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2

# Configuring a SINAMICS S120 with Startdrive >= V15

SINAMICS S120

https://support.industry.siemens.com/cs/ww/en/view/109743270

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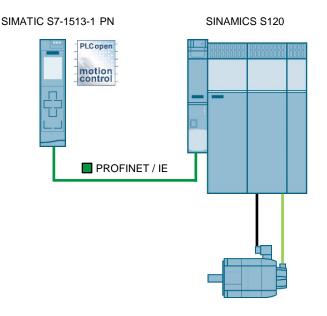
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# 1 Introduction

## 1.1 Overview

SIMATIC S7-1500 CPUs support the connection of drives as a speed, positioning or synchronous axis via PROFINET, PROFIBUS or an analog drive connection. TIA Portal V15 (or higher) additionally provides the option to insert a SINAMICS S120 drive into a TIA Portal project using the "SINAMICS Startdrive" software.

Figure 1-1: Components overview



In this application example, a SINAMICS S120 is operated as a position-controlled drive. This drive is to act as the master axis for a second drive configured with gearing. The configuration of the drives is created with "SINAMICS Startdrive".

## 1.2 Components used

This application example was created with the following hardware and software components:

Table 1-1: Hardware and software compon-	ents
------------------------------------------	------

Component	No.	Article no.	Note
SIMATIC S7-1513-1 PN	1	6ES7513-1AL01-0AB0	Alternatively, a different S7-1500 controller can be used.
SINAMICS Control Unit CU320-2 PN	1	6SL3040-1MA01-0AA0	-
SINAMICS S120 smart line module	1	6SL3130-6AE15-0AA0-Z	-
SINAMICS S120 double motor module	1	6SL3120-2TE13-0AA0-Z	-
Sensor module SMC20	1	6SL3055-0AA00-5BA1	-
Synchronous motor with incremental encoder without DRIVE-CLIQ interface	1	1FK7022-5AK71-1AG3	_
Synchronous motor with absolute encoder with DRIVE-CLIQ interface	1	1FK7022-5AK71-1LG0	-
STEP 7 Professional V15.1	1	6ES7822-105	-
SINAMICS Startdrive V15.1	1	6SL3072-4FA02-0X	-

This application example consists of the following components:

Table 1-2: Components of the application example

Component	Note
109743270_SINAMICS_S120_TIA_PROJ_v120.zip	This zip file contains the STEP 7 TIA Portal V15.1 project.
109743270_SINAMICS_S120_TIA_DOCU_V120.pdf	This document.

## 2.1 How the user program works

## **S7-1500 Motion Control**

S7-1500 Motion Control supports controlled positioning and moving of axes and is an integral part of each S7-1500 CPU. The S7-1500T technology CPU provides additional motion control functions.

The motion control functionality supports the following technology objects:

- Speed Axis
- Positioning Axis
- Synchronous Axis
- External Encoder
- Output Cam and Cam Track (version 3.0 or higher)
- Cam (S7-1500T: version 3.0 or higher)
- Kinematics (S7-1500T: FW 2.5 or higher)

Drives with PROFIdrive support and analog setpoint interface are controlled using standardized motion control instructions according to PLCopen.

The axis control panel and comprehensive online and diagnostics functions support the commissioning and optimization of drives.

This application example implements position-controlled operation of a SINAMICS S120 drive with the "Positioning Axis" technology object. In addition, it includes the configuration of a "synchronous axis".

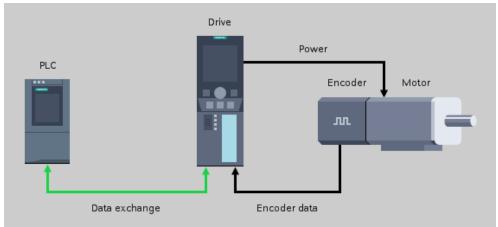


Figure 2-1: Configuration as a positioning axis

Note

Chapter <u>2.3.2</u> describes the configuration of the "Positioning Axis" and "Synchronous Axis" technology objects.

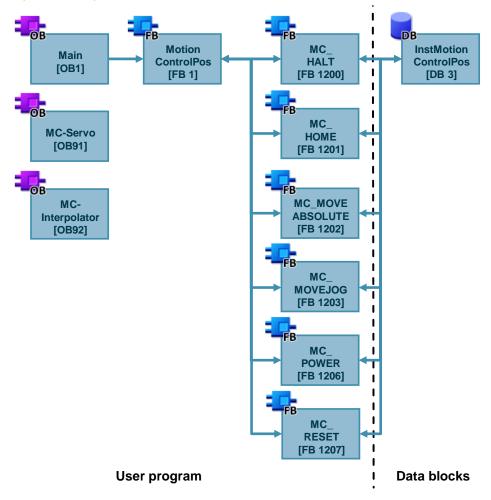
## Structure of the user program for the master axis

In this application example, the SINAMICS S120 servo drive acting as the master axis is configured as a "positioning axis". A user program provides you with the option to operate this position-controlled drive with the aid of motion control instructions. To this end, the following instructions were inserted into the program:

- MC\_HALT (FB 1200)
- MC\_HOME (FB 1201)
- MC\_MOVEABSOLUTE (FB 1202)
- MC\_MOVEJOG (FB 1203)
- MC\_POWER (FB 1206)
- MC\_RESET (FB 1207)

The motion control instructions for the master axis are called in the "MotionControlPos" function block (FB 1). This function block uses the "InstMotionControlPos" instance (DB 3).

Figure 2-2: Program structure for the master axis



#### Structure of the user program for the slave axis

In this application example, the SINAMICS S120 drive acting as a slave axis is configured as a "synchronous axis". In the user program, with the aid of the "MC\_GEARIN" motion control block, the slave axis can be synchronized with the master axis configured as a "positioning axis".

To this end, the following motion control instructions were inserted into the program:

- MC\_POWER (FB 1206)
- MC\_RESET (FB 1207)
- MC\_GEARIN (FB 1208)

The motion control instructions for the slave axis are called in the "MotionControlSyn" function block (FB 2). This function block uses the "InstMotionControlSyn" instance (DB 4).

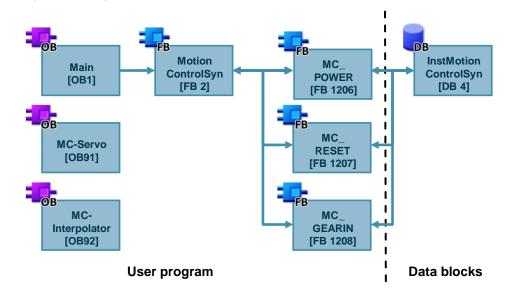


Figure 2-3: Program structure of the slave axis

**Note** For information about the motion control blocks, refer to the TIA Portal Online Help or the "SIMATIC S7-1500 Motion Control in TIA Portal" Function Manual <u>\3</u>.

https://support.industry.siemens.com/cs/ww/en/view/109749262

A watch table is available for operating the two drives using the motion control instructions. This table is shown in Chapter 2.5.3.

## 2.2 Configuring the SINAMICS S120

TIA Portal V15 (and higher) provides the option to configure the SINAMICS S120 drive with the "SINAMICS Startdrive" option package and control it using motion control instructions.

## 2.2.1 Configuring the SINAMICS S120 (offline)

**Note** Chapter <u>2.3.1</u> provides a detailed description of the offline configuration of the SINAMICS S120.

The offline configuration of the SINAMICS S120 is created in the "Device view" of your TIA Portal program. This is where you have to insert and connect the individual components of the SINAMICS S120 drive. The following figure shows the configuration of the SINAMICS S120 demonstration unit (article number: 6ZB2480-0BA00).

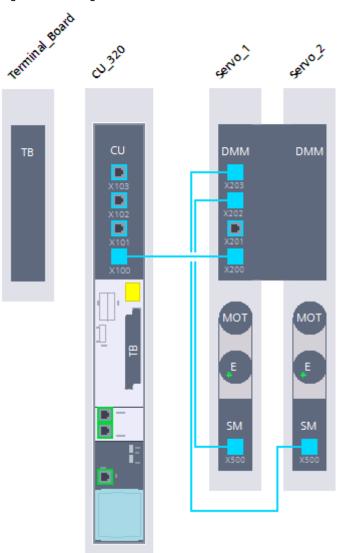


Figure 2-4: Configuration of the SINAMICS S120

The "Device overview" lists the used components of the SINAMICS S120 drive.

Device overview					
<b>**</b>	Module	Slot	Туре	Article no	Drive
	<ul> <li>Drive control</li> </ul>				1
	CU_320		CU320-2 PN	6SL3040-1MA01-0Axx	1
	<ul> <li>Drive axis_1</li> </ul>				2
	Motor Module_1		Double Motor Module Booksize	6SL3120-2TE13-0Axx	2
	Encoder evaluation_1		SMI20	1FK7022-xAK7x-xLGx	6
	Measuring system_1		EnDat 2.1 encoder	1FK7022-xAK7x-xLGx	5
	Motor_1		1FK7 synchronous motor	1FK7022-xAK7x-xLGx	4
	<ul> <li>Drive axis_2</li> </ul>				3
	Motor Module_1		Double Motor Module Booksize	6SL3120-2TE13-0Axx	3
	Encoder evaluation_1		Sensor Module Cabinet SMC20	6SL3055-0AA00-5Bxx	9
	Measuring system_1		SIN/COS encoder	1FK7022-xAK71-xAGx	8
	Motor_1		1FK7 synchronous motor	1FK7022-xAK71-xAGx	7
	<ul> <li>Input/output object_1</li> </ul>				4
	Terminal Board_1		Terminal Board TB30	6SL3055-0AA00-2Txx	10

#### Figure 2-5: Device overview

# **Note** For more information about the configuration, refer to the "SINAMICS S120 Commissioning Manual with Startdrive", <u>\5\</u>.

https://support.industry.siemens.com/cs/ww/en/view/109743147

## 2.2.2 Downloading the SINAMICS S120 configuration (online)

SINAMICS Startdrive also provides the option to download the configuration of the used SINAMICS S120 station to a TIA Portal project. The following table describes the steps necessary to do this.

Table 2-1: Downloading the drive configuration

No.	Action	Comment
1.	In the "Network view" of your TIA Portal project, insert a SINAMICS CU320-2 PN.	Connections     Metwork view     Search>     Connection     Metwork     Stoc Cu320-2 PN     SilvaMcCS drives     SilvaMcS drives     SilvaMcS drives     SilvaMcS drives     SilvaMcS drives     SilvaMcS drives     SilvaMcS for States     Silv
2.	Assign a PROFINET subnet to the CU320- 2 PN and assign the device name and the IP address according to the drive you are using.	Topology view Metwork view [] Network 12 Connections HMI connection v Prive S120 CU320-2 PN v S120 CU320-2 PN v Not assigned v PN/E_1 Drive [S120 CU320-2 PN] v PN/E_1 PN/E_1 PN/E_1 PN/E_
3.	<ol> <li>In the product window, select the drive.</li> <li>Download the configuration of the SINAMICS S120 drive to your TIA Portal project.</li> </ol>	Project Edit View Insert Online Options Tools Window Help Save project  Save project
4.	The drive configuration is downloaded to the TIA Portal project.	Upload from device  Loading configuration from device  Creation of the drive objects: Finished Creation of the parameters file: 5%  Cancel

No.	Action	Comment
5.	When the configuration has been successfully downloaded, establish an online connection to the drive.	Project Edit View Insert Online Options Tools Windo Save project  Gonnline  Devices & networks  Culton Configuration  Online & diagnostics  Culton Culton  Parameter  Commissioning  Diagnostics  Servo_2  Parameter  Commissioning  Diagnostics  Cambrid Commissioning  Cambrid Commissioning
6.	Commission the drive online and finally save this data to the drive's non-volatile memory.	<ul> <li>Drive [S120 CU320-2 PN]</li> <li>Device configuration</li> <li>Online &amp; diagnostics</li> <li>Cu_320</li> <li>Parameter</li> <li>Parameter</li> <li>Commissioning</li> <li>Diagnostics</li> <li>Servo_2</li> <li>Parameter</li> <li>Commissioning</li> <li>Diagnostics</li> <li>Servo_2</li> <li>Parameter</li> <li>Commissioning</li> <li>Diagnostics</li> <li>Parameter</li> <li>Tarces</li> </ul>
7.	Close the online connection and then re- download the drive configuration to your TIA Portal project.	
8.	Save the TIA Portal project.	-

## Note

The configuration of the SINAMICS S120 drive can only be downloaded to a TIA Portal project if the drive is not assigned to a controller.

<b>Drive</b> S120 CU320-2	PN (
Not assigned	

## 2.3 Configuring the hardware

The following tables describe the steps for configuring the SIMATIC S7 CPU and the SINAMICS S120 drive. This requires that you have installed the software on your PG/PC as described in <u>Table 1-1</u>.

## 2.3.1 Configuring controller and drive

Table 2-2: Configuring controller and drive

No.	Action	Comment
1.	Open TIA Portal and create a new project.	Siemens         Project       Edit       View       Insert       Online       Options         Save project       Save project       Save Project       Save Project       Save Project       Save Project
2.	Double-click "Add new device".	Project tree       ■         Devices       ■         ●       SINAMICS_S120         ●       Add new device         ●       Devices & networks
3.	<ol> <li>Insert your desired controller:</li> <li>Select "Controller".</li> <li>Select the desired CPU.</li> <li>Then click "OK".</li> </ol>	Add new device       X         Device name:       PLC_1         PLC_1       Image: Controller         Image: Controller       Image: Controller         Image: Controller

No.	Action	Comment
4.	Open the "Network view" and insert a new subnet. In the controller "Properties", set the desired network address.	Image: Topology view       Network view       Topology view         Image: Network       Connections       HMI connection       Image: Network view
5.	Add the SINAMICS S120 CU320-2 PN and connect it to the SIMATIC controller.	Sustain nouver simply      Consistent into Consistent interface (X1)      Constant interface (X1)      Constant interface (X1)      Constant interface interface (X1)      Constant interface (X1)      C
6.	<ol> <li>Select the assignment option of the SINAMICS S120.</li> <li>Assign the drive to the controller you are using.</li> </ol>	PLC CPU 1513-1 PN
7.	Open the topology view and connect Port_2 [X1.P2] of the SIMATIC controller to Port_1 [X1.P1] of the SINAMICS S120.	PLC CPU 1513-1 PN

No.	Action	Comment
8.	In the "Device view", configure the SINAMICS S120. Insert a "double motor module" into the device view. (The infeed of the SINAMICS S120 used in this application example does not have a DRIVE-CLIQ interface. Consequently, the infeed is not configured at this point.	CU_320 [\$120 CU320-2 PM]   CU_320 [\$120 CU320-2 PM]     CU_320 [\$120 CU320-2 PM]     CU_320 [\$120 CU320-2 PM]     CU_320 [\$120 CU320-2 PM]     CU_320 [\$120 CU320-2 PM]     CU_320 [\$120 CU320-2 PM]     CU_320 [\$120 CU320-2 PM]     CU_320 [\$120 CU320-2 PM]     CU_320 [\$120 CU320-2 PM]     CU_320 [\$120 CU320-2 PM]     CU_320 [\$120 CU320-2 PM]     CU_320 [\$120 CU320-2 PM]     CU_320 [\$120 CU320-2 PM]     CU320 [\$1
9.	In the motor module properties, you can change the motor module name.	U 203 U 203 V
10.	<ol> <li>In the Device view, select the motor module.</li> <li>In the double motor module properties, select the module you are using.</li> </ol>	Image: Construction of the second

No.	Action	Comment
11.	<ol> <li>From the catalog, insert a 1FK7 synchronous motor into the first motor module.</li> <li>In the motor properties, select the module you are using.</li> </ol>	Coptions
12.	Leave the SMI20 signal module unchanged.	CU_320 [S120 CU320-2 PN]       Image: Cuse of the second sec
13.	<ol> <li>From the catalog, insert another 1FK7 synchronous motor into the second motor module.</li> <li>In the motor properties, select the module you are using.</li> </ol>	Clustor view     Network view     N

No.	Action	Comment
14.	As the signal module in the second motor module, select the SMC20.	Image: CU_320 (5120 CU320-2 PN)         Image: CU_320 (5120 CU320-2 PN)         Image: CU_320 CU320-2 PN)         Image: CU_320-2 PN)         Image: CU_320-2 PN PN)         Image: CU_320-2 PN PN)         Image: CU_320-2 PN PN)         Image: CU_320-2 PN PN PN)         Image: CU_320-2 PN P
		Sensor Module
		General IO tags System constants Texts General
		Encoder evaluation - Selection ect Article number Filter> - Gilter> - Gilter - Gilt
15.	Insert the TB30 Terminal Module into the Device view and finally check the DRIVE-CLiQ connections.	CU_320 [5120 CU320-2 PM]  CU_320 [5120 CU320
16	The "Device eveniew" lists the	Image: State of the state
16.	The "Device overview" lists the components used.	Yi         Module         Site         Type         Anticleno         Drive           ▼ Orive control         1         1         1         1         1
		Drive axis_1     Vetor Module_1     Double Motor Module Booksize     SSL3120-2TE13-04xx 2     DRIVE-CLIQ interface     DRIVE-CLIQ interface
		Motor_1 1FK7 Synchronous motor 1FK7022-wK7.hvLGx 4 ▶ Encoder evaluation_1 SM20 1FK7022-wK7.hvLGx 6 Measuring system_1 EnDet 2.1 encoder 1FK7022-wK7.vLGx 5
		Drive axis_2     Motor Module_1     Double Motor Module Booksize     65L3120-27E13-0Axx     3
		Motoc_1         17K7 synchronous motor         17K702234K7149Ka         7           Incoder evaluation_1         Sensor Module Cabites MC20         6530594A00559x         9           Messuring system_1         SINICOS encoder         17K702234K7134Ga         8           * Inproductupt object_1         SINICOS encoder         17K702234K7134Ga         4
47		Pinpubosoto ejecc, 1     Terminal Board TB30     65L30550A600-2Tex     10  General
17.	In the "Device view", select the CU_320-2 PN. In "Telegram configuration", set	General - CU_220 (5/20 CU20-2 Pi)]  - Telegram configuration - General
	SIEMENS telegram 105 for the motor modules.	PROFINETInterface [X150]     Interface [X150]     General     Crine control-Telegram 1     Ethermet addresses     Send (Actual value)     Free telegram     Receive (Setpoint)     Free telegram
		Drive control-freign      Drive asiz_1-freigrams     Drive asiz_1-freigrams     Drive asiz_1-freigrams     Drive asiz_1-freigrams     Send (citcal value)     StELENS telegram 105     SELEXIS telegram 105
		Advanced options     Module parameters     Hardware identifier     Send (Actual value)     Recive (Setpoint)     SEMENS telegram 105
18.	Enable "Isochronous mode" in "Advanced options" - "Isochronous mode".	General  Gen
		Isochronous mode         values):         0         ms (=)           / Mod line settings         Intervals:         0.125           / Fort (V15 0P2)         Imme To (cuptor process values):         0         ms (=)           / Module parameters         Intervals:         0.125         ms (=)

No.	Action	Comment			
19.	In the "Parameter view", you can access	Project tree	SINAMICS \$120	CU_320 [\$120 CU320-2 PN] + Motor +	Parameter
19.	In the Parameter view, you can access	Devices		Sh Functi	on view
	parameters of the drive.	19	Display extended parameters 💌 🍃 🗒 🏠 🚡		
			Number	Parameter text	Value
		<ul> <li>SINAMICS_S120</li> </ul>	p187[0]	Encoder 1 encoder data set number	9
	Add new device	p188[0]	Encoder 2 encoder data set number	8	
	Devices & networks	p189[0]	Encoder 3 encoder data set number	8	
	PLC [CPU 1513-1 PN]	▶ r192	Power unit firmware properties 1		
	CU_320 [\$120 CU320-2 PN]	r193	Power unit firmware properties 2		
		Device configuration	p199[0]	Drive object name	9
	😼 Online & diagnostics	r200[0]	Power unit code number actual		
	EU_320	p201[0]	Power unit code number	8	
		🕶 🚘 Motor	r203[0]	Actual power unit type	
		Parameter	▶ r204[0]	Power unit hardware properties	
		Commissioning	r206[0]	Rated power unit power, Rated value	
		Ciagnostics	▶ r207[0]	Rated power unit current, Rated value	
20.	Save the configuration.			-	

## 2.3.2 Configuring the technology objects

Two technology objects are configured for this application example.

- 1. One "positioning axis" for operation as the master axis.
- 2. One "synchronous axis" for operation as a slave axis.

Table 2-3: Configuring the technology object

No.	Action	Comment
1.	<ul> <li>Insert the "Positioning Axis" technology object ("TO_PositioningAxis") for the master axis into the control project.</li> <li>Select the "Positioning Axis" technology object.</li> <li>Then click "OK".</li> </ul>	Add new object       X         Name:       Positioning-vis         Positioning-vis       Type:         Weison Control       Type:         Weison Control       Type:         TO_SpeedAvis       Number:         TO_Cammads       Vul         TO_Cammads       Vul         TO_Cimmadics       Vul         To_Cimmadics       Vul         To_Cimmadics       Vul         To_Cimmadics       Vul         To_Cimmadics       Number:         Sitiviticitent       Vul         Sitiviticitent
2.	In "Hardware interface", "Drive", "Drive type", select PROFIdrive. In "Drive", select the desired motor module of the SINAMICS S120.	Drive
3.	In "Hardware interface", "Encoder", "Encoder", select the desired encoder module of the SINAMICS S120. In addition, enter the encoder type you are using.	Encoder

No.	Action	Comment
4.	In "Data exchange with the drive", "Drive telegram", enter telegram 105. Check "Automatically apply drive values at runtime (online)".	Data exchange with the drive
5.	In "Data exchange with encoder", "Encoder telegram", enter telegram 105. Check "Automatic data exchange for encoder values (online)".	Data exchange with encoder Pute Power Pute Pute exchange Data exchange Encoder telegram 105 Mutamatic data exchange for encoder values (offine) Automatic data exchange for encoder values (offine) Mutamatic data exchange for encoder values (offine) Mutamatic data exchange for encoder values (offine)
6.	<ul> <li>Insert the "Synchronous Axis" technology object ("TO_SynchronousAxis") for the slave axis into the control project.</li> <li>Select the "Synchronous Axis" technology object.</li> <li>Then click "OK".</li> </ul>	Add new and open     Name       Add new and open
7.	In "Hardware interface", "Drive", "Drive type", select PROFIdrive. In "Drive", select the desired motor module of the SINAMICS S120.	Drive

No.	Action	Comment
8.	In "Hardware interface", "Encoder", "Encoder", select the desired encoder module of the SINAMICS S120. In addition, enter the encoder type you are using.	Encoder Drive Power Motor
9.	In "Data exchange with the drive/encoder", select telegram 105 (see steps 4 and 5).	-
10.	In "Leading value interconnections" add "PositioningAxis" to the list of possible leading values	bsic parameters
11.	Open the settings of the organization block "MC-Servo" and set the application cycle in "Cycle time" to "Synchronous to the bus".	General       Texts         General       Information         Information       Cycle time         Time stamps       Cyclical         Completion       Application cycle (ms)         Attributes       Ostributed I/O:         Cycle time       Distributed I/O:         PROFINET IO-System (100)       Send clock (ms)         Factor:       1         Application cycle (ms)       1
12.	Save the configuration.	-

## 2.3.3 Creating the S7 program

Chapter 2.1 shows the structure of the user program and the motion control instructions used. The following table shows how to create these programs.

**Note** Perform the steps in the following table for each drive object (master and slave axis).

Table	2-4.	Creating	the	<b>S</b> 7	program
rabie	Δ-Τ.	Creating	uie	01	program

No.	Action	Comment
1.	<ol> <li>Insert a function block into the program.</li> <li>Select the "function block".</li> <li>Set the desired address and programming language of the block.</li> <li>Select "OK" to confirm.</li> </ol>	Add new block       X         Name:       MacinoCantrol         Image:       Image:         Organization       Image:         Image:       Image:
2.	In "Instructions", open the "Motion Control" folder.	Options     Instructions       > Favorites     Instructions       > Basic instructions     Instructions       > Technology     Instructions       Name     Description       > PID Control     V3.2       > Motion Control     V4.0       Image: Moc_Power     Enable, disable technol V4.0
3.	From the "Motion Control" folder, insert the desired instructions into the function block created in step 1 of this table.	SINAMCS_S120     MationControl       Main Control     Name     Data type       Devices & networks     Image: Configuration       Devices & networks     Image: Configuration       Device configuration     Image: Configuration       Device sona diagnostics     Image: Configuration       Image: Configuration     Image: Configuration

No.	Action	Comment
4.	<ul> <li>When inserting the motion control instructions, use the multi-instance option.</li> <li>Advantages of the multi-instance option: <ul> <li>Lower number of instance DBs</li> <li>Easy programming of local subprograms</li> <li>Good structuring option for complex blocks</li> </ul> </li> </ul>	Call options       Multiple instance         Name in the interface       Mc_POWER_Instance         Single       If Power instance is a west its data in the instance data block the calling function block and not in its own instance data block. This allows you to concentrate the instance data block and to get by fewer instance data blocks in your program.         Multiple instance       If Power instance data block of the calling function block and to get by fewer instance data blocks in your program.         Multiple instance       If Power instance data block is not power program.         Multiple instance       If Power instance data block is not power program.         Multiple instance       If Power instance data block is not power program.         Multiple instance       If Power instance data block is not power program.         Multiple instance       If Power instance data block is not power program.         Multiple instance       If Power instance data block is not power program.         Multiple instance       If Power instance data block in your program.         Multiple instance       If Power instance         Multiple instance <t< td=""></t<>
5.	Call the function block with the motion control instructions in the OB1 organization block.	CPU 1513-1 PN     Device configuration     Online & disgnostics     Add new block     Add new block     Moin (OB1)     MolineControl (B82)     MotionControl [B83]
6.	Save the configuration.	-

## 2.4 Installation and startup

## 2.4.1 IP addresses and device names

Table 2-5: IP addresses and device names

Components	Device name	IP addresses
SIMATIC S7 1513-1 PN	PLC	192.168.0.1
SINAMICS S120 CU320-2 PN	Drive	192.168.0.10
PG/PC	-	192.168.0.200

The network mask is always 255.255.255.0 and no router is used.

## 2.4.2 Settings on the PG/PC

To connect the components of the application example to your development system (PG/PC), assign a static IP address to the PG/PC's network card.

Figure 2-6:	Network card	settings
-------------	--------------	----------

Local Area Connection Properties	× 1
Networking	
Connect using:	
Intel(R) PRO/1000 MT Network Connection	Internet Protocol Version 4 (TCP/IPv4) Properties
This connection uses the following items:	General         You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.         O Obtain an IP address automatically         IP address:         Subnet mask:         Default gateway:         Obtain DNS server address automatically         Obtain DNS server address automatically         IP address:         IP address:         Subnet mask:         Default gateway:         Obtain DNS server address automatically         Use the following DNS server addresses:         Preferred DNS server:       .         Alternate DNS server:       .         Validate settings upon exit       Advanced

These settings ensure that the components of the application example are reachable.

## 2.4.3 Downloading the project to the components

No.	Action	Comment
1.	Unzip the "109743270_SINAMICS_S120_TIA _PROJ_v10.zip" file to a local directory.	-
2.	Double-click the ap15 file in the project folder you have just unzipped to open the project in TIA Portal.	-
3.	If TIA Portal opens in the Portal view, go to the bottom left to select the "Project view".	<ul> <li>Help</li> <li>Wser interface language</li> <li>Project view</li> </ul>
4.	<ul> <li>Download the SIMATIC controller program:</li> <li>1. In the project tree, select the S7 controller.</li> <li>2. Download the project to the controller.</li> </ul>	Project Edit View Insert Online Options Tools Window  Project tree  Project tree  Devices  Add new device  Add new device  Devices & networks  Devices & networks  Dim PLC [CPU 1513-1 PN]  Dim Drive [S120 CU320-2 PN]  Di
5.	<ul> <li>Download the configuration of the SINAMICS drive:</li> <li>1. In the project tree, select the drive.</li> <li>2. Download the project to the drive.</li> </ul>	Project Edit View Insert Online Options Tools Window Project tree Project tree Devices SINAMICS_S120 Add new device Devices Add new device Devices Add new device Component device Component device Common data

## 2.5 Operation

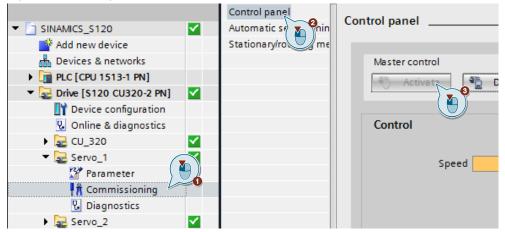
There are three options to operate the drive:

- The drive's control panel in Startdrive.
- The axis control panel in the technology object.
- A watch table in the control program.

## 2.5.1 Drive control panel

If you do not transfer the control program, you can operate the drive using a control panel in the Startdrive configuration.

Figure 2-7: (	Opening	the drive	control	panel



The control panel in Startdrive provides you with the option to operate the drive at a specified speed. It displays status messages and actual values of the drive. In addition, the control panel is where you acknowledge active fault messages.

#### Figure 2-8: Drive control panel

Speed 100.00 rpm		
Speed 100.00 rpm		
speed roo.oo ipin	Off Stop Backv	ward Forward
*	Jog backward	Jog forward
Drive status	Actual values	
Ready for switching on Operation enabled		
		Speed 0.0 rpm
Stationary/rotating measurement		Motor current 0.00 Arms
🛛 Fault 📃 Missing enables		Torque utilization 0.0 %
Active fault	Output frequency	▼ 0.0 Hz
Acknowledge faults	Output voltage	▼ 0.0 Vrms

## 2.5.2 Axis control panel

When you have transferred the control program, the technology object's axis control panel is available to you. It is located in the "Commissioning" folder of the technology object.



The axis control panel offers the following "operating modes":

- Homing
- Set home position
- Jog
- Velocity specification/speed setpoint
- Positioning relative and positioning absolute

Figure 2-10: Axis control panel of the technology object

Master control:		is:		Op	erating mode:	
🎨 Activate	eactivate	Enable 🛛 🕄 D	isable	Pos	itioning absolute	•
Control						
Target position:	480.0 mm	Acceleration:	1000.0	mm/s²	Start	Stop
Velocity:	50.0 mm/s	Deceleration:	1000.0	mm/s²		
		Jerk:	200000.0	mm/sª		
Axis status					Current values	
Drive ready		nabled				
Error		lomed	More		Position:	480.091 mm
					Velocity:	0.0 mm/s
Active errors:	0					
	🥏 Confirm					
Alarm display	7					

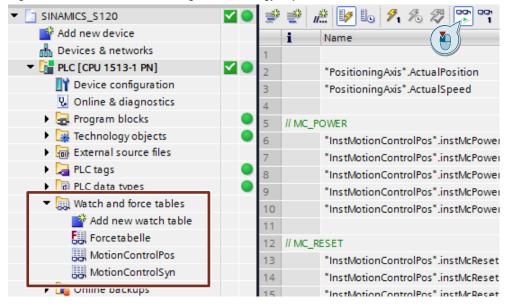
# **Note** For information on how to use the axis control panel, refer to the "SIMATIC S7-1500 Motion Control in TIA Portal" Function Manual, $\underline{3}$ .

https://support.industry.siemens.com/cs/ww/en/view/109749262

## 2.5.3 Watch tables

You use the watch tables to operate the motion control blocks. These blocks allow you to position the master axis. In addition, you can synchronize the slave axis with the master axis.

Establish an online connection to the SIMATIC controller and open a watch table. Figure 2-11: Watch tables for using the technology objects



The "MotionControlSyn" watch table is used to control the slave axis. Using the "MC\_GEARIN" motion control instruction, it can be synchronized with the master axis.

Figure 2-12: "MotionControlSyn" watch table

	i	Name	Display format	Monitor value	Modify value
1					
2		"SynchronousAxis".ActualPosition	Floating-point number	253.675	
3		"Synchronous Axis". Actual Speed	Floating-point number	108.053673058748	
4					
5	// MC_P	OWER			
6		"InstMotionControlSyn".instMcPower.Enable	Bool	TRUE	TRUE
7		"InstMotionControlSyn".instMcPower.Status	Bool	TRUE	
8		"InstMotionControlSyn".instMcPower.Busy	Bool	TRUE	
9		"InstMotionControlSyn".instMcPower.Error	Bool	FALSE	
10		"InstMotionControlSyn".instMcPower.Errorld	Hex	16#0000	
11					
12	// MC_R	ESET			
13		"InstMotionControlSyn".instMcReset.Execute	Bool	FALSE	FALSE
14		"InstMotionControlSyn".instMcReset.Done	Bool	FALSE	
15		"InstMotionControlSyn".instMcReset.Busy	Bool	FALSE	
16		"InstMotionControlSyn".instMcReset.Error	Bool	FALSE	
17		"InstMotionControlSyn".instMcReset.Errorld	Hex	16#0000	
18					
19	// MC_G	EARIN			
20		"InstMotionControlSyn".instMcGearin.Execute	Bool	TRUE	TRUE
21		"InstMotionControlSyn".instMcGearin.RatioNumerator	DEC+/-	1	
22		"InstMotionControlSyn".instMcGearin.RatioDenominator	DEC+/-	1	
23		"InstMotionControlSyn".instMcGearin.Busy	Bool	TRUE	
24		"InstMotionControlSyn".instMcGearin.InGear	Bool	TRUE	
25		"InstMotionControlSyn".instMcGearin.Error	Bool	FALSE	
26		"InstMotionControlSyn".instMcGearin.Errorld	Hex	16#0000	

The "MotionControlPos" watch table is used to control the master axis configured as a "positioning axis". Move this axis using the "MC\_MOVEABSOLUTE" absolute positioning command or the "MC\_MOVEJOG" JOG function.

	i	Name	Display format	Monitor value	Modify value
1					
2		"PositioningAxis".ActualPosition	Floating-point number	96.103	
3		"PositioningAxis".ActualSpeed	Floating-point number	119.433391839266	
4					
5	// MC_P	OWER			
6		"InstMotionControlPos".instMcPower.Enable	Bool	TRUE	TRUE
7		"InstMotionControlPos".instMcPower.Status	Bool	TRUE	
8		"InstMotionControlPos".instMcPower.Busy	Bool	TRUE	
9		"InstMotionControlPos".instMcPower.Error	Bool	FALSE	
10		"InstMotionControlPos".instMcPower.Errorld	Hex	16#0000	
11					
12	// MC_R	ESET			
13		"InstMotionControlPos".instMcReset.Execute	Bool	FALSE	FALSE
14		"InstMotionControlPos".instMcReset.Done	Bool	FALSE	
15		"InstMotionControlPos".instMcReset.Busy	Bool	FALSE	
16		"InstMotionControlPos".instMcReset.Error	Bool	FALSE	
17		"InstMotionControlPos".instMcReset.ErrorId	Hex	16#0000	
18					
19	// MC_H	OME			
20		"InstMotionControlPos".instMcHome.Execute	Bool	FALSE	FALSE
21		"InstMotionControlPos".instMcHome.Position	Floating-point number	0.0	
22		"InstMotionControlPos".instMcHome.Done	Bool	FALSE	
23		"InstMotionControlPos".instMcHome.Busy	Bool	FALSE	
24		"InstMotionControlPos".instMcHome.Error	Bool	FALSE	
25		"InstMotionControlPos".instMcHome.Errorld	Hex	16#0000	
26					
27	// MC_N	IOVEABSOLUTE			
28		"InstMotionControlPos".instMcMoveAbsolute.Execute	Bool	TRUE	TRUE
29		"InstMotionControlPos".instMcMoveAbsolute.Position	Floating-point number	400.0	400.0
30		"InstMotionControlPos".instMcMoveAbsolute.Velocity	Floating-point number	20.0	20.0
31		"InstMotionControlPos".instMcMoveAbsolute.Done	Bool	FALSE	
32		"InstMotionControlPos".instMcMoveAbsolute.Busy	Bool	TRUE	
33		"InstMotionControlPos".instMcMoveAbsolute.Error	Bool	FALSE	
34		"InstMotionControlPos".instMcMoveAbsolute.Errorld	Hex	16#0000	
35					
36	// MC_N	IOVEJOG			
37		"InstMotionControlPos".instMcJog.JogBackward	Bool	FALSE	FALSE
38		"InstMotionControlPos".instMcJog.JogForward	Bool	FALSE	FALSE
39		"InstMotionControlPos".instMcJog.Velocity	Floating-point number	30.0	30.0
40		"InstMotionControlPos".instMcJog.Error	Bool	FALSE	
41		"InstMotionControlPos".instMcJog.Errorld	Hex	16#0000	

The watch tables also show the current position and velocity of the axis.

**Note** For information about the motion control blocks, refer to the TIA Portal Online Help and the "S7-1500 Motion Control in TIA Portal" Function Manual <u>\3\</u>.

https://support.industry.siemens.com/cs/ww/en/view/109749262

#### 3 Appendix

#### 3.1 Service and support

## **Industry Online Support**

Do you have any questions or need assistance?

Siemens Industry Online Support offers round the clock access to our entire service and support know-how and portfolio.

The Industry Online Support is the central address for information about our products, solutions and services.

Product information, manuals, downloads, FAQs, application examples and videos - all information is accessible with just a few mouse clicks: support.industry.siemens.com

## **Technical Support**

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#### Industry Online Support app

You will receive optimum support wherever you are with the "Siemens Industry Online Support" app. The app is available for iOS and Android: 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/109743270
/3/	Function Manual: SIMATIC S7-1500 S7-1500 Motion Control V4.0 in TIA Portal V15 <u>https://support.industry.siemens.com/cs/ww/en/view/109749262</u> S7-1500 Motion Control V5.0 in TIA Portal V16 <u>https://support.industry.siemens.com/cs/ww/en/view/109766459</u>
\4\	List Manual: SINAMICS S120/S150 https://support.industry.siemens.com/cs/ww/en/view/109739998
\5\	SINAMICS S120 Commissioning Manual with Startdrive https://support.industry.siemens.com/cs/ww/en/view/109743147
\6\	FAQ: "Isochronous mode with PROFINET – an example with SIMATIC S7-1500" https://support.industry.siemens.com/cs/ww/en/view/109480489

## 3.3 Change documentation

Table 3-2

Version	Date	Modifications
V1.0	03/2017	First version
V1.0.1	11/2018	Add "Leading value interconnections" in row 10 in Table 2-3
V1.1	04/2020	Add steps for isochronous configuration in Table 2-2
V1.2	04/2020	Configuring SIEMENS telegram 105 in Table 2-2