

SIEMENS

SINUMERIK

MindSphere application Analyze MyPerformance /OEE, Analyze MyPerformance /OEE Pro - Application examples

Application examples

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Valid for control systems:
SINUMERIK 840D pl/ 840D sl/ 840DE sl
Software
Analyze MyPerformance /OEE, Version 01.03.00.04
Analyze MyPerformance /OEE Pro, Version 01.03.00.04


04/2023


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

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


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

Qualified Personnel

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

Proper use of Siemens products

Note the following:

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

Trademarks

All names identified by ® are registered trademarks of 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 into the following categories:

- General documentation/catalogs
- User documentation
- Manufacturer/service documentation

Additional information

You can find information on the following topics at the following address (<https://support.industry.siemens.com/cs/de/en/view/108464614>):

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

If you have any questions regarding the technical documentation (e.g. suggestions, corrections), please send an e-mail to the following address (<mailto:docu.motioncontrol@siemens.com>).

mySupport/Documentation

At the following address (<https://support.industry.siemens.com/My/ww/en/documentation>), you can find information on how to create your own individual documentation based on Siemens' content, and adapt it for your own machine documentation.

Training

At the following address (<http://www.siemens.com/sitrain>), you can find information about SITRAIN (Siemens training on products, systems and solutions for automation and drives).

FAQs

You can find Frequently Asked Questions in the Service&Support pages under Product Support (<https://support.industry.siemens.com/cs/de/en/ps/faq>).

SINUMERIK

You can find information about SINUMERIK at the following address (<http://www.siemens.com/sinumerik>).

Target group

This publication is intended for:

- Project engineers
- Technologists (from machine manufacturers)
- Commissioning engineers (systems/machines)
- Programmers
- Users

Benefits

The function manual describes the functions so that the target group knows them and can select them. It provides the target group with the information required to implement the functions.

Standard scope

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

Note regarding the General Data Protection Regulation

Siemens respects the principles of data privacy, in particular the data minimization rules (privacy by design). This means the following for this product:

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

Technical Support

Country-specific telephone numbers for technical support are provided on the Internet at the following address (<https://support.industry.siemens.com/sc/ww/en/sc/2090>) in the "Contact" area.


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


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Fundamental safety instructions

1.1 General safety instructions

 WARNING
<p>Danger to life if the safety instructions and residual risks are not observed</p> <p>If the safety instructions and residual risks in the associated hardware documentation are not observed, accidents involving severe injuries or death can occur.</p> <ul style="list-style-type: none"> • Observe the safety instructions given in the hardware documentation. • Consider the residual risks for the risk evaluation.

 WARNING
<p>Malfunctions of the machine as a result of incorrect or changed parameter settings</p> <p>As a result of incorrect or changed parameterization, machines can malfunction, which in turn can lead to injuries or death.</p> <ul style="list-style-type: none"> • Protect the parameterization against unauthorized access. • Handle possible malfunctions by taking suitable measures, e.g. emergency stop or emergency off.

1.2 Warranty and liability for application examples

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

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

1.3 Security information

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

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

Customers are responsible for preventing unauthorized access to their plants, systems, machines and networks. Such systems, machines and components should only be connected

1.3 Security information

to an enterprise network or the internet if and to the extent such a connection is necessary and only when appropriate security measures (e.g. firewalls and/or network segmentation) are in place.

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

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

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

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

<https://www.siemens.com/cert>.

Further information is provided on the Internet:

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



WARNING

Unsafe operating states resulting from software manipulation

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

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

Introduction

2.1 Overview

This document provides information on how to connect existing control environments with the "Analyze MyPerformance /OEE, /OEE Pro" application.

- SINUMERIK control with HMI-Advanced - Setting the proxy (Page 13)
- SINUMERIK control with SINUMERIK Operate (Page 20)
- Connecting the SINUMERIK control system with MindSphere (Page 23)
- SIMATIC IoT2040 (Page 23)

2.2 System requirements

If you want to connect the application to an existing control environment, carefully note the following requirements.

Requirement

To connect to MindSphere, you need a new version of the SINUMERIK Integrate Client. Install and configure the client subsequently.

Note

Windows XP

Windows XP and older versions of Windows do not support the TLS1.2 encryption protocol for secure data transmission that is necessary for a connection to MindSphere.

Hardware and operating software

The following procedure is provided with the following components by way of example:

Table 2-1 SINUMERIK 840D pl

Operating software version	SINUMERIK Integrate Client software version	Hardware version	Operating system
HMI-Advanced V07.06.02.05	V4.12.0.21	PCU 50.3B	WinXP SP3
		PCU Base 8.6	
HMI-Advanced V07.06	V4.12.0.21	PCU 50.1	
		PCU 50.3B	
HMI-Advanced V06.04	V4.12.0.21	PCU 50.1	
		PCU 50.3B	

HMI-Advanced V06.04.28.00	V4.12.0.21	PCU 50.2 with 566 MHz	WinNT 4.0
		PCU Base 7.3.5	
SINUMERIK Operate V2.7.3.10	V4.12.0.21	PCU 50.3	WinXP as of V8.6 SP3
		PCU 50.5	WinXP as of V1.3

Security instructions

NOTICE

Security standards for SINUMERIK control systems connected to MindSphere

The connection of SINUMERIK controls to MindSphere via TLS 1.2 /https meets the highest security standards.

SINUMERIK versions that do not meet these standards are not part of the product. For these versions, additional security measures must be taken.

You are responsible for preventing unauthorized access to your plants, systems, machines, and networks. Systems, machines and components should only be connected to the company's network or the Internet if and to the extent necessary and with appropriate security measures (e.g. use of firewalls and network segmentation) in place.

NOTICE

Data misuse due to an unprotected Internet connection

An unrestricted Internet connection can lead to data misuse.

Before establishing a network connection, ensure that your PC is exclusively connected to the Internet via a secure connection. Pay attention to the security-relevant notes.

Further information about communications security can be found in the Configuration Manual: Industry Security (<https://support.industry.siemens.com/cs/ww/en/view/108862708>).

Note

Operating PC security

The necessary security measures (e.g. virus scanner, firewalls, OS patching, etc.) must be implemented on the PCs that are used for visualization and configuration of the application with the machine operator or end user.

Further information about PCs in the industrial environment can be found in the Configuration Manual: Industry Security (<https://support.industry.siemens.com/cs/ww/en/view/108862708>).

Note**SINUMERIK control system security**

The necessary security measures (e.g. virus scanner, firewalls, OS patching, etc.) must be implemented on the PCUs/IPC.

Further information about communications security can be found in the Configuration Manual: Industry Security (<https://support.industry.siemens.com/cs/ww/en/view/108862708>).

Software

The connection is via the integrated SINUMERIK Integrate Client.

Always use the latest version.

Note**Parallel operation with SINUMERIK Integrate applications**

Parallel operation with SINUMERIK Integrate applications is not possible.

Delivery form

The SINUMERIK Integrate Client, the latest updates and further information on the applications and products are stored on PridaNet, from where they can be directly downloaded.

- OR -

You can contact your machine manufacturer.

- OR -

You can contact the Siemens Service & Support.

Further information

Further information about SINUMERIK Integrate can be found in the Commissioning Manual SINUMERIK Integrate MMP, MMT, AMC, AMP, AMM/E, AMD

More information

When connecting SINUMERIK controls that are not of the current generation, special attention must be paid to security requirements.

2.2 System requirements

The security requirements of MindSphere according to the state of the art must be considered for such controls and ensured with further measures and network components within the local IT environment.

- It must be ensured that the communication between the factory network and MindSphere meets the current security standards, e.g. TLS 1.2.
- It must be ensured that unauthorized access to the control in the company network / factory network environment and attacks on the firewall in front of the control are not possible.
- It must be ensured that communication inside the factory network environment cannot be attacked.

The guidelines of the customer's IT department must be followed.

Installation/configuration

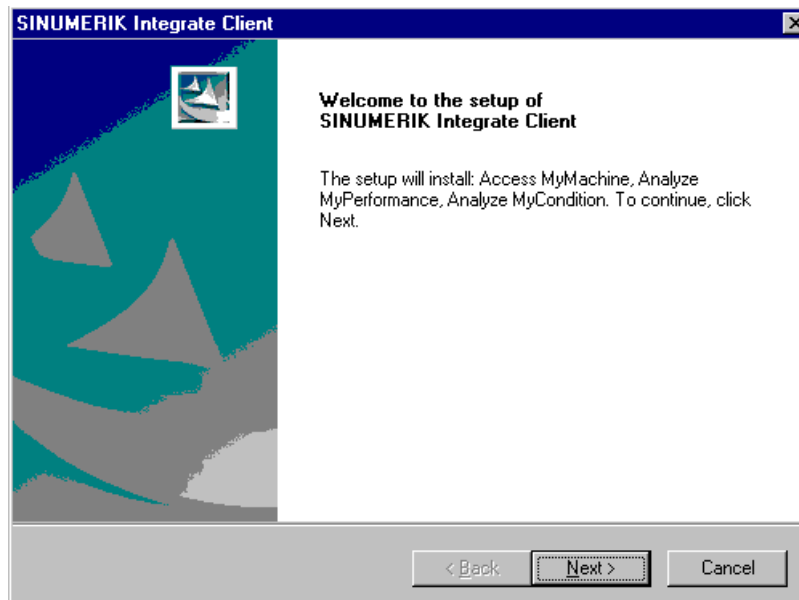
3.1 SINUMERIK control with HMI-Advanced - Setting the proxy

Requirement

To establish a connection to MindSphere, TLS 1.2 Support must be activated.
The description can be found in the following manual: SINUMERIK Integrate Installation Manual

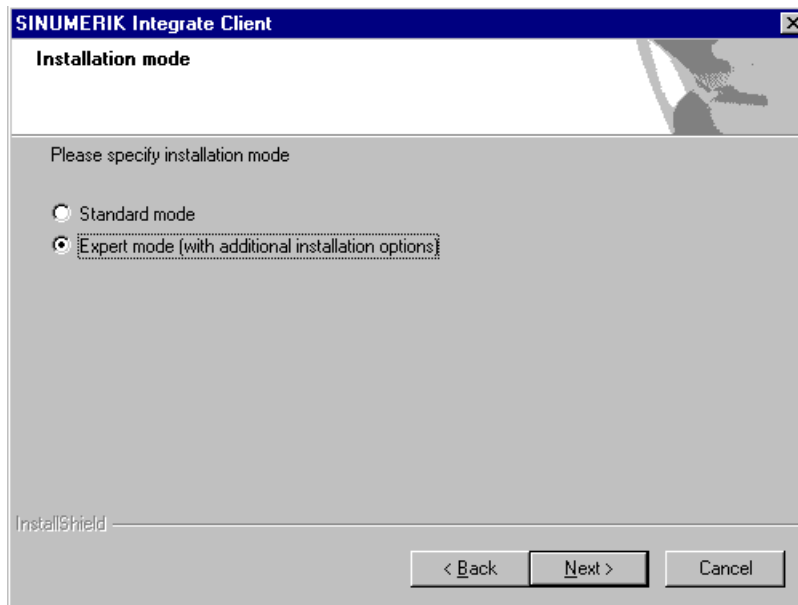
Procedure

1. Start the SINUMERIK control system in the Windows service mode.
2. Open the installation directory.
3. Start the "setup.exe" setup file by double-clicking.
 - If you have not installed the appropriate Internet Explorer, a message will appear indicating this, e.g. "The program requires Internet Explorer 6 or higher". Installation is canceled and you must install the appropriate Internet Explorer first. Then restart the client installation.
4. The welcome dialog box opens.
The installation language is English.
Click "Next >" to start the installation.

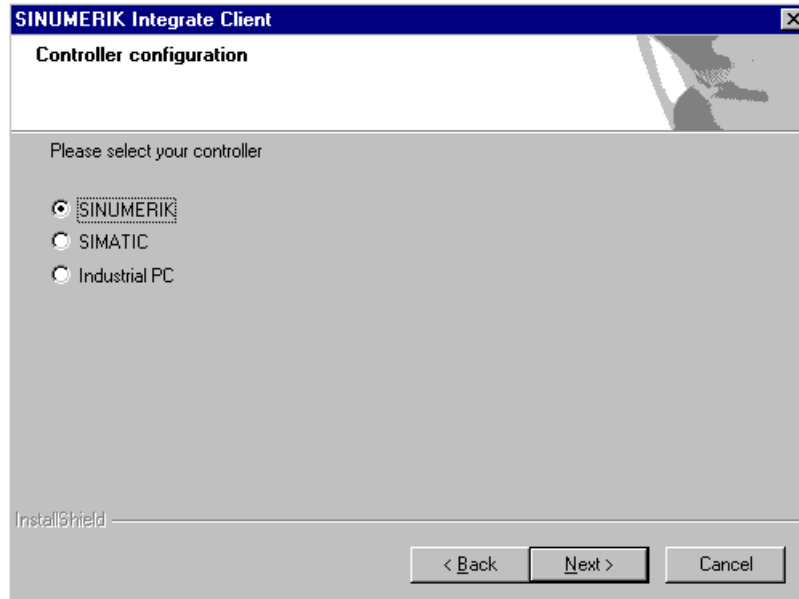


3.1 SINUMERIK control with HMI-Advanced - Setting the proxy

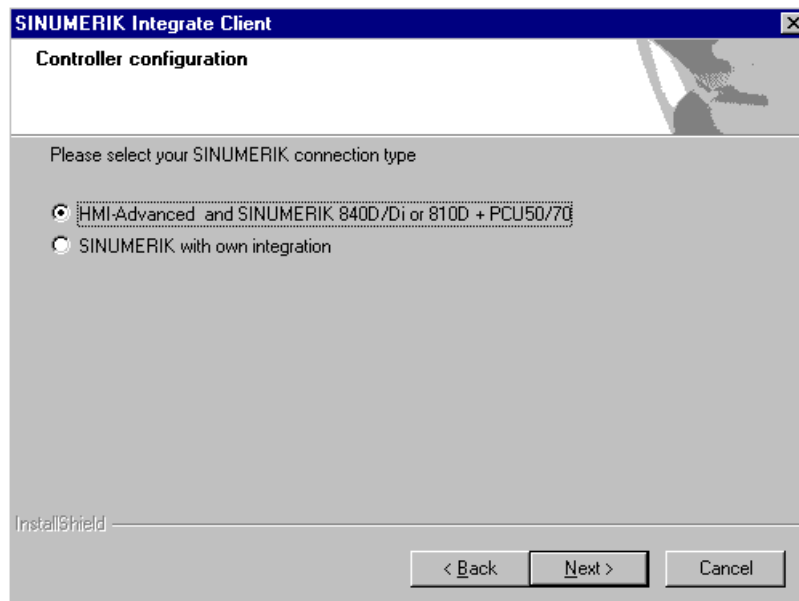
5. The "License Agreement" window opens.
Read the license agreement.
 - Click "Print" if you want to print out the terms.
 - Then activate the "I accept the terms of the license agreement" checkbox and click "Next >".
 - OR -
 - Click "< Back" to return to the previous window.
6. The "Installation mode" window opens.
 - Select the "Expert mode (with additional installation options)" checkbox.
 - Click "Next >".



7. The "Controller configuration" window opens.
 - Select, for example, the "SINUMERIK" option button.
 - Click "Next >".

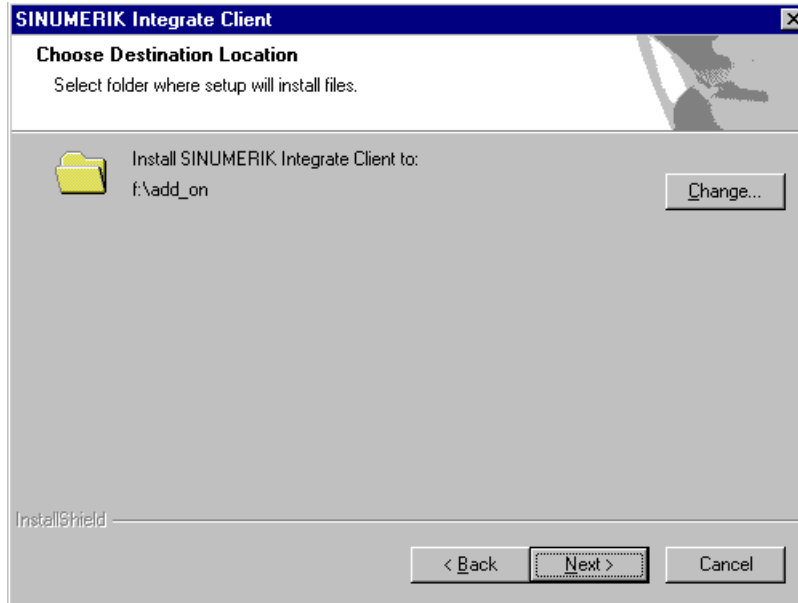


8. The SINUMERIK connection types are displayed in the "Controller configuration" window.
 - Select the option button "HMI-Advanced and SINUMERIK 840D/Di or 810D + PCU50/70".
 - Click "Next >".

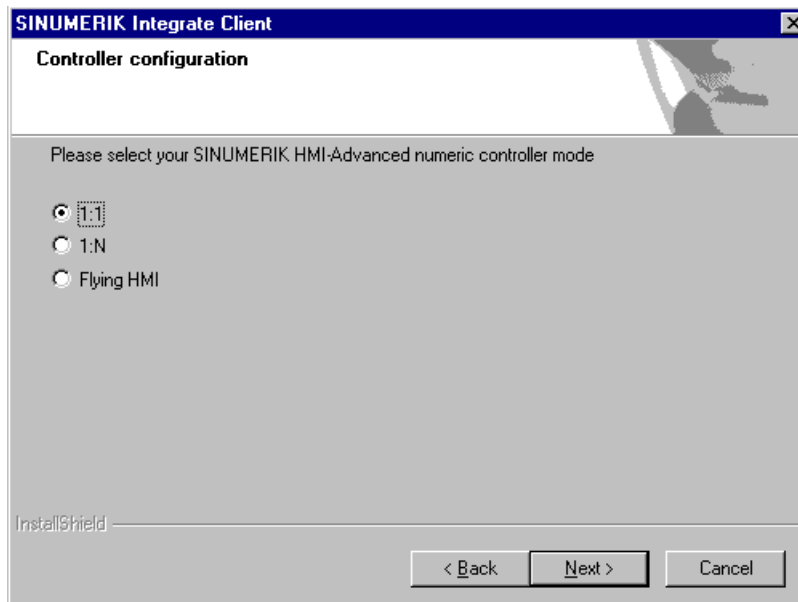


3.1 SINUMERIK control with HMI-Advanced - Setting the proxy

9. The "Choose Destination Location" window opens and the installation directory is displayed.
 - Click "Next >".
 - OR -
 - Click "Change..." to change the directory.

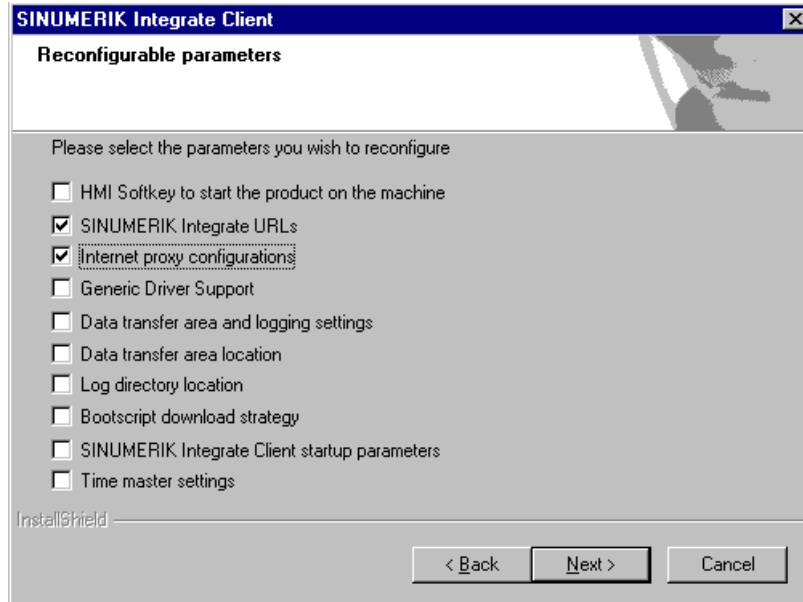


10. The "Controller configuration" window opens.
 - Select the option button for connection "1:1".
 - Then click "Next >".



11. The "Reconfigurable parameters" window opens.

- Select the "SINUMERIK Integrate URLs" and "Internet proxy configurations" check boxes.
- Click "Next >".

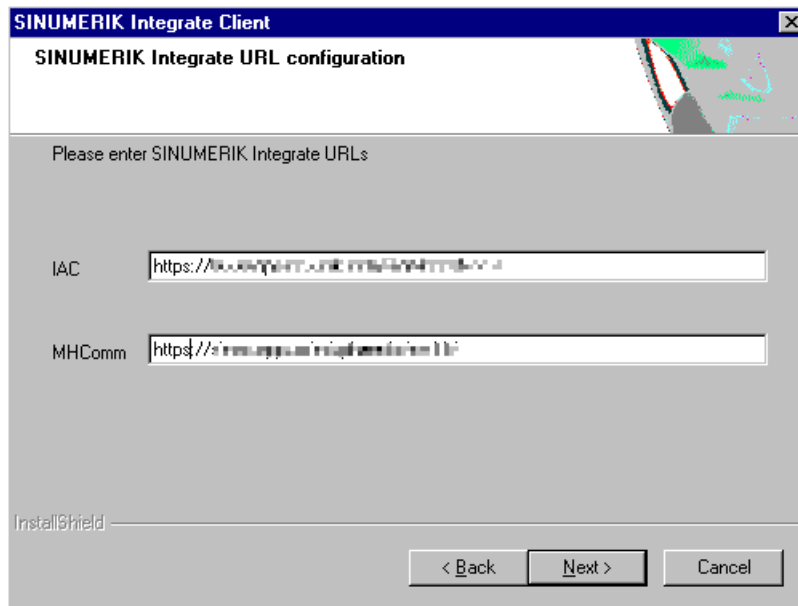


3.1 SINUMERIK control with HMI-Advanced - Setting the proxy

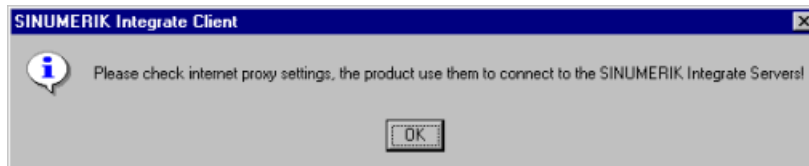
12. The "SINUMERIK Integrate URL configuration" window opens.
The proxy server is required to connect the control with MindSphere.
Enter the following web server URL depending on which MindSphere system you are connected with:

- MindSphere V3 Livesystem (<https://gateway.eu1.mindsphere.io/api/agentcom-mmmops/v3/ws11>)
- MindSphere Alibaba (<https://gateway.cn1.mindsphere-in.cn/api/agentcom-dimcopt/v3/ws11>)

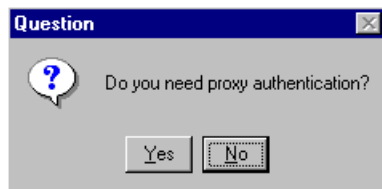
Click "Next >".



13. The following message is displayed.
Click "OK" to adapt the proxy server.

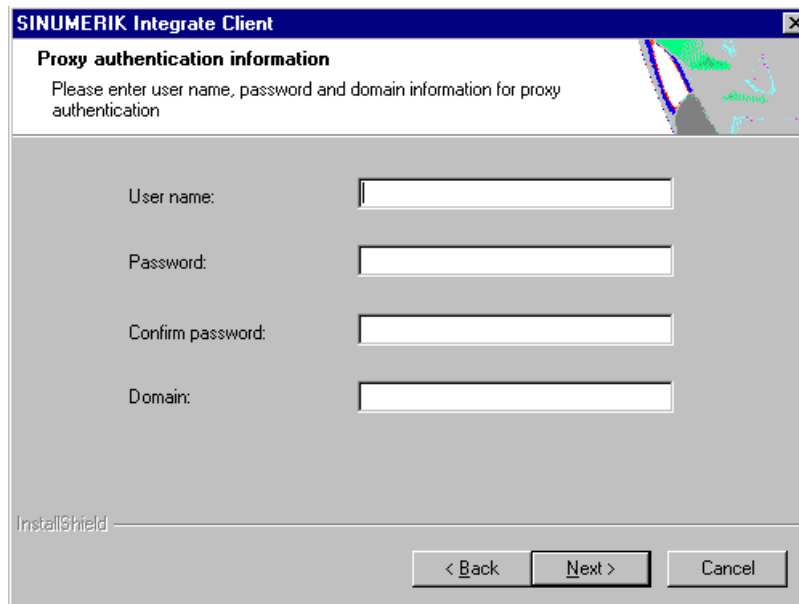


14. If authentication is required for the proxy, click "Yes".



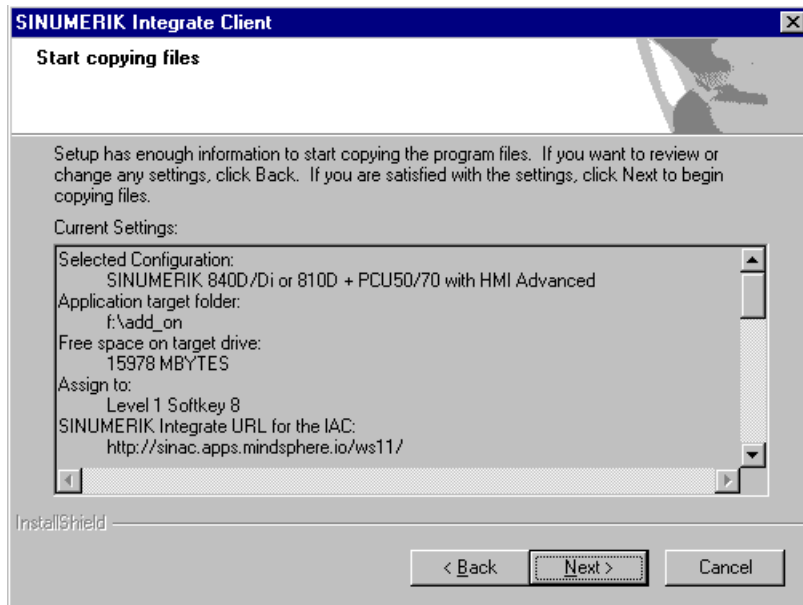
15. Enter the data in the input fields.

- User name:
- Password:
- Confirm password:
- Domain:
- Click "Next >".



The screenshot shows a dialog box titled "SINUMERIK Integrate Client" with a close button (X) in the top right corner. The main heading is "Proxy authentication information". Below the heading, there is a text instruction: "Please enter user name, password and domain information for proxy authentication". The dialog contains four input fields, each with a label to its left: "User name:", "Password:", "Confirm password:", and "Domain:". At the bottom of the dialog, there are three buttons: "< Back", "Next >", and "Cancel". The "Next >" button is highlighted with a black border. In the bottom left corner, the text "InstallShield" is visible.

16. The "Start copying files" window opens and the settings made are displayed.
- Click "Next >" to copy the data to the SINUMERIK control.



17. You are prompted to restart the system after the installation has been completed. To do this, click "OK".

3.2 SINUMERIK control with SINUMERIK Operate

The SINUMERIK Operate operating software is delivered together with the SINUMERIK Integrate Client software.

An update is not possible.

Note

Transferring SINUMERIK data on the MindSphere platform

The following steps allow you to transfer

the SINUMERIK data to the MindSphere platform. Processes in which software scripts are loaded to the SINUMERIK control are performed automatically, especially by input and confirmation of the web service URL.

Requirement

SINUMERIK Integrate has been enabled for use.

Integrate client with Windows XP/PCU

Ensure that the drive being used has sufficient storage space.

If this is not the case because drive C:\ has a limited size, then proceed as follows.

1. Carefully ensure that SINUMERIK Operate has not been started.
2. Open file "epsconfig.user.xml" under <SINUMERIKInstallDir>\user\sinumerik\hmi\cfg.
3. In all entries, replace "C:\" by "F:\".
With this step, you shift the directories for the temporary files to drive "F:\".

Procedure

1. The "Settings" window is open.
Press the "URLs>" softkey.
2. Press the "Edit" softkey and select the following settings:
 - Directory: Select the "User" entry in the "Directory" drop-down list.
 - Display home page: Select the "Overwrite here" check box.
 - RenderService: Select the "Overwrite here" check box.
 - Web service URL: Select the "Overwrite here" check box.
 - Enter the following Web service URL depending on which MindSphere system you are connected with:
MindSphere V3 Livesystem (<https://gateway.eu1.mindsphere.io/api/agentcom-mmmops/v3/ws11>)
MindSphere Alibaba (<https://gateway.cn1.mindsphere-in.cn/api/agentcom-dimcopt/v3/ws11>)
 - Enter the required value in the "Transmit timeout ms" input field (default value is 200). For MindSphere, a value of "20" is recommended, and activate the "Overwrite here" option box.
 - Enter the required value in the "Timeout on receive in ms" input field (default value is 200). For MindSphere, a value of "20" is recommended, and activate the "Overwrite here" option box.

The screenshot shows a settings window with the following configuration:

- Directories: User
- Display home page: Overwrite here
- RenderService: Overwrite here
- URL Web service: Overwrite here
http://wainac.apps.mindsphere.io/wa11
- Transmit timeout ms: 20 Overwrite here
- Timeout on receive in ms: 20 Overwrite here

3. Press the "OK" softkey.
A syntax check is performed and the access data is saved.
4. To establish a connection from the customer network, you must adapt the proxy settings.
 - Click on "Proxys>".
The saved settings are displayed.

5. Press the "Edit" softkey and select the following settings:
 - Select the "Use fix proxy" check box.
 - Enter your proxies in the "Proxy 1" to "Proxy 3" input fields.
 - Select the "Overwrite here" check box even if you only enter one proxy, to apply the new entry.
 - Press the "OK" softkey to save the settings.

Directories: **User**

Use system proxy settings Overwrite here

Automatic Overwrite here

Use proxy script Overwrite here

URL (proxy script)

Use fix proxy Overwrite here

Proxy 1: sq4.ocimaws.net:3128

Proxy 2:

Proxy 3:

Direct Overwrite here

6. If an authentication is required for the proxy, press the "Authorization" softkey.
 - Activate the "Overwrite here" check box to apply the new entry.
 - Enter the user data in the "Domain", "User name" and "Password" input fields.
 - Press the "OK" softkey to save the settings.

Directories: **User**

Overwrite here

Domain:

User name: mta proxy

Password:

Overwrite here

Workstation:

7. Restart the control so that the access data can take effect.

3.3 Connecting the SINUMERIK control system with MindSphere

The activation of SINUMERIK Integrate, the setting up of the URL/proxy and the restart creates the "boot_job" folder in the /var/tmp/ directory. If the directory is not set up, create it manually.

There are two ways to copy the "onboard.key" to the SINUMERIK control:

- Via the user interface of the operating software
- With the aid of WinSCP

Requirement

The onboard key has been generated

The "boot_job" folder is created on the control at one of the following paths:

- Linux (SINUMERIK 840/828): /var/tmp/boot_job
- Win7 PCU 50: C:\temp\boot_job
- WinXP PCU 50: F:\temp\boot_job

Procedure

1. Start the operating software on the control in service mode.
2. Insert the USB flash drive with the "onboard.key" file into the PCU.
The USB flash drive is shown in the directory tree.
3. Copy the "onboard.key" file, for example, to the following directory: C:\temp\boot_job.
4. After connection, the "onboard.key" file is deleted and the "cert.key" file is created.
In the Manage MyMachine Dashboard, the SINUMERIK control (machine) is shown online.

3.4 SIMATIC IoT2040

3.4.1 Overview

Overview

This chapter provides information on how to use SIMATIC IoT2040 to install a proxy.

With IoT2040, you connect SINUMERIK machines that do not support TLS 1.2 with MindSphere.

TLS 1.2 is required for the connection to IoT2040.

3.4.2 Hardware setup

Hardware setup

SIMATIC IoT2040 (6ES7647-0AA00-1YA2) is used to setup this configuration.

Products (<https://mall.industry.siemens.com/mall/en/WW/Catalog/Products/10321262>)

3.4.3 SIMATIC IoT2000 SD card example image on IoT2040

Procedure

Download the SIMATIC IoT2000 SD card example image from the following path:

SD card example image (<https://support.industry.siemens.com/cs/document/109741799/simatic-iot2000-sd-card-example-image?dti=0&lc=en-WW>)

- OR -

From the .zip file:

Image Zip example (https://support.industry.siemens.com/cs/attachments/109741799/Example_Image_V2.2.0.zip)

Roadkil's Disk Image

1. Use the "Roadkil's Disk Image" to install the image.
Download the standalone version under the following path:
Roadkil (<http://www.roadkil.net/program.php/P12/Disk%20Image>)
-

Note

Erasing all drives

To avoid malfunctions, erase all existing drives on the SD card before you start.

2. Select the "Write Image" tab.
 3. Select "Physical Disk" so that the image can be written to it.
-

Note

Selection of the physical disk

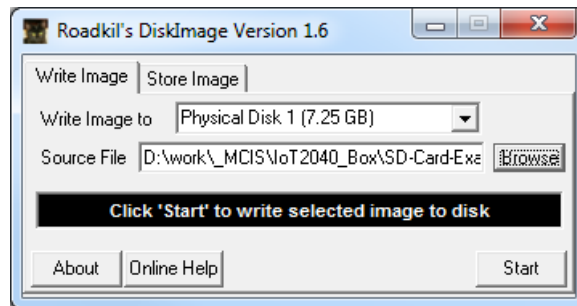
Ensure that the SD card is selected.

4. Select the "example-V2.2.0.wic" image file.
5. Click "Start".

Note

Preparing the SD card

Erase all existing drives on the SD card before you start.



dd

Parameter	Description
if	Input file
of	Output disk/drives
bs	Blocked space (10 MB is recommended)
--progress	Shows the progress

Procedure

1. Use "dd" to install the image.
 Download "dd" under the following path:
 dd (<http://www.chrysocome.net/dd>)
 - OR -
 From the zip. file:
 dd zip ([http://www.chrysocome.net/downloads/dd-0.6beta3.zip//
 XmlEditor.InternalXmlClipboard:0b34d906-6791-2de3-57fd-5a19fdca7b37](http://www.chrysocome.net/downloads/dd-0.6beta3.zip//XmlEditor.InternalXmlClipboard:0b34d906-6791-2de3-57fd-5a19fdca7b37))

Note

Erasing all drives

To avoid malfunctions, erase all existing drives on the SD card before you start.

2. Execute the following command, for example.
 Note: Run the following lines as a command:

```
dd if=D:\temp\example-V2.2.0.wic of=\\?  

\Device\Harddisk1\Partition0 bs=10M --progress
```

Windows computer

1. Open Windows "CMD" as administrator.
2. Open the directory in which "dd.exe" is stored.

3.4 SIMATIC IoT2040

3. Write "dd --list".
A list of all mounted drives is displayed.
4. Search for the correct drive that you want to use. Observe the displayed warning.
5. Download the image file and the target drive to the "dd tool".
The procedure takes approximately 3-5 minutes.
The success is displayed.
6. Next step: Output

```
dd --list
rawwrite dd for windows version 0.6beta3.
Written by John Newbigin <jn@it.swin.edu.au>
This program is covered by terms of the GPL Version 2.
Win32 Available Volume Information
\\.\Volume{7994290d-4b77-11e2-b265-c01885b5e329}\
  link to \\?\Device\HarddiskVolume2
  fixed media
  Not mounted
\\.\Volume{afccbe56-4bb9-11e2-8a23-2cd444b4b548}\
  link to \\?\Device\HarddiskVolume1
  fixed media
  Mounted on \\.\c:
\\.\Volume{049b1544-4b77-11e2-a26b-806e6f6e6963}\
  link to \\?\Device\HarddiskVolume3
  fixed media
  Mounted on \\.\d:
\\.\Volume{66f507b7-c527-11e7-8975-005056c00008}\
  link to \\?\Device\HarddiskVolume7
  removeable media
  Mounted on \\.\f:
\\.\Volume{049b1547-4b77-11e2-a26b-806e6f6e6963}\
  link to \\?\Device\CdRom0
  CD-ROM
  Mounted on \\.\e:
NT Block Device Objects
  \\?\Device\CdRom0
    size is 2147483647 bytes
  \\?\Device\Harddisk0\Partition0
    link to \\?\Device\Harddisk0\DR0
    Fixed hard disk media. Block size = 512
    size is 500107862016 bytes
  \\?\Device\Harddisk0\Partition1
    link to \\?\Device\HarddiskVolume1
```

```

\\?\Device\Harddisk0\Partition2
  link to \\?\Device\HarddiskVolume2
\\?\Device\Harddisk0\Partition3
  link to \\?\Device\HarddiskVolume3
\\?\Device\Harddisk1\Partition0
  link to \\?\Device\Harddisk1\DR4
  Removable media other than floppy. Block size = 512
  size is 7780433920 bytes
\\?\Device\Harddisk1\Partition1
  link to \\?\Device\HarddiskVolume7
  Removable media other than floppy. Block size = 512
  size is 7780433920 bytes
Virtual input devices
  /dev/zero          (null data)
  /dev/random        (pseudo-random data)
  -                  (standard input)
Virtual output devices
  -                  (standard output)
  /dev/null          (discard the data)

```

- Next step: Command
Note: run the following lines as a command:

```
dd if=D:\temp\example-V2.2.0.wic of=\\?\Device\Harddisk1\Partition0 bs=10M --progress
```

Error correction when writing the image to the SD card

If you expect problems when writing the image to the SD card:

- Disconnect the Internet connection.
- Stop the antivirus software.

A local security regulation can also hinder the execution of disk tools.

- Attempt to write the image with a computer to the SD card with less restrictive security regulations.

3.4.4 Infrastructure

Overview

This chapter provides notes and tips for the configuration of the IoT2040 in your network. The Linux installation is largely identical. But some specific topics for the associated Yocto image must be observed.

Default network configuration

The configuration for installation of the "default image" is shown below.

The standard network configuration of IoT2000 is:

- X1 P1 LAN (eth0)
 - DHCP: no
 - IP: 192.168.200.1
 - Subnet mask: 255.255.255.0
- X2 P1 LAN (eth1)
 - DHCP: yes

The network configuration is stored at: **/etc/network/interfaces**

```
# /etc/network/interfaces -- configuration file for ifup(8),
ifdown(8)
# The loopback interface
auto lo
iface lo inet loopback
# Wired interfaces
auto eth0
iface eth0 inet static
    address 192.168.200.1
    netmask 255.255.255.0
auto eth1
iface eth1 inet dhcp
```

Observe the following items for the first access to IoT2040:

- Port "X1 P1" is configured with the fixed IP address 192.168.200.1
 - For access from this port, set your IP address in the range 192.168.200.2 - 192.168.0.254
- Port "X2 P1" is configured as DHCP
 - For access from this port, interconnect to a network with DHCP server.
 - You must know the IP address of your IoT2040.

Changing the network configuration

Change the "# Wired interfaces" section to "/etc/network/interfaces":

Configure DHCP at a port, e.g. X2 P1 LAN (eth1)

```
auto eth1
iface eth1 inet dhcp
```

Configure a static (fixed) IP at a port, e.g. X1 P1 LAN (eth0)

```
auto eth0
iface eth0 inet static
    address 192.168.200.1
    netmask 255.255.255.0
    gateway 192.168.200.252
```

The "gateway" parameter is optional.

Note**Problems with the network configuration**

- Do not configure both network ports as DHCP!
 - Do not set both network ports as "default" gateways!
 - If there are any problems with the network configuration, try configuring both network ports as static IP addresses!
 - If the network problems cannot be rectified, contact your local network administrator.
-

Connecting IoT2040

You connect IoT2040 to X1 P1 either with fixed IP address or with DHCP.

X1 P1 with a fixed IP address

The default IP address at port "X1 P1" is "192.168.200.1".

- Connect the computer directly to this port using an Ethernet cable.
- Set your local IP address in the same subnet, e.g. "192.168.200.2".
- Connect IoT2000 with the default data.

Connecting X2 P1 with DHCP

Port "X2 P1" of the IoT2040 is configured for DHCP.

- Connect IoT2040 with a DHCP router that provides an IP address. This IP address must be known in order to connect IoT2040.
- Connect IoT2000 with the default data.

User name and password

User name and password are preset:

- User name: root
- Password: iot2000

Set the proxy connection

If you require a proxy server for the Internet connection, proceed as described in the next sections. For example, the Internet connection is required to download the packages required for the following steps.

You have two options for adding a proxy connection:

- Temporary, the connection is valid until the next start
- Permanent, the connection is retained permanently

The following example is used in the following sections:

Example:

Proxy: 123.124.125.126

Proxy port: 4321

For the implementation in your network, use the current data for your company.

Note

Apache Webserver

- The Apache Webserver does not accept the settings.
 - You must also add the proxy connection to the Apache configuration.
-

Temporary proxy connection

The proxy connection is temporary. The connection is valid until the next start or reboot.

The example data is used for the following commands; adapt your inputs with your company data.

- Proxy: 123.124.125.126
- Proxy port: 4321

For the implementation in your network, use the current data for your company.

Company proxy with user authentication

Perform the following commands in PuTTY:

- `export http_proxy="http://123.124.125.126:4321"`
- `export https_proxy="https://123.124.125.126:4321"`

The following command lists all environment variables; they so allow you to check your settings:

- `export`

Ports for the proxy connection

Several listener ports for Apache 80xxx are specified in the current documentation.

Note**Using different ports**

If specifications require that you use different ports, this is always possible.

Adapt the proxy port everywhere.

The following settings are valid:

- `/usr/local/apache2/conf/httpd.conf`
- `/usr/local/apache2/conf/extra/httpd-vhosts.conf`
- All settings that you configured, for example, with your SINUMERIK control.

Permanent proxy connection

The proxy connection is permanent and also remains after a warm restart or reboot.

The example data is used for the following commands; adapt your inputs with your company data.

1. Navigate to the "etc" directory.
2. Open the "profile" file.
3. Add the following lines:

```
export http_proxy="http://123.124.125.126:4321"
export https_proxy="https://123.124.125.126:4321"
```
4. Add the following line (as penultimate line) at the end of the file:

```
"umask 022"
```

Company proxy with user authentication

If your company proxy requires a user authentication, proceed as follows:

1. Navigate to the "etc" directory.
2. Open the "profile" file.
3. Add the following lines:

```
export http_proxy="http://username:password@123.124.125.126:4321"
export https_proxy="https://
username:password@123.124.125.126:4321"
Replace "username" with your user name, and "password" with your password.
```
4. Add the following line (as penultimate line) at the end of the file:

```
"umask 022"
```

Company proxy error correction

If problems occur with your particular environment:

- Try to find a solution that works for Linux, in particular in the Yocto project.

Because every company network reacts differently, it is not possible to provide a solution for every situation.

3.4.5 Apache http

Operational sequences and downloads

You require the following operational sequences and download packages for setting up the Apache httpd.

Note**Installation security**

Ensure that the current version is always used for the installation.

1. Download the following data packages:

- Apache HTTP Server (httpd) (<http://httpd.apache.org>)
- Apache APR & APR-util (<https://apr.apache.org/>)
- PCRE (<https://www.pcre.org/>)

If your IoT2040 has an Internet connection, call "wget" and download the data packages directly.

- OR -

- Download the data packages manually.
- Copy the data packages to the following directory: `/usr/downloads`.

2. Create the directory `"/usr/downloads"`:

```
cd /usr
mkdir downloads
cd downloads
```

3. To download all required packages, execute the following commands:

Note: Run the following lines as a command:

```
wget http://mirror.netcologne.de/apache.org//httpd/
httpd-2.4.33.tar.gz wget http://mirror.23media.de/apache//apr/
apr-1.6.3.tar.gz wget http://mirror.23media.de/apache//apr/apr-
util-1.6.1.tar.gz
```

Note: Run the following lines as a command:

```
wget ftp://ftp.csx.cam.ac.uk/pub/software/programming/pcre/
pcre-8.42.tar.gz
```

Opening packages

To open the packages, execute the following commands in the `"/usr/downloads/"` directory:

```
tar xzf httpd-2.4.33.tar.gz
tar xzf apr-1.6.3.tar.gz
tar xzf apr-util-1.6.1.tar.gz
tar xzf pcre-8.42.tar.gz
```


Storing packages in the appropriate folders

To store the packages in the appropriate folders and to name them correctly, run the following commands in directory "/usr/downloads/":

```
mkdir --parents /usr/local
mv httpd-2.4.33 apache2
mv apache2 /usr/local/
mv apr-1.6.3 apr
mv apr /usr/local/apache2/src/lib/
mv apr-util-1.6.1 apr-util
mv apr-util /usr/local/apache2/src/lib/
mv pcre-8.42 pcre
mv pcre /usr/local/
```

Installing "opkg" and "pcre"

1. Download and install "opkg".
`opkg install make`
2. Compile and install "pcre".
Run the following commands in directory "/usr/local/pcre":
`./configure --prefix=/usr/local/pcre`
`make`
`make install`

Apache APR - Compiling and installing

Note

Error in APR V1.6.3

Because of an error in APR V1.6.3, the compilation of APR causes an error. Edit the file manually to prevent this error.

Further information can be found at: APR (<https://stackoverflow.com/questions/18091991/error-while-compiling-apache-apr-make-file-not-found>).

- Execute the following instructions.
 - Check whether the error is still present in future APR versions.
-

1. Execute the following command:
`cd /usr/local/apache2/src/lib/apr/`
2. Create a copy of the original file before you begin editing.
`cp configure configure.original`
3. Replace the
`$RM "$cfgfile" line`
with
`$RM -f "$cfgfile"`

3.4 SIMATIC IoT2040

4. Save the change.
5. Switch to the folder: `cd /usr/local/apache2/src/lib/apr/`
Run the following commands:

```
./configure --prefix=/usr/local/apr/  
make  
make install  
/usr/local/apache2/src/lib/apr/libtool --finish /usr/local/apr/lib/
```

Compiling and installing Apache APR-util

1. Switch to the folder: `cd /usr/local/apache2/src/lib/apr-util/`
2. Execute the following commands:

```
./configure --prefix=/usr/local/apr-util --with-apr=/usr/  
local/apr  
make  
make install
```

Compiling and installing Apache HTTP server (httpd)

1. Switch to the folder: `cd /usr/local/apache2/`
2. Execute the following command:
Note: Run the following lines as a command:

```
./configure --prefix=/usr/local/apache2 --with-apr=/usr/  
local/apr/bin --with-apr-util=/usr/local/apr-util/bin --with-  
pcre=/usr/local/pcre/bin/pcre-config
```

Note

Line breaks

Retain the line breaks - The preceding lines form a command.

```
make  
make install
```

Starting and stopping Apache Webserver (httpd)

- Manual start:
`/usr/local/apache2/bin/apachectl start`
- Manual stop:
`/usr/local/apache2/bin/apachectl -k stop`
- Manual restart:
`/usr/local/apache2/bin/apachectl -k graceful`

Apache Webserver (httpd) - Configuring autostart

Creating the start file

1. Switch to the "/etc/init.d/" directory.
2. Create the "apache2" file.
3. Enter the following text in the file:

```
#!/bin/bash
#
# apache2      Startup script for the Apache HTTP server
#
chkconfig:    3 85 15
#              Apache is a World Wide Web server.
description:  It is used to serve \
              HTML files and CGI.
/usr/local/apache2/bin/apachectl $@
```

Editing file properties

1. Enter:
`chmod 755 /etc/init.d/apache2`
2. Execute the following command:
`update-rc.d -f apache2 defaults`

Further details can be found at: Apache Autostart (<https://serverfault.com/questions/16839/how-do-i-get-apache-to-startup-at-bootime-on-linux>)

3.4.6 Configuring SINUMERIK controls

3.4.6.1 Overview

Introduction

This chapter describes configuring the following SINUMERIK control for use of an Apache proxy on the IoT2040.

- SINUMERIK control system with HMI Advanced - Setting the proxy (Page 36)
- SINUMERIK control with SINUMERIK Operate - Setting the proxy (Page 45)

The following ports are used for the various MindSphere systems:

- Port 8082 is configured for the MindSphere V3 Livesystem

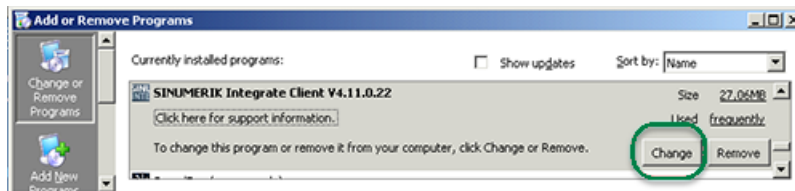
Configure the URL for connection to MindSphere with **http** - not with **https**.

- MindSphere V3 Livesystem (<http://gateway.eu1.mindsphere.io/api/agentcom-mmmops/v3/ws11>)
- MindSphere Alibaba (<http://gateway.cn1.mindsphere-in.cn/api/agentcom-dimcopt/v3/ws11>)

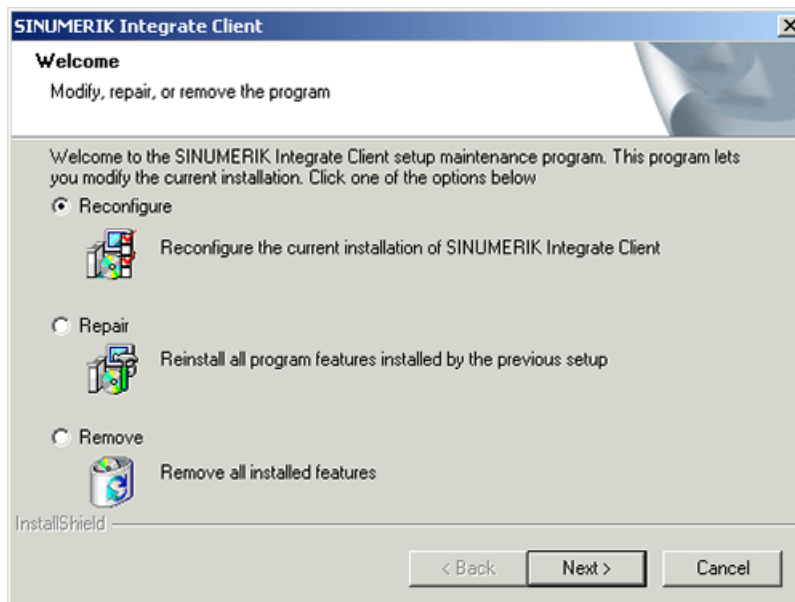
3.4.6.2 SINUMERIK control system with HMI Advanced - Setting the proxy

Procedure

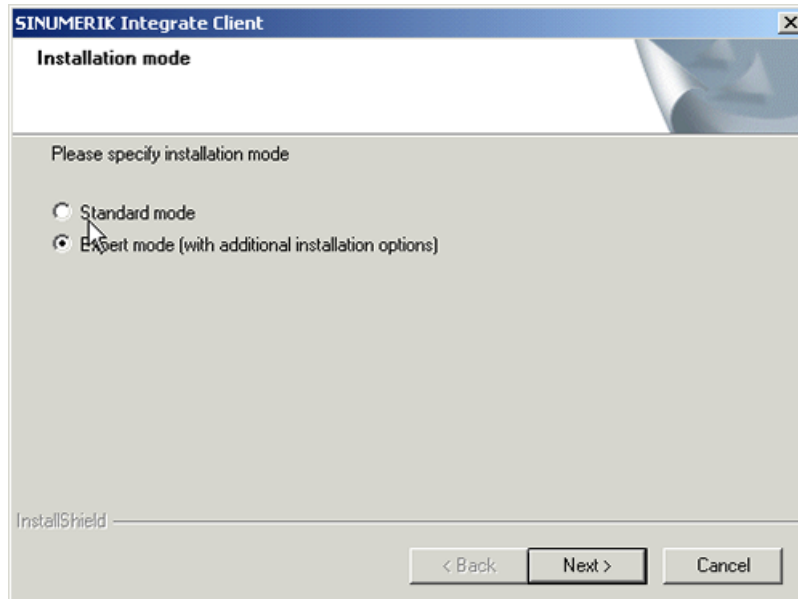
1. Start the PCU in the service mode.
2. Open "Add or Remove Programs" in Windows and select "SINUMERIK Integrate Client". Click "Change".



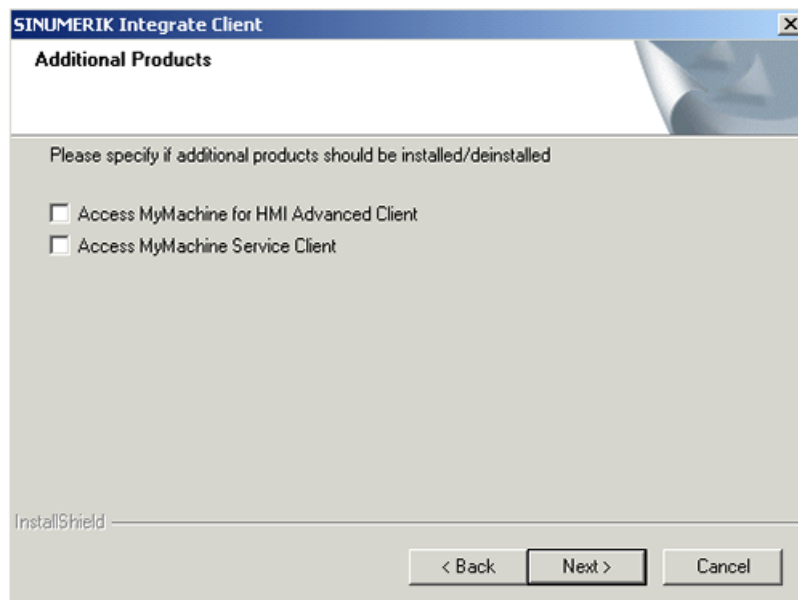
3. The "Welcome" window opens.
 - To edit the configuration, select the "Reconfigure" option button.
 - To perform the setup of the "SINUMERIK Integrate Client", click "Next >".



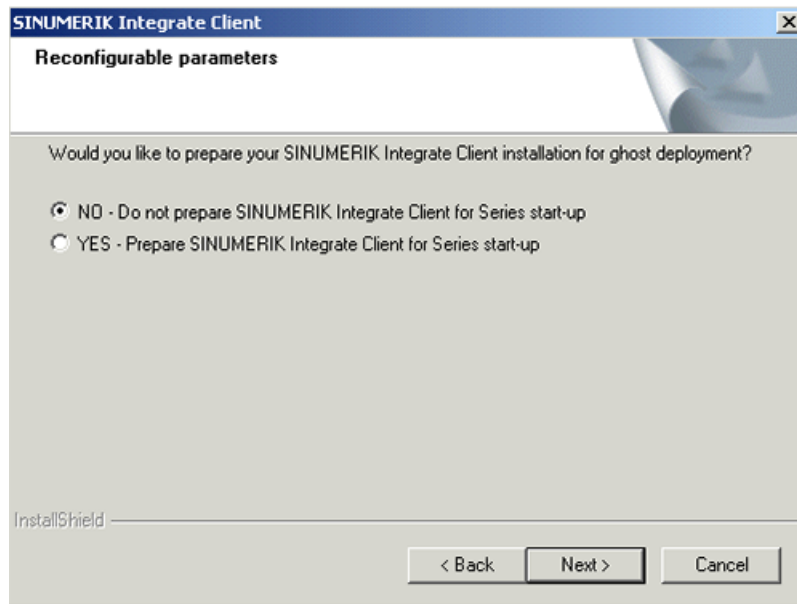
4. The "Installation mode" window opens.
 - Select the "Expert mode (with additional installation options)" checkbox.
 - Click "Next >".



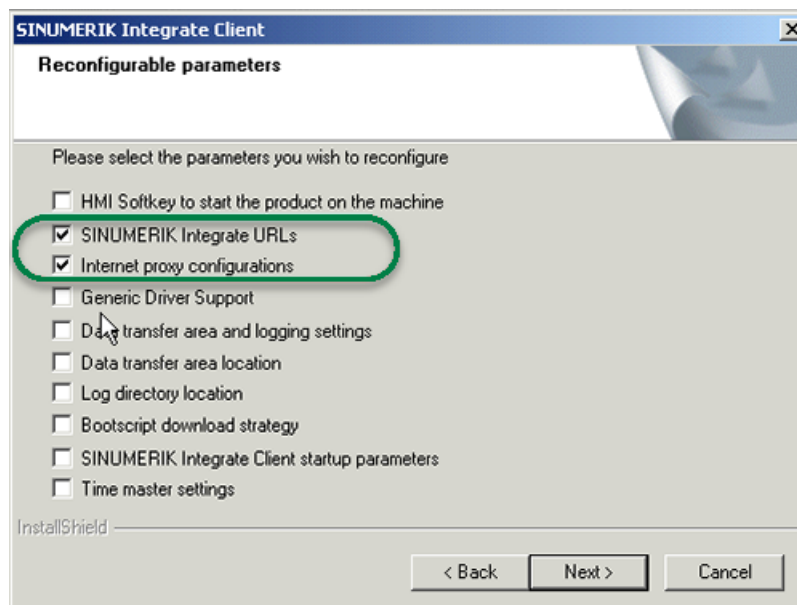
5. The "Additional Products" window opens.
 - Click "Next >".



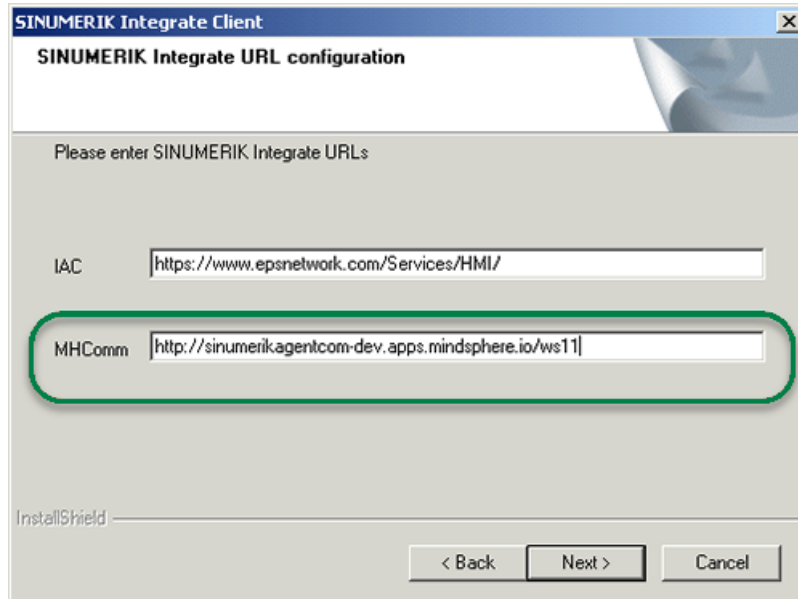
6. The "Reconfigurable parameters" window opens.
 - Select the "NO - Do not prepare SINUMERIK Integrate client for series start-up" option button.
 - Click "Next >".



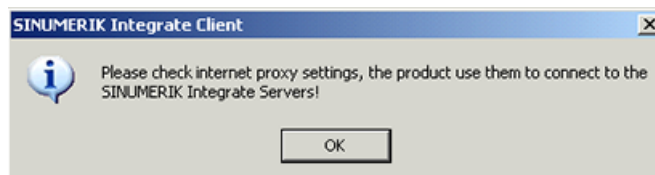
7. Activate the following checkboxes:
 - "SINUMERIK Integrate URLs"
 - "Internet proxy configurations"
 - Click "Next >".



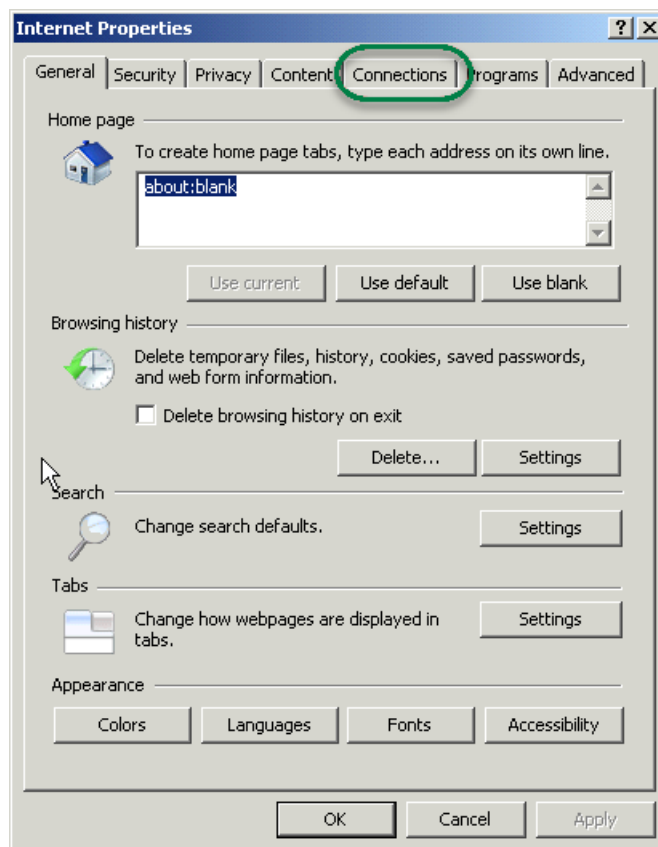
8. The "SINUMERIK Integrate URL configuration" window opens.
 - Configure the URL for connection to MindSphere with **http** and not with **https**. Enter the following URL in the "MHComm" input field, depending on which MindSphere system you are connected with:
MindSphere V3 Livesystem (<http://gateway.eu1.mindsphere.io/api/agentcom-mmmops/v3/ws11>)
MindSphere Alibaba (<http://gateway.cn1.mindsphere-in.cn/api/agentcom-dimcopt/v3/ws11>)
 - Click "Next >".



9. The following prompt is displayed: "Please check internet proxy setting, the product use them to connect to the SINUMERIK Integrate Servers!".
 - Click "OK".

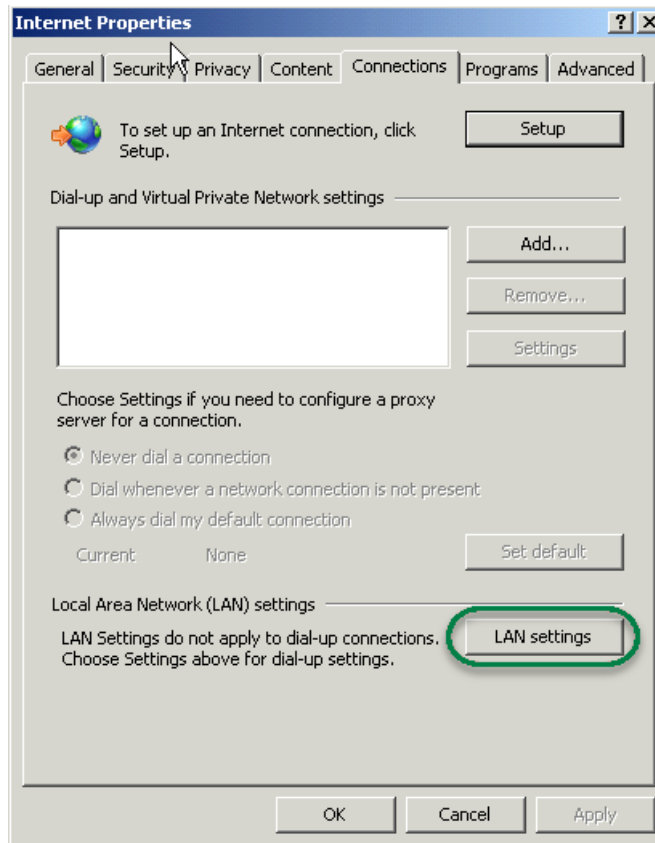


10. The "Internet Properties" > "General" window opens.
 - Open the "Connections" tab.

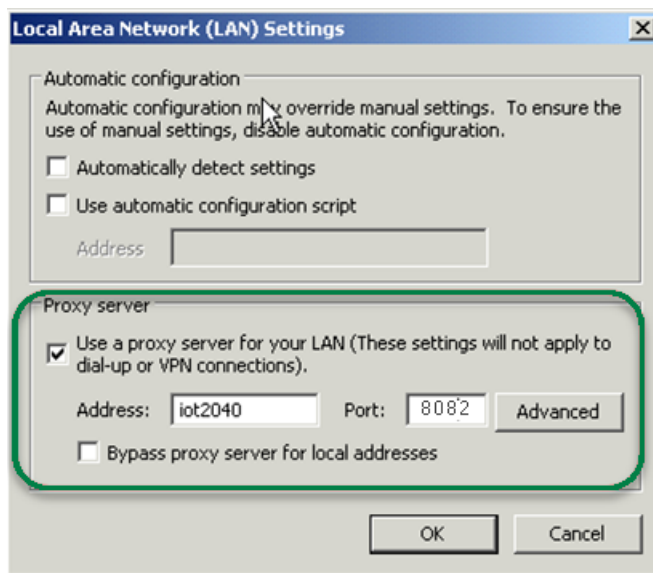


11. The "Connections" window opens.

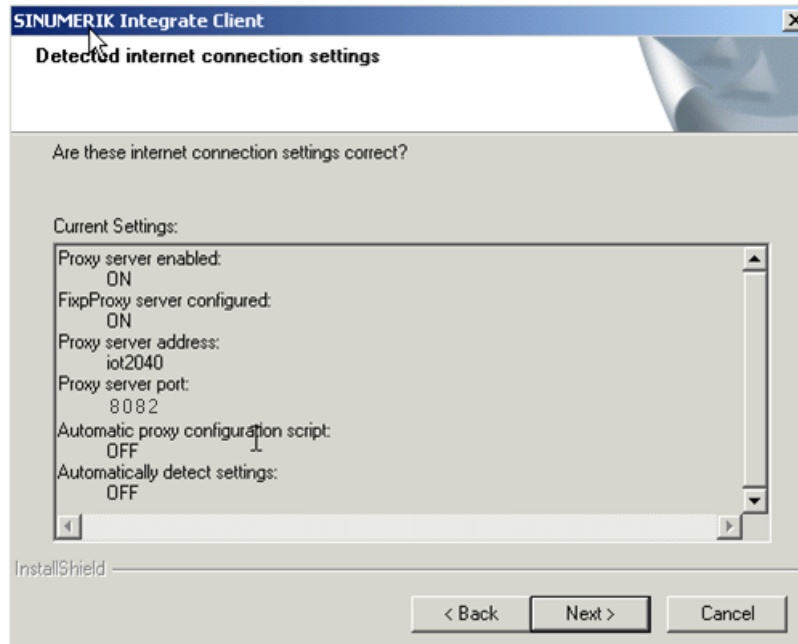
- In the "Local Area Network (LAN) settings" group box, click the "LAN settings" button.



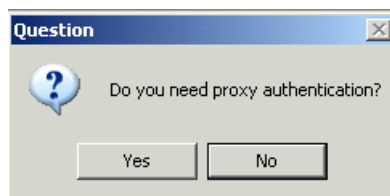
12. The "Local Area Network (LAN) settings" window opens.
Enter the proxy settings:
 - Deactivate the "Automatically detect settings" checkbox.
 - Deactivate the "Use automatic configuration script" checkbox.
 - In the "Proxy server" group box, select the "Use a proxy server for your LAN" check box.
 - Address: iot2040
 - Port (as configured in Apache), e.g.: 8082
 - Deactivate the "Bypass proxy server for local addresses" checkbox.
 - Click "OK".



13. The "Detected internet connection settings" window opens.
The defined proxy settings are shown for checking.
- Click "Next >".

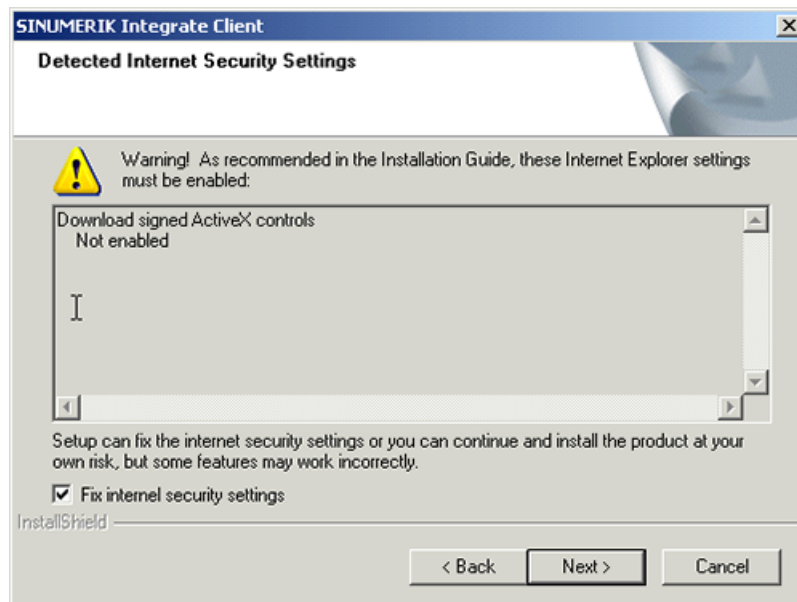


14. The following question is displayed: "Do you need proxy authentication?"
- Click the "No" button.

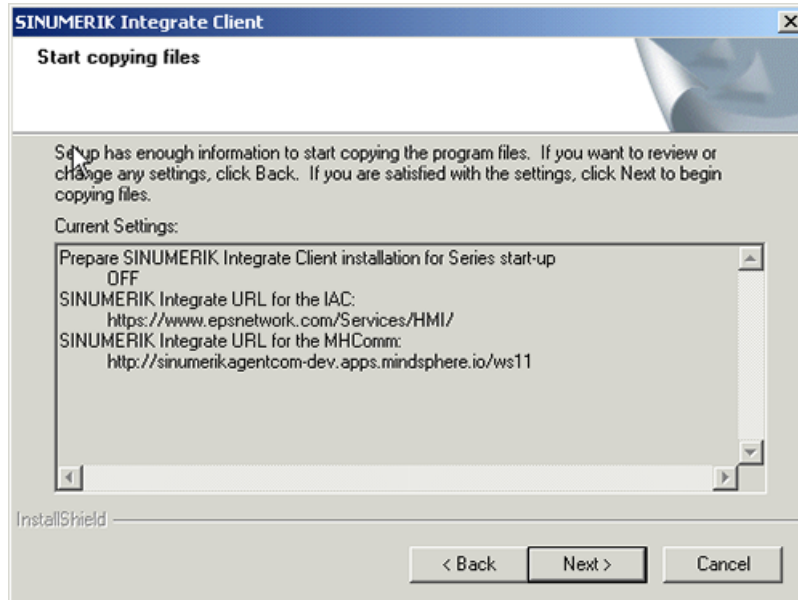


15. Select the "Fix internal security settings" check box.

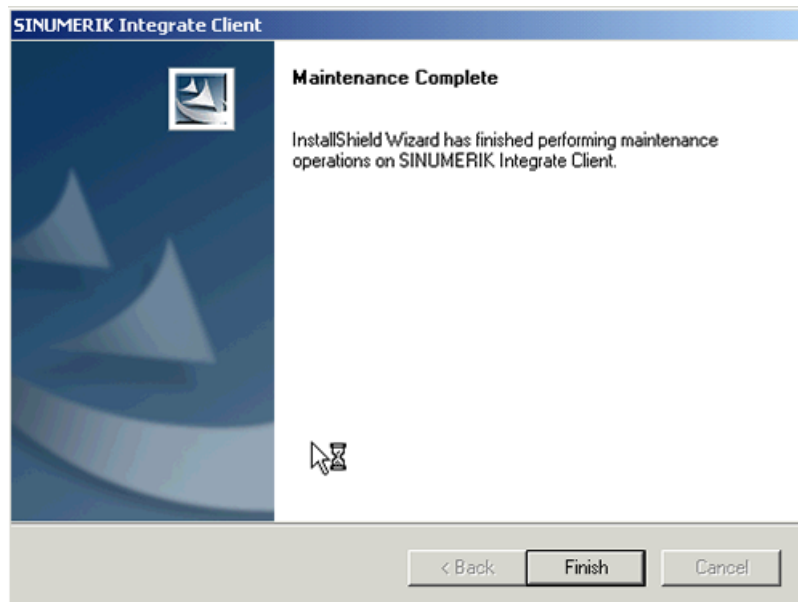
- Click "Next >".



16. The "Start copying files" window opens.
The specified proxy settings are displayed for validation.
- Click "Next >".



17. The "Maintenance Complete" window opens.
- Click "Finish>" to complete the installation.

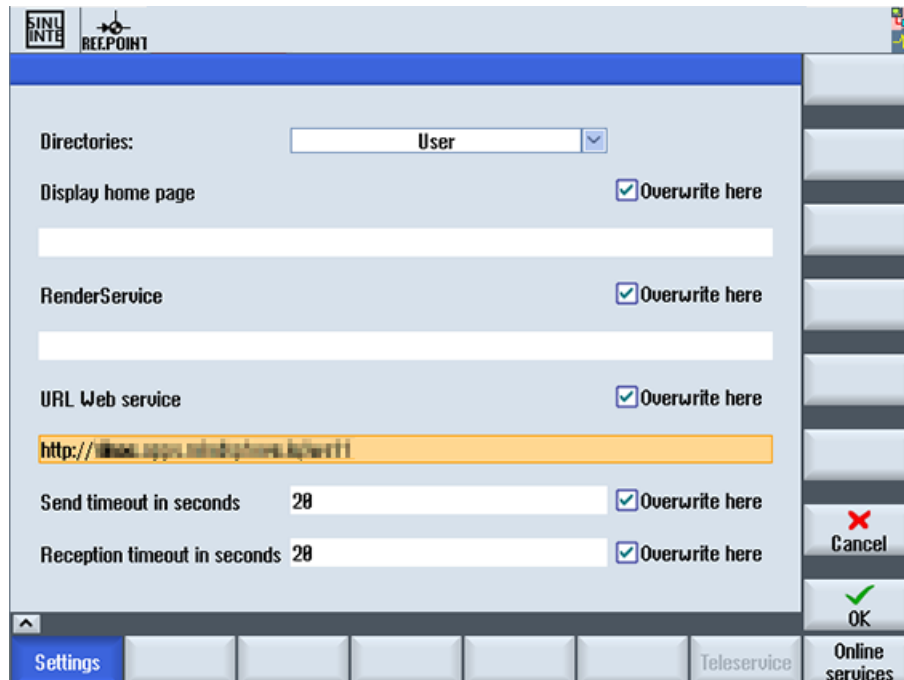


3.4.6.3 SINUMERIK control with SINUMERIK Operate - Setting the proxy

This chapter describes configuring the SINUMERIK Integrate Client for SINUMERIK Operate.

Procedure

1. The "Settings" window is open.
Press the "URLs>" softkey.
2. Press the "Settings" softkey and select the following settings:
 - Directory: Select the "User" entry in the "Directories" drop-down list.
 - Display home page: Activate the "Overwrite here" checkbox.
 - RenderService: Activate the "Overwrite here" checkbox.
 - Web service URL: Activate the "Overwrite here" checkbox.
 - Configure the URL for connection to MindSphere with **http**, and not with **https**.
Enter the following web service URL depending on which MindSphere system you are connected with:
MindSphere V3 Livesystem (<http://gateway.eu1.mindsphere.io/api/agentcom-mmmops/v3/ws11>)
MindSphere Alibaba (<http://gateway.cn1.mindsphere-in.cn/api/agentcom-dimcopt/v3/ws11>)
 - Enter the required value in the "Send timeout in seconds" input field (default value is 200).
For MindSphere, a value of "20" is recommended, and activate the "Overwrite here" option box.
 - Enter the required value in the "Receptions timeout in seconds" input field (default value is 200).
For MindSphere, a value of "20" is recommended, and activate the "Overwrite here" option box.



3. Configure the fixed proxy in SINUMERIK in the following format:
 - <ip-address>:<port>**:
 - <ip-address>: IP address of the IoT2040
 - <port>: Port used by Apache:

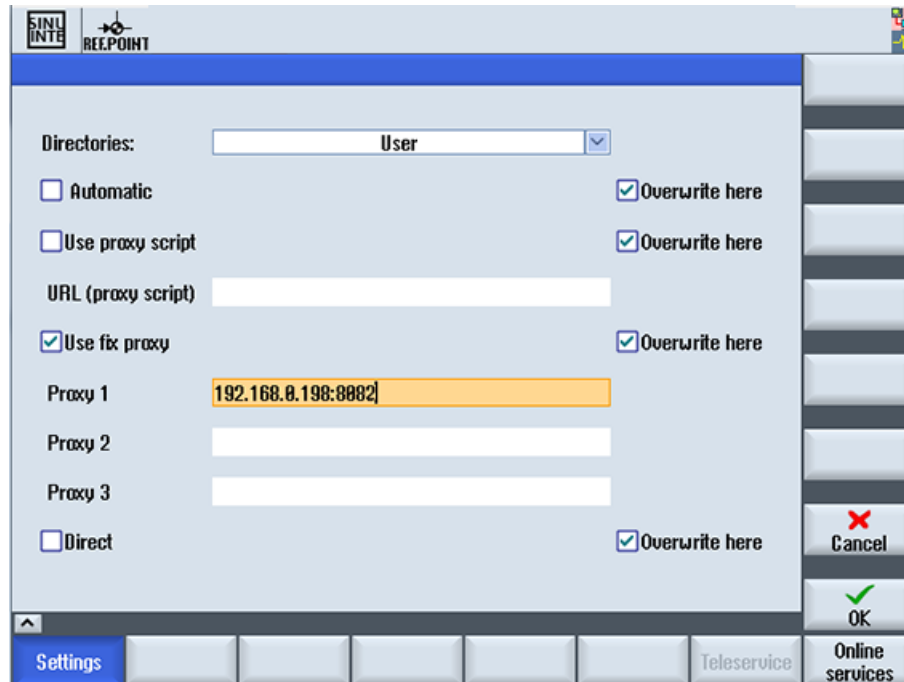
- Port 8082

Press the "OK" softkey.

Example

The IP address of IoT2040 is 192.168.0.198, this results in the following configuration:

- MindSphere V3 Livesystem: 192.168.0.198:8082

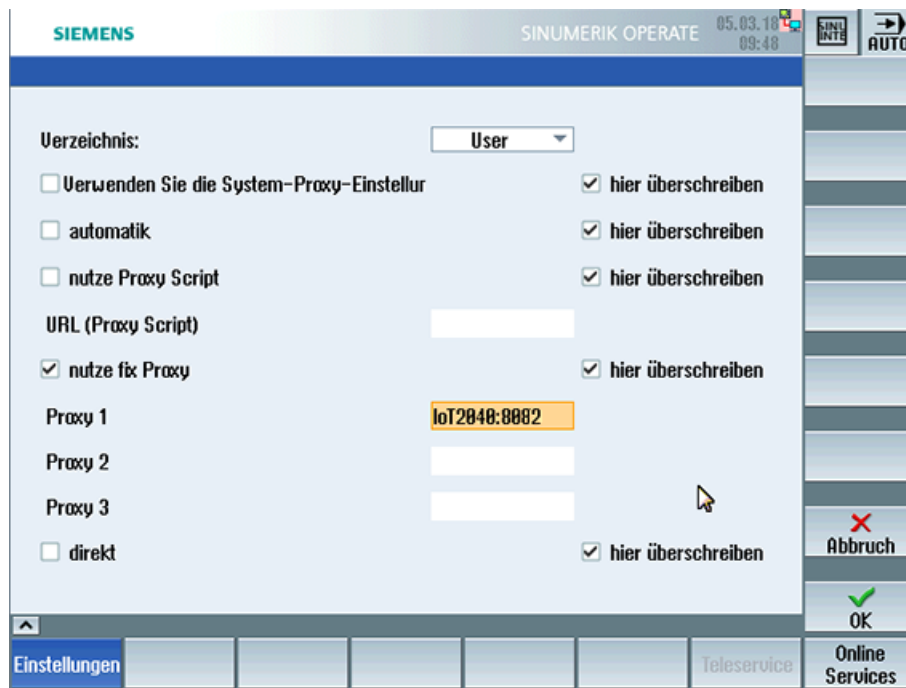


Error correction in the proxy connection

The certificate is generated with the general name IoT2040. Rather than the IP address, it may be necessary to use FQDN: IoT2040 to access the proxy.

If the IoT2040 is accessed with the DNS, no further action is required.

1. If no DNS is used, extend the host files with the IP and the name of the IoT2040.
In the PCU 50, the file is stored in the following directory:
C:\Windows\System32\drivers\etc\hosts
2. In the following example, add the following file to the "Host":
192.168.0.198 IoT2040
3. Enter the desired setting in the text box "Proxy 1", for example: "IoT2040:8082".



3.4.7 Backup of the root access to the IoT2040 Box

Although this step is optional, we recommend that this configuration is performed for security reasons.

3.4.7.1 Setting the password for root user

No default root password is set.

For security reasons, it is recommended that the root password is set as soon as possible.

Procedure

1. Open a remote session with PuTTY and enter the following command:

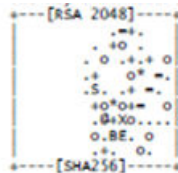
```
passwd
```
2. You are requested to enter a new password:
Enter the new password as specified:
Changing password for root
Enter the new password (minimum of 5 characters)
Please use a combination of upper and lower case letters and numbers.
New password:

3. Repeat the password:
Re-enter new password:
4. The following is then displayed:
passwd: password changed.
root@iot2000:~#
The password is set.

3.4.7.2 Generating SSH key pairs

Procedure

1. Create the directory in which the keys are stored:
`mkdir -p ~/.ssh`
2. Create the key pairs:
`ssh-keygen -t rsa`
 - Generate the key pair "public/private rsa".
 - Enter the storage location of the key, e.g. `/home/root/.ssh`.
 - Enter the password.
If you do not enter a password, then leave the entry empty.
 - Repeat the password.
Your identification is stored in the following directory: `/home/root/.ssh/id_rsa`.
Your public key is stored in the following directory: `/home/root/.ssh/id_rsa.pub`.
The fingerprint of the key is shown as follows:
SHA256:vN0y+nIMQ0Nb5UOBkZ8upyVa4wwf/8Z1IDg7TJcMvrg root@iot2000
The Randomart Image of the key is:



3. Copy the public key with the command "`ssh-copy-id`" to the authorization files of the new SINUMERIK control.
4. Ensure that the example name and the IP address have been replaced:
`cat ~/.ssh/id_rsa.pub | ssh root@192.168.0.198 "mkdir -p ~/.ssh && cat >> ~/.ssh/authorized_keys`
 - The following will be displayed:
The authenticity of host '192.168.0.198 (192.168.0.198)' can't be established.
ECDSA key fingerprint is
SHA256:KwhYZhXlAPiulK0WXUkTmzF35S9VDhqv0YcFo5/KSWg.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added '192.168.0.198' (ECDSA) to the list of known hosts.
DISPLAY "(null)" invalid; disabling X11 forwarding

You can find **more information** on key pairs at

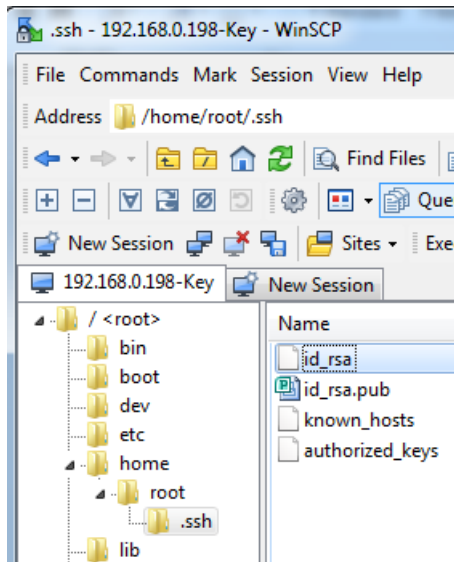
ssh key (<https://www.yoctobe.com/servers/setting-up-ssh-keys/>)

3.4.7.3 Generating the private key in PuTTY format

PuTTY SSH and the WinSCP client for Microsoft Windows do not use the same key format as the OpenSSH client. For this reason, a new SSH public and private key must be created with the PuTTYgen tool or an existing OpenSSH private key converted.

Procedure

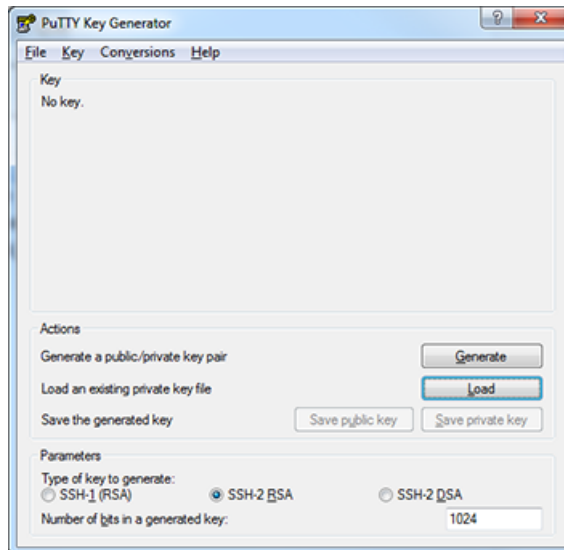
1. Download the generated private key from the IoT2040 into the local SINUMERIK control, into the following directory: /home/root/.ssh/id_rsa.



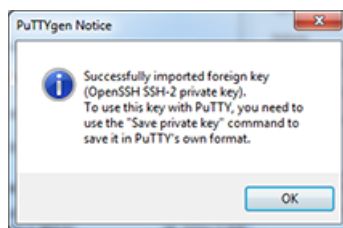
2. Start the PuTTY Key Generator by double-clicking "PuTTYgen".



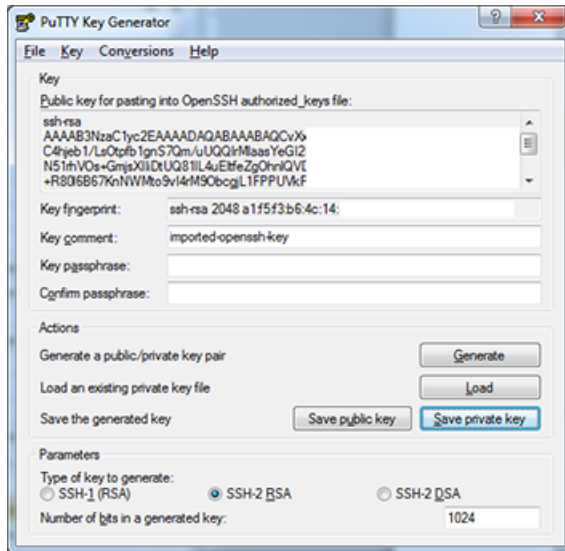
3. The "PuTTY Key Generator" window opens.
There is still no key.
 - Click "Load" in the "Actions" area.
Load the file with private key "id_rsa".



4. The "PuTTYgen Notice" window opens and a message indicates the success of the operation.
Click "OK".



5. The "PuTTY Key Generator" window opens.
The key is displayed.
 - In the "Actions" area, click "Save private key".



6. The new file, e.g. "id_rsa_PUTTY.ppk", is now created.

3.4.7.4 Connect to the IoT2040 using the private key

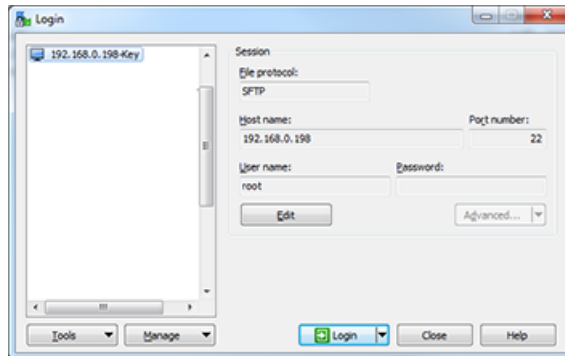
Requirement

Create the connection to the IoT2040 either with WinSCP or with PuTTY once you have installed the private key, e.g. "id_rsa_PUTTY.ppk".

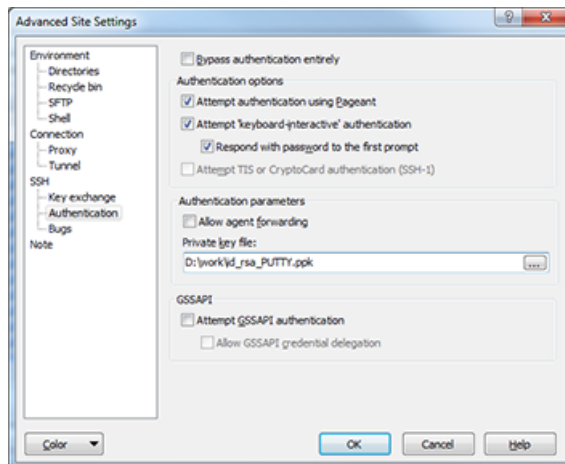
You can find **more information** at: Generating the private key in PuTTY format (Page 50).

Procedure

1. Login to WinSCP.



2. Select Edit > Advanced > SSH > Authentication > Authentication parameters > Private key file.



3. Deactivate the login with user name and password.

Note

Ensure login

Perform this step only when you are sure that you can login with the created private key! Otherwise, you can no longer login to the IoT2040 and must reinstall the firmware.

- Create a backup before you perform the next steps.
- Open the file `"/etc/ssh/sshd_config"`.
- Change the parameter: `PermitRootLogin without-password`.
- Change the parameter: `PermitEmptyPasswords no`.
- Remove any superfluous packages from the Yokto image (optional).
For security reasons, we recommend that the superfluous packages and binaries made available in the default image of the IoT2040 are deleted.
- `opkg remove gdbserver --force-removal-of-dependent-packages`
- `opkg remove gdb-dev`
- `opkg remove gdb`

Troubleshooting

4.1 SINUMERIK Integrate/ePS client log files

In file "setting.ini" you have the option of increasing the log level.

You can find the log files of SINUMERIK Integrate/ePS client in the following directory:

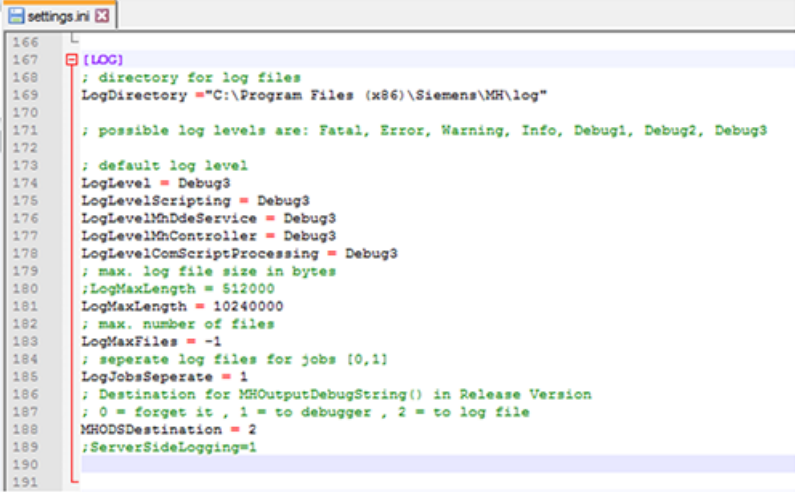
C:\Program Files (x86)\Siemens\MH\log\

- OR -

C:\Users\YourUserName\AppData\Local\VirtualStore\Program Files (x86)\Siemens\MH\log\

Procedure

1. Open the "settings.ini" file.
2. Search in the area [LOG].
3. Set log level "Debug3".
The standard log level is "Error".
4. Restart the client to activate changes.



```
166 L
167 [LOG]
168 ; directory for log files
169 LogDirectory = "C:\Program Files (x86)\Siemens\MH\log"
170
171 ; possible log levels are: Fatal, Error, Warning, Info, Debug1, Debug2, Debug3
172
173 ; default log level
174 LogLevel = Debug3
175 LogLevelScripting = Debug3
176 LogLevelMhDdeService = Debug3
177 LogLevelMhController = Debug3
178 LogLevelComScriptProcessing = Debug3
179 ; max. log file size in bytes
180 ;LogMaxLength = 512000
181 LogMaxLength = 10240000
182 ; max. number of files
183 LogMaxFiles = -1
184 ; separate log files for jobs {0,1}
185 LogJobsSeperate = 1
186 ; Destination for MHOutputDebugString() in Release Version
187 ; 0 = forget it , 1 = to debugger , 2 = to log file
188 MHODSDestination = 2
189 ;ServerSideLogging=1
190
191
```

4.2 Alarm message

Alarm: Bootscript was not found

Check the connection settings:

- Check the URL.
If you change the address, start the installation file again and adapt the URL.
- Check the functionality of TLS1.2 communication between proxy and MindSphere.
- If the machine does not connect to MindSphere, check the storage location of the file "onboard.key". The correct directory is: C:\tmp\boot_job

Appendix

A.1 List of abbreviations

Admin	Administrator (user role)
AMC	Analyze MyCondition
AMP	Analyze MyPerformance
CNC	Computerized Numerical Control
COM	Communication
DIR	Directory
FAQ	Frequently Asked Questions
h	Hour
HTTP	Hypertext Transfer Protocol
HTTPS	HyperText Transfer Protocol Secure
IB	Commissioning engineer (user role)
ID	Identification number
IFC	Interface Client
IoT	Internet of Things
IPC	Industrial PC
KPI	Key Performance Indicator
MB	Megabyte
MLFB	Machine-Readable Product Code
MMM	Manage MyMachines
MSTT	Machine control panel
NC	Numerical Control
NCU	Numerical Control Unit, NC hardware unit
OEE	Overall Equipment Efficiency
OEM	Original Equipment Manufacturer
OP	Operation Panel
OSS	Open Source Software
PB	Package Builder
PC	Personal Computer
PCU	PC Unit, computing unit
PLC	Programmable Logic Control: PLC
SI	SINUMERIK Integrate
SK	Softkey
SW	Software
URL	Uniform Resource Locator
UTC	Universal Time Coordinated, coordinated global time
UTS	Usage Transparency Service

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