attributes (wr, ac and li),
- Help display (hlp) and
- OPI-Variable (var).

Column properties are modified via the variable identifier in the definition line and the column index (starting at 1).

Example: VAR1[1].st="Column 1"

Column properties cannot be read in the LOAD block.

The wr, ac and li attributes can be specified for column definitions.

5.3.3 Focus control in the table grid

Description

The Row and Col properties can be used to set and calculate the focus within a table:

- Identifier.Row
- Identifier.Col
**Programming**

Each cell in a table has the Val and Vld properties.

In order to read and write cell properties, a line and column index must be specified in addition to the variable identifiers from the definition list.

Syntax: `Identifier[Line index, column index].val` or `Identifier[Line index, column index]`

Description: Val properties

Syntax: `Identifier[Line index, column index].vld`

Description: Vld properties

**Example**

```plaintext
Var1[2,3].val=1.203
```

If the line and column indices are not specified, the indices of the focused cell apply. This corresponds to:

```plaintext
Var1.Row =2
Var1.Col=3
Var1.val=1.203
```
5.4 Custom widgets

5.4.1 Defining custom widgets

Description

User-specific display elements are configured in the dialog using a custom widget.

Software option

In order to use custom widgets in dialog boxes, you require the following software options:

"SINUMERIK HMI sl Runtime OA programming"
"SINUMERIK HMI sl Runtime OA Easy Screen"

Programming

Definition: \texttt{DEF(name)}

Syntax: \texttt{(W/"","(library name).(class name)\\\\a,b,c,d\);}}

Description: W Defining custom widgets

Parameters: 
- Name: Custom widget name, freely selectable
- Library name: Can be freely selected, name of the dll (Windows) or (Linux) library file
- Class name: Freely selectable, name of the class function from the previously named library
- a, b, c, d: Position and size of the configuration

Example

A custom widget is defined in the dialog configuration in the following way:

\texttt{DEF Cus = (W/"","slesestcustomwidget.S1EsTestCustomWidget"\\\\20,20,250,100);}
5.4 Custom widgets

5.4.2 Structure of the custom widget library

Description

Essentially, the custom widget library contains a defined class. The name of this class must be specified in the dialog configuration in addition to the library names. Starting from library names, Easy Screen accesses a dll file file with the same name, e.g.:

sleptestcustomwidget.dll

Programming

The class definition of the dll file should look like this:

```cpp
#define SLETESTCUSTOMWIDGET_EXPORT Q_DECL_EXPORT

class SLETESTCUSTOMWIDGET_EXPORT SlEsTestCustomWidget : public QWidget
{
    Q_OBJECT
    ....
    ....
};
```
5.4.3 Structure of the custom widget interface

Description

The library is supplemented by an interface in order to display the custom widget in the dialog. This contains macro definitions with which Easy Screen initiates the custom widget. The interface is available in the form of a cpp file. The file name can be freely selected, e.g.: sleswidgetfactory.cpp

Programming

The interface is defined as follows:

```cpp
#include "slesestestcustomwidget.h" ; The header file for the relevant custom widgets is inserted at the beginning of the file

....
// Makros ; Macro definitions are not changed
....
WIDGET_CLASS_EXPORT(SlEsTestCustomWidget) ; The relevant custom widget is declared at the end of the file
```

Example

Content of the file sleswidgetfactory.cpp for a custom widget with the class name SlEsTestCustomWidget:

```cpp
#include <Qt/qglobal.h>
#include "slesestestcustomwidget.h"

///////////////////////////////////////////////////////////////////////////
// MAKROS FOR PLUGIN DLL-EXPORT - DO NOT CHANGE
///////////////////////////////////////////////////////////////////////////

#ifndef Q_EXTERN_C
#ifndef __cplusplus
#define Q_EXTERN_C extern "C"
#else
#define Q_EXTERN_C extern
#endif
#endif
```

#define SL_ES_FCT_NAME(PLUGIN) sl_es_create_##PLUGIN

#define SL_ES_CUSTOM_WIDGET_PLUGIN_INSTANTIATE( IMPLEMENTATION, PARAM) {
  IMPLEMENTATION *i = new PARAM;
  return i;
}

#ifdef Q_WS_WIN
#define EXPORT_SL_ES_CUSTOM_WIDGET_PLUGIN(PLUGIN,PARAM) 
  Q_EXTERN_C __declspec(dllexport) void* 
  _stdcall SL_ES_FCT_NAME(PLUGIN) (QWidget* pParent) 
  SL_ES_CUSTOM_WIDGET_PLUGIN_INSTANTIATE( PLUGIN,PARAM )
#else
#define EXPORT_SL_ES_CUSTOM_WIDGET_PLUGIN(PLUGIN,PARAM) 
  Q_EXTERN_C void* SL_ES_FCT_NAME(PLUGIN) (QWidget* pParent) 
  SL_ES_CUSTOM_WIDGET_PLUGIN_INSTANTIATE( PLUGIN,PARAM )
#endif

#define WIDGET_CLASS_EXPORT(CLASSNAME) 
  EXPORT_SL_ES_CUSTOM_WIDGET_PLUGIN(CLASSNAME,CLASSNAME(pParent))

////////////////////////////////////////
// FOR OEM USER - please declare here your widget classes for export
////////////////////////////////////////

WIDGET_CLASS_EXPORT(SlEsTestCustomWidget)
5.4.4 Interaction between custom widget and dialog

Description

Custom widgets interact with dialog boxes and can display values or manipulate them. Data is therefore exchanged for the following conditions:

<table>
<thead>
<tr>
<th>Condition</th>
<th>Direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>When starting or recompiling a dialog</td>
<td>Dialog → custom widget</td>
</tr>
<tr>
<td>When executing the GC command for generating cycle calls</td>
<td>Custom widget → Dialog</td>
</tr>
</tbody>
</table>

Programming

The following definitions are necessary for the interaction:

Expansion of the dialog configuration

Definition: DEF (variable)
Syntax: (type)//5,"(variable)","/wr2/
Variable type: Type Standard input field (no grid or toggle) with any data type (no W)
Parameters: Variable Any designation of a variable for data exchange
Input mode: wr2 Reading and writing

Example
DEF CUSVAR1 = (R//5,"CUSVAR1","/wr2/")

Expansion of the class definition

In the class definition of the custom widgets, a QProperty must be created whose name is identical to the selected variable of the dialog configuration, e.g.:

Q_PROPERTY(double CUSVAR1 READ cusVar1 WRITE setCusVar1);
Example

The class definition of the dll file should look like this:

```cpp
#define SLETESTCUSTOMWIDGET_EXPORT Q_DECL_EXPORT

class SLETESTCUSTOMWIDGET_EXPORT SlEsTestCustomWidget : public QWidget
{
    Q_OBJECT
    Q_PROPERTY(double CUSVAR1 READ cusVar1 WRITE setCusVar1);
    ....
    ....
};
```
6.1 How to activate the "Custom" operating area

Activating the "Custom" operating area

The "Custom" operating area is not activated on delivery.

1. First, copy the slamconfig.ini file from the /siemens/sinumerik/hmi/templates directory into the /siemens/sinumerik/hmi/cfg directory.

2. To activate the "Custom" operating area, the following must be entered:

```
[Custom]
Visible=True
```

Result

After activation is complete, the softkey for the "Custom" operating area can be found in the main menu (F10) on the menu continuation bar on the HSK4 (= default).

The "Custom" operating area displays an empty window covering the entire operating area, with a configurable header. All horizontal and vertical softkeys can be configured.
6.2 How to configure the "Custom" softkey

Configuring the softkey for the "Custom" operating area

The labeling and position of the softkey for the "Custom" operating area are configured in the slamconfig.ini file.

The following options are available for configuring the start softkey:

1. To replace a softkey label with a language-dependent text, the following must be entered in the [Custom] section:

   ```text
   TextId=MY_TEXT_ID
   TextFile=mytextfile
   TextContext=mycontext
   ```

   In this example, the softkey shows the language-dependent text which was saved with the text ID "MY_TEXT_ID" in text file mytextfile_XXX.qm under "MyContext" (XXX stands for language code).

2. To replace a softkey label with a language-neutral text, the following must be entered in the [Custom] section:

   ```text
   TextId=HELLO
   TextFile=<empty>
   TextContext=<empty>
   ```

   In this example, the softkey for the "Custom" operating area displays the text "HELLO" for every language.
3. **An icon** can also be displayed on the softkey in addition to the text.
   To do this, the following must be entered in the [Custom] section:

   ```
   Picture=mypicture.png
   ```

   The softkey then displays the icon from the file mypicture.png. Graphics and bitmaps are stored at the following path: `/oem/sinumerik/hmi/ico/ico<Resolution>`. The directory that corresponds to the display resolution must be used.

4. **The position** of the softkey can also be set. The following entry in the [Custom] section can be used to make this setting:

   ```
   SoftkeyPosition=12
   ```

   The default is position 12. This corresponds to the HSK4 on the menu continuation bar of the operating area's menu. Positions 1 - 8 correspond to HSK1 to HSK8 on the menu bar, positions 9 - 16 to HSK1 to HSK8 on the menu continuation bar.
6.3 How to configure the "Custom" operating area

Configuring the softkey for the "Custom" operating area

You need the easyscreen.ini and custom.ini files to configure the operating area. Templates for both these files are available in the /siemens/sinumerik/hmi/templates directory.

1. First copy the files to the /oem/sinumerik/hmi/cfg directory and make your changes from there.

2. The easyscreen.ini already contains a definition line for the "Custom" operating area:

   ;StartFile02 = area := Custom, dialog := SlEsCustomDialog, startfile := custom.com

   The ';' at the start of the line represents the comment character. This means the line is commented out and, as such, not active. To change this, the ';' must be deleted.

   The "startfile" attribute in this line is used to define that the entry will refer to the custom.com project file when the "Custom" operating area is selected.

3. You create the custom.com project file in the /oem/sinumerik/hmi/proj directory. This contains the relevant configuration, which is created in the same way as the aeditor.com file of the "Program" operating area. The configured start softkeys are then displayed in the "Custom" operating area.

4. You configure the language-neutral text for the title bar of the dialog in the custom.ini file.

   The following entry is available in the template for this purpose:

   [Header]Text=Custom

   You can replace this text with a customized one.

5. The template contains the following entry for configuring a start screen for the "Custom" operating area:

   [Picture]Picture=logo.png

   Logo.png is the name of the start screen which appears on the "Custom" operating area's start dialog. Here you can display a company logo, for example, or another image. The file should be saved in the directory for the corresponding resolution under:/oem/sinumerik/hmi/ico/…
6.4 Programming example for the "Custom" area

File overview

The following files are required:

- custom.ini
- easyscreen.ini

Programming

Content of the custom.com file:

```
//S(Start)
HS7=("Start example", se1, ac7)
PRESS(HS7)
LM("Maske4")
END_PRESS
//END
//M(Maske4/"Example: MCP"/"mcp.png")
DEF byte=(I/O/O/"Input byte=0 (default)"/"Byte number:","/wr1,li1///380,40,100/480,40,50)
DEF Feed=(IBB/O/"Feed override","/wr1/"EB3"/20,180,100/130,180,100),
Axistop=(B/O/"Feed stop","/wr1/"E2.2"/280,180,100/380,180,50/100)
DEF Spin=(IBB/O/"Spindle override","/wr1/"EB0"/20,210,100/130,210,100),
spinstop=(B/O/"Spindle stop","/wr1/"E2.4"/280,210,100/380,210,50/100)
DEF custom1=(IBB/O/"User keys 1","/wr1/"EB7.7"/20,240,100/130,240,100)
DEF custom2=(IBB/O/"User keys 2","/wr1/"EB7.5"/20,270,100/130,270,100)
DEF By1
DEF By2
DEF By3
DEF By6
DEF By7
HS1=("Input byte", SE1, AC4)
HS2=("")
HS3=("")
HS4=("")
HS5=("")
HS6=("")
HS7=("")
HS8=("")
VS1=("")
VS2=("")
```
"Custom" operating area

6.4 Programming example for the "Custom" area

VS3=""
VS4=""
VS5=""
VS6=""
VS7="Cancel", SE1, AC7
VS8="OK", SE1, AC7
PRESS(VS7)
  EXIT
END_PRESS
PRESS(VS8)
  EXIT
END_PRESS

LOAD
  By1=1
  By2=2
  By3=3
  By6=6
  By7=7
END_LOAD

PRESS(HS1)
  Byte.wr=2
END_PRESS

CHANGE(Byte)
  By1=byte+1
  By2=byte+2
  By3=byte+3
  By6=byte+6
  By7=byte+7
  Feed.VAR="EB"<<By3
  Spin.VAR="EB"<<Byte
  Custom1.VAR="EB"<<By6
  Custom2.VAR="EB"<<By7
  Axisstop.VAR="E"<<By2<<".2"
  Spinstop.VAR="E"<<By2<<".4"
  Byte.wr=1
END_CHANGE

CHANGE(Axis stop)
  IF Axistop==0
    Axistop.BC=9
  ELSE

6.4 Programming example for the “Custom” area

```plaintext
Axistop.BC=11
ENDIF
END_CHANGE

CHANGE(Spin stop)
  IF Spinstop==0
    Spinstop.BC=9
  ELSE
    Spinstop.BC=11
  ENDIF
END_CHANGE
//END

Result

Figure 6-1 Example with "Start example" softkey
6.4 Programming example for the "Custom" area

Figure 6-2  Example with bitmap and text fields
PLC softkeys

7.1 Introduction

Configuration

Description of the procedure:

- The systemconfiguration.ini contains a section [keyconfiguration]. The entry specifies an action for a special PLC softkey.
- A number is given as an action. An Easy Screen call is involved if the number is greater than or equal to 100.
- A section for defining the action to be performed must be created in the easyscreen.ini file. The name of the section is based on the name of the operating area and the dialog name (see entry under [keyconfiguration] → Area:=..., Dialog:=...) → [<Area>_<Dialog>] → e.g. [AreaParameter_SIPaDialog].
- The action numbers (which were given in the systemconfiguration.ini → see Action:=...) are defined in this section. There are two commands involved:
  1. LS("Softkey menu1","param.com") ... Loading a softkey menu
  2. LM("Screen form1","param.com") ... Loading a screen form

Selecting softkey menus via PLC softkeys

Easy Screen makes it possible to select Easy Screen softkey menus and Easy Screen dialogs via PLC softkeys. This can only be done if the "action" attribute to be specified when configuring the relevant PLC softkeys has a value greater than or equal to 100.

PLC softkeys are configured in the file systemconfiguration.ini in the section [keyconfiguration]:

[keyconfiguration]

KEY75.1 = Area:=area, Dialog:=dialog, Screen:=screen, Action:= 100,
Cmdline:=cmdline
The LM and LS commands to be executed upon activation of the relevant PLC softkeys are configured in the easyscreen.ini file. The names of the sections that are used for the purpose of configuration are structured as follows:

<table>
<thead>
<tr>
<th>areaname_dialogname</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>The first part of the name &quot;areaname&quot; refers to the operating area and the second part &quot;dialogname&quot; designates the dialog to which the commands configured in this section apply.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>AreaParameter_SlPaDialog</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>The names given in the systemconfiguration.ini file for the operating area and dialog should be used. The dialog does not have to be specified.</td>
<td></td>
</tr>
<tr>
<td>This is particularly true for operating areas which are only implemented by means of a single dialog. Please refer to the example on the left.</td>
<td></td>
</tr>
<tr>
<td>If &quot;screen1&quot; is displayed in the AreaParameter operating area implemented by the SlPaDialog dialog, the &quot;LS(&quot;Softkey1&quot;,&quot;param.com&quot;)&quot; command will be executed when the &quot;action&quot; with the value 100 occurs.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>action.screen=Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Both the &quot;action&quot; and &quot;screen&quot; attributes clearly indicate when the specified command will be executed.</td>
<td></td>
</tr>
<tr>
<td>The &quot;screen&quot; information is optional.</td>
<td></td>
</tr>
<tr>
<td>The following commands are permissible:</td>
<td></td>
</tr>
<tr>
<td>LM (LoadMask)</td>
<td></td>
</tr>
<tr>
<td>LS (LoadSoftkeys)</td>
<td></td>
</tr>
</tbody>
</table>
Reference lists

A.1 Lists of start softkeys

A.1.1 List of start softkeys for turning

Program operating area for turning

<table>
<thead>
<tr>
<th></th>
<th>Edit</th>
<th>Drilling</th>
<th>Turning</th>
<th>Contour turning</th>
<th>Milling</th>
<th>Miscellaneous</th>
<th>Simulation</th>
<th>NC select</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSK1</td>
<td>HSK2</td>
<td>HSK3</td>
<td>HSK4</td>
<td>HSK5</td>
<td>HSK6</td>
<td>HSK7</td>
<td>HSK8</td>
<td></td>
</tr>
<tr>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>Measure turning</td>
<td>Measure milling</td>
<td>OEM</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td>--</td>
<td>HSK10</td>
<td>--</td>
<td>--</td>
<td>HSK13</td>
<td>HSK14</td>
<td>HSK15</td>
<td>--</td>
<td></td>
</tr>
</tbody>
</table>

Turning

The following tables list the possible start softkeys for turning technology. Assignments of individual start softkeys can differ depending on the particular system. The specified OEM softkeys are permitted for Easy Screen.

G code start softkeys:

<table>
<thead>
<tr>
<th>Drilling</th>
<th>Turning</th>
<th>Contour turning</th>
<th>Milling</th>
<th>Miscellaneous</th>
</tr>
</thead>
<tbody>
<tr>
<td>VSK1</td>
<td>Centering</td>
<td>Stock removal</td>
<td>Contour</td>
<td>--</td>
</tr>
<tr>
<td>VSK2</td>
<td>Drilling reaming</td>
<td>Groove</td>
<td>Stock removal</td>
<td>--</td>
</tr>
<tr>
<td>VSK3</td>
<td>Deep-hole drilling</td>
<td>Undercut</td>
<td>Stock removal residual material</td>
<td>--</td>
</tr>
<tr>
<td>VSK4</td>
<td>Boring</td>
<td>Thread</td>
<td>Grooving</td>
<td>--</td>
</tr>
<tr>
<td>VSK5</td>
<td>Thread</td>
<td>Parting</td>
<td>Grooving residual material</td>
<td>--</td>
</tr>
<tr>
<td>VSK6</td>
<td>OEM</td>
<td>--</td>
<td>Plunge-turning</td>
<td>--</td>
</tr>
<tr>
<td>VSK7</td>
<td>Positions</td>
<td>OEM</td>
<td>Plunge turning residual material</td>
<td>OEM</td>
</tr>
<tr>
<td>VSK8</td>
<td>Repeat position.</td>
<td>--</td>
<td>&gt;&gt;</td>
<td>&lt;&lt;</td>
</tr>
</tbody>
</table>
ShopTurn start softkeys:

<table>
<thead>
<tr>
<th>Drilling</th>
<th>Turning</th>
<th>Contour turning</th>
<th>Milling</th>
<th>Miscellaneous</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSK2</td>
<td>HSK3</td>
<td>HSK4</td>
<td>HSK5</td>
<td>HSK6</td>
</tr>
<tr>
<td><strong>VSK1</strong></td>
<td>Drilling centered</td>
<td>Stock removal</td>
<td>New contour</td>
<td>Face milling</td>
</tr>
<tr>
<td><strong>VSK2</strong></td>
<td>Centering</td>
<td>Groove</td>
<td>Stock removal</td>
<td>Pocket</td>
</tr>
<tr>
<td><strong>VSK3</strong></td>
<td>Drilling reaming</td>
<td>Undercut</td>
<td>Stock removal residual material</td>
<td>Multi-edge spigot</td>
</tr>
<tr>
<td><strong>VSK4</strong></td>
<td>Deep-hole drilling</td>
<td>Thread</td>
<td>Grooving</td>
<td>--</td>
</tr>
<tr>
<td><strong>VSK5</strong></td>
<td>Thread</td>
<td>Parting</td>
<td>Grooving residual material</td>
<td>--</td>
</tr>
<tr>
<td><strong>VSK6</strong></td>
<td>OEM</td>
<td>--</td>
<td>Plunge-turning</td>
<td>--</td>
</tr>
<tr>
<td><strong>VSK7</strong></td>
<td>Positions</td>
<td>OEM</td>
<td>Plunge turning residual material</td>
<td>OEM</td>
</tr>
<tr>
<td><strong>VSK8</strong></td>
<td>Repeat position.</td>
<td>--</td>
<td>&gt;&gt;</td>
<td>&lt;&lt;</td>
</tr>
</tbody>
</table>

See also

Defining start softkeys (Page 15)
### A.1.2 List of start softkeys for milling

Program operating area when milling

<table>
<thead>
<tr>
<th>Edit</th>
<th>Drilling</th>
<th>Milling</th>
<th>Contour milling</th>
<th>Turning</th>
<th>Miscellaneous</th>
<th>Simulation</th>
<th>NC select</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSK1</td>
<td>HSK2</td>
<td>HSK3</td>
<td>HSK4</td>
<td>HSK5</td>
<td>HSK6</td>
<td>HSK7</td>
<td>HSK8</td>
</tr>
<tr>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>Measure</td>
<td>Measure</td>
<td>OEM</td>
<td>--</td>
</tr>
<tr>
<td>--</td>
<td>HSK10</td>
<td>--</td>
<td>--</td>
<td>HSK13</td>
<td>HSK14</td>
<td>HSK15</td>
<td>--</td>
</tr>
</tbody>
</table>

### Milling

The following tables list the possible start softkeys for milling technology. Assignments of individual start softkeys can differ depending on the particular system. The specified OEM softkeys are permitted for Easy Screen.

**G code start softkeys:**

<table>
<thead>
<tr>
<th>Drilling</th>
<th>Milling</th>
<th>Contour milling</th>
<th>Turning</th>
<th>Miscellaneous</th>
</tr>
</thead>
<tbody>
<tr>
<td>VSK1</td>
<td>Centering</td>
<td>Face milling</td>
<td>Contour</td>
<td>Stock removal</td>
</tr>
<tr>
<td>VSK2</td>
<td>Drilling reaming</td>
<td>Pocket</td>
<td>Path</td>
<td>Groove</td>
</tr>
<tr>
<td>VSK3</td>
<td>Deep-hole drilling</td>
<td>Multi-edge spigot</td>
<td>Predrilling</td>
<td>Undercut</td>
</tr>
<tr>
<td>VSK4</td>
<td>Boring</td>
<td>Groove</td>
<td>Pocket</td>
<td>Thread</td>
</tr>
<tr>
<td>VSK5</td>
<td>Thread</td>
<td>Thread milling</td>
<td>Pocket res. mat.</td>
<td>Parting</td>
</tr>
<tr>
<td>VSK6</td>
<td>OEM</td>
<td>Engraving</td>
<td>Spigot</td>
<td>--</td>
</tr>
<tr>
<td>VSK7</td>
<td>Positions</td>
<td>OEM</td>
<td>Spigot res. mat.</td>
<td>OEM</td>
</tr>
<tr>
<td>VSK8</td>
<td>Repeat position.</td>
<td>--</td>
<td>&gt;&gt;</td>
<td>&lt;&lt;</td>
</tr>
</tbody>
</table>
### ShopMill start softkeys:

<table>
<thead>
<tr>
<th>Drilling</th>
<th>Milling</th>
<th>Contour milling</th>
<th>Turning</th>
<th>Miscellaneous</th>
<th>Straight line circle</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSK2</td>
<td>HSK3</td>
<td>HSK4</td>
<td>HSK5</td>
<td>HSK6</td>
<td>HSK10</td>
</tr>
<tr>
<td>VSK1</td>
<td>Centering</td>
<td>Face milling</td>
<td>New contour</td>
<td>--</td>
<td>Stock removal</td>
</tr>
<tr>
<td>VSK2</td>
<td>Drilling</td>
<td>reaming</td>
<td>Pocket</td>
<td>Path</td>
<td>--</td>
</tr>
<tr>
<td>VSK3</td>
<td>Deep-hole drilling</td>
<td>Multi-edge spigot</td>
<td>Predrilling</td>
<td>--</td>
<td>Undercut</td>
</tr>
<tr>
<td>VSK4</td>
<td>Boring</td>
<td>Groove</td>
<td>Pocket</td>
<td>--</td>
<td>Thread</td>
</tr>
<tr>
<td>VSK5</td>
<td>Thread milling</td>
<td>Thread</td>
<td>Pocket res. mat.</td>
<td>--</td>
<td>Parting</td>
</tr>
<tr>
<td>VSK6</td>
<td>OEM</td>
<td>Engraving</td>
<td>Spigot</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>VSK7</td>
<td>Positions</td>
<td>OEM</td>
<td>Spigot res. mat.</td>
<td>OEM</td>
<td>OEM</td>
</tr>
<tr>
<td>VSK8</td>
<td>Repeat position.</td>
<td>--</td>
<td>&gt;&gt;</td>
<td>&lt;&lt;</td>
<td>Contour turning</td>
</tr>
</tbody>
</table>
A.2 List of colors

System colors

A uniform color table is available for configuring dialogs (subset of the respective standard colors). The color of an element (text, input field, background, etc.) can be selected from the following options (between 0 and 128).

<table>
<thead>
<tr>
<th>Index</th>
<th>Pictogram</th>
<th>Color</th>
<th>Color description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><img src="image" alt="Black" /></td>
<td>black</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td><img src="image" alt="Orange" /></td>
<td>orange</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td><img src="image" alt="Dark Green" /></td>
<td>Dark green</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td><img src="image" alt="Light Gray" /></td>
<td>Light gray</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td><img src="image" alt="Dark Gray" /></td>
<td>Dark gray</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td><img src="image" alt="Blue" /></td>
<td>Blue</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td><img src="image" alt="Red" /></td>
<td>Red</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td><img src="image" alt="Brown" /></td>
<td>brown</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td><img src="image" alt="Yellow" /></td>
<td>yellow</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td><img src="image" alt="White" /></td>
<td>White</td>
<td></td>
</tr>
<tr>
<td>128</td>
<td><img src="image" alt="Orange" /></td>
<td>orange</td>
<td>System color active field</td>
</tr>
<tr>
<td>129</td>
<td><img src="image" alt="Light Gray" /></td>
<td>Light gray</td>
<td>Background color</td>
</tr>
<tr>
<td>130</td>
<td><img src="image" alt="Blue" /></td>
<td>Blue</td>
<td>Header color (active)</td>
</tr>
<tr>
<td>131</td>
<td><img src="image" alt="Black" /></td>
<td>black</td>
<td>Header font color (active)</td>
</tr>
</tbody>
</table>
### A.3 List of language codes used in file names

#### Supported languages

**Standard languages:**

<table>
<thead>
<tr>
<th>Language</th>
<th>Abbreviation in file name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chinese simplified</td>
<td>chs</td>
</tr>
<tr>
<td>German</td>
<td>deu</td>
</tr>
<tr>
<td>English</td>
<td>eng</td>
</tr>
<tr>
<td>Spanish</td>
<td>esp</td>
</tr>
<tr>
<td>French</td>
<td>fra</td>
</tr>
<tr>
<td>Italian</td>
<td>ita</td>
</tr>
</tbody>
</table>

**Other languages:**

<table>
<thead>
<tr>
<th>Language</th>
<th>Abbreviation in file name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chinese traditional</td>
<td>cht</td>
</tr>
<tr>
<td>Korean</td>
<td>kor</td>
</tr>
<tr>
<td>Portuguese (Brazil)</td>
<td>ptb</td>
</tr>
<tr>
<td>Czech</td>
<td>csy</td>
</tr>
<tr>
<td>Hungarian</td>
<td>hun</td>
</tr>
<tr>
<td>Japanese</td>
<td>jpn</td>
</tr>
<tr>
<td>Polish</td>
<td>plk</td>
</tr>
<tr>
<td>Russian</td>
<td>rus</td>
</tr>
<tr>
<td>Swedish</td>
<td>sve</td>
</tr>
<tr>
<td>Danish</td>
<td>dan</td>
</tr>
<tr>
<td>Finnish</td>
<td>fin</td>
</tr>
<tr>
<td>Dutch</td>
<td>nld</td>
</tr>
<tr>
<td>Romanian</td>
<td>rom</td>
</tr>
<tr>
<td>Slovakian</td>
<td>sky</td>
</tr>
<tr>
<td>Turkish</td>
<td>trk</td>
</tr>
</tbody>
</table>
A.4 List of accessible system variables

References

List Manual System Variables/PGAsI/

See also

Multiple Read NC PLC (MRNP) (Page 118)
A.4 List of accessible system variables
Glossary

Access level
Graduated system of authorization, which makes the accessibility and utilization of functions on the operator interface dependent on the authorization rights of the user.

Array
An array can be used to organize data of a standard data type stored in the memory in such a way that it is possible to access the data via an index.

Attribute
Characteristic that assigns specific → Properties to an object (→ Dialog or → Variable).

Column index
Column number of an array

Configuration file
File, which contains definitions and instructions that determine the appearance of → Dialogs and their → Functions.

Definition lines
Program section in which → Variables and softkeys are defined

Dialog
Display of the → User interface
• Dialog-dependent softkey menu
  Softkey menu, which is called from a newly configured dialog.
• Dialog-independent softkeys
  Softkeys, which are not called from a dialog, i.e., start softkey and softkey menus, which the user configures before the first, new dialog.

Editor
ASCII Editor with which characters can be entered in a file and edited.
**Event**

Any action, which initiates execution of a → Method: Input of characters, actuation of softkeys, etc.

**Group**

Reload unit for → Configuration file

**Help variable**

Internal arithmetic variable to which no → Properties can be assigned and is not, therefore, visible in the → Dialog.

**Hotkeys**

6 keys on OP 010, OP 010C and SINUMERIK keyboards with hotkey blocks. Pressing the keys selects an operating area directly. As an option, 2 additional keys can be configured as hotkeys.

**Input/output field**

Also I/O field: for inputting or outputting variable values.

**Interpreter**

The interpreter automatically converts the defined code from the → Configuration file into a → Dialog and controls its use.

**Line index**

Row number of an array

**Menu tree**

A group of interlinked → Dialogs

**Method**

Programmed sequence of operations executed when a corresponding → Event occurs.

**Parameter**

Parameters are variable elements of the programming syntax and are replaced by other words/symbols in the → Configuration file.
**PI service**

Function which, on an NC, executes a clearly defined operation. PI services can be called from the PLC and the HMI system.

**PLC hard key**

PLC hard keys are provided via the PLC interface of the HMI software, just like hotkeys. The functions triggered by them in the HMI can be configured.

They take the form of MCP keys or evaluations of PLC signal logic operations in the PLC user program. For this reason, they are referred to as "virtual keys".

**Programming support**

Provision of → Dialogs to assist programmers in writing → Parts programs with "higher-level" components

**Properties**

Characteristics of an object (e.g. of a → Variable)

**Recompile**

NC code sections can be generated in a → Part program from input fields in → Dialogs in the → Programming support system. Recompilation is the reverse operation. The input fields used to generate a selected section of NC code are retrieved from the NC code and displayed in the original dialog.

**Selecting**

A program formulated in the NC language, which specifies motion sequences for axes and various special actions.

**Simulation**

Simulation of a → Parts program run without movement of the actual machine axes.

**Softkey labels**

Text/image on the screen, which is assigned to a softkey.

**Softkey menu**

All horizontal or all vertical softkeys

**Start softkey**

Softkey with which the first newly created → Dialog is started.
Glossary

**Toggle field**
A list of values in the → Input/output field; check with toggle field: The value input in a field must be the same as one of the listed values.

**User variable**
Variables defined by the user in the → Parts program or data block.

**Variable**
Designation of a memory location, which can be displayed in a → Dialog by assigning → Properties and in which input data and the results of arithmetic operations can be entered.
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Commissioning Manual

Valid for:
CNC software for 840D sl/ 840DE sl Version 2.6
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.

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

**CAUTION** with a safety alert symbol, indicates that minor personal injury can result if proper precautions are not taken.

**CAUTION** without a safety alert symbol, indicates that property damage can result if proper precautions are not taken.

**NOTICE**
indicates that an unintended result or situation can occur if the corresponding information is not taken into account.

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 for the specific task, 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.

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Note the following:

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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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System settings

1.1 Delivery condition of the system

Scope of validity

This document is valid for all systems that are supplied with Linux as operating system on the CompactFlash Card, such as all NCUs of the type NCU 7x0.

Structure and contents of the CompactFlash Card

A Linux partition as well as a FAT partition are available on the CompactFlash Card. The memory space of the CompactFlash Card is occupied mainly by the Linux-EXT3 partition containing the system software and the user data. A 2MB large FAT partition still exists but only for internal administration purposes.

When the system is in operation, the following directories (this is a selection and not a complete list) are available in the EXT3 partition on the CompactFlash Card:

<table>
<thead>
<tr>
<th>Directory</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>/siemens</td>
<td>Reserved for Siemens system software</td>
</tr>
<tr>
<td>/addon</td>
<td>Reserved for Siemens add-on software</td>
</tr>
<tr>
<td>/oem</td>
<td>Additional software and configurations of the machine manufacturer</td>
</tr>
<tr>
<td>/user</td>
<td>• Storage of user data</td>
</tr>
<tr>
<td></td>
<td>• Configuring the HMI application</td>
</tr>
<tr>
<td></td>
<td>• Data that are created using the HMI application when commissioning the system.</td>
</tr>
<tr>
<td>/system</td>
<td>Linux operating system</td>
</tr>
<tr>
<td>/user/system/etc</td>
<td>File basesys.ini (modifications possible)</td>
</tr>
<tr>
<td>/user/common/tcu</td>
<td>TCU configuration files</td>
</tr>
<tr>
<td>/var/log/messages</td>
<td>System log file (same as event.log under Windows)</td>
</tr>
</tbody>
</table>

Files in the directory under /user always have priority over files with the same name in the directory /oem → /addon → /siemens.
### System settings

#### 1.1 Delivery condition of the system

<table>
<thead>
<tr>
<th>NOTICE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Suitable editors for Linux</strong></td>
</tr>
<tr>
<td>In most Linux system files, lines may only be ended with LF, and not with CRLF as in Windows. Please take note of this when selecting an editor. The HMI application editor under &quot;Commissioning&quot; is suitable.</td>
</tr>
<tr>
<td>In the Linux operating system, the UNIX editor vi is available.</td>
</tr>
<tr>
<td>Please take note that the Linux operating system is case-sensitive.</td>
</tr>
</tbody>
</table>

#### Preset users

The following users have already been set up:

<table>
<thead>
<tr>
<th>Users</th>
<th>Access level</th>
<th>Target group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operator</td>
<td>Key switch position 0</td>
<td>Operators, users</td>
</tr>
<tr>
<td>Operator1</td>
<td>Key switch position 1</td>
<td>Operators, users</td>
</tr>
<tr>
<td>Operator2</td>
<td>Key switch position 2</td>
<td>Operators, users</td>
</tr>
<tr>
<td>Operator3</td>
<td>Key switch position 3</td>
<td>Operators, users</td>
</tr>
<tr>
<td>user</td>
<td>Password: CUSTOMER</td>
<td>Operators, users</td>
</tr>
<tr>
<td>service</td>
<td>Password: EVENING</td>
<td>Service personnel</td>
</tr>
<tr>
<td>manufact</td>
<td>Password: SUNRISE</td>
<td>Machine manufacturer</td>
</tr>
</tbody>
</table>
1.2 Meaning of switch positions

Overview

The NCU has two twist buttons in the lower section of the front panel.

- NCK start-up switch with label SIM/NCK
- PLC mode selector switch with label PLC

The switch positions are marked with even numbers or letters; the uneven numbers are represented by dots due to space limitations.

SIM/NCK twist button

The switch positions of the SIM/NCK switch have the following meaning:

<table>
<thead>
<tr>
<th>Switch position</th>
<th>Operating mode of the NCK</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Normal boot-up NCK</td>
</tr>
<tr>
<td>1</td>
<td>NCK boot-up with default values (= memory reset)</td>
</tr>
<tr>
<td>2</td>
<td>The NCK (and PLC) starts up with the data that was saved at the last shutdown.</td>
</tr>
<tr>
<td>7</td>
<td>Debug mode (NCK is not started.)</td>
</tr>
<tr>
<td>8</td>
<td>IP address of the NCU is displayed on the seven-segment display.</td>
</tr>
<tr>
<td>All others</td>
<td>Not relevant</td>
</tr>
</tbody>
</table>

PLC twist button

The switch positions of the PLC switch have the same meaning as in a SIMATIC S7-CPU:

<table>
<thead>
<tr>
<th>Switch position</th>
<th>Operating mode of the PLC</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>RUN</td>
</tr>
<tr>
<td>1</td>
<td>RUN (protected mode)</td>
</tr>
<tr>
<td>2</td>
<td>STOP</td>
</tr>
<tr>
<td>3</td>
<td>Memory reset (MRES)</td>
</tr>
<tr>
<td>All others</td>
<td>Not relevant</td>
</tr>
</tbody>
</table>
1.3 System booting

Sequence

To ensure unproblematic booting of the NCU, the CompactFlash Card must be inserted. When the NCU is booting up, visual information on the current operating system is provided using the following displays:

- The RDY-LED flashes slowly yellow when the CF card is accessed.
- During booting, the 7-segment display outputs different codes that indicate, for example, when the BIOS is started, when the CompactFlash Card is accessed, etc.

When the booting has been completed successfully, the following is displayed:

- The PLC LED lights up green.
- The 7-segment display shows "6." with a flashing dot.
- The RDY-LED lights up green. All other LEDs are not illuminated.

Performing a reset operation

The reset button is located behind the blanking plate of the NCU.

A reset operation resets the entire system and requires a system restart. This is comparable to a "Power On reset" except that the 24 V power supply does not have to be switched off.

Booting for servicing purposes

For service or diagnosis purposes, the NCU can be booted from a service system, the Emergency Boot System.

See also

How do you create a service system for the NCU? (Page 53)
1.4 Displays during system booting

Behavior of the LEDs when booting

Of the LEDs on the front panel of the NCU, only the RDY LED and its status is important when booting up the NCU.

<table>
<thead>
<tr>
<th>LED: RDY</th>
<th>LED designations: RUN STOP SU/PF SF DP1 DP2 OPT</th>
<th>State/phase</th>
<th>7-segment display</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orange</td>
<td>Orange</td>
<td>BIOS boot</td>
<td>Post codes, see table: Load BIOS</td>
</tr>
<tr>
<td></td>
<td>Slowly flashing orange (0.5 Hz)</td>
<td>Booting up the kernel Phase 2: Initialization of the driver</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Slowly flashing orange/green (0.5 Hz)</td>
<td>Booting the basic system Phase 3: Initialization of the basic system</td>
<td>See table: Load operating system</td>
</tr>
<tr>
<td>OFF</td>
<td>Set by PLC/option module</td>
<td>NRK/NCK outputs</td>
<td>See table: NRK/NCK outputs</td>
</tr>
<tr>
<td>green/red flashing (0.5 Hz)</td>
<td>Set by PLC/option module</td>
<td>Basic system shutdown</td>
<td>OFF</td>
</tr>
<tr>
<td>red</td>
<td>Set by PLC/option module</td>
<td>Kernel shutdown</td>
<td>OFF</td>
</tr>
<tr>
<td>red (5 Hz)</td>
<td>Set by PLC/option module</td>
<td>SINAMICS fault</td>
<td>---</td>
</tr>
</tbody>
</table>

SINAMICS faults and alarms, also see: SINAMICS S120/S150 List Manual (LH1)

Load BIOS

<table>
<thead>
<tr>
<th>7-segment display</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>00</td>
<td>Before loading the Master Boot Record (MBR) from the CompactFlash Card</td>
</tr>
<tr>
<td>01</td>
<td>Before starting the Master Boot Record (MBR) codes</td>
</tr>
<tr>
<td>02</td>
<td>Master Boot Record (MBR) code started</td>
</tr>
<tr>
<td>03</td>
<td>Second stage of the boot loader started, before reading the configuration file</td>
</tr>
<tr>
<td>04</td>
<td>Before loading the kernel</td>
</tr>
<tr>
<td>05</td>
<td>Before starting the kernel</td>
</tr>
</tbody>
</table>
System settings
1.4 Displays during system booting

Booting the basic system

<table>
<thead>
<tr>
<th>7-segment display</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (begin)</td>
<td>Basis initializations</td>
</tr>
<tr>
<td>2 (prepfs)</td>
<td>Cleaning up and preparing the file system</td>
</tr>
<tr>
<td>3 (hostname, loopback)</td>
<td>The name is set and the loopback interface configured.</td>
</tr>
<tr>
<td>4 (syslog)</td>
<td>Starting the system logging</td>
</tr>
<tr>
<td></td>
<td>Starting the CFS class 1, provide the network interfaces.</td>
</tr>
<tr>
<td>5 (network)</td>
<td>Initializing the network interfaces and the firewall</td>
</tr>
<tr>
<td>6 (NCU:rtai, TCU:tcuconfig)</td>
<td>Starting the time server (ntpd)</td>
</tr>
<tr>
<td>7 (lsh)</td>
<td>Starting the SSH server (if required, generate a host key if still not available).</td>
</tr>
<tr>
<td>8 (NCU:ftpd, TCU:mtouch)</td>
<td>Starting the FTP server</td>
</tr>
<tr>
<td>9 (NCU:tcuservices, TCU:usbexport)</td>
<td>Starting the TCU services (TFTP, VNC)</td>
</tr>
</tbody>
</table>

NRK/NCK outputs

<table>
<thead>
<tr>
<th>7-segment display</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Not applicable.</td>
</tr>
<tr>
<td>2</td>
<td>Not applicable.</td>
</tr>
<tr>
<td>3</td>
<td>Debugger was initialized.</td>
</tr>
<tr>
<td>4</td>
<td>NRK operating system was successfully activated.</td>
</tr>
<tr>
<td>5</td>
<td>NRK operating system has booted, init task is being processed (→ the application boots).</td>
</tr>
<tr>
<td>6</td>
<td>Initialization was successfully performed; the control is in cyclic operation.</td>
</tr>
<tr>
<td></td>
<td>with flashing point: The control is in cyclic operation and the cycles are active.</td>
</tr>
<tr>
<td>F</td>
<td>Internal error: Can only be read via additional diagnostics.</td>
</tr>
<tr>
<td>1 or 2</td>
<td>CompactFlash Card and SRAM data do not match. To resolve this problem, a general reset is required by booting with switch position 1 or 2.</td>
</tr>
<tr>
<td>Lxx=yyy</td>
<td>Internal error when starting NCK, “xx” is the line number in the mcsystem.ini, “yyy” is a unique error code for the code position.</td>
</tr>
</tbody>
</table>
## System settings

### 1.4 Displays during system booting

#### System error

<table>
<thead>
<tr>
<th>LED:</th>
<th>LED designations:</th>
<th>Meaning</th>
<th>7-segment display</th>
</tr>
</thead>
<tbody>
<tr>
<td>RDY</td>
<td>RUN STOP SU/PF SF DP1 DP2 OPT</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rapidly flashing red (2Hz)</td>
<td>Set by PLC/option module</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rapidly flashing red/orange (2 Hz)</td>
<td>Set by PLC/option module</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### 7-segment display

<table>
<thead>
<tr>
<th>7-segment display</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Permanent error:</strong></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>&quot;crash&quot;: The operating system crashes (this approximately corresponds to a Blue Screen for Windows); details can be found in the system log file.</td>
</tr>
<tr>
<td>P</td>
<td>&quot;partition&quot;: Error when repartitioning</td>
</tr>
<tr>
<td><strong>Temporary error:</strong></td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>&quot;error&quot;: A read or write error has occurred on the CompactFlash Card (an additional point is displayed for a write error). It is possible that the CompactFlash Card is defective and should be replaced.</td>
</tr>
<tr>
<td>F</td>
<td>&quot;full&quot;: The CompactFlash Card is too full, so it is probable that not all of the services will be able to be successfully started. When booting, this error is displayed for 1 minute; the system then continues to boot, however, it can be assumed that problems will occur.</td>
</tr>
</tbody>
</table>
System settings

1.4 Displays during system booting
Configuring the system

2.1 Ethernet interfaces of the NCU

Supplementary conditions

For the operation of an NCU:

- No more than one NCU may be operated as a DHCP server on the system network.
- An additional external keyboard is required for uppercase/lowercase letters and a mouse is needed when using the System Network Center.

Configuration of the interfaces

The following connections can be established via the Ethernet interfaces:

<table>
<thead>
<tr>
<th>Interface</th>
<th>Labeling</th>
<th>Internal name</th>
<th>Terminal settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethernet IE1/OP</td>
<td>X120</td>
<td>(Eth 2)</td>
<td>Connection to the system network with preset IP address 192.168.214.1 with subnet screen form 255.255.255.0 and active DHCP server for SINUMERIK</td>
</tr>
<tr>
<td>Ethernet IE2/NET</td>
<td>X130</td>
<td>(Eth 1)</td>
<td>Connection to company network as standard DHCP client</td>
</tr>
<tr>
<td>Ethernet</td>
<td>X127</td>
<td>(Ibn 0)</td>
<td>Service terminal with fixed IP address 192.168.215.1 and fixed subnet screen form 255.255.255.224 with active DHCP server</td>
</tr>
</tbody>
</table>

Network interface

The network interface is an interface that enables network communication. These are the Ethernet interfaces on the NCU.

VNC (Virtual Network Computing)

Virtual Network Computing is a software that displays the screen contents of a remote computer, with a running VNC server, on a local computer, with a running VNC viewer, and in return sends keyboard and mouse movements of the local computer to the remote computer.

Reference

Operator Components and Networking Manual
2.2 How to determine the IP address of the NCU

Determining the IP address of the NCU on the company network (X130)

On X130, the NCU is set to the address reference via DHCP. If the company network has a DHCP server no further settings are required.

There are several possibilities for determining the address that the NCU obtained on the company network, and these possibilities are listed below:

- If the NCU boots in switch position 8, it shows the IP address on X130 on the 7-segment display.
- Once the NCU has booted successfully, open a service shell on the TCU and execute the following command to obtain the desired information:
  
  SC SHOW IP

Changing the IP address

If the company network has no available DHCP server or if this cannot be used, you are given the option to set a fixed address for the NCU on X130 (in accordance with the addresses already used on the company network).

Example:

The following command results in an IP address 157.163.245.105 with a subnet mask 255.255.255.0.

  SC SET IP 157.163.245.105 255.255.255.0  -X130

NCU in the system network (X120)

On X120, the NCU is pre-selected as required: No settings are necessary.

See also

  Generic elements (Page 33)
2.3 Configuration file "basesys.ini"

Storage path

For a Linux basic system, the original file can be found on the CompactFlash Card at /system/usr/etc; OEM versions are stored under /oem/system/etc as well as /oem_i/system/etc and user versions under /user/system/etc.

Use

Settings are made in the basesys.ini file that specify the behavior of the system in the network.

To edit the basesys.ini file:

- Comments are introduced by ';' or '#' at the beginning of the line, and span the width of the line. Empty lines are also handled as comments.
- The sections that start with a "[NAME]" line are ignored by the basic system itself, but are sometimes used by the HMI.
- Variable definitions are written in the form "NAME=VALUE". Blanks are permitted around the '=' character. The value may also be enclosed in double quotation marks, but this is optional.

NOTICE

Only the basesys.ini file parameters described in this chapter can be changed.

The "System Network Center" can also be used for this purpose. Use the "sc start snc" command to call this program. To operate it, you will need a mouse.

2.3.1 Section [ExternalInterface]

Description

In this section, the parameters and settings for the external Ethernet interface are defined. For an NCU7x0, this is X130 (Eth1). If the external interface is in DHCP mode, i.e. the value of ExternalIP is empty or not defined, then all parameters listed here, with the exception of "DHCPClientId", are accepted by the DHCP server as long as the server provides a value for the parameter.

ExternalIP

If ExternalIP is not empty, the fixed IP address specified there is used on the company network interface. The ExternalNetMask then also needs to be set, as well as the gateway, name servers, host name, and domain if required.
If ExternalIP is not set or is empty, a DHCP client is started on the interface.

**Value:** IP address  
**Default:** Empty

**ExternalNetMask**  
ExternalNetMask must be set together with ExternalIP, in order to define the size of the network.

**Value:** Subnet mask  
**Default:** Empty

**Gateway**  
If the value of gateway is not empty, the host specified there is used as the default gateway, which means that all IP packages that cannot be directly assigned are sent here for routing. If no gateway is specified, only the networks that are directly connected are accessible.

**Value:** IP address  
**Default:** Empty

**Nameservers**  
If DNS name servers are specified here, then these 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 your DHCP client (TCU, PG) via the DHCP server of the NCU, so that this can also work with symbolic names.

**Value:** List of IP addresses (separated by a blank)  
**Default:** Empty

**Timeservers**  
Here you can specify a list of NTP servers (UDP/123) that can be used by the NTPD on the NCU for time synchronization.

**Value:** List of IP addresses (separated by a blank)  
**Default:** Empty

**Hostname**  
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:

- Host name from the basesys.ini file, if set
- A name received from the DHCP server (if DHCP client mode and a name have been supplied), the result of a reverse DNS lookup, i.e. which name belongs to the IP received (if nameservers are defined)
- A 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), numbers (0-9) and '-'
- max. 63 characters

**Value:** Name  
**Default:** Empty

**Domain**

These variables can be used to configure the DNS domain. The effect is that names in this domain can be resolved without qualification (e.g. if the domain is "test.local", you can also specify the name "computer1.test.local" as "computer1").

**Value:** Name  
**Default:** Empty

**DHCPClientID**

With these variables, you can influence which ClientID the DHCP client presents to its server. This ID can be used by the server to assign certain parameters to the client, for example a static IP address.

Usually, the MAC address of the Ethernet interface is used for this purpose. This is also the default setting. Alternatively, you can also use the host name ("@NAME"), which must then be defined in the basesys.ini, in order to be recognized before the DHCP request. It is also possible to use an arbitrary string for ClientID.

**Value:** @MAC, @CFID, @NAME or any string  
**Default:** @MAC
2.3 Configuration file "basesys.ini"

2.3.2 Section [InternalInterface]

Description
In the section [InternalInterface] the data is specified for synchronization of the DHCP server in the system network.

Note
This section of the basesys.ini file is on Linux systems (e.g. NCU, PCU 321) and, from PCU base software V8.1, also on Windows systems (e.g. PCU 50.3).

InternalIP
Use this variable to set the fixed IP address in the system network. InternalIP should always be used together with InternalNetMask.

Value: IP address
Default: 192.168.214.1

InternalNetMask
Specifies the subnet mask for InternalIP and should always be used together with it.

Value: Subnet mask
Default: 255.255.255.0

InternalIP_Alias
Use this variable to define an additional alias IP address for the interface of the system network (X120); this is practical in certain application cases.

Value: IP address
Default: Empty
InternalIP_Alias should always be used together with InternalNetMask_Alias.

InternalNetMask_Alias
This variable specifies the subnet mask for InternalIP_Alias and should always be used together with it.

Value: Subnet mask
Default: Empty
SyncModeDHCPD_SysNet

If this variable is not set on "OFF" 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 50.3 concurrently without having to adjust the network settings.

Value: ON_MASTER, ON_HIGH (= ON), ON_LOW, or OFF
Default: ON_HIGH

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 **ON_MASTER** setting instead of **ON_HIGH** you can influence the synchronization in such a manner that the server with the "Master" setting is always the active server (for this it must be active on the network). This means that in the normal situation deterministically the same controller is always the DHCP server and you can find the actual address data (/var/etc/udhcp-eth0.leases) and the TCU data (/user/common/tcu/etc.) there. **ON_MASTER** should only be set for a single DHCP server in the system network; there should not be multiple masters.

- The **ON_LOW** setting assigns the DHCP server a lower priority than normal. It then becomes the active server if no server with **ON_HIGH** or **ON_MASTER** is found in the network.

**Note**

Compatibility with earlier versions

The priority level "ON_LOW" is used automatically if the DHCP server was previously switched off with the no longer available variable DisableDHCPDeth0=1. Such an NCU then indeed does have a (standby) DHCP server and keeps a backup of the lease data, however normally it does not become an active server.

InternalDynRangeStart

With the two variables InternalDynRangeStart and InternalDynRangeEnd, you can explicitly specify the range of IP address assigned by the DHCP server. The number band of the presetting should normally suffice.

Value: IP address
Default: First address in the system network + 10 or +2 (if ≤ 16 addresses)

InternalDynRangeEnd

Value: IP address
Default: Last address in the system network - 15 or -1 (if ≤ 16 addresses)
2.3 Configuration file "basesys.ini"

**DHCPDNoMasterWait**

If a synchronizing DHCP server has once seen a master server in the past, then it waits for synchronization until the time specified here elapses before it 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 controllers.

- **Value:** Time in seconds
- **Default:** 120

**InternalDNSDomain**

This is used to specify the Top Level Domain (TLD) name that is 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.

As presetting the "local" recommended by the RFC1035 is used for local networks, to avoid conflicts with globally defined domain names. Recommendation: The preset should be maintained.

- **Value:** Domain name (letters, numbers, '-', '_', max. 63 characters)
- **Default:** local

### 2.3.3 Section [IBNInterface]

**Description**

The settings in this section affect interface X127.

**EnableDHCP_IBNNet**

If this variable is set to 0 then this prevents the start of the DHCP server on the commissioning interface (X127).

- **Value:** Empty, 0 or 1
- **Default:** Empty

**EnableSysNetToIBNForwarding**

If this variable is set to 1, it is possible to transmit packages from the system network (X120) to X127. A firewall usually prevents this.
It is important to remember that there is no NAT involved, and the sender is responsible for ensuring (with a suitable routing entry, for example) that packages sent to the PG or service PC on X127 with the address 192.168.215.x only reach the NCU to which the device is connected.

Value: Empty, 0 or 1
Default: Empty

**DisableIBNForwarding**

If this variable is set to 1, the NAT transfer of packages from the service connection X127 to the system network (X120) is deactivated.

Value: Empty, 0 or 1
Default: Empty

### 2.3.4 Section [SNMP]

**Description**

Character strings delivered via SNMP (Simple Network Management Protocol) are entered here. This is a way of giving out information.

**SNMPLocation**

This string is used for the standard OID SNMPv2-MIB::sysLocation. It is possible to specify a location here, which can be subsequently called with an SNMP client.

Value: Any character string
Default: Empty

**SNMPContact**

This string is used for the standard OID SNMPv2-MIB::sysContact. It is possible to specify a contact address here, which can be subsequently called with an SNMP client.

Value: Any character string
Default: Empty
2.3 Configuration file "basesys.ini"

SNMPAutLocation
This string is used for the Siemens-specific OID
automationSystemIdent.automationLocationTag. It is possible to specify an additional
location here, which can be subsequently called with an SNMP client. This is similar to
SNMPLocation in terms of the MIB description, although it is intended for entries relating to
automation.

Value: Any character string
Default: Empty

SNMPFunction
This string is used for the Siemens-specific OID
automationSystemIdent.automationFunctionTag. It is possible to specify a function
designation here, which can be subsequently called with an SNMP client.

Value: Any character string
Default: Empty

See also
Example: Configuration file 'basesys.ini' (Page 27)

2.3.5 Section [DCP]

Description
The parameters in this section define the properties of the DCP protocol (Discovery and
Basic Configuration Protocol) e.g. that are used in the menu item "Accessible participants" of
STEP 7 is used.

InternalDcpEnabled
This can be used to switch-on and switch-off the DCP in the system network (X120); for the
NCU, the value is also used for X127.

Value: 0 or 1
Default: 1
ExternalDcpEnabled

This can be used to switch-on and switch-off the DCP in the company network (X130).

Value: 0 or 1
Default: 0

2.3.6 Section [LLDP]

Description

The parameters in this section define the properties of the LLDP protocol (Link Layer Discovery Protocol), which is used by several applications for network diagnostics.

InternalLdpEnabled

This can be used to switch-on and switch-off LLDP in the system network (X120); for the NCU, the value is also used for X127.

Value: 0 or 1
Default: 1

ExternalLdpEnabled

This can be used to switch-on and switch-off LLDP in the company network (X130).

Value: 0 or 1
Default: 0

InternalLdpTLVsTxEnabled

Using this parameter, additional information in the LLDP packages are enabled at X120/X127, which are normally not included.

Value: Numerical value from 0 ... 15
Default: 0
Configuring the system

2.3 Configuration file "basesys.ini"

The value is a bit field, i.e. the total value is obtained as a sum (total) of the specified numbers, if the corresponding information is to be sent:

1: port description
2: system name
4: system description
8: capabilities

ExternalLldpTLVsTxEnabled
Using this parameter, additional information in the LLDP packages is enabled at X130, which are normally not included.

Value: Numerical value from 0 ... 15
Default: 0

The value corresponds to parameter InternalLldpTLVsTxEnabled.

2.3.7 Section [LinuxBase]

Description
Additional setting possibilities of the Linux system are combined in this section.

Synchronizing the time
There are two different cases:

- If there is an external NTP server to act as a time server (entered in the basesys.ini file or via DHCP), then the PLC clock is synchronized via the Linux clock.
- If there is no external time server, the PLC clock will be the master for the Linux clock:

<table>
<thead>
<tr>
<th>NOTICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power on the PLC in switch setting 3: &quot;MRES&quot;</td>
</tr>
<tr>
<td>With &quot;memory reset&quot; the time of the PLC clock remains intact and is not reset.</td>
</tr>
<tr>
<td>If the PLC is switched on in switch position 3 &quot;MRES&quot; then the time will be reset. In this case the valid time is taken over from the Linux system and does not need to be reset.</td>
</tr>
</tbody>
</table>
Timezone

The time zone set here is used by the system to convert UTC time into local time. The time zone is also sent to all applications via the environment variable TZ, and is taken into account by the libc function localtime().

The time zone influences all time entries in the basic system, particularly for the command "date", for "ls -l", and in the system log file (on the CompactFlash Card under /var/log/messages).

Value: Time zone description
Default: UTC

Some selected time zone descriptions are listed in the comments of the supplied example file "basesys.ini":

LogFileLimit

The size of the system logfile /var/log/messages can be restricted with the help of this variable. By entering "Zero", the logfile has no size limitations.

The specified limit is no hard limit for reasons of efficiency but rather a sort of limit value. If the logfile reaches a limit value times factor 1.5, then it is reduced to around 75% of the limit value. A check is carried out every two minutes maximum to see if the file has become too large.

Value: Size in KB
Default: 100 KB

FirewallOpenPorts

Here you can specify a list of the ports which is to be enabled in the firewall of the external network interface. Always enabled are TCP/22 (ssh) and TCP/102 (S7 communications). Logfile is "TCP" or "UDP", the port is the (numerical) port number of the service to be enabled.

Value: List of logfile/port pairs
Default: Empty

Several entries are separated by a blank.

For example, you can additionally enable the VNC server:

FirewallOpenPorts=TCP/5900 TCP/5904 TCP/5905
**DisableSubsystems**

Using this variable, you can suppress mounting and starting of certain subsystems (CFS systems). Several subsystem names, too, can be specified - separated by blanks.

Value: List of CFS names (separated by a blank)
Default: Empty

The names can either be simple CFS basic names (e.g. "nck") - ignoring all CFS systems with this name - or you specify an absolute path (e.g. `/siemens/sinumerik/nck`) referring specifically to this CFS system.

It is also possible to set "DisableSubsystems=all" whereby not a single CFS system can be mounted or started any more.

**DisablePLCTimeSync**

If this variable is set to 1, synchronization of the system time with the PLC time (in both directions) will not be executed.

Value: 0 or 1
Default: 0

**EnableCoreDumps**

If this variable is set as equal to 1, a logfile for processes is created and stored under `/var/tmp`. The protocol file contains a memory print of the process that has crashed or that has terminated.

Value: Empty, 0 or 1
Default: 0
2.3.8 Example: Configuration file 'basesys.ini'

Configuration file basesys.ini

The following defaults are applied to the template_basesys.ini file which is supplied in the directory /siemens/system/etc.:

; Default Linux basesystem configuration
; section ID is for Windows compatibility and is ignored
[ExternalInterface]

; If ExternalIP is set, you can force the external Ethernet interface to use a fixed IP addr. etc instead of using DHCP
; if a Hostname is set, it even overrides one received by DHCP
;ExternalNetMask=255.255.255.0
;Hostname=somename
;Domain=example.com

; if ExternalIP is empty (default), DHCP is used with the following
; ClientID. The default is "@MAC" to use the MAC address, 
; alternatives are "@NAME" to use the hostname (Hostname above)
; or any other arbitrary string.
;DHCPClientID=@MAC

[InternalInterface]
; With InternalIP and InternalNetMask (both must be set together),
; you can change the address on the internal/TGU/automation net.
; This should not be needed normally.
;InternalIP=192.168.214.1
;InternalNetMask=255.255.255.0

; These two can define an alias IP for X120.
;InternalIP_Alias=192.168.216.1
;InternalNetMask_Alias=255.255.255.0

; This defines a "name of station" for PROFINET (ERTEC interface),
; e.g. for DCP. If not defined or empty, the usual hostname is also
; the PN name.
;PN_StationName="PN_IO"

; Setting EnableDHCPD_SysNet to 0 suppresses that a DHCP server
; is started on that interface
;EnableDHCPD_SysNet=0
; Set synchronization of all DHCP servers in the system/TCU network
; (X120). Possible values are:
; OFF, ON_LOW (low priority),
; ON or ON_HIGH (normal priority), or ON_MASTER (highest priority).
; ON_MASTER is used to make this machine deterministically
; the DHCP master server, but should be used only for one server
; in the network.
;SyncModeDHCPD_SysNet=ON

; 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

; If once a DHCP master was seen, the DHCP server waits this many
; seconds for the master to show up before trying to become the
; active server.
;DHCPDNoMasterWait=120

; DNS domain name used for names in system/TCU network
; (default is "local" to conform with RFC)
InternalDNSDomain=local

; FixedDomain and FixedNameservers can be used to define a DNS
; domain and nameservers, if the DHCP/DNS server on system network
; is disabled.
;FixedDomain=local
;FixedNameservers=192.168.214.1

; If DisableNATRouting is set to 1, the NCU won't forward from TCU
; or IBN net (X120 and X127, resp.) to external net (X130).
; If set to "X120" or "X127", forwarding will only be disabled
; from that interface.
;DisableNATRouting=1

[IBNInterface]
; Setting EnableDHCPD_IBNNet to 0 suppresses that a DHCP server
; is started on that interface.
;EnableDHCPD_IBNNet=0

; If DisableIBNForwarding is set to 1, the NCU won't do NAT routing
; from IBN network (X127) to system network (X120).
;DisableIBNForwarding=1

; If EnableSysNetToIBNForwarding is set to 1, the NCU forwards packets
; from X120 to X127. (Please note that the sending host must be able
; to route the packets to the NCU by its own means, the NCU just
; accepts and forwards packets to 192.168.215.x with this setting.)
;EnableSysNetToIBNForwarding=1
2.3 Configuration file "basesys.ini"

[SNMP]
; The following variables define strings which are delivered
; on certain SNMP requests.
; SNMPLocation and SNMPContact are reported for the standard OIDs
; SNMPv2-MIB::sysLocation and SNMPv2-MIB::sysContact, resp.
; SNMPAutLocation and SNMPFunction are used in the Siemens specific
; AUTOMATION-SYSTEM-MIB as automationSystemIdent.automationLocationTag
; and automationSystemIdent.automationFunctionTag, resp.
SNMPLocation="not specified"
SNMPContact="not specified"
SNMPAutLocation="not specified"
SNMPLocation="not specified"

[DCP]
; These variables en/disable the DCP protocol on X120/X127
; and X130, resp.
;InternalDcpEnabled=0
;ExternalDcpEnabled=1

[LLDP]
; These variables en/disable the LLDP protocol on X120/X127
; and X130, resp.
;InternalLldpEnabled=0
;ExternalLldpEnabled=1

[LinuxBase]
; Keep size of /var/log/messages around this value (not followed
; exactly for performance reasons)
LogfileLimit=102400

; Protocol/Port pairs to open in the firewall
; (e.g., TCP/5900, UDP/514, ...)
;FirewallOpenPorts=TCP/5900 TCP

; If there is only one Ethernet interface, it's used by default as
; an external (company) network. Alternatively, usage as automation
; net (TCU boot support etc.) is possible by setting NetworkModel
; to "automation". (Only NCU, Service and PCU20A variants!)
;NetworkModel=automation

; DisableSubsystems can be used to skip certain CFSes (= subsystems)
; a list of multiple names (separated by spaces) is possible
; a simple name means all CFSes with this name, an absolute path
; (e.g., /siemens/sinumerik/nck) exactly this one CFS
; with the special value "ALL", all subsystems can be disabled
;DisableSubsystems=nck

; Directory for OEM netboot files (served by tftp to diskless clients)
NetbootDirectory=/oem/common/netboot
Configuring the system

2.3 Configuration file "basesys.ini"

```
; Properties of local time zone: names, offset, start and end day
; Some examples:
; Europe: WET0WEST,M3.5.0,M10.5.0
;         CET-1CEST,M3.5.0,M10.5.0
;         EET-2EEST,M3.5.0,M10.5.0
; USA:    EST5EDT,M4.1.0,M10.5.0
;         CST6CDT,M4.1.0,M10.5.0
;         MST7MDT,M4.1.0,M10.5.0
;         PST8PDT,M4.1.0,M10.5.0
; China:  CST-8
; Japan:  JST-9
Timezone=UTC

; If DisablePLCTimeSync is set, no time synchronization
; with PLC will happen.
;DisablePLCTimeSync=1

; Set to 1 to enable coredumps in /var/tmp
EnableCoreDumps=0
```
2.4 Service Commands

2.4.1 Using service commands

Overview
The service command 'sc' is a tool used for performing a range of service tasks on a SINUMERIK NCU. The required action is written in the command line after the 'sc', e.g.: sc help
This action produces a list of all actions with a short description. After the action, further parameters or options can follow.
'sc' is available in both the NCU basic system and the service system (mostly in the form of a USB memory.) However, some actions are only useful in one of the two systems (NCU/Service). This is noted for each action.

See also
The most important terms and abbreviations are explained in the glossary.

Privilege levels
The 'sc' command can execute its actions using more privileges than are normally granted to the calling user. For example, starting or stopping subsystems requires root privileges, but 'sc' allows every user who belongs to the 'service' group to do this.

Each action of 'sc' is assigned a "privilege level". This is a user group to which the user must belong in order to execute the action. As the groups are hierarchically nested, members of "higher" groups can also use the action in question. For example, the group 'manufact' is above 'service', which means that members of the group 'manufact' can call all actions that require the privilege level 'service'.

The privilege level that the caller requires is noted for each individual action. The possible levels are (in ascending order):
- none
- operator
- user
- service
- manufact

Example:
An action with the privilege level 'user' can also always be executed by members of the groups 'service' and 'manufact'. Actions with privilege level 'none' can be called by all users.
If a user does not have the required privileges, the following error message is output:
Action 'ACTION' needs at least GROUP privilege level.
2.4.2 Syntax for the Actions

Description

'sc' in the command line is essentially not case-sensitive.

The following entries are therefore interpreted as identical:

- `sc help show`
- `SC help SHOW`
- `sc HeLp sHoW`

In some cases, however, upper/lower case can make a difference, for example in file or user names. This is avoided wherever possible.

The conventions used are as follows:

- Names completely in upper case represent objects to be used depending on the situation.
  
  **Example:** `sc help ACTION`

  In this case, ACTION is to be replaced by the action for which you want a description. If written in lower case, however, the entry should be entered as specified.

- Square brackets indicate optional entries.
  
  **Example:** `sc help [ACTION]`

  In this case the specification of an action is optional, which means that you can enter an action, but do not have to. Square brackets may also be nested:

  ... `[USERNAME/[DOMAIN]]` ...

  In this case, USERNAME and DOMAIN are both optional, but you can only enter a DOMAIN if you have also entered the USERNAME.

- Alternatives are separated with '|'.
  
  **Example:** `sc start all|system|SUBSYSTEM`

  This means that any of the following commands applies:

  - `sc start all`
  - `sc start system`
  - `sc start SUBSYSTEM`

  In the latter case, SUBSYSTEM in upper case can be replaced by a concrete subsystem name.

- As a shortened form, alternatives can also be written in square brackets:
  
  `sc save [-full|-user]` ...

  Here you can use the option "-full" or "-user", or none at all.

- Options that begin with '-' can always be entered in any order.
  
  For example, the notation could be interpreted to mean that "-force" must come after "-full" or "-user", but this is not necessarily the case:

  `sc save [-full|-user] [-force] FILENAME`
2.4.3 Generic elements

Overview

This section describes the syntax elements that are used by several actions.

Permitted interface designations

The names of network interfaces are used by "sc show ip", "sc set ip" and "sc enable DHCPsvr", for example.

As the input of an interface is optional, it is always introduced by a '-' character. The '-' is followed by the actual name. In most cases, multiple names are possible for the same interface.

Accepted names are:

- System network port: "X120", "eth2", "tcu", "internal"
- Company network port: "X130", "eth1", "factory", "extern"
- IBN port: "X127", "ibn0", "pg"

Permitted subsystem designations

Subsystem names are entered when using "sc enable" and "sc start", for example. In most cases, the name of the subsystem is simply the name of the corresponding CFS, without the path and without the extension ".cfs". For example, for the CFS /siemens/sinumerik/nck.cfs, the relevant subsystem name is simply "nck".

It is also possible to use absolute paths (beginning with '/') in a subsystem name. In the example above, you could also use "/siemens/sinumerik/nck" as a subsystem name. The difference between names with and without a specified path is that without the path, all CFS with this name are included, but if the path is specified, only this exact CFS is meant.

Subsystem

A subsystem is a CFS that not only contains a collection of files, but also executes a program, for example, at runtime. To do this, the CFS contains a script that is used to control the starting and stopping of this program.

For this reason, only administrators are permitted to set up NFS file systems, and NFS is usually only implemented in uniformly administrated environments. Exported file systems on the server are addressed directly on the server via their path.

CFS (Compressed File System)

A CFS (file extension ".cfs") is a compressed file system, similar to a zip file. It contains files and subdirectories that look like normal files on the controller at runtime. Files and directories contained in a CFS cannot be changed. They are decompressed at runtime as required.
NFS (Network File System)

NFS is the most common protocol for remote file systems in the world of Unix, and is also available for Windows. NFS is closely based on the Unix privilege model – each time a file is accessed, a UID and GID are supplied which the server then uses to decide whether the operation is permitted. The server relies on the client to provide the correct IDs.

Remote File System

A file system that is contacted over the network. The files are physically located on another computer in the network (the "server"), but appear locally the same as all other files. Operations performed on these files are sent via the network to the server, instead of being executed directly on a local storage medium (such as a hard drive or CompactFlash Card).

As a server usually exports more than one file system, a name for the required file system must also be entered in addition to the name of the server.

SMB (Server Message Block)

SMB is the underlying protocol of MS Windows file systems (also known as drives, releases, shares, etc.). SMB connections are always active in the context of a specific user, who must be known to the server. Exported file systems have a name (release name), by which they can be addressed. The client does not need to know the concrete path on the server.
2.5 Description of the actions

2.5.1 Help

Description

Syntax: sc help [Action]
Alternative names: -h, --help
Privilege level: none

The call of "sc help" without any additional action outputs a list of possible actions with a short description. If you enter an additional action, you receive a more detailed description for this action.

Examples:
sc help
All actions:
help [ACTION]
Print help about a specific or list all actions
restart
Reboot the machine
enable hmi|nck|SUBSYSTEM...
enable DHCPsrv -INTERFACE
Enable HMI, NCK, or any other subsystem
[...]

sc help enable
enable hmi|nck|SUBSYSTEM...
DHCPsrv -INTERFACE

Enable subsystem(s), like 'hmi', 'nck', and so on. A subsystem name is the name of the CFS containing it, without the '.cfs' extension. This enables all CFSs with that name, but you can also use a full path (e.g. /siemens/sinumerik/nck) to enable just a specific CFS. Another form is to enable the DHCP server on a network interface, for example 'enable DHCPsrv -X120'.
2.5 Description of the actions

2.5.2 Check-cf

Description

Syntax: sc check-df
Alternative names: checkcf
Privilege level: user

With this action, the CF card is checked reading to see whether it contains defective sectors. If errors occur, this is noted in the file /var/log/messages.

2.5.3 Clear

Description

Various actions can be performed with the "clear" command; only the "clear dhcp" command is relevant here.

clear dhcp

Syntax: sc clear dhcp [-INTERFACE]
Alternative names: ---
Privilege level: service

This command clears any state of the DHCP server at the specified interface (default setting is the system network) and resets it to its initial state. This means that the Lease data is deleted: all IP addresses are re-assigned in the network and the server forgets having ever seen a master server.

This action is only appropriate on a machine on which the active DHCP server runs.

Note

The clearing of the Lease data does not delete the entire file, but only the data contained therein. This action also increments the version number, so that available standby DHCP servers can also perform the deletion.
2.5.4 Closeport

Description

Syntax: sc closeport ID
Alternative names: ---
Privilege level: service

Mode of operation

This command closes a port in the firewall opened previously with the "sc openport" command. This is only necessary when the port is to be closed manually before the time set with "sc openport" expires. Otherwise the port is closed automatically when the port service life expires.

ON parameter is the ID number of the firewall rule output by "sc openport".

2.5.5 Connect

Description

Syntax: sc connect [-ro] SERVER:/PATH [MOUNTPOINT]

Alternative names: mount
Privilege level: none

This action makes a remote file system on a server available on the controller. This is enabled by linking the remote file system to a local directory, known as the "MOUNTPOINT". The files offered by the server are then visible under this directory.

NOTICE

Note that when entering this command, the password appears on the screen in plain text according to the specified syntax.

For path names, use the slash "/" and not the backslash "\".
Supported file systems

Two types of remote file system are supported: Windows SMB and Unix NFS. These two systems have completely different characteristics, particularly in terms of user administration:

- In Windows SMB, you connect to the server as a particular user that the server must recognize. Via this connection, you then access the files as this user, independently of which local user triggers the action.

  This feature means that in SMB systems, you already have to enter a user name, if necessary its domain, and a password at the time of connection.

- In NFS servers, the connection itself does not require a particular user to be entered. Instead, for each file operation, the user who wants to carry out the operation must log on to the server. The server then decides whether or not to permit this. Users are entered using a user ID and group ID, not with names. The server must therefore recognize the corresponding IDs (or permit access for all users.)

Another type of remote file system that is supported are USB memory devices exported from TCUs (USB Flash Drive). Since these are integrated using NFS, the entries for server and path are similar to those for NFS. However, the TCU names are administrated differently, and the USB memory devices have specific paths that do not physically exist.

Notation of the remote file system

For SMB and NFS/TCU, the file system is entered using different notations:

**SMB:** //\[USERNAME]/\[DOMAIN]/\[PASSWORD]\@[SERVER]/SHARE

The fixed share is: //\SERVER/SHARE

The server name can of course also be a numeric IP address. SHARE is the name of the release on the server. Note that the character `$`, which often occurs in this type of name, must be preceded by a backslash (\`) in the command line. Otherwise, the system tries to expand a variable.

A user name can also be entered in front of the server name, separated with a `@` character. If necessary, the user name can also be extended by adding `'\` followed by the Windows domain to which it belongs. The password belonging to this user is normally queried interactively, so that it is not visible on the screen.`

For some applications, however, it may be necessary to write the password on the command line. (For example, programs started from WinSCP cannot read from the keyboard.) In this case, you can append an additional `\%` character, followed by the password. If this contains any special characters that are interpreted by the shell (`<, >, &`, `;`, `,`, `\`, `$`, ``, `,`, `|`), you should shield these by preceding them with a backslash. Commas in SMB passwords cannot be interpreted.

**NFS:** SERVER:/PATH

In NFS, entering the user is not required, which just leaves the two components SERVER and PATH. As before, SERVER is the name of the file server. In contrast to SMB, PATH is a path name that exists on the server, and not an arbitrarily assigned name.

The command "sc show drives SERVER" shows the file systems offered by a particular server in the correct notation. For SMB, if required, the user name etc. still need to be added.
After the entry of the remote file system, you can also specify the required directory ('MOUNTPOINT') in which the remote files will become visible locally. This should be an empty directory to which you have write access. If MOUNTPOINT is omitted, 'sc' itself generates a suitable directory. The name is /tmp/drvNN (numbered consecutively), and is displayed when the connection is successful.

The option "-ro" connects the remote file system in read-only mode, which means that you can only read and do not have write access. This can be useful if you want to exclude changes that originate from the controller, or if the server only allows read-only connections.

As explained above, an SMB file system is connected as the specified user. To prevent a third user from executing file operations on the controller in the name of the connected user, the local directory can normally only be accessed by the latter (and all members of the same group).

However, if you do want to make the remote directory available to further local users, you can use the option "-public" to make the MOUNTPOINT belong to the "operator" group, and this access is therefore guaranteed.

### 2.5.6 Disable

**Description**

The "sc disable" command switches the specified subsystems off. These subsystems are then not loaded again at the next restart. You can also switch several subsystems off with a single "disable" command.

"hmi", "nck" or any other subsystem names can be used for the subsystems.

"sc disable IPAlias" deactivates the second alias IP address for the X120 network interface.

**Syntax:**

```
sc disable hmi\|nck\|SUBSYSTEM ...
sc disable DHCPSvr -INTERFACE
sc disable DHCPsync [-X120]
sc disable IPAlias [-X120]
```

**Alternative names:** ---

**Privilege level:** service

**See also:**

Parameters "InternalIP_Alias" and "InternalNetMask_Alias" in the "basesys.ini" file.
Specific subsystems

The name "DHCPsvr" is a special case. This does not switch a normal subsystem on or off, but specifies whether or not a DHCP server should be started on a network interface. The interface is entered in the standard form.

The synchronization of the DHCP server is switched on and off with "DHCPSync". The synchronization is only possible in the system network.

The commands "sc enable" and "sc disable" function by changing certain variables in the file /user/system/etc/basesys.ini. In subsystems, this variable is "DisableSubsystems", in DHCPSvr "DisableDHCPD<INTERFACE>".

2.5.7 Disconnect

Description

Syntax: sc disconnect MOUNTPOINT
        sc disconnect all

Alternative names: umount, unmount

Privilege level: user

The action "disconnect" terminates the connection to a remote file system previously connected using "connect". If the MOUNTPOINT has been automatically created by 'sc', the corresponding directory is also deleted again.

The variant "sc disconnect -all" can be used to remove all existing SMB and NFS file systems.

2.5.8 Distribute

Description

Syntax: sc distribute [parameter]

Alternative names: dist

Privilege level: service

This command distributes TCU data to other machines in the system network. Only the parameter "tcudata" is relevant here.

distribute tcudata

Syntax: sc distribute tcudata

Alternative names: ---

Privilege level: service
This command informs the active DHCP server that TCU data in /user/common/tcu has been manually changed. The server can then distribute this data to the standby servers.

It is recommended that the version file in /user/common/tcu be changed manually as this is only read in once by the DHCP server at the start. An incrementing of the version would then only take effect at a restart.

Note
This command can be performed on any machine in the system network, not only on the active server. A message is always sent to the active server.

2.5.9 Enable

Description

Syntax: 
- `sc enable hmi|nck|SUBSYSTEM ...`
- `sc enable DHCPSvr -INTERFACE`
- `sc enable DHCPSync [-X120] [-PRIORITY]`
- `sc enable IPAlias [-X120] [IPADDR[/NETMASK]]`

Alternative names: ---
Privilege level: service

The "sc enable" command switches on the specified subsystems such that these are also activated when a subsystem is started. You can also switch several subsystems on with a single "enable" command.

"hmi", "nck" or any other subsystem names can be used for the subsystems.

"sc enable IPAlias" defines a second alias IP address for a network interface. This is only supported for X120. The IP address itself has the usual notation with four numbers separated by decimal points. If not specified, the subnet screen form can be determined from the class (A/B/C) of the IP or determined explicitly. The CIDR notation (number of bits of the network section) is also possible.

See also:
Parameters "InternalIP_Alias" and "InternalNetMask_Alias" in the "basesys.ini" file.

Specific subsystems

The name "DHCPSvr" is a special case. This does not switch a normal subsystem on or off, but specifies whether or not a DHCP server should be started on a network interface. The interface is entered in the standard form.
2.5 Description of the actions

The commands "sc enable" and "sc disable" function by changing certain variables in the file /user/system/etc/basesys.ini. In subsystems, this variable is "DisableSubsystems", in DHCPSvr "DisableDHCPD<INTERFACE>".

DHCP synchronization

The synchronization of the DHCP server is switched on and off with "DHCPSync". The synchronization is only possible in the system network (X120). A priority can also be specified. -LOW, -HIGH or -MASTER.

The priorities have the following effect for the synchronization of the DHCP server:

- **MASTER**: The computer node will become an active DHCP server. If several servers have been configured in the system network, this computer has the highest priority.
- **HIGH**: The computer node belongs to the server candidates with high priority, i.e. if no server with "MASTER" priority becomes active, then a computer with "HIGH" priority can be the active server.
- **LOW**: The computer node belongs to the server candidates with low priority, i.e. if no server with "MASTER" priority or "HIGH" priority becomes active, then a computer with "LOW" priority can be the active server.

Note

Recommended settings are:
- DHCP operation and DHCP synchronization are switched on in the system network.
- **Exactly one** NCU is set as DHCP server.
- **Maximum of two** computers are candidates with "HIGH" priority.
- All other components are set as DHCP clients or candidates with "LOW" priority.

See also:

Parameter "SyncModeDHCPD_SysNet" in the "basesys.ini" file.

2.5.10 Openport

Description

Syntax: `sc openport [-MINUTES] PROTO/PORT SOURCE ...
Alternative names: ---
Privilege level: service`
Mode of operation

This command opens a port in the firewall to the company network (X130) for a certain time. The default time is 15 minutes, but this can be changed with the -MINUTES option. The maximum possible time is 60 minutes.

The port to be opened is specified in the form "PROTO/PORTNR". The protocol can be either "tcp" or "udp". This is followed by the specification of the hosts from which the port should be accessible. Several forms are possible here:

- A single IP address: "128.128.12.12"
- A host name (if this can be resolved via DNS), e.g. "server"
- An IP area with network screen form specification, e.g. "128.128.12.0/255.255.255.0"
- An IP area with specification of the valid bits, e.g. "128.128.12.0/24"

If the specification of the source host is completely missing, this is normally acknowledged with an error message. However, an exception is when the "sc openport" command is entered in a shell opened via SSH. The permitted host is taken from the environment variable $SSH_CLIENT that contains the IP of the SSH client.

If the opening was successful, an ID number is output in a status message:

```
sc: Port tcp/25 is open, rule ID is 6620
```

This ID can be used with "sc closeport" to manually close the port earlier.

See also:

Parameter "FirewallOpenPorts" in the "basesys.ini" file.

2.5.11 Restart

Description

Syntax: sc restart
Alternative names: reboot
Privilege level: service

The action "sc restart" triggers a controlled shut down of the machine (stops all subsystems and the basic system), and then initiates a restart. The effect is the same as the "reboot" command in the basic system, which can only be executed by "root".
2.5.12 Restore

Description

Syntax: 
```
sc restore [-full|-addon|-addon+|-oem|-oem+|-user]
```

Alternative names: ---
Privilege level: user

A backup created using "sc save" can be restored to the controller using "sc restore".

Mode of operation

As for "sc save", a restore is only possible from the service system or if subsystems are stopped. If "sc restore" reports an error, for example that the restore will cause running subsystems to crash, you can use the option "-force" to force the operation – just as for "sc save".

Normally, "sc restore" deletes the whole destination area before the backup is restored (complete CF card for full backup, /user in user data backups). This means that no files are subsequently available that were not included in the backup.

Options

If no further options are specified, the archive should represent a full backup and this should be restored in full. The status of all files is therefore the same after the "restore" as it was at the time of the backup.

- The -full option additionally forces the partition and the file system to be recreated on the CF card. This is only possible from a service system however. -full is necessary if the partition table and/or file system is missing or damaged.
- However, if you want to restore the backup files without losing any files that have been created in the meantime, you can use the option "-nodelete" to prevent these from being deleted. "-nodelete" is not executed together with "-full", as when the file system is recreated, all files are essentially deleted.
- The options -addon, -oem, -user, -addon+ and -oem+ also allow you to unpack only parts of an archive.
- The -update option is used for loading software updates supplied by Siemens. The -restart option can also be useful with -update. If user-defined system files are changed when loading an archive, a restart or reinitialization is necessary. In such cases, "sc restore" outputs a message to that effect at the end of the operation. The -restart option causes the required action to be performed automatically.
2.5.13 Save

Description


Alternative names: backup
Privilege level: user

The call of "sc help" without any additional action outputs a list of possible actions with a short description. If you enter an additional action, you receive a more detailed description for this action.

The action "Save" or "Backup" creates a backup of the CF card in FILENAME. If the action is used from a service system, the backup receives the files of the underlying controller, not of the service system itself.

Options

The following options are used for selecting which directories of the file system are to be written to the archive:

- **-full:** complete backup (default): all files of the controller, incl. Boot Loader
- **-addon:** only /addon directory
- **-oem:** only /oem directory
- **-user:** only /user directory (user data)
- **-addon+:** /addon, /oem and /user
- **-oem+:** /oem and /user

If "sc save" is used directly on the controller and the subsystems are running, this may lead to inconsistencies between saved files, because they can still change during the backup process. Therefore, in this case "sc save" normally ends in an error message to inform you that subsystems are still running.

- If you want to create a backup anyway, you can use the -force option. "sc save" still issues a warning, but the process continues. If "sc save" is started from the service system, no subsystems of the controller are running and "-force" is not necessary.
- The -update option writes an Img-D control file to the archive. This makes it possible to use the archive at a later date via "sc restore -update".

Example:

sc save -user /tmp/drv01/backup.tgz
2.5 Description of the actions

2.5.14 Show

Description

Syntax: sc show ip [-INTERFACE]
Alternative names: ----
Privilege level: none

In the "sc show" command, various displays are grouped together showing the status of the system.

show ip

Syntax: sc show ip [-INTERFACE]
Privilege level: none

This command displays the IP address data of network interfaces. You have the option to enter a specific interface. If no particular interface is specified, the data for all existing interfaces is displayed, as well as the Default Gateway.

Example:
sc show ip
X120 (system network, eth0):
  configured: (default)
  current : IP=192.168.214.1 Netmask=255.255.255.0
MAC=08:00:06:73:55:fd
  DNS Name : ncu1.local
  Nameserver: 127.0.0.1
  DNS Suffix: local
  DHCP : synced server, prio=high, active
  Statistics: RX=0.0MB (0.00% errors), TX=0.2MB (0.00% errors)
X130 (company network, eth1):
  configured: DHCP
  current   : IP=111.222.333.64 Netmask=255.255.248.0
MAC=08:00:06:73:55:fe
  DNS Name : name.test.siemens.de
  Nameserver: 111.222.333.12 111.222.333.13 111.222.333.14
  DNS suffix: test.siemens.de
  DHCP : client (server: 111.222.333.221)
  Statistics: RX=1.2MB (0.00% errors), TX=0.0MB (0.00% errors)
X127 (engineering network, ibn0):
  configured: server
  current   : IP=192.168.215.1 Netmask=255.255.255.224
MAC=08:00:06:73:55:ff
  DNS Name : ncu-ibn
  DHCP : server
  Statistics: RX=0.0MB (0.00% errors), TX=0.0MB (0.00% errors)
Default gateway: 111.222.333.1 (via eth1)
Used nameserver: 127.0.0.1
Used DNS suffix: test.siemens.de local
The following data is displayed for each interface:

- **Name**: the name of the connection socket (X1_ _), together with the name used by the operating system in brackets (ethN or ibnN).
- **"configured"**: the IP address configured in the basesys.ini (variables ExternalIP/ExternalNetMask for X130, InternalIP/Internal-NetMask for X120), or "(default)" if nothing is configured in the basesys.ini, or "DHCP" if the address was sourced via DHCP.
- **"current"**: the currently set IP address together with the network screen form and MAC address of the interface.
- **"DNS Name"**: Result of a DNS reverse lookup on the current IP address.
- **"Nameserver"**: Here the list of DNS servers is output which are related to this interface (receive e.g. DHCP via this interface).
- **"DNS Suffix"**: DNS search suffix related to this interface.
- **"DHCP"**: Indication is given here if a DHCP client or server is running for this interface. In the case of a client, the server where the IP address comes from is displayed, too. A DHCP server on X120 can additionally be synchronized on the system network. Then the information is displayed if this is the active server or if it is in standby mode.
- **"Statistics"**: Total amount of data received or sent via this interface, and the percentage of faulty packages.

When all interfaces are displayed, the default gateway is also output, i.e. the address of a router to which all packages are sent that cannot reach their destination directly via a local interface.

The default gateway is therefore a piece of data that applies to all interfaces and of which there is only one instance. However, there is one interface via which it must be possible to address the default gateway. This is displayed in brackets after the address.

**show drives**

Syntax: sc show drives SERVER  
Privilege level: none

"sc show drives" shows the available remote file systems for a particular server. The server name SERVER can be an NFS server, an SMB server or "TCU", which represents any USB media that are connected to a TCU. For details of possible server names and entering a user name (often required for SMB), see the description of the "sc connect" command.
2.5 Description of the actions

Examples

Notation:

sc show drives someuser/somedomain@somepc # Windows-Server
Password: ******
//somepc/C$
//somepc/D$
//somepc/images
sc show drives someserver # NFS-Server
someserver:/export/home1
someserver:/export/home2
sc show drives TCU # TCU USB-Medien
TCU1:/dev0-0
TCU2:/dev0-0

All the available remote file systems of the relevant server are listed in the notation that is expected by "sc connect".

- SMB shared drives on Windows servers always begin with "//", followed by the server name and the name of the shared drive. In NFS file systems, the server name is always first, followed by a colon and then the export path.
  Connection to SMB servers usually requires the entry of a user name (with domain, if applicable) and a password.

- A USB memory on a TCU is a special form of NFS, and therefore also has the same notation as an NFS file system. The specified path exists - but not physically - on the TCU, but is converted there to USB by the NFS server.

show net

Syntax: sc show net [-xml] [-hw|-tco|-sw|-swfull|-loc|-panel]
          -dhcp|-switch]-[all] [HOSTS...]

Privilege level: none

The "sc show net" command displays the devices in the system network and gives additional information on these devices.

As both these functions rely on SNMP (Simple Network Management Protocol), only those devices able to use SNMP will be found. SNMP as from version 2.6 is available for Linux-based devices, for all other devices (e.g. MCP) this depends on the respective software version. If a simple call is made, without any additional options, a list of the devices found will appear showing the relevant IP address, DNS name (if known), and a short description (module name).
Options

The various switches, which can also be combined, allow additional information to be output on the devices found:

- Unless additional options are involved, the output format for "sc show net" is designed to be displayed on the screen. The alternative XML format is preferable, however, if further machine-based processing is required. This can be selected via the -xml option (this option must be the first one!).

- If the command line contains nothing after the switches, "sc show net" will search the entire system network by broadcast for devices able to use SNMP. This search takes time, however, and in the case of larger systems, the volume of information output may be considerable. In view of this, a list of IP addresses or (DNS) names can be specified to ensure a better overview. This will limit the search process and only the named devices will be included.

-hw Information on hardware, such as the MLFB, serial number, hardware ID, hardware version, SRM version, manufacturer, and the serial number of the CF card. Some devices have two of these hardware blocks (the second one being intended for an integrated device). The PLC in the NCU and the TACO in the OP on an TCU are two such examples.

-tco Operating state data: switching counter, operating hours counter, quantity of data written to the CF card, number of times maximum temperature exceeded

-loc Location data: location, function, and contact details for the device (if configured there)

-sw Displays brief details of the software installed, just the version of the overall status (or of the basic system, if this is all that is installed)

-swfull Displays all the installed software components. These are represented hierarchically in the form of a tree. The following is provided for each component: information on the version, internal version (if different), target version (if different), version details, and the installation path.

-panel: Displays panel-specific data: size and color depth of the display, MCP/TCU/DCK/EKS index, and the VNC server currently represented

-dhcp Data on a synchronizing DHCP server: operating state (off/standby/active), priority, versions of the .leases file and TCU data, and the range for dynamically assigned IP addresses

-switch Displays the settings of rotary switches on the device, e.g. the NC and PLC switches of an NCU or the DIPFIX of an HT 8

-all Equivalent to all the switches above

Note

EUNA (End User Notification Administration)

The data and information read out here is written to the EUNA file and saved on the respective device.
2.5 Description of the actions

2.5.15 Start, Stop

Description

Syntax: `sc start all|system|SUBSYSTEM`

Alternative names: ---

Privilege level: service

These two actions start or stop individual or all subsystems. Since these actions have a direct influence on the runtime behavior, they are only available directly on the PLC, but not in the service system (with the exception of "sc stop system"). The subsystems of the underlying PLC do not run here, and can therefore not be controlled.

Note

Only "all" and "system" function, but not arbitrary subsystems.

Both of these actions have only been implemented to a restricted extent.

Subsystem names

"hmi", "nck", or any other names, can be used for the subsystems. Multiple subsystems can also be specified in a row, which are then started and stopped in this order.

"all" and "system" are special values for the subsystem:

- "all" starts or stops all available subsystems.
- "sc stop system" similarly stops all subsystems, but also the basic system with the PLC.
- "start system" is identical to "start all" and exists mainly for reasons of symmetry.

start snc

Syntax: `sc start snc`

Alternative names: ---

Privilege level: service

This command starts the "System Network Center". To operate it, you will need a mouse.

The "System Network Center" you can end with "Exit". If you do not wish to end the "System Network Center", then switch to the HMI with the following key combination:

- `<Recall>` + `<MENU SELECT>` (Area switchover key) or
- `<F9>` + `<F10>` on an external keyboard
Reference

A description of the settings in the "System Network Center" is provided in the Operating Components and Networking Manual.
Configuring the system

2.5 Description of the actions
Service and diagnostics

3.1 Creating a service system

Overview

To backup user data or the complete CompactFlash Card, proceed as follows:

- Creating a service system.
- Backing up the license
- Backup: Data backup on USB storage medium or on a network drive.
- System diagnostics
  - Output network settings
  - Changing the network settings
  - Starting the VNC Viewer

To restore the user data or the complete CompactFlash Card, proceed as follows:

- Restore/Recover: Restore the data from USB storage medium or from network drive.
- Carry out software update.
- Carry out firmware update.

Capacity

Note

CompactFlash Card > 1 GB

A CompactFlash Card with a capacity of > 1 GB is not partitioned, but behaves just like a 1 GB CompactFlash Card.

3.1.1 How do you create a service system for the NCU?

Purpose

In case service is needed, create a portable "Emergency Boot System" (EBS) on a USB memory. Thus you can start the booting of the NCU from the service system in order to carry out various service tasks, such as data backup or updates, in a service shell.
Service and diagnostics
3.1 Creating a service system

Two partitions are created on the service system:
- A Linux partition that is invisible under Windows.
- An FAT partition for DOS or Windows applications.

The FAT partition can be read and written to under Linux as well as from a Windows system. The FAT partition can be addressed under the path/data in a command shell under Linux.

Scope of delivery
To create a service system on a USB storage medium, the following files are included on CD:
- an executable file installdisk.exe
- an image file linuxbase-512M.img for USB-FlashDrive with 512 MB
- an image file linuxbase-resize.img for USB-FlashDrive > 512 MB
- a file with the newest information siemensd.txt

Recommendation:
It is better to use SIMATIC PC USB-FlashDrive.

Note
To create the service system, you need administrator rights.
All data already on the USB storage medium will be deleted.
The transfer is optimized for USB 2.0; therefore, the transmission to the USB storage medium takes longer when using USB 1.1 than USB 2.0

Proceed as follows
To create a service system on a 512 MB USB storage medium:
1. Copy the service system onto a local hard disk of your programming device (PG) or PC.
2. Connect the USB storage medium to the USB interface of the PG/PC.
3. Determine in Windows Explorer which drive letter the USB storage medium was assigned, e.g. H:
4. Open a DOS shell and change to the directory in which the files for the service system are stored.
5. In the DOS shell, enter the following command:
   \C:\\installdisk --verbose --blocksize 1m linuxbase-512M.img h:

Result:
The image is transferred to the USB storage medium; a partition for Linux and a FAT partition for Windows systems are created.
1. Disconnect the USB storage medium and connect it again.

   Result:
   After this has been completed successfully, you will have a bootable service system on the USB storage medium.

   **NOTICE**
   **USB storage medium > 512 MB:**
   If you use a USB storage medium with a storage capacity > 512 MB as service system, there is a further variant, "linuxbase-resize.img", so that the storage capacity of the USB storage medium is retained.

   To create a service system on a USB storage medium > 512 MB:
   1. Copy the service system onto a local hard disk of your PG/PC.
   2. Connect the USB storage medium to the USB interface of the PG/PC.
   3. Determine in Windows Explorer which drive letter the USB storage medium was assigned, e.g. H:
   4. Open a DOS shell and change to the directory in which the files for the service system are stored.
   5. In the DOS shell, enter the following command:
       `installdisk --verbose --blocksize 1m linuxbase-resize.img h:`
   **Result:** The image is transferred to the USB storage medium.
Service and diagnostics

3.1 Creating a service system

3.1.2 This is how you operate the service system

Connecting-up the service system

Procedure:
1. Connect the USB storage medium to the USB interface X125 or X135 of the NCU.
2. Switch-off the system and then switch on again.

OR
3. Press the "Reset" button.

The service system is unzipped from the USB storage medium when the NCU boots for the first time: Only then can the USB storage medium be used as service system and the entire storage capacity is available.

Operating the service system

Keys and softkeys to navigate in the service system:

<table>
<thead>
<tr>
<th>Softkey</th>
<th>Key on OP</th>
<th>External keyboard</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>↓</td>
<td>HSK1</td>
<td>&lt;F1&gt;</td>
<td>Moves the cursor down a row</td>
</tr>
<tr>
<td>↑</td>
<td>HSK2</td>
<td>&lt;F2&gt;</td>
<td>Moves the cursor up a row</td>
</tr>
<tr>
<td>Page↓</td>
<td>HSK3</td>
<td>&lt;F3&gt;</td>
<td>Moves the cursor down a page</td>
</tr>
<tr>
<td>Page↑</td>
<td>HSK4</td>
<td>&lt;F4&gt;</td>
<td>Moves the cursor up a page</td>
</tr>
<tr>
<td>Char↓</td>
<td>HSK5</td>
<td>&lt;F5&gt;</td>
<td>Inserts text or digits</td>
</tr>
<tr>
<td>Char↑</td>
<td>HSK6</td>
<td>&lt;F6&gt;</td>
<td>Inserts text or digits</td>
</tr>
<tr>
<td>VSK7</td>
<td>Cancel</td>
<td>←</td>
<td>Cancel / Return</td>
</tr>
<tr>
<td>VSK8</td>
<td>Ok</td>
<td>→</td>
<td>OK / Confirm</td>
</tr>
<tr>
<td>Pos1</td>
<td>END</td>
<td></td>
<td>Moves the cursor to the top row</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Moves the cursor to the bottom row</td>
</tr>
</tbody>
</table>
3.1.3 Diagnostics functions

Functions of the service menu

The following functions for service and diagnostics are available on the service system:

![Service menu](image)

Figure 3-1 Service menu

Overview of the main menu:

<table>
<thead>
<tr>
<th>Main menu</th>
<th>Description</th>
<th>Reference to chapter/manual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firmware Update</td>
<td>BIOS update or perform a PLC BIOS update.</td>
<td>This is how you update the firmware (Page 75)</td>
</tr>
<tr>
<td>VNC Viewer</td>
<td>Start a VNC Viewer</td>
<td>Calling the VNC Viewer (Page 84)</td>
</tr>
<tr>
<td>Diagnosis</td>
<td>Starting a diagnostic function to display network-connection data and data on the system CompactFlash Card.</td>
<td>Performing system diagnostics (Page 79)</td>
</tr>
<tr>
<td>Backup NCU Software and Data</td>
<td>Backup system and user data on the USB FlashDrive or network drive.</td>
<td>Backup data via the service menu (Page 63)</td>
</tr>
<tr>
<td>Update NCU Software and Data</td>
<td>Upgrade the system from the USB FlashDrive or network drive.</td>
<td>This is how you update the software (Page 77)</td>
</tr>
<tr>
<td>Restore NCU Software and Data</td>
<td>Restore system and user data from the USB storage medium or network drive.</td>
<td>Backup data via the service menu (Page 63)</td>
</tr>
</tbody>
</table>
### 3.1 Creating a service system

#### Main menu | Description | Reference to chapter/manual
---|---|---
Modify NCU Settings | • Change network settings  
• Activate/deactivate HMI  
• Restore delivery condition of the following components:  
  - HMI  
  - NCK  
  - PLC  
  - Drive | This is how you change the system settings (Page 81)

Service Shell | A Service Shell is opened in order to input service commands. | Backing up data via the service shell (Page 70)  
Service Commands (Page 31)
3.1.4 This is how you connect to a network drive

Connecting network drives

1. Select "Connect to network drive".
2. Enter the complete path name of the network drive.
3. Register yourself with a user name with access authorization to this drive.

Note the syntax of the examples specified:

![Connecting network drives](image)

4. Confirm with "Ok". You are then prompted to enter a password.
3.2 Backup license

Validity of the license key

The license key corresponds to the serial number of the CompactFlash Card. If the CompactFlash Card is replaced for a SINUMERIK 840D sl, the license key loses its validity and the system is no longer ready for operation.

This situation can occur for a defective hardware of the system CompactFlash Card.

Application

For the following cases, backup the license key of the CompactFlash Card on a USB storage medium or on a network drive:

- Software update without license key
- System software error without defective hardware

<table>
<thead>
<tr>
<th>NOTICE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Replacement CompactFlash Card</strong></td>
</tr>
<tr>
<td>The following data are required in order to obtain a valid license key after replacing the system CompactFlash Card: The serial number of the defective and the new CompactFlash Card.</td>
</tr>
</tbody>
</table>
3.2.1 This is how you backup the license key

Backing up the license key on a USB storage medium

Procedure:

1. In the main menu, select the menu item “Backup NCU Software and Data”.

The following menu is displayed:

![Service Console](image)

Figure 3-3 Backing up licenses
2. Select the menu item "Backup license key to USB memory stick".

   The following menu is displayed:

   ![Image of Service Console with menu options]

   Figure 3-4  Save license key

   The license key is backed up in the specified directory together with the serial number of the CompactFlash Card.

See also

The procedure is essentially the same as for "Backup license key to network drive". In addition, you connect to a network drive:

This is how you connect to a network drive (Page 59)
3.3 Backup data via the service menu

3.3.1 This is how you backup user data

Backing up and restoring user data

Procedure:

1. In the main menu, select the menu item "Backup NCU Software and Data".
2. Select "Backup user data to USB memory stick" and confirm with "Ok".
3. Enter a complete file name - as shown in the example:

![Image of Backup User Data Procedure](https://example.com/image.png)

Figure 3-5 Entering a file name
3.3 Backup data via the service menu

4. Confirm with "Ok". The following message is output after the operation has been successfully completed:

![Service Console - Create Backup]

```
Writing partial backup to /data/ta_test.tgz:
  12592 kB (uncompressed)
done.
Syncing archive... done.
Press any key to continue
```

Figure 3-6 Operation complete

See also

The procedure for "Backup user data to network drive" is essentially the same. In addition, you connect to a network drive:

This is how you connect to a network drive (Page 59)
3.3.2 Restoring user data

Procedure:

1. In the main menu, select the menu item "Restore NCU Software and Data". The following menu is displayed:

![Service Console](image)

2. Select "Restore user data from USB memory stick" and confirm with "Ok".
   The list of the tgz files available on the USB storage medium are displayed.
3. Select the appropriate tgz file and confirm with "Ok".
   A message is output after the operation has been successfully completed.

See also

The procedure for "Restore user data from network drive" is essentially the same. In addition, you connect to a network drive:

This is how you connect to a network drive (Page 59)
3.3.3 This is how you create a complete backup of the CompactFlash Card

Creating a complete backup

Procedure:

1. In the main menu, select the menu item "Backup NCU Software and Data".
   The following menu is displayed:

   [Image of menu showing options: Backup complete CF card to USB memory stick, Backup user data to USB memory stick, Backup license key to USB memory stick, Backup complete CF card to network drive, Backup user data to network drive, Backup license key to network drive, Connect to network drive]

   Figure 3-8 Backup up

2. Select "Backup complete CF card to USB memory stick" and confirm with "OK".
3. Enter a complete file name - as specified in the example.

4. Confirm with "OK". This can take several minutes.

The operation is displayed:

![Backup operation display](image)

Figure 3-9  Backing up ...

A message is output after the operation has been successfully completed.

See also

The procedure for "Backup complete CF card to network drive" is essentially the same. In addition, you connect to a network drive:

This is how you connect to a network drive (Page 59)
3.3 Backup data via the service menu

3.3.4 This is how you install a complete system backup

Installing the complete backup

With this menu item, a complete backup of the data from the service system or from a network drive is installed on the CompactFlash Card, i.e. this backup includes both the system software as well as also the user data.

<table>
<thead>
<tr>
<th>NOTICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formatting</td>
</tr>
</tbody>
</table>
This procedure corresponds to formatting the CompactFlash Card and all of the existing data are overwritten.

Installing the complete backup

Procedure:

1. In the main menu, select the menu item "Update NCU Software and Data".

   The following menu is displayed:

   ![Service Console](image)

   **Figure 3-10 Recover system**
3.3 Backup data via the service menu

2. Select the menu item "Recover system from USB memory stick (reformat CF card)" and confirm with "Ok".
   The list of the tgz files available on the USB storage medium is displayed.
3. Select the appropriate tgz file and confirm with "Ok".
   A message is output after the operation has been successfully completed.

Completion

The system must be restarted in order that the new data become effective.

See also

The procedure for "Recover system from network drive (reformat CF card)" is essentially the same. In addition, you connect to a network drive:

This is how you connect to a network drive (Page 59)
3.4 Backing up data via the service shell

Backing up and restoring using a service shell

To call a service shell, depending on the configuration, the following possibilities are available:

(I) Configuration of NCU with TCU: the service shell is called under Linux.
(II) Configuring the NCU with PCU 50 or programming device (PG).

A service shell can be called under:
- on the NCU under Linux
- on the PCU/PG using the VNC Viewer (system network or company network)
- on the PCU/PG using WinSCP (system network or company network)

3.4.1 This is how you save data on a service system

Proceed as follows

To back up the complete system:

1. Connect the service system to a USB interface (X125 or X135) of the NCU and press the reset button.
   Alternatively, you can switch the NCU off, connect the service system, and switch the NCU on again.
   Result: The NCU boots from the service system.
2. In the main menu, select the menu item "Service Shell".
3. Log on as a service technician using the user name "manufact" and password "SUNRISE".
4. Using the command "sc backup" you can create the backup file "backup01.tgz".
   The directory /data on the service system is provided for backup files. The complete path should be specified.
5. Choose –full, to backup all data on the CompactFlash Card, or –user, if you only want to backup user data.
   Example: sc backup –full /data/backup01.tgz
   Result: A backup file of the complete CompactFlash Card is created under /data on the service system on the USB storage medium.
3.4.2 This is how you restore data from the service system

Proceed as follows

To restore the complete system:

1. Connect the service system to a USB interface (X125 or X135) of the NCU and press the reset button.

   Alternatively, you can switch the NCU off, connect the service system, and switch the NCU on again.

   **Result:** The NCU boots from the service system and the main menu is displayed.

2. In the main menu, select the menu item "Service Shell".

3. Log on as a service technician using the user name "manufact" and password "SUNRISE".

4. With the command "sc restore" you can write the backup file "backup01" from the service system back to the CompactFlash Card in the NCU. The complete path should be specified.

   **Example:** `sc restore /data/backup01.tgz`

   **Result:**

   The system state stored in the file "backup01" is restored on the NCU.

   **Note**

   If access to the system data on the CompactFlash Card is not possible because the CompactFlash Card is defective or empty, you can only log in as user "admin" with the password "SUNRISE" and no longer as the user "manufact".

3.4.3 This is how you save data on a network drive

**Sequence**

Proceed as follows:

- Connect the service system.
- "Service Shell" open.
- Establish a connection to a network drive.
- Create a backup file.
3.4 Backing up data via the service shell

Scenario I: Start Command Shell under Linux

Procedure:
1. Connect the service system to the USB interface X125 or X135 of the NCU.
2. In the main menu, select the menu item "Service Shell".
3. Log on as a service technician using the user name "manufact" and password "SUNRISE".
4. Use the command "sc connect" to connect the network drive:
   \[ sc\ connect\ //username%password@server/share\ /tmp/backup \]
   Please enter here the user name and the password for the network drive that is to be connected to.
5. Using the command "sc save", create the backup file "backup01".
   Choose –full, to backup all data on the CompactFlash Card, or –user, if you only want to backup user data in the directory /user.
   Example: \[ sc\ save\ –full\ /tmp/backup/backup01 \]
   Result:
   A backup file of the complete CompactFlash Card is created under the specified path on the network drive.

Scenario II: Start the command shell with WinSCP on the programming device:

Procedure:
1. Start WinSCP and enter the following data in the log-on window:
   - IP address of the NCU (or, if required, host name)
   - User name "manufact" with password "SUNRISE".
2. Select in the menu "Commands" → "Open Terminal".
3. Execute the data backup using the commands described in steps 4 to 6 from scenario I.

Scenario III: Start the command shell using the VNC Viewer on the programming device

Procedure:
1. Start the VNC Viewer and connect to the NCU using the IP address (or where relevant, using the host name)
2. Log on under the "manufact" user name with the password "SUNRISE".
3. To restore the data, enter the corresponding commands as described under steps 3 to 5 in scenario I.
3.4 Backing up data via the service shell

3.4.4 This is how you restore data from the network drive

**Sequence**

Proceed as follows:

- Connect the service system.
- "Service Shell" open.
- Establish a connection to a network drive.
- Restore the data.

**Scenario I: Start command shell under Linux**

1. Connect the service system to the USB interface X125 or X135 of the NCU.
2. In the main menu, select the menu item "Service Shell".
3. Log on as a service technician using the user name "manufact" and password "SUNRISE".
4. Use the command "sc connect" to connect the network drive:
   
   ```bash
   sc connect //username%password@server/share /tmp/backup
   ```

   1. Please enter here the user name and the password for the network drive that is to be connected to.

   To completely restore the system (system data and user data), enter the following: `sc restore --full backup01`
   
   **Result:** The whole system is overwritten by the backup data.

2. To restore user data only, enter the following command:
   
   ```bash
   sc restore --user backup01
   ```
   
   **Result:** The user data are written back again.

   All subsystems are then restarted: `sc start all`
   
   **Result:** The system state stored in the file "backup01.tgz" is restored on the NCU.

**Scenario II: Start the command shell with WinSCP on the programming device:**

**Procedure:**

1. Start WinSCP and enter the following data in the log-on window:
   - IP address of the NCU (or, if required, host name)
   - User name "manufact" with password "SUNRISE".
2. Select in the menu "Commands" → "Open Terminal".
3. To restore the data, enter the corresponding commands as described under steps 3 to 5 in scenario I.
Service and diagnostics
3.4 Backing up data via the service shell

Scenario II: Start the command shell using the VNC Viewer on the programming device

Procedure:
1. Start the VNC Viewer and connect to the NCU using the IP address (or where relevant, using the host name)
2. Log on under the "manufact" user name with the password "SUNRISE".
3. To restore the data, enter the corresponding commands as described under steps 3 to 5 in scenario I.
3.5 Updating the software

3.5.1 This is how you update the firmware

Firmware Update

When service is required, it may be necessary for a service technician to install a BIOS update. Siemens provides the corresponding update file. Possible formats include: *.img or *.rom or *.bin. Or, the update file is already supplied on the service system, then step 1 is eliminated.

Procedure:
1. Copy the update file to the service system.
2. Connect the service system to interface X125 or X135 of the NCU.
3. Switch on the system.
4. In the main menu, select the menu item "Firmware Update".

The following menu is displayed:

![Firmware update menu]

Figure 3-11 Firmware update
5. Select "BIOS Update" and confirm with "Ok".

The BIOS version installed on the NCU and the update files available in the service system are output:

![Select the updates](Image)

6. Select the update file and confirm with "OK".

A "Restart" is then required.

The procedure to update the PLC-BIOS is essentially the same as the procedure described here.

---

**Note**

**Fall back strategy**

Before the BIOS update is installed, a backup of the installed BIOS version is saved on the service system.

For safety reasons, only files can be selected that are suitable and are appropriate for this NCU.
3.5.2 This is how you update the software

Update / Recover

The following options are available:

- Update the software from the service system or from the network drive.
- Completely restore the CompactFlash Card with the system software from the service system or from the network drive (Recover system ...).

Updating the software

Procedure:

1. In the main menu, select the menu item "Update NCU Software and Data".

   The following menu is displayed:

   ![Figure 3-13 Software update](image)

   Figure 3-13 Software update

2. Select the menu item "Update system software from USB memory stick".

   The list of the tgz files available on the USB storage medium are displayed.
3. In order to check which software version contains the tgz file, first select the tgz file, then press "Show version".

The following information is output:

![Version information](image)

Figure 3-14 Version information

4. Select the appropriate tgz file and confirm with "Ok".

A message is output after the update has been successfully completed.

**Completion**

The system must be restarted in order that the new data become effective.

**See also**

The procedure for "Update system software from network drive" is essentially the same. In addition, you connect to a network drive: [This is how you connect to a network drive](Page 59)

For a complete backup of the system: [This is how you install a complete system backup](Page 68)
3.6 System diagnostics

3.6.1 Performing system diagnostics

Overview of diagnostic functions

The following diagnostic functions to display network settings are included in this menu:

<table>
<thead>
<tr>
<th>System diagnosis</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Show all network settings</td>
<td>Connection data of all Ethernet interfaces is displayed.</td>
</tr>
<tr>
<td>Show network settings X120 (system network)</td>
<td>The connection data of interface X120 is displayed.</td>
</tr>
<tr>
<td>Show network settings X127 (engineering network)</td>
<td>The connection data of interface X127 is displayed.</td>
</tr>
<tr>
<td>Show network settings X130 (factory network)</td>
<td>The connection data of interface X130 is displayed.</td>
</tr>
</tbody>
</table>
Service and diagnostics

3.6 System diagnostics

<table>
<thead>
<tr>
<th>System diagnosis</th>
<th>Description</th>
</tr>
</thead>
</table>
| Show card identification | The following data of the system CompactFlash Card is output:  
- Serial number  
- System software version  
- Hardware version (NCU) |
| Check card integrity  | Checking the CompactFlash Card system                                                                                                     |

**Example:** Connection data of all Ethernet interfaces of the NCU:

```
Figure 3-16  NCU: Interfaces
```

**See also**

This is how you check the CompactFlash Card (Page 82)
3.6.2 This is how you change the system settings

Modify NCU Settings

You can change the following system settings in this menu:

![Figure 3-17 Changing system settings](image)

<table>
<thead>
<tr>
<th>Menu item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change network settings</td>
<td>Changing network settings of the NCU.</td>
</tr>
<tr>
<td>Disable internal HMI (currently enabled)</td>
<td>Activating/deactivating an HMI task</td>
</tr>
<tr>
<td>Reset HMI data to factory defaults</td>
<td>Restoring the delivery condition of HMI data.</td>
</tr>
<tr>
<td>Reset NC data to factory defaults</td>
<td>Restoring the delivery condition of NC data.</td>
</tr>
<tr>
<td>Reset PLC data to factory defaults</td>
<td>Restoring the delivery condition of PLC data.</td>
</tr>
<tr>
<td>Reset DRIVE data to factory defaults</td>
<td>Restoring the delivery condition of drive data.</td>
</tr>
</tbody>
</table>

**NOTICE**

Reset ... data to factory defaults

If this data is restored to the delivery condition, then all specific commissioning settings that were performed up until now are overwritten.
3.6.3 This is how you check the CompactFlash Card

Displaying identification data

Procedure:

1. In the main menu, select the menu item "Diagnosis".

The following menu is displayed:

![System diagnostics menu](image)

Figure 3-18 System diagnostics
2. Select the menu item "Show card identification".

The following data for identification are output:

![Service Console]

**Emergency Boot System - Diagnosis**

Show CF card identification

Serial no. of CF card: 112112112112112

Software on CF card:
- Name: SINUMERIK 7.xC with HMI (31a 10c) Standard
  - Version: PRELIMINARY_V02.01.00
- Name: PLC
  - Version: 02.07.00.86

Hardware info stored on CF card:
- Name: SIEMENS SINUMERIK 040D s1 NCU710.2
  - Version: A
- Name: Mainboard
  - Version: V01.81.00.86
- Name: FPGA
  - Version: 8.2
- Name: BIOS
  - Version: V01.83.00.86

Press any key to continue

Figure 3-19   Identification

3. Select the menu item "Check card integrity".
3.6 System diagnostics

The CompactFlash Card is checked for errors:

![Service Console](image)

Checking CF card for read errors:

- 2637 488MB

Figure 3-20  Check

Note
This procedure can take several minutes.

3.6.4 Calling the VNC Viewer

Purpose

The VNC Viewer is used to connect directly with a VNC Server and, for example, to operate an HMI application.

Furthermore, it enables you to call up a list of all the network devices, thereby obtaining an overview of the system network.
Starting the VNC Viewer

Procedure:

1. In the main menu, select the menu item "VNC Viewer".
   The following menu is displayed:

   ![VNC Viewer menu](image)

   - Server name, e.g. IP address or DNS.
   - The password is optional and can also be left empty.
   - The following assignment applies to the "Session number":

<table>
<thead>
<tr>
<th>Number</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Session 0</td>
<td>HMI-Applikation</td>
</tr>
<tr>
<td>Session 4</td>
<td>Command Shell</td>
</tr>
<tr>
<td>Session 5</td>
<td>System log file</td>
</tr>
<tr>
<td>Session 6</td>
<td>System Network Center (SNC)</td>
</tr>
</tbody>
</table>

2. To start the VNC Viewer, enter the following connection data:
   - Server name, e.g. IP address or DNS.
   - The password is optional and can also be left empty.
   - The following assignment applies to the "Session number".
3.6 System diagnostics

3.6.5 WinSCP and PuTTY

Use

The programs WinSCP and PuTTY are freely-available open source programs for Windows. WinSCP is intended especially for transferring files from and to Linux systems, PuTTY for the remote operation of a command shell.

- WinSCP can be downloaded via the following link: http://winscp.net/eng/download.php (Installation Package).
  
  WinSCP also offers a "command shell" that is limited so that commands can be issued, but no callbacks can be answered.

- PuTTY, by contrast, offers a complete command shell.

  PuTTY web page: http://www.chiark.greenend.org.uk/~sgtatham/putty

With both programs, a service technician can log onto the NCU and carry out service tasks. The username 'manufact' with the password 'SUNRISE' is available for the Siemens service technician.

Starting WinSCP

WinSCP is started from Windows after the service technician has logged onto the NCU with which he is connected using the corresponding authorization (e.g. as user "manufact" with password "SUNRISE").

From the "Commands" menu, select "Open terminal" to open a command shell. There you can carry out the service commands in the usual way.
### Appendix

#### A.1 Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CF</td>
<td>CompactFlash card: Memory card</td>
</tr>
<tr>
<td>CFS</td>
<td>Cluster File System</td>
</tr>
<tr>
<td>DCK</td>
<td>Direct Control Keys Direct control keys</td>
</tr>
<tr>
<td>DCP</td>
<td>Discovery and Basic Configuration Protocol</td>
</tr>
<tr>
<td>DHCP</td>
<td>Dynamic Host Configuration Protocol: Dynamic assignment of an IP address and other configuration parameters on a computer in a network</td>
</tr>
<tr>
<td>DNS</td>
<td>Domain Name System: Conversion of domain names into IP addresses</td>
</tr>
<tr>
<td>EBS</td>
<td>Emergency Boot System</td>
</tr>
<tr>
<td>EKS</td>
<td>Electronic Key System: System to check the identity of a user (authentication system)</td>
</tr>
<tr>
<td>EUNA</td>
<td>End User Notification Administration</td>
</tr>
<tr>
<td>HMI</td>
<td>Human Machine Interface: Operator interface</td>
</tr>
<tr>
<td>IRT</td>
<td>Isochronous Realtime (Ethernet)</td>
</tr>
<tr>
<td>LLDP</td>
<td>Link Layer Discovery Protocol: multi-vendor Layer 2 Protocol defined in accordance with the IEEE-802.1AB standard, allows information to be exchanged between devices.</td>
</tr>
<tr>
<td>MAC</td>
<td>Media Access Control: The MAC address is a 48-bit Ethernet ID.</td>
</tr>
<tr>
<td>MCP</td>
<td>Machine Control Panel Machine control panel</td>
</tr>
<tr>
<td>MPI</td>
<td>Multi-Point Interface Multiple interface</td>
</tr>
<tr>
<td>MUI</td>
<td>Multilanguage User Interface</td>
</tr>
<tr>
<td>NCK</td>
<td>Numerical Control Kernel: NC kernel with block preparation, travel range, etc.</td>
</tr>
<tr>
<td>NCU</td>
<td>Numerical Control Unit: NCK hardware unit</td>
</tr>
<tr>
<td>NRT</td>
<td>Non-Realtime (Ethernet)</td>
</tr>
<tr>
<td>NTFS</td>
<td>New Technology File System</td>
</tr>
<tr>
<td>NTP</td>
<td>Network Time Protocol: Standard for synchronizing clocks in the entire network</td>
</tr>
<tr>
<td>NTPD</td>
<td>NTP Daemon: Utility that runs in the background and does not have to be started by the user.</td>
</tr>
<tr>
<td>PCU</td>
<td>PC Unit: Computer unit</td>
</tr>
<tr>
<td>PDEV</td>
<td>Physical device</td>
</tr>
<tr>
<td>PG</td>
<td>Programming device</td>
</tr>
<tr>
<td>PLC</td>
<td>Programmable Logic Control: PLC</td>
</tr>
<tr>
<td>RAM</td>
<td>Random Access Memory: Program memory which can be read and written into</td>
</tr>
<tr>
<td>RDY</td>
<td>Ready The system is ready to operate.</td>
</tr>
<tr>
<td>SNMP</td>
<td>Simple Network Management Protocol (network protocol for monitoring and controlling network elements such as routers, servers, switches, and printers from a central station)</td>
</tr>
<tr>
<td>TCU</td>
<td>Thin Client Unit</td>
</tr>
<tr>
<td>TFTP</td>
<td>Trivial File Transfer Protocol: Very simple data transmission protocol</td>
</tr>
<tr>
<td>UDP</td>
<td>User Datagram Protocol: NTP is mostly processed via UDP.</td>
</tr>
<tr>
<td>USB</td>
<td>Universal Serial Bus</td>
</tr>
</tbody>
</table>
### Appendix

#### A.1 Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>UPS</td>
<td>Uninterruptible power supply</td>
</tr>
<tr>
<td>UTC</td>
<td>Universal Time, Coordinated Coordinated universal time</td>
</tr>
<tr>
<td>VNC</td>
<td>Virtual Network Computing</td>
</tr>
</tbody>
</table>
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A.2 Licenses for WinSCP and PuTTY
Glossary

CFS (Compressed File System)
A CFS (file extension ".cfs") is a compressed file system, similar to a zip file. It contains files and subdirectories that look like normal files on the controller at runtime. Files and directories contained in a CFS cannot be changed. They are decompressed at runtime as required.

Network interface
The network interface is an interface that enables network communication. These are the Ethernet interfaces on the NCU.

NFS (Network File System)
NFS is the most common protocol for remote file systems in the world of Unix, and is also available for Windows. NFS is closely based on the Unix privilege model – each time a file is accessed, a UID and GID are supplied which the server then uses to decide whether the operation is permitted. The server relies on the client to provide the correct IDs.

Remote File System
A file system that is contacted over the network. The files are physically located on another computer in the network (the "server"), but appear locally the same as all other files. Operations performed on these files are sent via the network to the server, instead of being executed directly on a local storage medium (such as a hard drive or CompactFlash Card).

As a server usually exports more than one file system, a name for the required file system must also be entered in addition to the name of the server.

SMB (Server Message Block)
SMB is the underlying protocol of MS Windows file systems (also known as drives, releases, shares, etc.). SMB connections are always active in the context of a specific user, who must be known to the server. Exported file systems have a name (release name), by which they can be addressed. The client does not need to know the concrete path on the server.

Subsystem
A subsystem is a CFS that not only contains a collection of files, but also executes a program, for example, at runtime. To do this, the CFS contains a script that is used to control the starting and stopping of this program.

For this reason, only administrators are permitted to set up NFS file systems, and NFS is usually only implemented in uniformly administrated environments. Exported file systems on the server are addressed directly on the server via their path.
VNC (Virtual Network Computing)

Virtual Network Computing is a software that displays the screen contents of a remote computer, with a running VNC server, on a local computer, with a running VNC viewer, and in return sends keyboard and mouse movements of the local computer to the remote computer.
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# SINUMERIK

**SINUMERIK 840D sl**

**PCU-Basesoftware (IM8)**

*Commissioning Manual*

## Contents

1. Commissioning a system
2. Configuring the system
3. Install software and updates
4. Backing up and restoring data
5. Service and diagnostics
6. List of Abbreviations

**Valid for:**

- SINUMERIK PCU 50.3 with PCU Base software V8.6 SP1
- SINUMERIK PCU 50.5 with PCU Base software V5XP 1.1

02/2011

6FC5397-1DP40-0BA0
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.

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

⚠️ **CAUTION**
with a safety alert symbol, indicates that minor personal injury can result if proper precautions are not taken.

**CAUTION**
without a safety alert symbol, indicates that property damage can result if proper precautions are not taken.

**NOTICE**
indicates that an unintended result or situation can occur if the corresponding information is not taken into
account.

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 for the specific task, 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.

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Note the following:

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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 adhered to. The information in the relevant documentation must be observed.

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owner.

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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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Commissioning a system

1.1 Delivery condition of the system

Overview

The PCU has onboard interfaces for communicating via Ethernet, MPI and PROFIBUS DP. The integrated free slots remain free for other tasks. The PCU is equipped with the Windows XP ProEmbSys operating system and for data backup tasks with the Symantec Ghost software.

Interfaces:

- Four USB ports (USB 2.0) offer points where a keyboard, mouse and other peripheral devices can be connected.
- For CF cards, there is a covered slot.
- Two internal PCI slots are available for specific expansions.

For commissioning:

- Two 7-segment displays and two LEDs are integrated for diagnostic purposes. They indicate the current operating status and display the BIOS error codes during boot up.
- If the PCU is to be operated without an operator panel front, a monitor and an additional keyboard will also be required:
  - For diagnostics when booting the PCU
  - When installing a replacement hard disk

(alternatively, the hard disk can also be installed externally).

References: Operator Components and Networking Manual

Supplied software on the PCU

The software installed on delivery of the PCU includes the components below, among others:

<table>
<thead>
<tr>
<th>Software</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>MS Windows XP Professional SP2</td>
<td>V 6.0</td>
</tr>
<tr>
<td>Internet Explorer</td>
<td>V 6.0</td>
</tr>
<tr>
<td>MPI driver</td>
<td>V 6.03</td>
</tr>
<tr>
<td>Symantec Ghost (default)</td>
<td>V 8.2 (incl. Ghost Explorer)</td>
</tr>
<tr>
<td>TCU Support</td>
<td>V 8.6</td>
</tr>
<tr>
<td>(is already installed and available on the hard disk under D:\Updates, if it must be re-installed.)</td>
<td></td>
</tr>
</tbody>
</table>
Documentation for all Ghost tools is supplied on the PCU’s hard disk under E:\TOOLS.

**Note**
For the system component versions contained in the PCU Basesoftware, see the C:\BaseVers.txt file.

### 1.1.1 Hard disk partitions

**Memory segmentation**

The hard disk of the **PCU 50.3** has 40 GB of storage capacity and is segmented into a primary partition C and an expanded partition with the three logical drives D, E and F which operate with NTFS file access.

![Division of the hard disk](image1)

The **PCU 50.5** is equipped with a solid state drive (SSD) with NTFS file access, which is also segmented to provide a primary partition C and an expanded partition with the three logical drives D, E and F.

![Segmentation of the SSD with 32 GB](image2)

Depending on the order, the operating software can already be installed when the unit is shipped. It is installed subsequently by the customer the first time the system is booted up. For reasons of data security, the operating software and the Windows XP system software are distributed over the different hard disk partitions.
Content of the partitions

The individual partitions are intended for the following data or already contain this data:

- **EMERGENCY (C:)** Reserved for service tasks under WinPE 2005.
- **TMP (D:)** Used for storing Ghost images (e.g. of the status on delivery) and local backup images. Contains the installation directory where the software to be installed is first copied to from a remote PG/PC prior to the actual installation procedure.
- **SYSTEM (E:)** Reserved for the Windows XP software. The Windows XP software is available on the recovery media CD via network, for example to install drivers or updates as and when needed later on.
- **USER (F:)** For installing user programs. Applications such as HMI system software (incl. data storage and temporary data), STEP 7, OEM applications for HMI or customer-specific applications should only be installed here.

**NOTICE**

All of the applications must be exclusively installed on USER (F:) even if these applications have a different drive set as the default drive in their installation path.

The partition names EMERGENCY, TMP, SYSTEM, USER must not be changed; otherwise the “ServiceCenter” will no longer function.

**See also**

- Installing SINUMERIK products (Page 57)
- Starting ServiceCenter Backup Restore (Page 67)

**1.1.2 System features**

**Configuration of the operating system**

For safety reasons, Windows XP has been preset as follows:

- The Autorun function is deactivated.
- Automatic Windows Update is deactivated.
- Monitoring and alerts for antivirus software and automatic update are deactivated.
- Links used to call up Internet Explorer from the service desktop and the start menu are removed.
Commissioning a system

1.1 Delivery condition of the system

- Remote Procedure Call (RPC) is possible for calls that are not connected.
- The firewall settings are activated on the network card Eth 1 and deactivated on Eth 2.

Changes to Windows services

Other default settings:

<table>
<thead>
<tr>
<th>Windows services:</th>
<th>Start-up type:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Browser</td>
<td>Manual (Not started)</td>
</tr>
<tr>
<td>Error Reporting Service</td>
<td>Disabled</td>
</tr>
<tr>
<td>Portable Media Serial Number</td>
<td>Manual (Not started)</td>
</tr>
<tr>
<td>SSDP Discovery Service</td>
<td>Disabled</td>
</tr>
<tr>
<td>Universal Plug and Play Host</td>
<td>Disabled</td>
</tr>
<tr>
<td>Web Client</td>
<td>Manual (Not started)</td>
</tr>
<tr>
<td>Wireless Zero Configuration</td>
<td>Manual (Not started)</td>
</tr>
</tbody>
</table>

Name of the PCU

Upon delivery of the system, a unique computer name is generated which can be read out under: “Start” → “Settings” → ”Control Panel” → ”System”, ”Computer Name” tab.

Pre-configuration of the PCU

The PCU has two Ethernet interfaces with default settings suitable to connect to SINUMERIK solution line:

- **Eth 1** is preset as a default DHCP client for connection to a company network.
- **Eth 2** is preset as a SINUMERIK DHCP server for connection to a system network. Eth 2 is preset to the fixed IP address 192.168.214.241.

See also

This is how you set the IP address of the PCU (Page 36)

References: Operator Components and Networking Manual
1.2 User administration

1.2.1 Which users are set up?

Preset users

Each user is from one user type and belongs to one user group. The user types are implemented under Windows in user groups with various user rights.

Upon delivery of the system, the following users are defined at the factory:

- **The "operator"**
  
  In terms of type, the "operator" is classed as an HMI user and belongs to the operators' user group (operator.group). These operators have limited user rights under Windows.

- **The "user"**
  
  In terms of type, the "user" is classed as an HMI user and belongs to the operators' user group (user.group). These operators have extended user rights under Windows.

- **The "auduser"**.
  
  The "auduser" is an HMI service user type of user and belongs to the system administrators' user group. The system administrators have the user rights of a local administrator under Windows.

<table>
<thead>
<tr>
<th>User name</th>
<th>Password</th>
<th>User type</th>
<th>Windows user group</th>
<th>User Rights</th>
<th>User group</th>
</tr>
</thead>
<tbody>
<tr>
<td>operator</td>
<td>operator</td>
<td>HMI (operator.group)</td>
<td>operator.group</td>
<td>Restricted</td>
<td>Operator</td>
</tr>
<tr>
<td>user</td>
<td>CUSTOMER</td>
<td>HMI (user.group)</td>
<td>user.group</td>
<td>&quot;Power User&quot;</td>
<td>Operator</td>
</tr>
<tr>
<td>auduser</td>
<td>SUNRISE</td>
<td>HMI+Service</td>
<td>Administrators</td>
<td>local administrator</td>
<td>System administrators</td>
</tr>
<tr>
<td>siemens</td>
<td>*****</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>System administrators</td>
</tr>
</tbody>
</table>
The individual user types differ in the following areas:

<table>
<thead>
<tr>
<th>User type</th>
<th>Area of activity</th>
</tr>
</thead>
</table>
| HMI (operator.group) | • Boot up of the PCU  
                      | • Operating the HMI program  
                      | • Windows Desktop |
| HMI (user.group)   | • Boot up of the PCU  
                      | • Operating the HMI program  
                      | • Windows desktop |
| HMI+Service        | • Boot up of the PCU  
                      | • Operating the HMI program  
                      | • Service Desktop |

Service Desktop

The service desktop provides the HMI+Service user with a Windows desktop, which is expanded to include tools and functions for service tasks, such as manage users, install software, save/restore data, check system integrity, etc.

Windows desktop

The HMI user is able to use a Windows desktop which can be expanded to suit his or her individual needs.

Starting ServiceCenter Users

Using this link on the service desktop, you can start ServiceCenter Users as an HMI+Service user. In ServiceCenter Users, the boot behavior of the PCU as well as settings for the HMI program and desktop are set globally for all users and individually for specific users.

The users are managed in the “ServiceCenter Users”, so that the commissioner/service technician no longer has to make corresponding settings directly in the registry.
1.2 User administration

1.2.2 User settings

"Global Settings"

In the ServiceCenter Users, as HMI service user, you set parameters under "Global Settings" for the system behavior:

- When the PCU is booting up
- When the HMI program is starting
- With reference to the desktop

Note

The following diagrams show, as an example, an application with the SINUMERIK Operate software installed.

Using ServiceCenter Users

Buttons:

- Use "Exit" to quit ServiceCenter Users.
- If you press the "Reboot" button, the system immediately reboots (without prior prompting).
"Startup (1)" tab

Figure 1-3 Global Settings: Startup (1) tab

Table 1-1 The default is marked in "bold".

<table>
<thead>
<tr>
<th>Startup (1) tab</th>
<th>Option</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Background</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bitmaps folder:</td>
<td>F:\hmisl\siemens\sinumerik\hmi\ico\ ...</td>
<td>Directory with boot screens</td>
</tr>
<tr>
<td>Default bitmap folder:</td>
<td>F:\hmisl\siemens\sinumerik\hmi\ico\ico800</td>
<td>Directory containing default boot screens</td>
</tr>
<tr>
<td>Installing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enable:</td>
<td>&quot;yes&quot;</td>
<td>Authorization is in place to install user software during booting.</td>
</tr>
<tr>
<td></td>
<td>&quot;no&quot;</td>
<td>No installation authorization</td>
</tr>
<tr>
<td>Logon dialog:</td>
<td>&quot;yes&quot;</td>
<td>Display &quot;Installing Logon&quot; dialog.</td>
</tr>
<tr>
<td></td>
<td>&quot;no&quot;</td>
<td>Do not display &quot;Installing Logon&quot; dialog.</td>
</tr>
<tr>
<td>Veto Dialog:</td>
<td>&quot;no&quot;</td>
<td>For pending installation during the boot up: No prompting, the installation begins immediately.</td>
</tr>
</tbody>
</table>
### 1.2 User administration

#### Startup (1) tab

<table>
<thead>
<tr>
<th>Option</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;yes&quot;</td>
<td>For pending installation during the boot up: Prompt asking whether to install.</td>
</tr>
<tr>
<td>Authentication:</td>
<td>Authentication of an HMI+Service user in the &quot;Installing Logon&quot; dialog is undertaken manually.</td>
</tr>
<tr>
<td>&quot;EKS&quot;</td>
<td>Authentication of an HMI+Service user in the &quot;Installing Logon&quot; dialog involves EKS. The &quot;Installing Logon&quot; dialog appears if authentication by EKS has failed in the background.</td>
</tr>
<tr>
<td>&quot;manual+EKS&quot;</td>
<td>Authentication of an HMI+Service user in the &quot;Installing Logon&quot; dialog either involves EKS or is performed manually.</td>
</tr>
</tbody>
</table>
“Startup (2)” tab

![Global Settings](image)

Figure 1-4  “Startup (2)” tab

Table 1-2  The default is marked in "bold".

<table>
<thead>
<tr>
<th>Startup (2) tab</th>
<th>Option</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Keys, filtering</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enable</td>
<td>“yes”</td>
<td>Key filtering is activated.</td>
</tr>
<tr>
<td></td>
<td>“no”</td>
<td>Key filtering not activated.</td>
</tr>
<tr>
<td>Filter file</td>
<td>E:\WINDOWS\System.ini</td>
<td>Select the file with filter settings</td>
</tr>
<tr>
<td>Desktop Logon</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Start dialog:</td>
<td>“yes”</td>
<td>Display &quot;Desktop Access&quot; dialog</td>
</tr>
<tr>
<td></td>
<td>“no”</td>
<td>Do not display &quot;Desktop Access&quot; dialog</td>
</tr>
<tr>
<td>Logon Dialog:</td>
<td>“yes”</td>
<td>Display &quot;Desktop Logon&quot; dialog.</td>
</tr>
<tr>
<td></td>
<td>“no”</td>
<td>Do not display &quot;Desktop Logon&quot; dialog.</td>
</tr>
<tr>
<td>Default password map:</td>
<td>“no”</td>
<td>The password must be entered exactly as specified.</td>
</tr>
<tr>
<td>Authentication</td>
<td>“manual”</td>
<td>Authentication with user name and password (manual)</td>
</tr>
<tr>
<td></td>
<td>“EKS”</td>
<td>Authentication with EKS</td>
</tr>
<tr>
<td></td>
<td>“manual+EKS”</td>
<td>Either authentication with user name and password or with EKS</td>
</tr>
</tbody>
</table>
"HMI" tab

Figure 1-5 "HMI" tab

Table 1-3 The default is marked in "bold".

<table>
<thead>
<tr>
<th>&quot;HMI&quot; tab</th>
<th>Option</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Keys Filtering</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enable</td>
<td>&quot;yes&quot;</td>
<td>Key filtering is activated.</td>
</tr>
<tr>
<td></td>
<td>&quot;no&quot;</td>
<td>Key filtering not activated.</td>
</tr>
<tr>
<td>Filter file</td>
<td>E:\WINDOWS\System.ini</td>
<td>Select the file with filter settings</td>
</tr>
<tr>
<td><strong>Program</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Start:</td>
<td>&quot;yes&quot;</td>
<td>The HMI program is started.</td>
</tr>
<tr>
<td></td>
<td>&quot;no&quot;</td>
<td>The HMI program is not started.</td>
</tr>
<tr>
<td>File:</td>
<td>F:\hmis\siemens\sinumerik\ hmi\autostart\run_hmi.exe</td>
<td>Select the HMI program</td>
</tr>
<tr>
<td>Task bar autohide:</td>
<td>&quot;no&quot;</td>
<td>HMI program: Hide start task bar</td>
</tr>
<tr>
<td></td>
<td>&quot;yes&quot;</td>
<td>HMI program: Show start task bar</td>
</tr>
<tr>
<td>Task bar on top:</td>
<td>&quot;no&quot;</td>
<td>HMI program: Start task bar in the background</td>
</tr>
<tr>
<td></td>
<td>&quot;yes&quot;</td>
<td>HMI program: Start task bar always visible</td>
</tr>
</tbody>
</table>
"Desktop (1)" tab

Table 1-4 The default is marked in "bold".

<table>
<thead>
<tr>
<th>&quot;Desktop (1)&quot; tab</th>
<th>Option</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable:</td>
<td>&quot;no&quot;</td>
<td>Desktop not displayed</td>
</tr>
<tr>
<td></td>
<td>&quot;yes&quot;</td>
<td>Displaying the desktop</td>
</tr>
</tbody>
</table>

Content

| Icons Autoshow Tools: | "no" | Do not display links on the desktop. |
|                      | "yes" | Display links on the desktop. |
| Startmenu Autoshow Tools: | "no" | Do not display programs in the "Start menu" |
|                       | "yes" | Display programs in the "Start menu". |

Background

| Bitmaps folder: | (none) | Directory with background screens for the desktop |
| Default bitmap folder: | (none) | Directory with default background screens for the desktop |

Task bar

| Autohide: | "no" | Desktop: Hide start task bar |
|          | "yes" | Desktop: Show start task bar |
| On Top:   | "no" | Desktop: Start task bar in the background |
|           | "yes" | Desktop: Start task bar always visible |
"Desktop (2)" tab

![Global Settings](image)

**Figure 1-7** SCU "Desktop (2)" tab

<table>
<thead>
<tr>
<th>&quot;Desktop (2)&quot; tab</th>
<th>Option</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Keys, filtering</td>
<td>&quot;yes&quot;</td>
<td>Key filtering is activated.</td>
</tr>
<tr>
<td></td>
<td>&quot;no&quot;</td>
<td>Key filtering not activated.</td>
</tr>
<tr>
<td>Filter file</td>
<td>E: \WINDOWS\System2.ini</td>
<td>Select the file with filter settings</td>
</tr>
</tbody>
</table>

**Principle of passing on**

The settings made under "Global Settings" are passed on to individual users. The settings which are passed on can still be adapted to suit each user.
Example: Specific user settings

The settings under "Global Settings" are inherited by all users:

1. Left-click the user in the "Users" list.
2. After entering the password, you can adapt the settings as required.

The settings that cannot be changed are displayed with a gray background.

Figure 1-8 Specific settings for the "HMI (user.group)" user
1.2.3 This is how you create a new user

Creating new users

Procedure:
1. Click on "New User" button.
2. Enter a user name.
3. Assign a user type, e.g. "HMI", and a user group to the user.
   The Windows user group is only active locally on the PCU.

4. Confirm with "Apply".
5. You will then be asked to specify a password.
6. After confirming with "OK", the new user is created and displayed in the list under "Users".
Adding new users from a domain

If the PCU is a member of a domain, users already existing in this domain can be added as HMI users or HMI+Service users:

1. Click on the "New User" button.
2. To do this, select the corresponding entry in the "Domain" list and a user from the "Name" list.
3. Assign a user type and a user group to the user.
   The Windows user group is only active locally on the PCU.

See also

How to add the PCU to a domain (Page 37)

1.2.4 This is how you administer users

Overview

As an HMI+Service user, you can execute the following tasks in the Users ServiceCenter:
- Change user names.
- Delete users.

Change the user name

1. Left or right-click the user who you wish to rename in the list.
2. To change the user name, select "Rename" from the pop-up menu.
3. Enter a new name and confirm with OK.

Deleting a user

To delete a user again, follow these steps:

1. Left or right-click the user who you wish to delete in the list.
2. To delete the user, select "Delete" from the short-cut menu using righthand mouse key.

Result: The user is deleted after confirming the confirmation prompt.
1.3 Boot up behavior of the PCU

1.3.1 Dialogs when booting

Selection when booting up

The following dialogs are shown during boot up:

- "Installing Logon" dialog.
  
  This dialog is displayed if an "Install" directory is found on a bootable storage medium (e.g. USB-FlashDrive) when booting up.

![Installing Logon dialog](image)

Figure 1-10 Installing Logon
• "Desktop Access" dialog
  - This dialog is displayed if **either** no HMI program is installed, the installation has been skipped **or** the start of the HMI program has been deactivated during ramp-up.

  Displaying this dialog can be suppressed through configuration in the global or user settings. "Desktop" is then selected as the default.

  ![Desktop Access dialog]

  **Note**

  If an HMI program is installed, the "Start HMI" button is also available in the "Desktop Access" dialog.
"Desktop Logon" dialog

The "Desktop Logon" dialog enables the user to log on to the desktop. This dialog also appears

- If no valid user data has been provided by the authentication system (EKS).
- If authentication on the "Startup(1)" tab is set to "manual".

**NOTICE**

Setting the access level via EKS:

- If an EKS unit is active, i.e., the key is inserted and can be evaluated, then the key information for the EKS unit alone determines the active access level. The access level in the HMI program cannot be changed when EKS is active.
- If the key is withdrawn from the active EKS unit, i.e. the EKS unit becomes inactive, the system adopts the current access level as determined by the key switch.
- If changing the operating right amongst the operating stations, the EKS unit of the new active operating station is authoritative. If no EKS unit is assigned there, the effect is the same as for an inactive EKS unit.
- The key information is evaluated by the HMI. Once an access level has been determined from the key information, HMI adopts this access level and also sets it in the NCK: The last access level set always applies to the system.
1.3.2 Boot up of the PCU: no HMI program installed

Requirement
No HMI program is installed during the PCU boot up.

Ramp-up phase

Figure 1-13  PCU bootup diagram (without HMI program)
1.3 Boot up behavior of the PCU

Explanations:

- If installation programs are present in directory D:\Install, you will be prompted during the first boot up as to whether the installation procedure should be started. After installation is completed, you need to restart the system.

  The installation can also be skipped and carried out later. To do this, use the HMI Explorer (Installation via service desktop (Page 58)).

- "Desktop", "ServiceCenter Users" or "Shutdown" can be selected in the dialog "Desktop Access".
  - When selecting "Desktop", the "Desktop Logon" dialog is opened.
  - When selecting "ServiceCenter Users", the "Installing Logon" dialog is opened.

---

**Note**

When booting the PCU for the first time, the user can only log on as 'auduser'.

1.3.3 Boot up of the PCU: HMI program already installed

**Requirement**

There is already an HMI program installed.
1.3 Boot up behavior of the PCU

Ramp-up phase

![Diagram of PCU bootup process]

Figure 1-14  PCU bootup diagram (HMI program installed)

Explanations:
- If the HMI program is already installed, the PCU boots up and the HMI program is started (default).
- During the boot up, there is a time interval for pressing key <3> when the version information appears on the lower right of the background screen. Then the "Installing Logon" dialog opens.
- To carry out service tasks, you will have to log on as a service user.
  The following input options are available:
  - Manual logon to a domain using user name and password.
  - Logon using EKS: A key and valid user data for authentication must be provided for this. If valid user data is not available via the EKS, the "Desktop Logon" dialog is displayed along with user name and password.
  - Both options can be selected.
1.3.4 Setting the screen resolution

Overview

The system behavior during boot up for the screen resolution is set in the file tcu.ini. You will find the delivery status for tcu.ini in E:\siemens\system\etc.

Modified tcu.ini files are saved in F:\addon_base\..., F:\oem_base\..., F:\user_base\...


Set the resolution when booting up the PCU

The following options are available in the # RESOLUTION section in the tcu.ini:

<table>
<thead>
<tr>
<th>Settings</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 = SYSTEM</td>
<td>The resolution is not specially set; i.e., the resolution last used in the system is active, e.g., the resolution which had been set manually in the Control Panel.</td>
</tr>
<tr>
<td>1 = AUTO_OP_1</td>
<td>Default: During boot up, the resolution is automatically set (&quot;PCU panel&quot; has priority) in accordance with the following scenarios:</td>
</tr>
<tr>
<td>2 = AUTO_OP_2</td>
<td></td>
</tr>
<tr>
<td>3 = AUTO_MON_1</td>
<td></td>
</tr>
<tr>
<td>4 = AUTO_MON_2</td>
<td></td>
</tr>
<tr>
<td>5 = 640X480</td>
<td></td>
</tr>
<tr>
<td>6 = 800X600</td>
<td></td>
</tr>
<tr>
<td>7 = 1024X768</td>
<td></td>
</tr>
<tr>
<td>8 = 1280X1024</td>
<td></td>
</tr>
</tbody>
</table>

The meanings of the settings are as follows:

**Example 1:** There is a PCU panel (irrespective of whether there is a PCU monitor and TCU panels) [in active TCU mode: The following additional condition applies: PCU is activated (with dynamic resolution switching enabled)]: The resolution is set to the max. resolution of the PCU panel (max. 1280x1024).
### 1.3 Boot up behavior of the PCU

<table>
<thead>
<tr>
<th>Settings</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Example 2:</strong></td>
<td>There is no PCU panel, however there is a PCU monitor (irrespective of whether there are any TCU panels):</td>
</tr>
<tr>
<td></td>
<td>[in active TCU mode:</td>
</tr>
<tr>
<td></td>
<td>The following additional condition applies: PCU is activated (with dynamic resolution switching enabled)]:</td>
</tr>
<tr>
<td></td>
<td>The resolution is not specially set; i.e., the resolution last used in the system is active, e.g., the resolution which had been set manually in the Control Panel.</td>
</tr>
<tr>
<td></td>
<td>(Different to AUTO_OP_2 !)</td>
</tr>
<tr>
<td><strong>AUTO_OP_2</strong></td>
<td>Like AUTO_OP_1, except:</td>
</tr>
<tr>
<td></td>
<td>Example 2: There is no PCU panel, however there is a PCU monitor (irrespective of whether there are any TCU panels):</td>
</tr>
<tr>
<td></td>
<td>[in active TCU mode:</td>
</tr>
<tr>
<td></td>
<td>The following additional condition applies: PCU is activated (with dynamic resolution switching enabled)]:</td>
</tr>
<tr>
<td></td>
<td>The resolution is set to the max. resolution of the PCU monitor, reduced to the next lowest SINUMERIK resolution. The SINUMERIK resolutions are 640x480, 800x600, 1024x768 and 1280x1024.</td>
</tr>
<tr>
<td></td>
<td><strong>Example:</strong> In the case of a PCU monitor with a max. resolution of 1440x900, the SINUMERIK resolution setting is 1280x1024.</td>
</tr>
<tr>
<td><strong>AUTO_MON_1</strong></td>
<td>During boot up, the resolution is automatically set (&quot;PCU monitor&quot; has priority) in accordance with the following scenarios:</td>
</tr>
<tr>
<td></td>
<td><strong>Example 1:</strong> There is a PCU monitor (irrespective of whether there is a PCU panel and TCU panels)</td>
</tr>
<tr>
<td></td>
<td>[in active TCU mode:</td>
</tr>
<tr>
<td></td>
<td>The following additional condition applies: PCU is activated (with dynamic resolution switching enabled)]:</td>
</tr>
<tr>
<td></td>
<td>The resolution is set to the max. resolution of the PCU monitor, reduced to the next lowest SINUMERIK resolution. The SINUMERIK resolutions are 640x480, 800x600, 1024x768 and 1280x1024.</td>
</tr>
<tr>
<td></td>
<td><strong>Example:</strong> In the case of a PCU monitor with a max. resolution of 1440x900, the SINUMERIK resolution setting is 1280x1024.</td>
</tr>
<tr>
<td></td>
<td>If there is a PCU panel, the display there is panned if the max. resolution of the PCU panel is lower than the max. resolution of the PCU monitor.</td>
</tr>
<tr>
<td></td>
<td><strong>Example 2:</strong> There is no PCU monitor, however there is a PCU panel (irrespective of whether there are any TCU panels):</td>
</tr>
<tr>
<td></td>
<td>[in active TCU mode:</td>
</tr>
<tr>
<td></td>
<td>The following additional condition applies: PCU is activated (with dynamic resolution switching enabled)]:</td>
</tr>
<tr>
<td></td>
<td>The resolution is not specially set; i.e., the resolution last used in the system is active, e.g., the resolution which had been set manually in the Control Panel.</td>
</tr>
<tr>
<td></td>
<td>(Different to AUTO_MON_2 !)</td>
</tr>
</tbody>
</table>
### Commissioning a system

#### 1.3 Boot up behavior of the PCU

<table>
<thead>
<tr>
<th>Settings</th>
<th>Meaning</th>
</tr>
</thead>
</table>
| Example 3: | There is no PCU monitor and no PCU panel (= headless operation):  
A) in active TCU mode:  
a) dynamic resolution switching is enabled (resolution adaptation entry in TCU.ini) and at least one TCU is already logged on:  
The resolution is set to the resolution of the TCU which is currently active.  
b) dynamic resolution switching is enabled (resolution adaptation entry in TCU.ini) and no TCU has logged on yet or dynamic resolution switching is disabled:  
The resolution is set to the max. resolution of the current PCU panel, i.e., which logged on during the previous session.  
Default: Default TCU resolution in accordance with the registry.  
**Notice:** The first TCU panel to logon (later) becomes activated. The focus handler then automatically sets the resolution to this TCU panel's resolution (in the case of dynamic resolution switching).  
A) in inactive TCU mode:  
The resolution is not specially set - i.e. the resolution used during the previous session in the system is active, e.g. the resolution set manually in Control Panel. |
| AUTO_MON_2 | Like AUTO_MON_1, except:  
Example 2: There is no PCU monitor, however there is a PCU panel (irrespective of whether there are any TCU panels):  
[In active TCU mode:  
The following additional condition applies: PCU is activated (with dynamic resolution switching enabled)]:  
The resolution is set to the max. resolution of the PCU panel (max. 1280x1024). |
| 640X480    | During boot up, the SINUMERIK resolution is set to 640x480. |
| 800X600    | During boot up, the SINUMERIK resolution is set to 800x600. |
| 1024X768   | During boot up, the SINUMERIK resolution is set to 1024x768. |
| 1280X1024  | During boot up, the SINUMERIK resolution is set to 1280x1024. |
1.4 BIOS settings

Overview

The BIOS of the PCU is preset in such a way that no changes are required. The date and

**NOTICE**

Your device configuration is preset for working with the software supplied with the unit. You

shall only change the preset values if you have modified your device in any way, or if a

fault occurs when the unit is powered up.

Starting BIOS setup

1. Start the BIOS SETUP as follows:

   Reset the device (warm or cold restart).

   After the first boot up, the following message appears:

   Press < F2 > to enter SETUP or <ESC> to show boot menu

2. Press the F2 key as long as the BIOS prompt appears on the screen.

   The BIOS main menu opens:

   ![BIOS Main Menu](image)

   **Figure 1-15 BIOS Main Menu (Example)**
BIOS setup: Defaults

The following system parameters are saved on delivery:

**Menu: Main**

<table>
<thead>
<tr>
<th>System parameters</th>
<th>Defaults</th>
<th>Custom entries</th>
</tr>
</thead>
<tbody>
<tr>
<td>System Time</td>
<td>hh:mm:ss</td>
<td></td>
</tr>
<tr>
<td>System Date</td>
<td>MM/DD/YYYY</td>
<td></td>
</tr>
<tr>
<td>IDE Channel 0 Master</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>IDE Channel 0 Slave</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>SATA Port 0</td>
<td>40008 MB</td>
<td></td>
</tr>
<tr>
<td>SATA Port 1</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>SATA Port 2</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>SATA Port 3</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>Memory Cache</td>
<td>Write Back</td>
<td></td>
</tr>
</tbody>
</table>

**Boot options**

<table>
<thead>
<tr>
<th>Boot options</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Quick boot mode</td>
<td>Enabled</td>
</tr>
<tr>
<td>SETUP prompt</td>
<td>Enabled</td>
</tr>
<tr>
<td>POST errors</td>
<td>All, but not keyboard</td>
</tr>
<tr>
<td>Summary screen</td>
<td>Enabled</td>
</tr>
<tr>
<td>Diagnostic screen</td>
<td>Enabled</td>
</tr>
<tr>
<td>Post Code/Status</td>
<td>LPC Bus</td>
</tr>
</tbody>
</table>

**Keyboard features**

<table>
<thead>
<tr>
<th>Keyboard features</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Numlock</td>
<td>ON</td>
</tr>
<tr>
<td>Key click</td>
<td>Disabled</td>
</tr>
<tr>
<td>Keyboard auto-repeat rate</td>
<td>30 / sec</td>
</tr>
<tr>
<td>Keyboard auto-repeat delay</td>
<td>½ sec</td>
</tr>
</tbody>
</table>

**Hardware Options**

<table>
<thead>
<tr>
<th>Hardware Options</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>PCI MPI/DP</td>
<td>Enabled</td>
</tr>
<tr>
<td>Onboard Ethernet 1</td>
<td>Enabled</td>
</tr>
<tr>
<td>On-board Ethernet 1 Address</td>
<td>08 00 06 90 xx xx</td>
</tr>
<tr>
<td>On-board Ethernet 1 Remote Boot</td>
<td>Enabled</td>
</tr>
<tr>
<td>Onboard Ethernet 2</td>
<td>Enabled</td>
</tr>
<tr>
<td>On-board Ethernet 2 Address</td>
<td>08 00 06 90 xx xx</td>
</tr>
<tr>
<td>On-board Ethernet 2 Remote Boot</td>
<td>Disabled</td>
</tr>
<tr>
<td>SafeCard functions</td>
<td>Enabled</td>
</tr>
</tbody>
</table>
1. Commissioning a system

1.4 BIOS settings

<table>
<thead>
<tr>
<th>Hardware Options</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Fan control</td>
<td>Enabled</td>
</tr>
<tr>
<td>CRT/LCD selection</td>
<td>Simultan. Auto</td>
</tr>
</tbody>
</table>

Menu: Advanced

<table>
<thead>
<tr>
<th>System parameters</th>
<th>Defaults</th>
<th>Custom entries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Installed O/S</td>
<td>Other</td>
<td></td>
</tr>
<tr>
<td>Reset configuration data</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Legacy USB support</td>
<td>Disabled</td>
<td></td>
</tr>
<tr>
<td>USB controller restart</td>
<td>Enabled</td>
<td></td>
</tr>
<tr>
<td>I/O Device Configuration</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Internal COM 1</td>
<td>Enabled</td>
<td></td>
</tr>
<tr>
<td>Base I/O address</td>
<td>3F8</td>
<td></td>
</tr>
<tr>
<td>Interrupt</td>
<td>IRQ 4</td>
<td></td>
</tr>
</tbody>
</table>

PCI Configuration

<table>
<thead>
<tr>
<th>PCI device slot 1</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Option ROM scan</td>
<td>Enabled</td>
</tr>
<tr>
<td>Enable master</td>
<td>Enabled</td>
</tr>
<tr>
<td>Latency timer</td>
<td>Default</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PCI device slot 2</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Option ROM scan</td>
<td>Enabled</td>
</tr>
<tr>
<td>Enable master</td>
<td>Enabled</td>
</tr>
<tr>
<td>Latency timer</td>
<td>Default</td>
</tr>
</tbody>
</table>

SATA/PATA Configuration

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>PATA Controller:</td>
<td>Enabled</td>
</tr>
<tr>
<td>SATA Controller mode</td>
<td>Enhanced</td>
</tr>
<tr>
<td>AHCI Configuration</td>
<td>Disabled</td>
</tr>
<tr>
<td>RAID support</td>
<td>Disabled</td>
</tr>
</tbody>
</table>

Menu: Security

<table>
<thead>
<tr>
<th>System parameters</th>
<th>Defaults</th>
<th>Custom entries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supervisor password is</td>
<td>Disabled</td>
<td></td>
</tr>
<tr>
<td>User password is</td>
<td>Disabled</td>
<td></td>
</tr>
<tr>
<td>Set user password</td>
<td>Enter</td>
<td></td>
</tr>
<tr>
<td>Set supervisor password</td>
<td>Enter</td>
<td></td>
</tr>
</tbody>
</table>
Commissioning a system

1.4 BIOS settings

### System parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Defaults</th>
<th>Custom entries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Password on boot</td>
<td>Disabled</td>
<td></td>
</tr>
<tr>
<td>Fixed disk boot sector</td>
<td>Standard</td>
<td></td>
</tr>
</tbody>
</table>

### Menu: Boot

<table>
<thead>
<tr>
<th>System parameters</th>
<th>Defaults</th>
<th>Custom entries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boot priority order:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1: SATA0:</td>
<td>Fujitsu MHT2040BHTBD</td>
<td></td>
</tr>
<tr>
<td>2: PCI BEV:</td>
<td>VIA BootAgent</td>
<td></td>
</tr>
<tr>
<td>3:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excluded from boot order:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Menu: Version

<table>
<thead>
<tr>
<th>System parameters</th>
<th>Defaults</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIMATIC PC</td>
<td>SINUMERIK PCU 50.3</td>
</tr>
<tr>
<td>BIOS version</td>
<td>V05.01.06</td>
</tr>
<tr>
<td>BIOS number</td>
<td>A5E00370214-ES005</td>
</tr>
<tr>
<td>MPI/DP firmware</td>
<td>V01</td>
</tr>
<tr>
<td>CPU type</td>
<td>Celeron ® M processor 1.50GHz</td>
</tr>
<tr>
<td>CPU ID</td>
<td>06D8</td>
</tr>
<tr>
<td>Code revision</td>
<td>0020</td>
</tr>
</tbody>
</table>

### Menu: Exit

| Save Changes & Exit       | All changes are saved; a system restart is carried out with the new parameters. |
Changing BIOS settings

Once additional components have been installed or attached, it may be the case that the system has to be informed of this via the BIOS setup:

1. Ramp up the device.
2. When the prompt to activate the BIOS setup appears, press the <F2> key (corresponds to horizontal softkey 2 on the OP).
3. The BIOS setup menu appears. In the menu, use the cursor keys to navigate to the desired selection box.
4. Change the setting using the <+> key (press <SHIFT> and <X> at the same time) or the ↔ key on the numeric keypad.
5. Using the left-right cursor keys, you can reach other setup menus.
6. Press <ESC> (Alarm Cancel> key) to go to the "Exit" menu (or press the right cursor key again).
7. Press the <Enter> key to exit the setup menu.

Then the system powers up.

Note
Changes to the BIOS settings, with the exception of the boot sequence, require an OEM contract to be concluded.
2.1 System settings

2.1.1 How to change the name of the PCU

Default

The PCU is supplied with an automatically generated computer name.

Procedure

To change the name of the PCU:

1. Select "Start" → "Control Panel" → "System".
2. Select the "Computer Name" tab and click on "Change".

The following dialog opens:

![Computer Name Changes dialog](image)

Figure 2-1 Changing the name of the PCU
2.1.2 This is how you set the IP address of the PCU

Default

**NOTICE**

The IP address 192.168.214.241 is set as a factory default for every PCU on the system network.
You must only perform the steps described below if you wish to change this default.

Procedure

1. Select the following on the PCU on the service desktop: "Start" → "Settings" → "Network Connections".
   The "Network Connections" window opens.
2. Double-click the Ethernet 2 interface you want to parameterize which is to be used for connecting the TCU or system network.
   The "Ethernet 2 (System Network) Properties" window opens.
3. Under the "General" tab, select "Internet Protocol (TCP/IP)" and click the "Properties" button.
   The "Internet Protocol (TCP/IP) Properties" window opens:
4. Under the "General" tab, select the "Use the following IP address" option and enter the IP address and the subnet screen form.

Recommended setting for the first PCU:

![IP configuration settings](image)

5. Enter the required new IP address and confirm the settings with "OK".

2.1.3 How to add the PCU to a domain

Requirement

Only a user with the corresponding entitlement, e.g. a domain administrator, can add a PCU to an existing domain.

Domain Controller (DC)

A domain controller (DC) is a server for central authentication and authorization of computers and users in a network. In a network with a domain controller, several computers are combined to form one domain.

Proceed as follows

To add the PCU to a domain:

Default: The PCU belongs to a "WORKGROUP" and is not assigned to any domain.

2. Click "Change ...".

The following dialog opens:

3. Enter the name of the domain to which you want to add the PCU.

4. You will then be asked to log on as a user with the corresponding entitlement to conclude the process.
2.1.4 How to connect an external monitor

Conditions

To connect an external monitor, the following conditions apply:

- The external monitor is connected to the DVI interface on the PCU (using an adapter, if necessary).
- The monitor may not be connected while in use.

Procedure

To connect an external monitor:

1. Right-click the PCU's service desktop and select "Properties" from the pop-up menu.
2. Select the "Settings" tab and then click "Advanced".
3. Select the "Troubleshooting" tab and set the "Hardware acceleration" to a value other than zero. The recommended setting is "full".
4. Close the dialog and click OK to confirm all the dialogs.
5. Repeat steps 2 and 3. There is an additional tab for "Intel(R) ... Graphics Controller"
6. Click the "Graphics Properties" button. On the "Devices" tab the external monitor corresponds to the "Monitor" selection; the OP/TP on the PCU corresponds to the "Notebook" selection.
7. Select a "Primary Device" and a "Secondary Device".
8. Close the dialog and click OK to confirm all the dialogs: The external monitor is now ready.
2.2 Configuring a customized operator interface

2.2.1 How to select the language for the Windows system

Default setting

In the delivery condition, the Windows XP operating system is only installed on the PCU in English and with a US keyboard layout.

Requirement

In order to be able to switch languages, the desired languages must be installed from the DVD of the "SINUMERIK Service Pack Recovery Media Win XP ProEmbSys SP2". With the "Multilingual User Interface" (MUI), you can switch to menus, dialogue boxes and keyboard layouts for the Windows system in different languages:

Select a language

After installing a language from the corresponding CD, proceed as follows:

1. Choose "Start" → "Control Panel" → "Language and Regional Options", to open the following dialogue box:
2. Choose the "Languages" tab, in order to switch the language for the Windows XP operator interface. Under "Language used in menus and dialogues," choose the new language and confirm with OK.

3. On the "Advanced" tab, choose the language for programs that do not support Unicode.

Result

To make the language change effective, the PCU must be rebooted. The selectable languages are displayed using the font set of the respective language.

NOTICE

The settings for the keyboard layout and the formats for date, time and number displays on the "Regional Options" tab must not be changed. These settings are automatically adjusted depending on the language selected for the operator interface under HMI Advanced.

See also

How to install additional languages under Windows XP (DVD) (Page 63)
2.2 Configuring a customized operator interface

2.2.2 Displaying the boot screen

Default

The Siemens boot screens are archived in the PCU under the following path:

F:\hmisl\siemens\sinumerik\hmi\ico\ico\R<Resolution>\splash.png

<Resolution>: 640, 800, 1024 or 1280 dpi

Directories

Set up a directory containing several boot screens (for different resolutions). This directory should be segmented into subdirectories 640, 800, 1024 and 1280, which each contain a boot screen of the appropriate resolution.

A directory containing boot screens can also be set up, likewise divided into subdirectories 640, 800, 1024 and 1280. The boot screen stored there for a particular resolution is displayed if no boot screen (including one with a lower resolution) is found in the booting-screen directory described above.

If no boot screen (including one with a lower resolution) is found, a general boot screen is displayed, which is part of the PCU-Basesoftware.

Screen name and resolution

The name can be selected freely; only one file is permitted per directory. The screens must be created with a graphics tool in the resolution indicated by the subdirectory name and stored in the corresponding directory. The HMI software selects the screen, depending on the resolution of the available operator panel.

Setting the directories

The directories are set in ServiceCenter Users under:

- Startup: Bitmaps folder
- Startup: Default bitmap folder
2.2.3 Changing the background of the service desktop

Overview

A background pattern for the service desktop is not set via the "Control Panel" (system control), but in the registry:

- **Background pattern:**

<table>
<thead>
<tr>
<th>Key:</th>
<th>HKLM\SOFTWARE\Siemens\SINUMERIK\Basic software\ &lt;version&gt;\HMI desktop</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value:</td>
<td>Pattern (STRING)</td>
</tr>
<tr>
<td>Date:</td>
<td>&lt;bit code&gt;&quot; (e.g., &quot;0 80 114 32 0 5 39 2&quot;, see HKCU\Control Panel\Patterns)</td>
</tr>
<tr>
<td></td>
<td>&quot;(None)&quot; (= NO background pattern)</td>
</tr>
<tr>
<td>Init data:</td>
<td>Background pattern previously set via the Control Panel</td>
</tr>
<tr>
<td>Default data:</td>
<td>&quot;(None)&quot; (if entry is not available/readable)</td>
</tr>
</tbody>
</table>

- **Background image:**

  A background screen for the service desktop is not user-specifically set via the "Control Panel" (system control), but in the ServiceCenter Users under "Service: Bitmap Folders" or "Service: Default Bitmap Folders".

**Note**

An attempt to set the service desktop background (as in standard Windows) via the Control Panel does not affect the service desktop background display, but only the boot screen display.
2.3 Customized settings during boot up

Overview

Regarding the settings and functionality, booting followed by the start of an HMI program starting differs from booting with subsequent start of the Service Desktop.

2.3.1 Configuring key filters for an HMI program

Filtering keys

During boot up of an HMI program, keystroke sequences and pressed function keys are simultaneously filtered. The keystroke sequences and functions that were pressed simultaneously and are to be filtered are configured in file E:\Windows\System.ini.

Filtering keystroke sequences:

<table>
<thead>
<tr>
<th>Section</th>
<th>MMC103Keyb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Key</td>
<td>SeqAct</td>
</tr>
<tr>
<td>Value</td>
<td>&lt;bit mask&gt;</td>
</tr>
<tr>
<td></td>
<td>(= keystroke sequences to be filtered, specified in accordance with the comment in E:\Windows\System.ini)</td>
</tr>
<tr>
<td>Init value</td>
<td>262143</td>
</tr>
</tbody>
</table>

Filtering function keys that were pressed simultaneously:

<table>
<thead>
<tr>
<th>Section</th>
<th>MMC103Keyb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Key</td>
<td>ConcurrentKeyMask</td>
</tr>
<tr>
<td>Value</td>
<td>&lt;bit mask&gt;</td>
</tr>
<tr>
<td></td>
<td>(= function keys to be filtered, specified in accordance with the comment in E:\Windows\System.ini)</td>
</tr>
<tr>
<td>Init value</td>
<td>255</td>
</tr>
</tbody>
</table>

In the ServiceCenter Users, the keys that are to be filtered can be configured for each specific user:

- while the system boots → "Startup (2)" tab
- while the HMI program runs: → "HMI" tab
- on the Service Desktop or Windows Desktop: → "Desktop (2)" tab
system.ini file

# ------------------------------------------------------------------------
# SIEMENS KEYBOARD-DRIVER SECTION (START)
# ------------------------------------------------------------------------
# State of driver after startup
# (0=NORMAL, 1=PERMANENT-SHIFT ACTIVE)
keybStartState=0

# Type of Keyboard to be used
# (0=MMC103, 1=MFII)
keybType=0

# Filtering Key Sequences
# -------------------------
# Activation of Key-Sequences to be ignored
# SeqAct holds a BIT-Pattern for a max of 20 sequences
# which could be ignored by the keyboard-driver
# if bit-n is set in Seq-Act, the according sequence
# will be ignored
# The following 20 sequences are implemented
# 0 CTRL-ALT-DEL
# 1 ALT-F4
# 2 ALT-TAB
# 3 LEFTSHIFT-ALT-TAB
# 4 RIGHTSHIFT-ALT-TAB
# 5 CTRL-ESC
# 6 ALT-ESC
# 7 ALT-SPACE
# 8 (SHIFT)-CTRL-F1
# 9 (SHIFT)-CTRL-F2
# 10 (SHIFT)-CTRL-F3
# 11 (SHIFT)-CTRL-F4
# 12 (SHIFT)-CTRL-F5
# 13 (SHIFT)-CTRL-F6
# 14 (SHIFT)-CTRL-F7
# 15 (SHIFT)-CTRL-F8
# 16 M$_1$
# 17 M$_2$
# 18 CAPSLOCK
# 19 NUMLOCK
# 20 (reserved)
KeySequencesEnable =1
2.3 Customized settings during boot up

SeqAct=262143

# Filtering Concurrent Keys
# -----------------------------------
# Definition and selection of function keys (buttons) which shall not be
# pushed in parallel or at the same time (function keys F1-F12 and
# additional hardkeys).
# If more of these buttons are pushed at the same time, the system removes the
# code of these buttons except the code of the button which was pushed first.
# This function of the keyboard-driver is activated by ConcurrentKeyEnable.
# ConcurrentKeyMask holds a BIT-Pattern for a max of 17 function keys, which
# must not be pushed simultaneously (concurrently). If bit-n is set in
# ConcurrentKeyMask, the corresponding button is supervised.
# The following 17 function keys are implemented:
# F1
# F2
# F3
# F4
# F5
# F6
# F7
# F8
# F9
# F10
# F11
# F12
# PAGE-UP (NUMLOCK) Alarm Hardkey on Operator Panel
# PAGE-DOWN (NUMLOCK) Tool Management Hardkey on Operator Panel
# HOME (NUMLOCK) Program Manager Hardkey on Operator Panel
# END (NUMLOCK) Program Hardkey on Operator Panel
# CURSOR-DOWN (NUMLOCK) Alarm Hardkey on Operator Panel

---

Note

Scope of the keys

Only keys, which have already been defined in the system.ini file, can be enabled.
No additional keys can be defined for filtering.

See also

ServiceCenter Users: User settings (Page 11)
2.3.2 Saving service desktop settings

Starting the service desktop

The Windows platform is freely accessible via the service desktop. When the service desktop is started, all of the programs that would automatically be started by Windows (standard version) during log-in are also started.

- Executing an HMI program
  The HMI program can also be started from the service desktop.

- Ending an HMI program
  When an HMI program started from the service desktop is exited, you are returned to the service desktop.

Saving the service desktop (default)

The settings on the service desktop (e.g. arrangement of the links on the service desktop) are not saved when you log off. A service technician should always find the same starting condition on the service desktop, not the settings from a previous session.

Saving the settings of the service Desktop

This behavior can be changed by making an entry in the registry. The following settings can be saved via this registry entry:

- Positions of open windows
- Size and position of the task bar
- Moving and deleting links

<table>
<thead>
<tr>
<th>Key:</th>
<th>HKLM\SOFTWARE\Siemens\SINUMERIK\Basic software&lt;version&gt;\HMI Manager</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value:</td>
<td>SaveSINDesktopSettings (DWORD)</td>
</tr>
<tr>
<td>Date:</td>
<td>1 (the settings are saved) or 0 (the settings are NOT saved)</td>
</tr>
<tr>
<td>Init data:</td>
<td>- Value is not created by the basic software -</td>
</tr>
<tr>
<td>Default data:</td>
<td>0 (if entry is not available/readable)</td>
</tr>
</tbody>
</table>

The key is effective for all service users and other users.

Links on the service desktop are always saved, irrespective of the registry entry.

Note

Application windows that are still open before logging out, must be closed by the setting "Save settings" before exiting the service desktop. Otherwise, these application windows will briefly be displayed and then closed again during a restart immediately before the HMI program starts.
2.3 Customized settings during boot up

2.3.3 Starting programs during boot up

Starting additional programs

Programs can also be started at the same time as the HMI program and are started automatically by Windows when the service desktop is opened. This start in parallel to the HMI program can be configured.

If the programs to be started are located in the Windows directories of E:\Documents and Settings, the following registry entry must be set:

<table>
<thead>
<tr>
<th>Key:</th>
<th>HKLM\SOFTWARE\Siemens\SINUMERIK\Basic software\ &lt;version&gt;\HMI Manager</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value:</td>
<td>StartSINHMIStartupDirsPrograms (DWORD)</td>
</tr>
<tr>
<td>Date:</td>
<td>1 (the programs are started) or 0 (the programs are NOT started)</td>
</tr>
<tr>
<td>Init data:</td>
<td>0</td>
</tr>
<tr>
<td>Default data</td>
<td>0 (if entry is not available/readable)</td>
</tr>
</tbody>
</table>

If the programs to be started are set in the registry entries 'HKCU\Software\Microsoft\Windows\CurrentVersion\Run' and 'HKLM\Software\Microsoft\Windows\CurrentVersion\Run', the following registry entry must be set:

<table>
<thead>
<tr>
<th>Key:</th>
<th>HKLM\SOFTWARE\Siemens\SINUMERIK\Basic software\ &lt;version&gt;\HMI Manager</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value:</td>
<td>StartSINHMIRunPrograms (DWORD)</td>
</tr>
<tr>
<td>Date:</td>
<td>1 (the programs are started) or 0 (the programs are NOT started)</td>
</tr>
<tr>
<td>Init data:</td>
<td>0</td>
</tr>
<tr>
<td>Default data</td>
<td>0 (if entry is not available/readable)</td>
</tr>
</tbody>
</table>

Executing an HMI program

While the HMI program is being executed, Windows Explorer runs in the background and its settings (disabled browser functionality, taskbar, start menu, ...) prevent the Windows platform being accessed unintentionally.

The behavior of the taskbar can be user-specifically set in the ServiceCenter Users under "HMI program" using "Taskbar Autohide" and "Taskbar On Top".

Ending an HMI program

When the HMI program is ended, Windows XP shuts down completely.
2.3.4 Starting OEM programs

Overview

You can start OEM programs directly before starting the HMI system software. This requires these programs (or their links) to be stored in subdirectories of the directory C:\RunOEM.

Starting sequence

The subdirectories are executed in the order listed. The programs within a subdirectory are started in the chronological order in which they were placed in the subdirectory.

- Programs in the C:\RunOEM\SeqOnce subdirectory are started once and sequentially, i.e., a program is not started until the previously started program is completed.
- Programs in the C:\RunOEM\Seq subdirectory are started sequentially whenever the system is ramped up, i.e., a program is not started until the previously started program is completed.
- Programs in the C:\RunOEM\ParOnce subdirectory are started once and simultaneously. They run parallel with the HMI system software.
- Programs in the C:\RunOEM\Par subdirectory are started simultaneously whenever the system is ramped up. They run parallel with the HMI system software.

Not only program files, but also other types of file can be stored in the subdirectories, which are then opened in accordance with their file type.

For example, ".txt" files are opened using Notepad, ".htm" files are opened using Internet Explorer.

2.3.5 Starting applications in service mode

Starting other applications

If other applications are to be started in service mode, enter them with their complete path in the [OEMRun] section in the file WINBOM.INI:

Example: Starting the "Notepad" program

```
[OEMRunOnce]
"Start WinVnc", "x:\I386\system32\StartWinVnc.exe"
"Check Password","x:\I386\system32\CheckPFPwd.exe"

[OEMRun]
"Start Backup/Restore", "x:\I386\system32\GhostOrder.exe"
"notepad","e:\windows\notepad.exe"
```

All other entries must not be changed.
2.4 PCU with SITOP UPS module

Preconditions

- PCU-Basesoftware WinXP V08.00.00 or higher for USB port
- SITOP software, version 2.5.2.4 or higher is installed:
  SITOP software is available to download from: www.automation.siemens.com/sitop
- SITOP monitor/configuration program is installed:
  To enable this, the SITOP software must be copied to the E:\SITOP directory set up on the PCU. This directory already contains PCU tools required for shutdown on the SITOP UPS. If this directory does not exist in an older version of the PCU-Basesoftware, it must be created so that it will be compatible for any subsequent updating of the PCU-Basesoftware.
- UPS USB driver for Windows XP is installed:
  Installation is described in the relevant SITOP documentation. The documentation is part of the SITOP software download package.
- The SITOP UPS hardware is connected.

NOTICE

The SITOP software version 3.1.0.6 can be operated with PCU-Basesoftware V08.02.00.01 or higher subject to the following conditions:
- SITOP software must not be installed as a Windows service, but must be started as a normal application (as described in the chapter titled "Starting and configuring the SITOP monitor").
- The SITOP service prevents the correct switch-off procedure being performed on the SITOP UPS module when PCU-Basesoftware is installed.

Application

If the supply voltage at the PCU dips, the SITOP UPS modules below could maintain operation for a limited period if a backup battery is being used, allowing the PCU to be properly shut down before the battery is exhausted.

<table>
<thead>
<tr>
<th>Designation</th>
<th>Order number</th>
</tr>
</thead>
<tbody>
<tr>
<td>SITOP with USB interface</td>
<td>MLFB:</td>
</tr>
<tr>
<td>• SITOP DC UPS module (24 V / 15 A)</td>
<td>6EP1931-2EC42</td>
</tr>
<tr>
<td>• SITOP battery module 3.2 Ah</td>
<td>6EP1935-6MD11</td>
</tr>
<tr>
<td>• SITOP UPS 500S basic module (2.5 kWs)</td>
<td>6EP1933-2EC41</td>
</tr>
<tr>
<td>• SITOP UPS 501S expansion module (5 kWs)</td>
<td>6EP1935-5PG01</td>
</tr>
</tbody>
</table>
The PCU 50.3 requires approximately 60 seconds to safely shutdown when the power fails. For a typical power consumption of approx. 60 W, a capacitor-buffered UPS with an energy storage device of 7.5 kWs is recommended. If longer buffer times are required, then several expansion modules can be connected in a cascade connection.

**Note**

**Information about the test environment for machine OEMs**

The "SITOP UPS" function has been tested in the standard configuration with the operating software. When installing add-on or OEM software components, the shutdown procedure of the complete system has to be checked by the user.

For additional information, please refer to the KT10.1 Catalog.

### 2.4.1 Starting and configuring the SITOP monitor

**Windows boot up**

The SITOP monitor has to be started by Windows automatically during ramp-up: Activate this setting when installing the SITOP software in the dialog "Configuration - default settings for the SITOP Software". Select the option "Start program with Windows". After the PCU has restarted, the SITOP monitor is then automatically started. The next installation step is to configure the monitor.

**NOTICE**

The SITOP monitor must not be started via the Windows Autostart directory.
Configuring the system

2.4 PCU with SITOP UPS module

General settings

The following settings must be made in the SITOP monitor configuration dialogue box:

- Parameterization of the interface: For module with USB port
- Parameterization of the change action:

  The monitoring window display must be deselected, as this function can lead to sporadic faults on the HMI operator interface.

![Configuration of the SITOP monitor: General settings](image)

Parameterization of the SITOP monitor

Enter the path of the program that ensures that HMI Advanced and the PCU shut down properly in the event of a power failure into the parameter area of the buffer.

E:\SITOP\Shutdown.bat

![Configuration of the SITOP monitor: Buffering settings](image)

Alternatively, the following setting can be used: E:\Windows\system32\hmiexit.exe
2.4.2 Configuration of the SITOP UPS module

Buffering parameterization

The UPS module can be used to select whether buffering should be completed after a predetermined period of time or not until the accumulator’s lowest discharge threshold (= maximum buffer time) has been reached. Both buffering parameterizations result from this.

"Maximum buffer time" mode (PCU basic software XP 08.00.00 or higher)

This mode enables the system to be shut down in a time-optimized manner. The UPS module is synchronized with the shutdown of the operating system. Buffering is maintained until the operating system has been shut down. The operating system must shut down within a maximum of five minutes (including all applications). Otherwise, the UPS module buffers for the maximum buffer time (dependent on the accumulator state).

Required settings on the UPS module (USB interface)

<table>
<thead>
<tr>
<th>On - Off</th>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+2V</td>
<td>Cut-in threshold</td>
</tr>
<tr>
<td>2</td>
<td>+1V</td>
<td>+22V fixed</td>
</tr>
<tr>
<td>3</td>
<td>+0.5V</td>
<td>End-of-charge voltage + 26.3V fixed</td>
</tr>
<tr>
<td>4</td>
<td>+1V</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>+1V</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>+0.5V</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>+0.2V</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>+0.2V</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>+0.1V</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>0.35A / 0.7A</td>
<td>Charging current</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>On - Off</th>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>Set time/max. time</td>
</tr>
<tr>
<td>2</td>
<td>+320 s</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>+160s</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>+80s</td>
<td>Buffer time</td>
</tr>
<tr>
<td>5</td>
<td>+40s</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>+20s</td>
<td>+5 s fixed</td>
</tr>
<tr>
<td>7</td>
<td>+10s</td>
<td>Disconnection</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>Battery operating state on/off</td>
</tr>
</tbody>
</table>

Legend:

- Delivery condition setting
- Setting for operation on the PCU
"Fixed buffer time" mode

In this mode, the UPS module always buffers for the pre-selected, fixed period of time. It is not possible to synchronize the UPS module with the operating system shutdown.

Required settings on the UPS module

<table>
<thead>
<tr>
<th>Number</th>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>On - Off</td>
<td>+2V</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>+1V</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>+0.5V</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>+1V</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>+1V</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>+0.5V</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>+0.2V</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>+0.2V</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td>+0.1V</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>0.35A / 0.7A</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Number</th>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>On - Off</td>
<td>+320 s</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>+160s</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>+80s</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>+40s</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>+20s</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>+10s</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>Disconnection</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td>Battery operating state on/off</td>
</tr>
</tbody>
</table>

Legend:
- ○ Delivery condition setting
- ● Setting for operation on the PCU
2.4.3 Configuration for exiting the HMI

HMI monitoring

Exiting of the HMI advanced is monitored by a separate application, hmiexit.exe. This application is started implicitly via the shutdown.bat batch file. In case of error, the application forces the operating system to shut down. An error occurs if the HMI cannot be exited within the configured delay.

Optionally, the parameters below can be set for hmiexit in file:

E:\SITOP\hmiexit.ini.

[Actions]

# Waiting time in seconds for closing HMI Advanced applications
Wait = 120

# Action on expiration of the waiting time
ForceShutdown = True

These default settings only need to be changed if it takes longer than 120 seconds to exit the HMI applications in an OEM installation. This configuration is not usually changed.

Configuring the "EXIT" softkey

During production, the option to shut down the HMI via the "EXIT" softkey in the operating area menu should be disabled, as this function cannot be synchronized with the UPS module.

The "EXIT" softkey is disabled by entering ExitButton=False in the regie.ini file.

Hibernate

The operating system's hibernate mode is suspended when operating the UPS, as the USB interface always has to be active for the UPS module.

Note

More information can be found in the product descriptions with the corresponding order number.
Configuring the system

2.4 PCU with SITOP UPS module
Install software and updates

3.1 Installing SINUMERIK products

Overview

This chapter describes how to install additional software on the basis of the pre-installed PCE basic software or how to carry out an update.

The description below is based on the delivery condition of the hardware and software components.

The service desktop is, for example, used for the following tasks:

- Installing HMI system software
- Setting the running environment of the HMI system software
- Checking the hard disk or version
- Privilege for SIMATIC STEP 7
3.2 Installation via service desktop

Installing additional software

The service desktop makes it possible to install system software or a software update. This mostly affects installation/update packages that are to be installed via the Windows network.

Installation can be performed in two ways:

- The installation/update package is stored in directory D:\INSTALL. When booting the PCU the next time, the installation/update process is automatically started while booting. Only when the installation or update process is completed does normal boot manager continue and, if necessary, HMI software started.
- The installation/update process can be started from the service desktop directly by executing the installation/update package.

Using installation directories

Several installation directories can be set to enable an operator setup to be executed automatically. Installation directories include the subdirectory D:\Install and the directories listed in the [SetupDirs] section of the E:\Windows\System32\HMIServe.ini parameters file.

The "D:\Install" installation directory is preset there.

The key names contained within a section of the E:\Windows\System32\HMIServe.ini parameters file must be unique.

The installation directories are evaluated in the sequence described in the parameters file. If the parameters file is missing or it does not contain a [SetupDirs] section, the preset "D:\Install" installation directory is considered instead.

If the [SetupDirs] section contains installation directories, but not "D:\Install", the "D:\Install" directory is not considered within the context of the set installation directories.

When executing a setup using OpFile.txt, the issue of whether or not the setup requires a reboot once it has been completed is taken into account and displayed via a corresponding OpFile.txt entry. If a corresponding entry exists, a reboot is triggered. If there is a chain of setups to be executed one after the other, the reboot is performed once the final setup is complete.

Installing with HMI Explorer

The "HMI Explorer" Windows program is available on the service desktop. When this program is called up, detailed version information relating to the HMI system software applications installed and to Windows XP is displayed.

Applications can be individually started or uninstalled via the HMI Explorer. Select the menu "Install" to display and install the available software packages.
### Description of HMI Explorer

The properties dialogue box gives detailed information on installing the software product:

- **Information on the SINUMERIK product:**
  
  The "Info" dialogue box provides information on the selected SINUMERIK product:

  - **Current version:** Specifies which version of the SINUMERIK product is currently installed. The version is shown in long form.
  - **Internal version:** Shows the current internal version number of this product.
  - **Installation Date/Time:** Shows the installation date and time of the current version.
  - **Installation path:** Displays the path for the main directory of the SINUMERIK product.
  - **Start application:** Gives information on the path to the *.exe file, which launches the SINUMERIK product.
• **Language of the product**

The "Language" dialogue box lists the installed languages for the respective SINUMERIK product and provides information on the name of the installed language. If the language is not known, an abbreviation of its name is displayed. Known languages of HMI Explorer are German, English, Spanish, French and Italian. The version of the installed language is also displayed. Information is also given regarding the installation time and date.

• **History of the product**

The "History" dialogue box shows information on the history of the SINUMERIK product. This dialogue box gives information on the release version, any service packs and hot fixes. The "release" entry is always available. The entries for "service pack" and "hot fix" only appear if they have been installed. Information on the "version", "internal version" and "installation date/time" is given for each entry on this list.

• **Component information**

The "Components" dialogue box shows the information on the components accompanying a product:

- Component: Component name
- Version: Internal version of the components
- Path: Path of the components
- File: *.exe file
- Enable: Shows whether or not the component is enabled
- Description: Description of components
- Type: Type of components

![Figure 3-2 "Components" dialogue box (example)]
3.3 How to install and authorize SIMATIC STEP 7

Overview

SIMATIC STEP 7 V5.4 SP1 can also be installed on the PCU.

<table>
<thead>
<tr>
<th>Delivery item:</th>
<th>SIMATIC STEP 7 V5.4 SP1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Components:</td>
<td>SIMATIC STEP 7 V5.4 SP1 and AddOn for SINUMERIK 840D sl</td>
</tr>
<tr>
<td>Type of delivery:</td>
<td>1 installation DVD</td>
</tr>
<tr>
<td>System requirements:</td>
<td>PCU-Basesoftware V8.0 or higher A network connection or a connection to a DVD drive is required.</td>
</tr>
</tbody>
</table>

Recommendation: Mouse port

Note

The "MPI driver" package available on the PCU is part of the HMI software and must not be uninstalled!

Installation under Windows XP

You must follow the installation sequence described here!

1. Boot up the PCU in the service desktop.
2. Access DVD (via network or external DVD drive) and call up SETUP.EXE in the root directory there.
3. The installation proceeds with operator prompting. The installation directory for STEP 7 should be changed to F:... where the directory in F: can be freely selected.
4. The prompt for "Transfer license keys" must be answered with "No, transfer the license keys later." The licensing is done after the installation of SINUMERIK add-on. Once installation is complete, the PC will need to be rebooted. During boot up, select the service desktop again.
5. Switch to the Sinumerik_Add_on directory on the DVD and call SETUP.EXE. The installation proceeds with operator prompting. Once installation is complete, the PC will need to be rebooted. During boot up, select the service desktop again.
6. Start the link "STEP7 authorizing" on the service desktop. This authorizes STEP 7 and it can now be started from the HMI Advanced operator interface (STEP 7 appears as its own operating area on the expansion bar of the area menu, protected with access level 3).

The following entries are made automatically in F:\Add_on\oemframe.ini:

```ini
[s7tgtopx]
; with HMI Advanced: eliminate minimize/maximize buttons
; of the Step7 window
WindowStyle_Off=196608
; with HMI Advanced: switch to previous task when Step7 is terminated
nSwitchToTaskAfterTermination= -2
```

These entries may also need to be modified in OEM configurations.
3.4 How to install additional languages under Windows XP (DVD)

Use

Use the SINUMERIK service pack recovery Media WIN XP ProEmbSys SP2 to:

- Subsequently install Windows components
- Re-establish the delivery condition of the PCU without application software
- To install other languages for Windows XP

Contents of the DVD

There are the following directories on the DVD:

<table>
<thead>
<tr>
<th>Directory</th>
<th>Contents</th>
</tr>
</thead>
</table>
| 1_WIN_Components | Windows XP ProEmbSys SP2  
                    | Windows XP ProEmbSys operating system, incl. SP2 for post-installation of software components that are no longer located on the PCU. |
| 2_XP_Base     | Symantec Ghost image for PCU 50.3 and EBOOT  
                    | - Ghost image of the delivery condition of the PCU basic software Windows XP for PCU 50.3 without application software.  
                    | - Ghost image for creating an "Emergency Boot System" (identical to the directory D:\EBOOT on the PCU) |
| 3_MUI_1       | Chinese (simplified)  
                    | Traditional Chinese  
                    | Japanese  
                    | Korean  
                    | Romanian  
                    | Slovakian |
| 4_MUI_2       | Danish  
                    | German  
                    | French  
                    | Dutch  
                    | Italian  
                    | Spanish  
                    | Swedish |
3.4 How to install additional languages under Windows XP (DVD)

Directory | Contents
--- | ---
5_MUI_3 | Brazilian Portuguese
 | Finnish
 | Polish
 | Russian
 | Czech
 | Turkish
 | Hungarian

EULA TERMS
Certificate of authenticity

Contains
Not contained

Installing languages

To install additional languages, proceed as follows:

1. If no DVD drive is directly connected via a USB port, the DVD can be accessed via a network to a released DVD disk drive via "Explorer" → "Tools" → "Map Network Drive". The letter G should be selected as the drive letter.

2. Select the directory with the appropriate language, the program "MUISETUP.EXE" starts. After accepting the licensing conditions, you can start the installation procedure with "Continue". A list of all of the pre-installed languages and the languages available on the DVD is displayed.

3. Now the desired languages can be installed/uninstalled by inserting or deleting a check mark in front of the language.

4. Other settings include:
   - Choice of language version for the standard user/new user
   - The language for programs without Unicode support must be set to "English (US)"
   - The font set must also be set to "English (US)"

5. After confirming with "OK," the installation begins. Many languages (e.g. Chinese) require system files that are also located on the DVD.

   If the installation drive is other than the recommended "G:" the "Windows XP Professional Service Pack 2 CD" or the "Windows XP Professional CD" may be required. The path name must then be changed accordingly.

6. After successful installation, a reboot may be requested depending on the language.

Note

- The choice can only be made from among the languages that were previously installed on the PCU.
- The new language of Windows XP only goes into effect if the user logs in again after the changeover or the PCU is turned off and then on again.
- The language setting of the operating software is independent of this. It is set independently of this under "Start-up" → "HMI" → "Change Language".
4.1 Backing up and restoring data

Overview

The entire contents of hard disks can be saved as a disk image using the Symantec Ghost utility. These disk images can be stored on various storage media and the data restored to the hard disk at a later date.

PCU replacement hard disks and complete PCU hard disks are supplied by the plant with Symantec Ghost already installed. Symantec Ghost is used for the data storing and restoring processes described in the following sections.

More information is available on the Internet at: http://www.ghost.com/

4.1.1 How to create a service system for PCU

Use

In case servicing is needed, create a portable service system as an "Emergency Boot System" (EBS) on a USB memory store on the basis of WinPE.

Recommendation:

It is better to use SIMATIC PC USB-FlashDrive.

Creating a service system

The Ghost image is available on the hard disk under D:\Eboot in order to create the service system for a PCU on a USB memory.

Use the following procedure:

1. Start the PCU in the service mode.
2. Plug a USB memory with at least 256 MB into a PCU USB port.
3. Launch Ghost32.exe in directory E:\Tools
4. Select Ghost: Local → Disk → From Image. As the source, select D:\Eboot\eboot.gho and as the destination select the USB memory store (recognizable by its storage capacity).

Result:

After successfully transferring eboot.gho to the USB memory store, the service system for the PCU is ready to use.

Using the same procedure, create a service system on a PG/PC. For this, the Symantec Ghost program must be installed on the PG/PC.
4.1 Backing up and restoring data

Boot up the service system

1. Plug the EBS into one of the rear USB ports of the PCU.
2. Press the <ALARM CANCEL> key on the operator panel or the <ESC> key on an external keyboard while the BIOS of the PCU is booting up in order to display the "Boot Menu".
3. Select the entry "USB-HDD: XXX " from the list of available media.
   **Result:**
   The PCU boots up from the service system and the ServiceCenter starts.
4. First select "Start" to start the ServiceCenter and then "Backup/Restore Disk Image", to restore the hard disk using the disk image.

<table>
<thead>
<tr>
<th>NOTICE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>During booting:</strong></td>
</tr>
<tr>
<td>- The boot-up of the PCU from the EBS via the front USB interface (=USB V1.1; rear USB V2.0) of a directly connected OP is also possible but it is considerably slower.</td>
</tr>
<tr>
<td>- It is not possible to boot up the PCU from the EBS via the USB interface of a TCU.</td>
</tr>
<tr>
<td>- It is not possible to save network settings on the EBS.</td>
</tr>
<tr>
<td>- VGA mode is only possible via a DVI → VGA adapter.</td>
</tr>
</tbody>
</table>

Booting the service system in the headless mode

Precondition: the PCU is installed in the control cabinet and is only operated with a TCU that has no OP/TP.

For a PCU 50.3 with BIOS version 05.01.11:
- After locking the hard disk, you can boot up from the USB service system and power up using WinPE.
- Then release the hard disk again and proceed in the manner described above.

For a PCU 50.5 with V5XP1.1:
- Set the service switch to "9", if you wish to operate the PCU 50.5 in the headless mode.
- Set the service switch to "E", if you wish to boot the PCU 50.5 from the USB service system.

See also

- How to backup and restore the hard disk (Page 72)
- Setting the service switch (Page 90)
4.1.2 Starting ServiceCenter Backup Restore

Starting ServiceCenter Backup Restore

You start the ServiceCenter Backup Restore for the following tasks:

- Backing up/restoring data
  - Starting via linking from the service desktop
  - Starting during boot up via entry in the "background" under SINUMERIK
- From the service system in the event of service
- When installing a replacement hard disk

In order to ensure that the user is authorized to carry out service tasks, direct access is password-protected during boot up of the PCU. This password can be changed.

**NOTICE**

If you start the ServiceCenter Backup Restore via the service desktop from a service system or when installing a replacement hard disk, no password is needed.

The following dialog appears after you double-click the ServiceCenter Backup Restore link on the service desktop:

![ServiceCenter Backup-Restore](image)

- **Start ...** With "Start," you start the shutdown of the system and the start of the ServiceCenter.
- **Settings ...** With "Settings," you open the dialogue box for network settings.
- **Show File ...** Under "Show File," you can view the log of the last data back up.
- **Set password ...** This is where you enter a new password for ServiceCenter Backup Restore. (the default is the same as for the service user "auduser".)
- **Exit** Cancel and return to the service desktop.

Figure 4-1 Starting service
Network settings

1. To connect the PCU to a programming device or PC, choose "Settings" in order to check or reset the set IP addresses.

2. Select "Use Windows settings", to keep the factory defaults. (This is the default here as well.)

3. Select "Use the following settings", to set a new configuration:
   - With "Obtain an IP address automatically (DHCP)," you receive an automatically assigned IP address from your DHCP server.
   - With "Use the following IP address," you enter an IP address in the range of 192.168.214.250 – 254 using subnet screen form 255.255.255.0.

4. To activate a DNS name service, specify the server's IP address under "DNS Domain Server" and the extension, e.g. "network.com" under "DNS Domain Suffix".
   The default is ".local" if you don't enter anything else.

Note

Changes to the network settings that you make here only become effective after you reboot the PCU.

On the other hand, if you make changes to the network settings from service desktop, they are immediately adopted.
See also

System features (Page 7)

4.1.3 Select service task

Selecting the service task

After start-up of the ServiceCenter, the following dialog opens:

![ServiceCenter Selection](image)

Figure 4-3 ServiceCenter Selection

Select from the following service tasks:

- Backup/Restore a local Partition Image
- Backup/Restore a Disk Image
- Restore the Rollback Image
- Restore the Emergency Image
- Image Organizer
4.1 Backing up and restoring data

Show log file
This option opens file bacres.txt, which contains a log of all backup records.

Network Settings
With "Network Settings," you open the dialogue box for network settings.

Launch Program
To start a program in service mode, enter the program name here, e.g. "cmd" for starting a DOS shell.

4.1.4 How to backup and restore local partitions

Backing up partitions
1. Select the "Backup" action from "Backup/Restore a local Partition Image" to backup an image of one or more C, E, and F partitions locally on the D:\Images partition of the hard disk:
2. Select the partitions for which an image is to be produced.

3. Before the backup is started, the size of each partition will be displayed in the next dialogue.

   **Recommendation:**
   
   If you wish to save the backup file and restore it later, we recommend that you always create a complete image of partitions (C, E and F).

**Restoring partitions**

Select the "Restore" action from "Backup/Restore a local Partition Image" to restore an image of one or more C, E, and F partitions locally from the D:\Images partition:
**Backing up and restoring data**

4.1 **Backing up and restoring data**

**Restore the Rollback Image**

To restore the most recently saved image, namely the current image ("Rollback Image"), select "Restore the Rollback Image".

The "Rollback Image" is the last created back-up of a partition.

4.1.5 **How to backup and restore the hard disk**

**Backing up the hard disk**

Select "Backup/Restore a Disk Image" to backup an image of the hard disk using the network connection:

![Backup Restore](image)

**Figure 4-5** Backup hard disk via the network

1. In order to establish a network connection with access to a released drive, select "Add Network Drive" and specify the name of the file for "Image File Name."
2. Under "Share," enter the computer name and the released directory.
3. To receive access rights, enter a user name and password.

![Add Network Drive](image)

Figure 4-6 Drive Connection

4. Under "Options," select whether the disk image that is to be created is divided into several files of a certain size, so that these files can fit on one CD.

**Restoring a hard disk**

Select the "Restore" action from "Backup/Restore Disc Image" to restore an image. Click "Next>" to be prompted:

**See also**

Requirements (Page 75)

**4.1.6 Restoring system data from "Emergency Image"**

**Restoring system data**

Select "Restore the Emergency Image", to restore the emergency image. This image must contain the back-up of partition E and can also contain a back-up of partitions C, D or F. It is provided in the event that only the system on partition E: is defective. The user data on partition F: are kept in the current status.

**CAUTION**

The reading in of an "Emergency Image" from partition E: can only take place if no additional software has been installed or configured after this back up is created or the registry entries of all the applications that are on partition F: must be included in the image. Use the "Image Organizer" function only to identify an image as an emergency image that fulfills these conditions.

To restore the system data with "Emergency Image", the PCU must be booted from the service system (EBS).
Manage images

Select “Image Organizer” to mark out one image contained in the displayed list as the emergency image, or to delete an existing image.

See also

How to create a service system for PCU (Page 65)
4.2 Operating the service PC or the PG on the network

Applications

For the following applications, you will, for example, need a connection in the system network between the PCU and a PG/PC:

- To store a backup image from the hard disk of a PCU on a PG/PC.
- To restore a PCU hard disk via the CD-ROM drive of a PG/PC.
- To commission a replacement hard disk.

4.2.1 Requirements

Overview

The following figures show the typical connection options in the system network:

- PCU to "Eth 2" with service PG/PC, directly, using a crossed Ethernet cable
- PCU to "Eth 2" with service PG/PC, via a switch, using an un-crossed Ethernet cable

If you want to connect the service PG/PC via a company network (Eth 1), contact your network service center.

Meaning of the connections:

- Eth 1 as a DHCP client
- Eth 2 as a DHCP server
- Eth 2 with a fixed IP address

Green connection  Uncrossed Ethernet cable
Gray connection  Crossed Ethernet cable (crossover)
4.2 Operating the service PC or the PG on the network

Configuration with PG/PC directly to PCU

![Diagram of PG/PC directly connected to PCU]

Figure 4-7 Connecting a PG directly to a PCU

Configuration with PG/PC and switch to PCU

![Diagram of PG/PC connected via a switch to a PCU]

Figure 4-8 Connecting a PG via a switch to a PCU

Note

If a PCU is switched off and on again without its own OP/TP including TCU, and if the PCU boot-up is supposed to take place from the service system (EBS), an external VGA monitor and keyboard are needed in order to operate the PCU.

An external VGA monitor and keyboard are not needed if the TCUs are operating and the PCU is not switched off with the EBS during booting.
4.2 Operating the service PC or the PG on the network

Basic procedure

On the PG/PC with Windows XP:

- Connecting a PG/PC to a PCU according to one of the configurations shown above.
- The network protocol used is: TCP/IP.
  TCP/IP is already pre-configured in the basic PCU software.
- Setting up IP addresses on the same subnetwork.
- Releasing a directory on the PG/PC for network access.

On the PCU under WinPE:

- Start the ServiceCenter under WinPE on the PCU.
- Establish a network connection to the released directory of the PG/PC.
- Using the "Backup" function, a ghost image of the PCU hard disk is saved in the released directory of the PG/PC in the event of a need for service.
- With the "Restore" function, the hard disk of the PCU is restored from a ghost image in the released directory of the PG/PC.

See also

How to backup and restore the hard disk (Page 72)

4.2.2 How to connect a PC/PG to a PCU within the system network

Settings on a PG/PC with Windows XP

On a PG/PC, the following settings must be made:

1. Select "Control Panel" → "Network Connections" → "Local Area Connection Properties", then you will see the following dialogue box:
2. Check to see whether "File and Printer Sharing ..." is selected, so that directories can be released and then select "Internet Protocol (TCP/IP)".
3. Open the "Properties" dialogue box and select the option "Use the following IP address", in order to enter an IP address, such as 192.168.214.250 and the subnet screen form 255.255.255.0.

4. Select "Control Panel" → "System" → "Computer Name" tab to view the computer name of the PCU: e.g. SIEMENS-ABC4711

5. Select "Control Panel" → "Folder Options" → "View" and activate "Use simple file sharing (Recommended)", to avoid problems with the release of the directory.

Releasing directory for network access (Windows XP)

1. Create a directory on a local drive; e.g. D:\PCU_Backup
2. Using the right mouse key, open the "Properties" dialogue box of the directory and the "Sharing" tab.

3. Select "Share this folder". As a share name (release name), the directory name is used, e.g. PCU_Backup.

If the directory name is changed, the new name must be specified when connecting the drive!

**Note**
Ensure there is sufficient free memory on the hard disk of the PG/PC to be able to save the ghost image when creating a back-up.
4. Select "Permissions" and activate the "Change" square for all the users in the "Allow" column so that files can be saved in this directory (e.g. the ghost image).

![Permissions for PCU Backup]

**Procedure**

The following steps must be carried out on the PCU:

1. Start the ServiceCenter with "Start Backup/Restore console".
2. Maintain the pre-setting of the "Network Options" on the PCU:

   IP address of PCU: 192.168.214.241 with subnet screen form 255.255.255.0
   IP address of PG/PC: 192.168.214.250 with subnet screen form 255.255.255.0

1. In the ServiceCenter, select the service task "Backup/Restore a Disk Image".
2. Establish a network connection to the released directory, e.g. \SIEMENS-ABC4711\PCU_Backup.
3. Restore the hard disk of the PCU using the ghost image.

**Note**

If the transfer is interrupted during the "Restore" process, no consistent system is available on the hard disk, i.e. the "Restore" process cannot be repeated because the PCU no longer boots up.

In this event, the "Emergency Boot System" on the USB memory store is used.

**See also**

How to backup and restore the hard disk (Page 72)
How to create a service system for PCU (Page 65)
4.2 Operating the service PC or the PG on the network

4.2.3 How to connect a PC/PG to an NCU within the company network

Add route ... in WINPE

This function is required for the following application: Backing up/restoring ghost images

Example configuration

Figure 4-9 Network routing

Conditions

The following conditions must be met in order to use this function:

- The PG must be connected to X127 of an NCU in the system network.
- The NCU and PCU must be connected via the system network.
- You activate routing on the NCU via X127:
  - basesys.ini (in the /card/user/system/etc directory), parameter EnableSysNetToIBNForwarding=1
  - OR
  - System Network Center, "System Basics" tab, parameter IBN network (X127) settings: "Forwarding from system network" enable
- Enable a directory on the PC/PG.
- The user who logs on must be one of the recognized Windows users on the PC/PG; for example, auduser is not recognized on a PC.
4.2 Operating the service PC or the PG on the network

Procedure

Activate routing prior to establishing the network connection:

1. Press the "Add Route ..." button.

   ![ServiceCenter Backup-Restore](image)

   **Figure 4-10** ServiceCenter Backup-Restore

2. Establish the network connection using "Add Network Drive ...".

   In the example: `\192.168.215.2\<sharename>`

   ![Dialog: Add Route ...](image)

   **Figure 4-11** Dialog: Add Route ...
3. Logon and password details for a local user on the PG:

![Add Network Drive](image)

Figure 4-12  ServiceCenter: Add Network Drive

4. Define the computer name as an IP address; you cannot give it your own name.

   Share access to a directory or to the CD or DVD drive on the PG/PC must have been enabled.
4.3 Commissioning the replacement hard disk

Overview

The replacement hard disk is supplied with an installed "Emergency Boot System".

The mechanical and electrical steps involved in replacing the PCU hard disk are described in:

References: /BHsl/ Operator Components and Networking Manual

Commissioning the replacement hard disk

After installing the replacement hard disk, the Ethernet interfaces of the PCU are preset in the following manner:

- Ethernet 1 (Company Network) as a standard DHCP client
- Ethernet 2 (System Network) as a SINUMERIK DHCP server with the fixed IP address 192.168.214.241 and subnet screen 255.255.255.0

The PCU must therefore be disconnected from the system network before the replacement hard disk is fitted.

Download a hard disk back-up (disk image) to commission the replacement hard disk.

Please proceed as follows:

1. Connect a PG/PC as per the recommended configurations.
2. Start the ServiceCenter and select "Restore Disk Image".

Note

If the transfer is interrupted during the "Restore" process, no consistent system is available on the hard disk, i.e. the "Restore" process cannot be repeated because the PCU no longer boots up.

In this event, the "Emergency Boot System" is used.

See also

Requirements (Page 75)
How to backup and restore the hard disk (Page 72)
How to create a service system for PCU (Page 65)
Backing up and restoring data

4.3 Commissioning the replacement hard disk
5.1 PCU Hardware Diagnostics

Intended use

The PCU hardware supports the diagnostics of important system components via an integrated "safecard", which is designated as a Safecard-On-Motherboard (SOM). These diagnostic functions are only evaluated by systems with HMI Advanced. The fault statuses of the hardware are reported in the form of alarms via the operator interface of HMI Advanced. This allows for visualization of the data in HMI Advanced and external evaluation.

Monitored Parameters

The following physical parameters of the PCU hardware are monitored:

- CPU temperature
- Housing temperature
- I/O chip temperature
- Speed of the two housing fans
- S.M.A.R.T - status of the hard disk

Logging faults

The PCU hardware monitor logs all hardware faults in the Windows event log so that the faults can be output even without installing an HMI application.

The alarms are output in the log under "Control Panel" → "Administrative Tools" → "Event Viewer".

Note

The PLC interface of the HMI is located in DB10 of the PLC user program and is supplied by the PCU hardware monitor in the event of a failure.

See also

- Commissioning the replacement hard disk (Page 85)
- Operator Components and Networking Manual: Chapter, spare parts
- Description of the alarms: SINUMERIK 840D sl Diagnostics Manual
5.2 Evaluation of the 7-segment display

Intended use

The 7-segment display is intended for PCU diagnostics in operation without a local OP (known as "Headless mode"). If an error is detected during booting, a local display is needed for subsequent error analysis of the connection.

Figure 5-1 7-segment display with LEDs

The two displays have the following function:

- Segment display H1
  Segment display H1 and the associated LED are assigned to the PCU basic software. Status codes are output during system booting, normal operations and shutdown. Compatibility in relation to the NCU modules is taken into account.

- Segment display H2
  Segment display H2 and the associated LED are assigned to the application software.

Meaning of status codes

- During system power-up:

<table>
<thead>
<tr>
<th>LED H1</th>
<th>LED H2</th>
<th>7-segment display</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orange</td>
<td>Orange</td>
<td>Output of BIOS post codes</td>
<td>After switching on the system</td>
</tr>
<tr>
<td>Orange</td>
<td>Off</td>
<td>After cycling the BIOS</td>
<td></td>
</tr>
<tr>
<td>Orange</td>
<td>Off</td>
<td>After starting Windows</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>Start Windows</td>
<td>Load device drivers needed for the Windows start</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
<td>PCU hardware service</td>
<td>The PCU hardware service has been started.</td>
</tr>
<tr>
<td>5</td>
<td>0</td>
<td>Network</td>
<td>Wait for network interfaces to be ready.</td>
</tr>
<tr>
<td>8</td>
<td>0</td>
<td>TCU support test step 1</td>
<td>Wait for FTP server to start</td>
</tr>
<tr>
<td>9</td>
<td>0</td>
<td>TCU support test step 2</td>
<td>Wait for boot server to start for TCU network boot and for TCU hardware service to start</td>
</tr>
<tr>
<td>A</td>
<td>0</td>
<td>TCU support test step 3</td>
<td>Wait for VNC server to start</td>
</tr>
</tbody>
</table>
5.2 Evaluation of the 7-segment display

### During operation:

<table>
<thead>
<tr>
<th>LED H1</th>
<th>LED H2</th>
<th>7-segment display</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Flashing green</td>
<td>OK</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Flashing red</td>
<td>Error:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>Temperature alarm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>Fan alarm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>Hard disk alarm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6</td>
<td>Failure of VNC server or VNC server service stopped</td>
</tr>
</tbody>
</table>

### During shutdown:

<table>
<thead>
<tr>
<th>LED H1</th>
<th>LED H2</th>
<th>7-segment display</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Flashing red/green</td>
<td>Shutdown active</td>
</tr>
</tbody>
</table>
5.3 Setting the service switch

Intended use

The "PCU Hardware Service" component as part of the PCU Base software provides a function to read-out the switch positions.

![Rotary coding switch (hexadecimal)](image)

Figure 5-2 Rotary coding switch (hexadecimal)

Meaning of switch positions

Only the settings of the service switch that are relevant for the commissioning engineer are listed:

<table>
<thead>
<tr>
<th>Switch setting</th>
<th>Mode of operation</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>---</td>
<td>Normal operation (default setting)</td>
</tr>
<tr>
<td>6</td>
<td>Users</td>
<td>Reserved for additional software</td>
</tr>
<tr>
<td>9</td>
<td>Service</td>
<td>Headless operation without OP/TP</td>
</tr>
<tr>
<td>A</td>
<td>Service</td>
<td>Firmware recovery</td>
</tr>
<tr>
<td>C</td>
<td>Service</td>
<td>Checking</td>
</tr>
<tr>
<td>D</td>
<td>Service</td>
<td>Diagnostics</td>
</tr>
<tr>
<td>E</td>
<td>Service</td>
<td>Booting from the emergency boot system</td>
</tr>
</tbody>
</table>
5.4 Enabling/disabling error log during boot up

Application

Each time the system is booted up, information is written to a block in the file D:\$$Base.log, which contains the date, time and nature of administrative interventions.

Information about the booting controlled by the HMI Manager, can be displayed on the screen and written to log file D:\$$Base.log.

Output in log file

The output is controlled by registry values:

- **Type of information**
  The type of information to be output is set via registry value "HKLM\SOFTWARE\Siemens\SINUMERIK\Basic software\<version>\HMI Manager\InfoLevel":

  **InfoLevel (DWORD)**
  
  = 1: Mandatory information is output (default setting)
  
  = 2: Mandatory and supplementary information is output
  
  = 3: Mandatory, supplementary and trace information is output
  
  (InfoLevel <= 0 is treated as InfoLevel == 1; InfoLevel <= 3 is treated as InfoLevel == 3)

- **Outputting information to the screen**
  Whether the information is also to be displayed on the screen (as well as being output to the log file) is set via registry value 'HKLM\SOFTWARE\Siemens\SINUMERIK\Basic software\<version>\HMI Manager\ShowInfo':

  **ShowInfo (DWORD)**
  
  = 0: Displays the mandatory information, no display of the supplemental and trace information
  
  = 1: Mandatory, supplementary and trace information is displayed (default)
5.5  How to search for stations within the system network

Intended use

The VNC scanner is used within the system network. The scanner is primarily used to identify devices containing an active VNC server, e.g. NCU or PCU.

The VNC scanner offers the option of connecting directly to the VNC server and, for example, operating an HMI application. The integrated VNC viewer is used to do this.

Furthermore, it enables you to call up a list of all the network devices, thereby creating an overview of the system network.

Note

The VNC scanner is available on the Service Desktop of the PCU and on the PCU base software DVD for installation on a PG/PC.

You require a mouse to use this program.

Operating "VNC scanner"

1. You can launch the "VNC Scanner" program via this link on the Service Desktop of the PCU.

![VNC Scanner](image)

Figure 5-3  VNC scanner
2. "IP start / IP end": Set the IP-address browsing range.
   Eight ranges can be saved. Click on button " >" to switch to the next range.

3. "VNC" option:
   - ON: only search for VNC servers.
   - OFF: search all the stations in the network.

4. Start the search with the "Start" button.
   The following station parameters will be listed:
   - IP address
   - MAC address
   - Name in the network
   - VNC port
   - Response time of the station in milliseconds
   - Device type

**Note**

**local device #**

When the devices are listed, an IP address will be identified with "#" to indicate that this is the local device on which the VNC scanner will be used.
5. By right-clicking a network station from the list, you can execute the following actions via a pop-up menu:

- "VNC": Connecting directly to the VNC server and, if applicable, operating the HMI.
- "VNC → Auto reconnect": Corresponds to the option "Automatic reconnect if the server closes the connection" in order to restore the connection to the selected network station.
- Ping: Opens a command shell and executes the "ping" command to the selected network station.

**Note**

**Operation via a VNC viewer:**

A system can only be monitored from another station via an external VNC viewer (default).

To view the system from another station, this function must be enabled by the system. You can find the settings for this in the "System Network Center" or directly in tcu.ini in the [VNCViewer] section.

Should you wish to access a PCU via the company network using the VNC scanner or VNC viewer, port 5900 must be added to the PCU under "Control Panel" → "Windows Firewall" → "Exceptions".

**Reference:** Operator Components and Networking Manual

**Additional Options**

1. Use this button to start the VNC viewer.
5.5 How to search for stations within the system network

2. Use the "Option" button to set parameters for the search.

![VNC scanner: Set search parameters](image)

- **VNC scanning algorithm:**
  Default is "Fast", i.e. device feedback within approximately 100 ms
- **Devices detection:** (corresponds to the "VNC" option, see point 3).
  - "VNC server devices": only search for VNC servers.
  - "All devices": search all the stations in the network.
- **VNC viewer location:**
  Link to the VNC viewer (open source program: already pre-installed on the PCU; on a ServicePC this link must be specified).
- **Viewer default connection mode:**
  "Automatic reconnect if the server closes the connection" (default: OFF)
  - OFF: One attempt is made to establish a connection.
  - ON (loop mode): For situations where access will be via Internet, for example for service purposes, then the system will wait longer and try again after several milliseconds to establish a connection to this station.
- "Reset IP range": All IP address ranges are reset.
- **Console log:** Opening a console to output a protocol, e.g. for error analysis (default: OFF).
5.5 How to search for stations within the system network

Options for the VNC viewer

**CAUTION**

Do not change defaults!

To ensure that the VNC viewer works properly, the following options may not be changed.

After starting the VNC viewer, the following dialog opens:

![UltraVNC Win32 Viewer 1.0.1 Release](image)

**Figure 5-6** Default: UltraVNC

After clicking the "Options ..." button, the following dialog opens:

![Connection Options](image)

**Figure 5-7** Default: Connection Options ...
### List of Abbreviations

#### A.1 Abbreviations

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<thead>
<tr>
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<th>Description</th>
</tr>
</thead>
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<tr>
<td>CF</td>
<td>CompactFlash card: Memory card</td>
</tr>
<tr>
<td>CFS</td>
<td>Cluster File System</td>
</tr>
<tr>
<td>DCK</td>
<td>Direct Control Keys: Direct control keys</td>
</tr>
<tr>
<td>DCP</td>
<td>Discovery and Basic Configuration Protocol</td>
</tr>
<tr>
<td>DHCP</td>
<td>Dynamic Host Configuration Protocol: Dynamic assignment of an IP address and other configuration parameters on a computer in a network</td>
</tr>
<tr>
<td>DNS</td>
<td>Domain Name System: Conversion of domain names into IP addresses</td>
</tr>
<tr>
<td>EBS</td>
<td>Emergency Boot System</td>
</tr>
<tr>
<td>EKS</td>
<td>Electronic Key System: System to check the identity of a user (authentication system)</td>
</tr>
<tr>
<td>EUNA</td>
<td>End User Notification Administration</td>
</tr>
<tr>
<td>HMI</td>
<td>Human Machine Interface: Operator interface</td>
</tr>
<tr>
<td>IRT</td>
<td>Isochronous Realtime (Ethernet)</td>
</tr>
<tr>
<td>LLDP</td>
<td>Link Layer Discovery Protocol: multi-vendor Layer 2 Protocol defined in accordance with the IEEE-802.1AB standard, allows information to be exchanged between devices.</td>
</tr>
<tr>
<td>MAC</td>
<td>Media Access Control: The MAC address is a 48-bit Ethernet ID.</td>
</tr>
<tr>
<td>MCP</td>
<td>Machine Control Panel: Machine control panel</td>
</tr>
<tr>
<td>MPI</td>
<td>Multi-Point Interface: Multiple interface</td>
</tr>
<tr>
<td>MUI</td>
<td>Multilanguage User Interface</td>
</tr>
<tr>
<td>NCK</td>
<td>Numerical Control Kernel: NC kernel with block preparation, travel range, etc.</td>
</tr>
<tr>
<td>NCU</td>
<td>Numerical Control Unit: NCK hardware unit</td>
</tr>
<tr>
<td>NRT</td>
<td>Non-Realtime (Ethernet)</td>
</tr>
<tr>
<td>NTFS</td>
<td>New Technology File System</td>
</tr>
<tr>
<td>NTP</td>
<td>Network Time Protocol: Standard for synchronizing clocks in the entire network</td>
</tr>
<tr>
<td>NTPD</td>
<td>NTP Daemon: Utility that runs in the background and does not have to be started by the user.</td>
</tr>
<tr>
<td>PCU</td>
<td>PC Unit: Computer unit</td>
</tr>
<tr>
<td>PDEV</td>
<td>Physical device</td>
</tr>
<tr>
<td>PG</td>
<td>Programming device</td>
</tr>
<tr>
<td>PLC</td>
<td>Programmable Logic Control: Programmable logic controller</td>
</tr>
<tr>
<td>RAM</td>
<td>Random Access Memory: Program memory which can be read and written into</td>
</tr>
<tr>
<td>RDY</td>
<td>Ready: The system is ready to operate.</td>
</tr>
<tr>
<td>SNMP</td>
<td>Simple Network Management Protocol (network protocol for monitoring and controlling network elements such as routers, servers, switches, and printers from a central station).</td>
</tr>
<tr>
<td>SSD</td>
<td>Solid State Drive</td>
</tr>
<tr>
<td>TCU</td>
<td>Thin Client Unit</td>
</tr>
<tr>
<td>TFTP</td>
<td>Trivial File Transfer Protocol: Very simple data transmission protocol</td>
</tr>
<tr>
<td>UDP</td>
<td>User Datagram Protocol: NTP is mostly processed via UDP.</td>
</tr>
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## List of Abbreviations

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<th>Description</th>
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<td>USB</td>
<td>Universal Serial Bus</td>
</tr>
<tr>
<td>UPS</td>
<td>Uninterruptible power supply</td>
</tr>
<tr>
<td>UTC</td>
<td>Universal Time, Coordinated: Coordinated universal time</td>
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<td>VNC</td>
<td>Virtual Network Computing</td>
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A.1 Overview
## Appendix

### A.1 Overview

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<tbody>
<tr>
<td>DOConCD</td>
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