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NEWS

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# SINUMERIK MC with SINAMICS S210 as NC Axis

SINUMERIK MC / SW V1.12

https://support.industry.siemens.com/cs/ww/en/view/109769849

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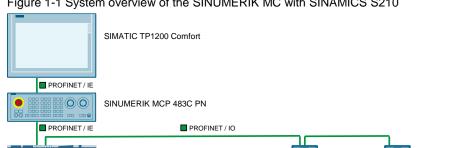
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### Introduction 1

#### 1.1 **Overview**

This application example describes how to interface a SINUMERIK MC with a SINAMICS S210 via PROFINET IRT. Two drives are used as NC axes. The SIMATIC TP1200 Comfort is used as the HMI device, and the SINUMERIK MCP 483C PN is used to control the movement of the axes.



SINAMICS S210

SIMOTICS 1FK2

SINAMICS S210

Figure 1-1 System overview of the SINUMERIK MC with SINAMICS S210

SINUMERIK MCU 1720

#### 1.2 Mode of operation

The application example as described here is limited to the setting up of a connection between one SINUMERIK MC and two SINAMICS S210, the basic controller settings, and the drive configuration. The objective is to operate the SINAMICS S210 drives as NC axes via the SINUMERIK NC.

SIMOTICS 1FK2

# Prerequisites and additional configuration

To use this application example, the SINUMERIK MCP 483C PN and the interfaces between the NC and the PLC must have been configured so that the simulation axes can be moved, for example by a part program. You will find information about commissioning the NC and the PLC under 3 and commissioning the SINUMERIK MCP 483C PN under \4\.

You will find information about configuring and programming the SIMATIC TP1200 Comfort under \5\ and \6\.

# 1.3 Components used

This application example has been created with the following hardware components:

Table 1-1

Component	Number	Article number	Note
SINUMERIK MCU 1720	1	6FC5222-1AA00-0AA0	-
SINAMICS S210	2	6SL3210-5HB10-1UF0	-
SIMOTICS 1FK2 Motor	1	1FK2102-0AG00-0SA0	-
SIMOTICS 1FK2 Motor	1	1FK2102-0AG10-0SA0	-
SINUMERIK MCP 483C PN	1	6FC5303-0AF22-0AA1	-
SIMATIC TP1200 Comfort	1	6AV2124-0MC01-0AX0	-

This application example has been created with the following software components:

Table	1-2
-------	-----

Component	Version	Note
SINUMERIK MC CNC SW	V1.12	
SINAMICS S210 FW	V5.2	
SINUMERIK MCP 483C PN FW	N/A	GSDML-V2.1-SIEMENS- SINUMERIK-MCPRT- 20161205.XML
SIMATIC TP1200 Comfort SW	V15	
TIA Portal	V15.1 Upd2	
SINAMICS Startdrive Advanced	V15.1 Upd2	
STEP 7 Professional	V15.1 Upd2	
SINUMERIK STEP 7 Toolbox	V15.1 Upd1	
SINUMERIK STEP 7 Motion Control	V15.1 Upd1	
SINUMERIK Integrate Create MyHMI /WinCC	V15.1 Upd1	
WinCC Professional	V15.1 Upd2	
SINUMERIK ONE Operate Commissioning Tool	V4.92	

# 2 Engineering

# 2.1 Hardware setup

Connect the components as shown in Figure 1-1. The SINUMERIK MCP 483C PN and the SIMATIC TP1200 Comfort must be connected to the X160 interface of the SINUMERIK MCU 1720. To operate the SINAMICS S210 as a NC axis, PROFINET IRT must be used. Therefore, the SINAMICS S210 must be connected to the X150 interface of the SINUMERIK MCU 1720 and the interconnection of the remaining interfaces must be consistent with the hardware configuration of the TIA Portal.

**NOTE** In this example, the handwheel of the SINUMERIK MCP 483C PN cannot be used. If you want to use the handwheel, connect the MCP to the X150 interface of the SINUMERIK MCU 1720.

# 2.2 Configuration

# 2.2.1 Configuration of SINUMERIK MCU 1720 and SINAMICS S210 in TIA Portal

Use the TIA Portal to configure the SINAMICS S210 drives.

- 1. As shown in <u>Figure 1-1</u>, connect the SINUMERIK MCU 1720, the SINAMICS S210 drives, and the PG/PC via the X150 network.
- 2. In TIA Portal, add a new SINAMICS S210 device.

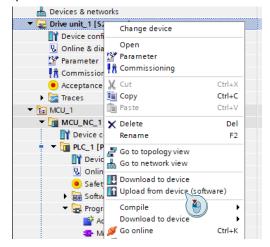
 In the Properties window of the S210 device, enter an IP address and a subnet mask.

In this example:

- IP address: "192.168.0.2"
- Subnet mask: "255.255.255.0"

Drive unit_1 [S210 PN]					
General					
General     PROFINET interface [X150]	Ethernet addresses				
General	Interface networked with				
Ethernet addresses	Subnet: Not networked				
Advanced options	Add new subnet				
Module parameters <ul> <li>Ethernet commissioning int</li> </ul>	IP protocol				
Power Module settings Web server	IP address: 192 . 168 . 0 . 2				
	Subnet mask: 255 . 255 . 255 . 0				

4. Upload the data from the real device to the S210 object.



		s nodes of "Drive unit_"				
	Device	Device type	Slot	Interface type	Address	Subnet
	Drive unit_1	S210 PN	CU X150		192.168.0.2	
		\$210 PN	CU X127	PN/IE	169.254.11.22	
		Type of the PG/PC i	nterface:	PN/IE		•
		PG/PC i	nterface:	Intel(R) PRO/1	000 MT Desktop Adap	iter 💌 🖲
		Connection to interface		Direct at slot 'CL		
			gateway:			
				[	Show all compatible	devices
	Select target devi	ce:			show an compatible	devices
	Select target devi Device	ce: Device type	Interfac	e type Add	dress	Target device
	-		Interfac PN/IE	e type Add		
	-			e type Add	dress	Target device
	-			e type Add	dress	Target device
	-			e type Add	dress	Target device
Flash LED	-			e type Add	dress	Target device
Flash LED	-			e type Add	dress	Target device
Flash LED	-			e type Add	dress	Target device
	Device			e type Add	iress address	Target device
Flash LED	Device			e type Add	dress	Target device
	Device			e type Add	iress address	Target device
	Device			e type Add	iress address	Target device

Start a search for the devices of the X150 network by choosing menu entry "Show all compatible devices".

Select one of the two found devices and activate the "Flash LED" option to signal the active upload at the relevant device.

	Device	Device type	Slot	Interface type	Address	Subnet	
	Drive unit_1	S210 PN	CU X150	PN/IE	192.168.0.2		
		S210 PN	CU X127	PN/IE	169.254.11.22		
		Type of the PG/PC int	erface:	PN/IE			
							) ) 🍙 🕞
		PG/PC int			1000 MT Desktop Adap		) 💎 🔄
	Con	nection to interface/	ubnet:	Direct at slot '0	:U X150'	-	
		1st ga	teway:			Ŧ	) 💎
	Select target device:				Show all compatible	devices	1
	Davica	Device type	Interfer	atura A	deser.	Target devic	-
-11	Accessible device	\$210 PN	ISO	0	0-1C-06-48-5B-81	-	
R	Accessible device	\$210 PN	ISO	0	0-1C-06-48-5B-8C	-	
		-	PN/IE	A	ccess address	-	
Flash LED							
						<u>S</u> tart :	earch
Online status information	:				Display only error n	nessages	
🛓 Found accessible de	vice Accessible device						1
Scan completed. 2 completed.	ompatible devices of 3	accessible devices fo	ound.				
	n retrieval completed.						
🖌 Scan and information							N

Click the "Upload" button to start uploading and wait until uploading has finished.

5. In the Properties window, you can change the drive name, for example to "Axis X".

Axis X [S210 PN]				
General				
General     PROFINET interface [X150]	General			
General				
Ethernet addresses	Basic parameterization: 🔎			
<ul> <li>Telegram configuration</li> </ul>				
Drive control-Telegrams	Project information			
Advanced options				
Module parameters				
Ethernet commissioning int	Name: Axis X			

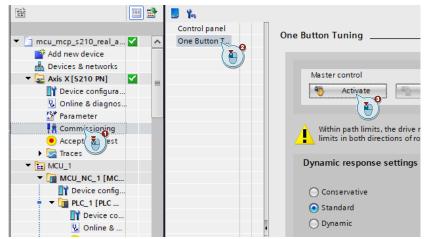
Select the "Generate PROFINET device name automatically" option.

Axis X [S210 PN]	S Properties
General	
General	Router address: 0 . 0 . 0 . 0
<ul> <li>PROFINET interface [X150]</li> </ul>	
General	PROFINET
Ethernet addresses	
<ul> <li>Telegram configuration</li> </ul>	Generate PROFINET device name automatically
Drive control-Telegrams	PROFINET device name: axis x
Advanced options	
Module parameters	Converted name: axxisxaxxb93c
Ethernet commissioning int	Device number:

Download the configuration to the drive.

	<u> </u>	
🔻 ⋥ Axis X [521	Change device	
🕎 Device o		
况 Online 8		
📝 Parame	🚰 Parameter	
👫 Commis	Commissionin	9
🖲 Accepta		Ctrl+X
🕨 🔄 Traces	💼 Copy	Ctrl+C
▼ 🔚 MCU_1	🛅 Paste	Ctrl+V
TIMCU_N	X Delete	Del
📑 Devi	Rename	F2
🕴 🔻 🛅 PLC_	🐙 Go to topology	view
🕎 D	Go to network	
V. 0		
😐 s	L Download to d	
▶ 🙀 S	🚹 Upload from d	evic 🔪 (tware)

- 6. Tune the drive:
  - Go online to the drive. •
  - In the menu, choose "Commissioning" > "One Button Tuning" and then • click the "Activate" button.



Accept the default monitoring time. •

Activate ma	ister control X
<u>.</u>	The master control of the control panel will be activated. This function is only suitable for commissioning, diagnostic and service purposes and may only be used by authorized personnel.
	The following applies when the control panel is active: The safety shutdowns from the higher-level controller have no effect.
	The "Stop with space bar" function is active. Pressing the space bar triggers a quick stop, which, however, cannot be guaranteed in all operating cases. For this reason, there must be a hardware version of the EMERGENCY STOP circuit. You must take the necessary measures to do this. Note: A quick stop is triggered even if you switch to another application or open dialog boxes (e.g. loading another station). Non-observance can result in injury and material damage. The connection between the PC and drive is monitored. If no sign-of-life is received from the PC during this monitoring time, the master control is returned for safety reasons and a coast down of the axis triggered.
	Monitoring time: 2000 ms
	Cancel

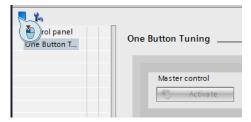
• For "Dynamic response settings" and "Path limitation", select appropriate values according to your application. Then click the "Start" button to begin tuning.

One Button Tuning	
Master control	Optimization
💨 Activate 🔁 Deactivate	Start
Within path limits, the drive must be able to limits in both directions of rotation to max.s	freely traverse without endangering persons and mech peed and to 80% of static motor torque.
Dynamic response settings	Configuration
Conservative	Path limit from 0° to
O Dynamic	Status
	One Button Tuning successfully completed

• Wait until tuning is completed. The result of tuning is displayed.

Oynamic response setting Conservative Standard Dynamic	gs Configuration Path limit from 0° to 1,080 °		Ext	ended se
Optimization result	Status           One Button Tuning	successfully complete	c Controller pa	rameters
Number		Previous value	Current value	Jnit
p1460[0]	P gain	0.0037	0.0035	
p1462[0]	Integral time	3.31	3.23	
p1498[0]	Load moment of inertia	0.000000	0.000000	
r5276[0]	Kv factor estimated	0.00	30.98	
r5277[0]	Precontrol symmetrizing time estimated	0.00	0.27	

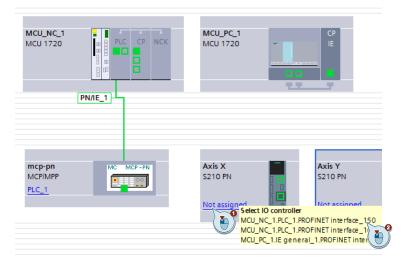
• Save the drive data retentively.



- 7. Repeat steps 2 to 6 for the other drive with the following settings:
  - IP address: 192.168.0.3
  - Drive name: "Axis Y"

-

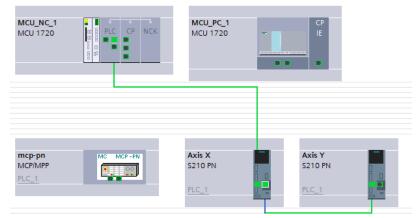
8. In the network view, assign both drives "Axis X" and "Axis Y" to the X150 interface of the SINUMERIK MCU 1720 PLC.



In the topology view, connect the X150 interfaces according to the real hardware wiring.

In this example:

- PLC\_1 X150.P1 → Axis X X150.P1
- Axis X X150.P2  $\rightarrow$  Axis Y X150.P1



- 9. In the Properties window of the PLC, configure the real-time settings:
  - Synchronization role: "Sync master"
  - Send clock: "2 ms"

<ul> <li>Fail-safe</li> <li>PROFINET interface [X150]</li> </ul>	^		Real time settings		
<ul> <li>PROFINE I Internace [X150]</li> <li>General</li> </ul>					
			> > IO communication		
F-parameters					
Ethernet addresses					
Time synchronization		Send clock: 2.000			
Operating mode					
<ul> <li>Advanced options</li> </ul>			> > Synchronization		
Interface options					
Media redundancy					
<ul> <li>Real time settings</li> </ul>	-	Sync domain: Sync-Domain_1			
IO com 🔪 ic		Ш	Synchronization role: Sync master		
Synchr		Ш	RT class: RT,IRT		
Real time opt					

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- 10. Configure the SINAMICS S210:
  - In the Properties window of the PROFINET interface, configure "Send (Actual value)" for the telegram:
    - Telegram: "SIEMENS telegram 105"
    - Start address: "I 1800" (X axis)
      - "I 1820" (Y axis)
    - Process image: "PIP NCK"
  - The telegram settings for "Receive (Setpoint)" will be adjusted automatically.
  - Configure the RT class as IRT.

PROFINET interface [PROFINE]	1)			Properties	🗓 Info 🕕 🔮 Diagnostics
General IO tags Sys	tem constants Texts				
General		Drive		Partner	
Ethernet addresses	Name	Drive control-Telegrams		→ PLC_1	
<ul> <li>Telegram configuration</li> <li>Drive control-Telegrams</li> </ul>	Role	Device		Controller	
Send (Actual value)	IP address	192 . 168 . 0 . 2		192.168.0.1	
Receive (Setpoint) ( 🍋 )	Telegram	SIEMENS telegram 105			
Advanced options	Slot	3			
	Start address	PZD 1		1 1800	
	Length	10	words	10	words
	Extension			-	
	Organization block				
	Process image			PIP NCK	-
	Trocess mage			TH THEN	
PROFINET interface [PROFINET	1			Properties	Info 🚯 😼 Diagnostics 👘 👘
General IO tags Syst	tem constants Texts				
General	Drive control-Telegrams				
Ethernet addresses  Telegram configuration					
Drive control-Telegrams	Send (Actual value)				
Send (Actual value)		Drive		Partner	
Receive (Setpoint	Name	Drive control-Telegrams	→	PLC_1	
Advanced options	Role	Device		Controller	
	IP address	192.168.0.3		192.168.0.1	
		SIEMENS telegram 105			•
	Slot				
	Start address			1 1820	
	Length		words	10	words
	Extension			-	
	Extension				
	Organization block				
	Process image			PIPINCK	

11. Compile and download the HW configuration to the PLC.

# 2.2.2 Configuring the NCK with the SINUMERIK ONE Operate commissioning tool

Configure the NCK MDs in such a way that the NCK can control the SINAMICS S210 drives.

- 1. Link the PLC start address of the X axis and Y axis of the SINAMICS S210 drives to the NCK:
  - MD13050[0] \$MN\_ DRIVE\_LOGIC\_ADDRESS = 1800
  - MD13050[1] \$MN\_DRIVE\_LOGIC\_ADDRESS = 1820

Assign the telegram types of the SINAMICS S210 drives to the NCK:

- MD13060[0] \$MN\_DRIVE\_TELEGRAM\_TYPE = 105
- MD13060[1] \$MN\_DRIVE\_TELEGRAM\_TYPE = 105
- 2. Change the mode of the axes from "Simulation axis" to "Real axis":
  - MD30130[0] \$MA\_CTRLOUT\_TYPE = 1
  - MD30240[0] \$MA\_ENC\_TYPE = 1
  - MD32250[0] \$MA\_RATED\_OUTVAL = 100%
- 3. Reset the NCK.

Now the two real axes with SINAMICS S210 can be moved in JOG mode or controlled by a part program.

### 3 Appendix

#### 3.1 Service and support

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support.industry.siemens.com/cs/ww/en/sc/2067

# 3.2 Links and literature

Table 3-1

No.	Торіс					
\1\	Siemens Industry Online Support https://support.industry.siemens.com					
\2\	Link to this entry page of this application example https://support.industry.siemens.com/cs/ww/en/view/109769849					
\3\	SINUMERIK MC MCU commissioning: NC, PLC, Drive Commissioning Manual https://support.industry.siemens.com/cs/document/109769920					
\4\	SINUMERIK 840D sl Operator Components and Networking Manual https://support.industry.siemens.com/cs/document/109736205					
\5\	SINUMERIK 840D sI SINUMERIK Integrate Create MyHMI /WinCC V15.1 Configuration Manual https://support.industry.siemens.com/cs/document/109763525					
\6\	SIMATIC HMI HMI devices Comfort Panels Operating Instructions https://support.industry.siemens.com/cs/document/49313233					

# 3.3 Change documentation

Table 3-2

Version	Date	Modifications
V1.0	08/2019	First version