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SINAMICS G: Axis positioning with the SINA_POS block

SINAMICS G120 / SIMATIC S7-1200

<https://support.industry.siemens.com/cs/ww/en/view/109736845>

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1 Introduction

1.1 Overview

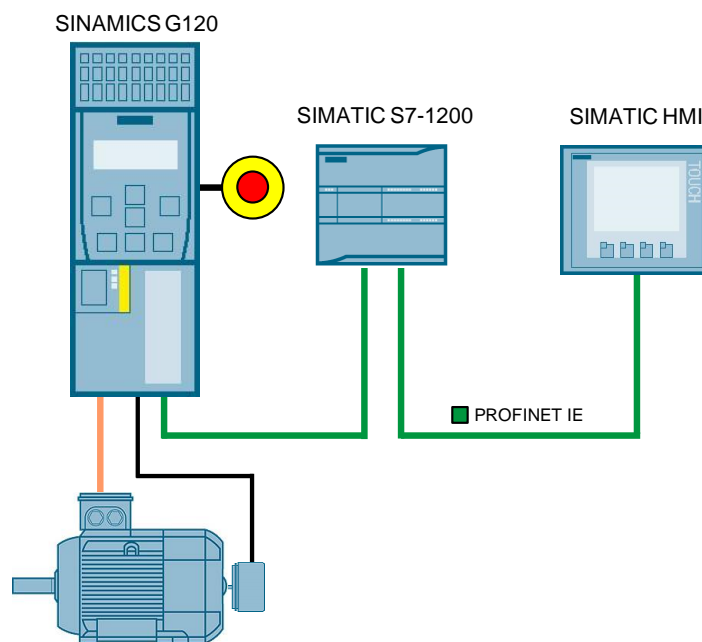
The SIMATIC S7-1200 can be operated as a PROFINET controller. For this, the PROFINET-capable SINAMICS G120 drive can be used as PROFINET device and be controlled by SIMATIC S7-1200.

This application example specifies a setpoint position for a SINAMICS G120 drive. The drive will then move to the setpoint position using the basic positioner (EPos) function.

Overview of the application example

The following figure provides an overview of the application example.

Figure 1-1: Overview



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1.2 Requirements of the application example

Table 1-1: Requirements of the application example

Requirement	Explanation
Access to process data	The control word switches the SINAMICS G120 drive on or off and specifies the setpoint speed value. Pending faults at the drive are displayed and acknowledged.
Positioning	The drive is positioned with the basic positioning function.
Monitoring the communication	The communication connection between the controller and the drive are monitored for interruptions.
Safety function of the SINAMICS G120	The SINAMICS G120 drive will have the option of performing a fail-safe shutdown (STO).

2 Engineering

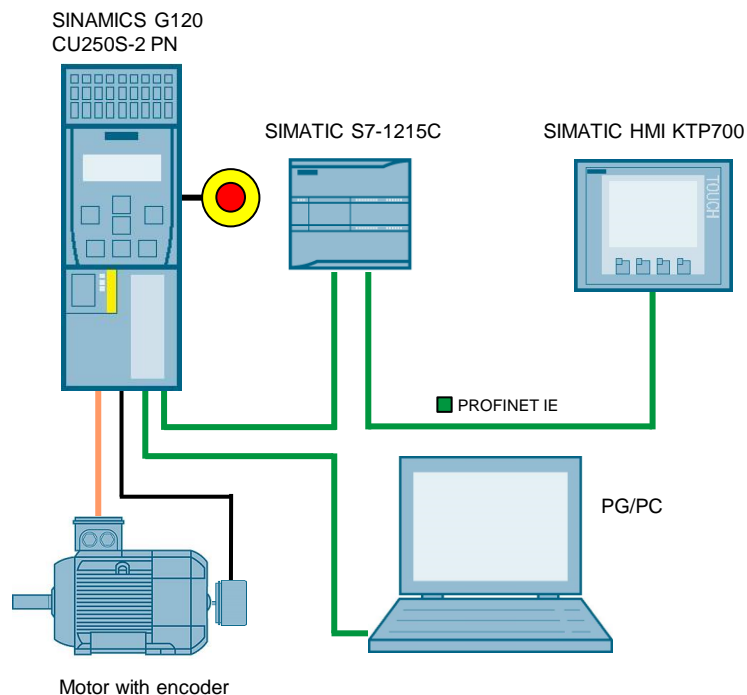
This application example shows the PROFINET connection of a SINAMICS G120 to a SIMATIC S7-1215C with SINAMICS Startdrive. The "SINA_POS" block is used for controlling and positioning the drive.

2.1 Overview

Schematic layout

The figure below shows a schematic overview of the most important components of the solution:

Figure 2-1: Interconnection of the components



Advantages

The use of the standard block "SINA_POS" offers a quick and simple option to control and position the SINAMICS drive.

Topics not covered by this application

This application example does not contain a description of:

- Structure and principle of operation of the "SINA_POS" block
- Configuration of the safety functions in the SINAMICS G120 drive

Assumed knowledge

Basic knowledge of the TIA Portal and Startdrive is assumed.

2.2 Description of the core functionality

Configuring the communication

Both the SIMATIC controller and the SINAMICS converter are configured and programmed in the TIA Portal. To do this, the following data are automatically generated in the hardware configuration:

- IP addresses
- PROFINET device names
- I/O address ranges for the data to be exchanged between the SIMATIC controller and the SINAMICS drive.

However, they can be modified at any time. Which process data are exchanged between SIMATIC controller and SINAMICS drive is specified by the frame type (in the example: standard telegram 111). The telegram type is also configured in the hardware configuration.

Data exchange

Data exchange between SINAMICS G120 and SIMATIC S7-1200 is done with the "SINA_POS" block in the process data range. Process data is transferred cyclically, which means in each bus cycle.

Positioning

The axis of the SINAMICS drive is positioned using only the "SINA_POS" standard block. This standard block uses the basic positioning function (EPos) configured in the drive.

2.3 Hardware and software components

The application was created with the following components:

Hardware components

Table 2-1: Hardware components

Component	Qty.	Article number	Note
SIMATIC CPU 1215C DC/DC/DC (FW 4.2.1)	1	6ES7215-1AG40-0XB0	Alternatively, you can also use a different CPU.
SINAMICS CU250S-2 PN Vector (FW 4.7.6)	1	6SL3246-0BA22-1FA0	-
SINAMICS PM240-2 IP20	1	6SL3210-1PB13-0ULx	-
Asynchronous motor	1	1LA7060-4AB10-Z	Alternatively, you can use a different asynchronous motor.
HTL speed encoder	1	1XP8001-1	-
SIMATIC Panel KTP700 Basic PN	1	6AV2123-2GB03-0AX0	The panel is optional.
PROFINET lines	-	6XV1840-2AH10	-
PROFINET connector	6	6GK1901-1BB10-2AA0	-

Software components

Table 2-2: Software components

Component	Qty.	Article number	Note
STEP 7 Professional V14	1	6ES7822-1..04-..	-
WinCC Advanced V14	1	6AV210.-...4-0	-
SINAMICS Startdrive V14	1	6SL3072-4EA02-0XG0	-
License for the Basic positioner	1	6SL3054-4AG00-2AA0-Z E01	with memory card

Example files and projects

The following list contains all files and projects that are used in this application example.

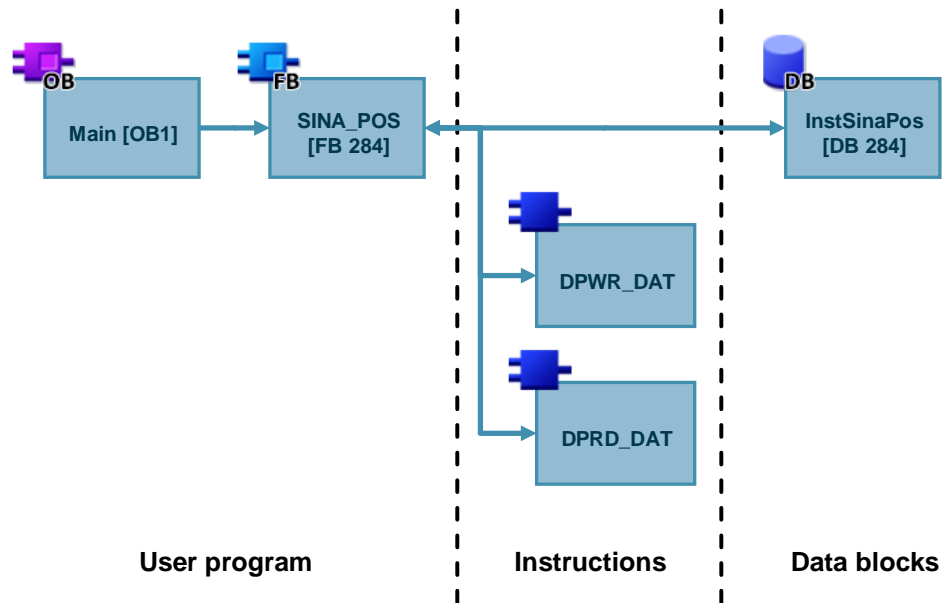
Table 2-3: Example files and projects

Component	Note
109736845_G120_CU250S2PN_at_S7_1200_SINA_POS_v10.zip	This zip file contains the STEP 7 V14 project.
109736845_G120_CU250S2PN_at_S7_1200_SINA_POS_DOCU_v10.pdf	This document.

3 Function Principle of the Application Example

Program overview

Figure 3-1: Program overview



3.1 Data exchange to the SINAMICS drive

Commands DPWR_DAT and DPRD_DAT

The “SINA_POS” block establishes the cyclic communication to a drive. To do this, the block accesses the following command:

- DPWR_DAT (writing consistent data of a DP standard slave)
- DPRD_DAT (reading consistent data of a DP standard slave)

These instructions ensure that the consistency is maintained across the entire process data, i.e. all elements of the process data of a device are from the same bus cycle or are transferred within a bus cycle.

Note For more information on the commands DPWR_DAT and DPRD_DAT refer to the Online Help of the TIA Portal.

Control words and status word via standard telegram

The “SINA_POS” function block is used to cyclically control a SINAMICS G120 drive with the standard telegram 111 (positioning drive with extended functions).

Table 3-1: Transmission telegram to the drive

Address	Name	Content
PZD 1	STW1	Control word 1
PZD 2	POS_STW1	Control word 1 for the basic positioner
PZD 3	POS_STW2	Control word 2 for the basic positioner
PZD 4	STW2	Control word 2
PZD 5	OVERRIDE	Setpoint speed value
PZD 6	MDI_TARPOS	Position setpoint value with direct setpoint specification (MDI)
PZD 7		
PZD 8	MDI_VELOCITY	MDI velocity
PZD 9		
PZD 10	MDI_ACC	MDI acceleration
PZD 11	MDI_DEC	MDI delay
PZD 12	-	not assigned

Table 3-2: Receive telegram from the drive

Address	Name	Content
PZD 1	ZSW1	Status word 1
PZD 2	POS_ZSW1	Status word 1 for the basic positioner
PZD 3	POS_ZSW2	Status word 2 for the basic positioner
PZD 4	ZSW2	Status word 2
PZD 5	MELDW	Status word for messages
PZD 6	XIST_A	Actual position value
PZD 7		
PZD 8	NIST_B	Actual speed value
PZD 9		
PZD 10	WARN_CODE	Number of the currently active warning
PZD 11	FAULT_CODE	Number of the currently active fault
PZD 12	-	not assigned

3.2 SINA_POS function block

Note The “SINA_POS” block and its documentation is contained in the “DriveLib” library.

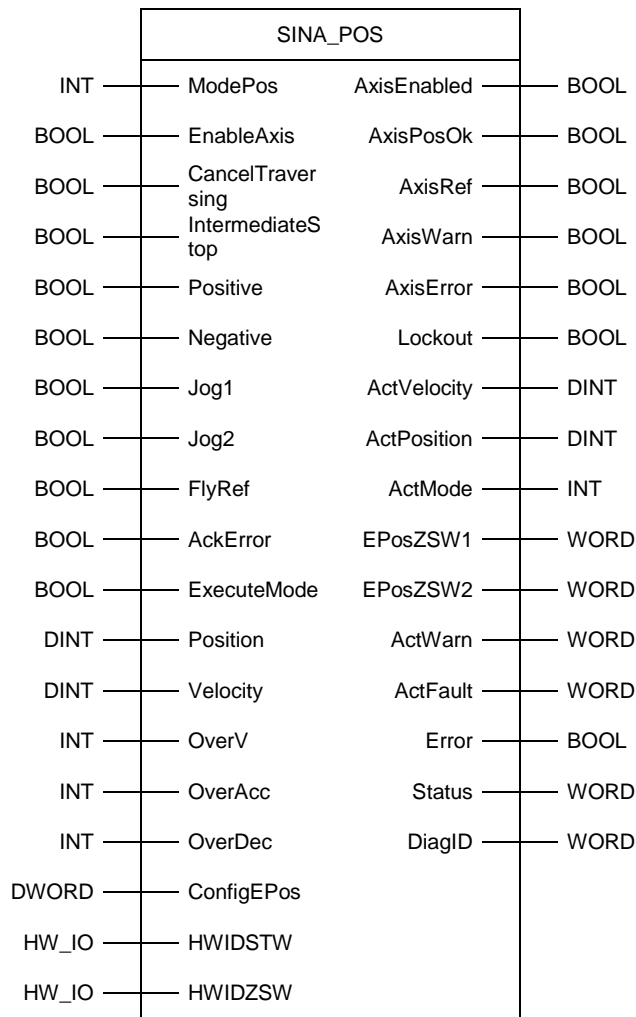
<https://support.industry.siemens.com/cs/ww/en/view/109475044>

Block call

The “SINA_POS” block can be called in the following organization blocks (OBs):

- Cyclic task: OB1
- Interrupt OB: for example OB32

Figure 3-2: Call of SINA_POS



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Block parameters

The following table lists the input and output parameter of the "SINA_POS" block.

Table 3-3: "SINA_POS" input parameters

Name	Type	Start value	Function
ModePos	INT	0	Operating mode: 1: Positioning, relative 2: Positioning, absolute 3: Positioning as setup 4: Homing – reference point approach 5: Homing – reference point definition 6: Traversing block 7: Jog mode 8: Jog mode, incremental
EnableAxis	BOOL	FALSE	Start/stop the drive
CancelTraversing	BOOL	TRUE	FALSE: discard active positioning job TRUE: do not discard
IntermediateStop	BOOL	TRUE	FALSE: active move command is interrupted TRUE: no intermediate stop
Positive	BOOL	FALSE	positive direction

3 Function Principle of the Application Example

Name	Type	Start value	Function
Negative	BOOL	FALSE	negative direction
Jog1	BOOL	FALSE	Jog mode, signal source 1
Jog2	BOOL	FALSE	Jog mode, signal source 2
FlyRef	BOOL	FALSE	FALSE: disable Homing on the fly TRUE: enable Homing on the fly
AckError	BOOL	FALSE	Acknowledgment of errors
ExecuteMode	BOOL	FALSE	Enable positioning job or setpoint transfer
Position	DINT	0	Position setpoint value in Length Unit (see Section Path unit LU)
Velocity	DINT	0	Speed setpoint value in Length Unit/min (see Section Path unit LU)
OverV	INT	100	Velocity override 0 – 199%
OverAcc	INT	100	Acceleration override 0 – 100%
OverDec	INT	100	Deceleration override 0 – 100%
ConfigEPos	DWORD	16#00000003	The following bits of the control word of the drive are pre-assigned: Bit 1: OFF2 Bit 2: OFF3
HWIDSTW	HW_IO	0	Hardware ID setpoint value (see Section Telegram slot)
HWIDZSW	HW_IO	0	Hardware ID actual value (see section Telegram slot)

Table 3-4: "SINA_POS" output parameters

Name	Type	Start value	Function
Error	BOOL	FALSE	General fault
Status	WORD	0	Display of status values: 16#7002: no fault 16#8401: Fault in the drive 16#8402: On-inhibit 16#8403: Homing on the fly could not be initiated 16#8600: DPRD_DAT error 16#8601: DPWR_DAT error 16#8202: incorrect mode selected 16#8203: incorrect setpoint values configured 16#8204: incorrect traversing block number selected
DiagID	WORD	0	Extended communication fault
AxisEnabled	BOOL	FALSE	Drive ready
AxisError	BOOL	FALSE	Drive fault active
AxisWarn	BOOL	FALSE	Drive warning active
AxisPosOk	BOOL	FALSE	Axis has reached target position
AxisRef	BOOL	FALSE	Reference point set
ActVelocity	DINT	0	actual velocity in Length Unit/min
ActPosition	DINT	0	actual position in Length Unit
ActMode	INT	0	currently active mode

3 Function Principle of the Application Example

Name	Type	Start value	Function
Lockout	BOOL	FALSE	On-inhibit of the drive is active
EPosZSW1	WORD	0	Status of the EPos ZSW1
EPosZSW2	WORD	0	Status of the EPos ZSW2
ActWarn	WORD	0	current warning number
ActFault	WORD	0	current fault number

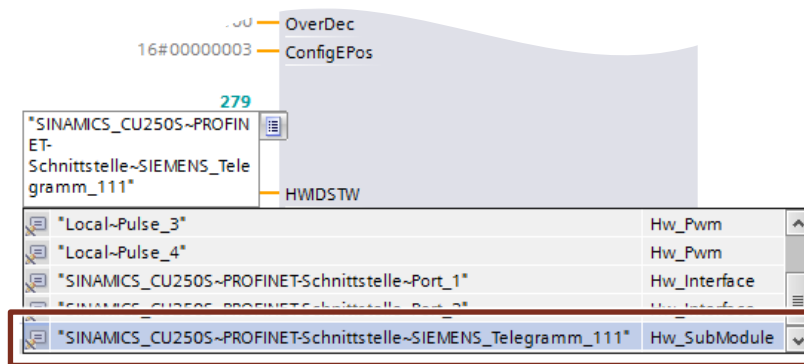
Path unit LU (Length Unit)

The "SINA_POS" block works with the neutral path unit LU (Length Unit). The path unit LU can be a distance (e.g. 1LU = 1mm) or an axis angle (e.g. 1LU = 1 milligrad). This is defined in when configuring the drive.

Telegram slot

The block inputs HWIDSTW and HWIDZSW must reference to the hardware ID of the standard telegram.

Figure 3-3: Entering the telegram slot



When using a PROFINET connection between the SIMATIC controller and the SINAMICS G120 drive, the same hardware ID must be configured for block inputs HWIDSTW and HWIDZSW.

Note

For more information on the "SINA_POS" block and its function refer to the Online Help of the TIA Portal or to the "DriveLib" documentation.

<https://support.industry.siemens.com/cs/ww/en/view/109475044>

Instance data block

The “SINA_POS” block interface is restricted to few inputs and outputs. All signals of standard telegram 111 are available via the instance data block at all times.

The instance data block “SINA_POS_DB” contains the following information:

- Function block inputs (1)
- Function block outputs (2)
- An area with static tags (3)
- The standard telegram 111 structure in the statistical tag range (4)

Figure 3-4: Structure of the instance data block

	Name	Data type	Start value	Retain	Accessible f...	Visible in ...	Setpoint	Comment
1	Input							
2	ModePos	Int	0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Settings of the mode
3	EnableAxis	Bool	0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Start / Stop command
4	CancelTraversino	Bool	1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Reject active traverse task
19	HWDSTW	HW_IO	0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Start addr from the I/O process image area of...
20	HWDZSW	HW_IO	0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Start addr from the I/O process image area of...
2	Output							
22	Error	Bool	0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Error or faults are active
23	Status	Word	0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Mode of operation disturbance
24	DianID	Word	0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
38	InOut							
39	Static							
40	sbOfflEdge	Bool	0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Positive edge of starting or stopping the device
41	sbOffl	Bool	0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Starting or stopping the device
42	sbExecuteEdge	Bool	0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Positive edge of activate traversing block
43	sbExecute	Bool	0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Activate traversing block
71	sbModePos	Bool	0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Mode of setting okay send buffer of telegra...
72	sxSendBuf	Struct		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
73	sxRecvBuf	Struct		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

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3.3 Safe Torque Off (STO)

3.3.1 STO via digital inputs

The converter with the “Safe Torque Off” (STO) function active prevents the unwanted startup of machine components. This safety function can be configured with specific digital inputs for a SINAMICS G120 drive with a control unit with safety function. To do this, the safety functions must be enabled in the control unit.

Note

A detailed description of the configuration of the safety function STO using digital inputs can be found in the application example “SINAMICS G: Speed Control of a G110M / G120 (Startdrive) with S7-1500 (TO) via PROFINET or PROFIBUS with Safety Integrated (via Terminal) and HMI”.

<https://support.industry.siemens.com/cs/ww/en/view/78788716>

If the drive is run with EPOS and the STO function is active, the drive can show the alarm message F07490 (EPOS: Enable signal withdrawn while traversing).

3.3.2 STO as per SIL 3 with power module PM240-2

The PM240-2 power modules in sizes FSD, FSE and FSF can be used to realize the “Safe Torque Off” (STO) according to PLe as per EN 13849-1 and according to SIL 3 as per IEC61508. Two terminal blocks (STO_A and STO_B) and two Dip switches are available on the front side of the power module.

Note

More information on how to use the STO safety function as per SIL 3 with the PM240-2 power module can be found in the “SINAMICS G120 power module PM240-2” manual.

<https://support.industry.siemens.com/cs/ww/en/view/109482011>

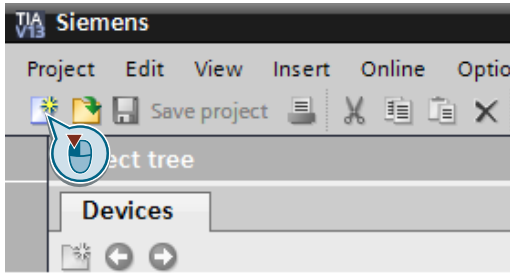
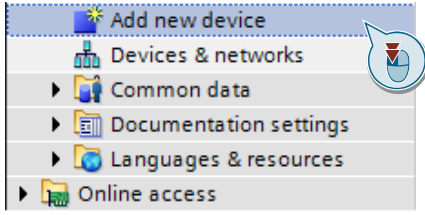
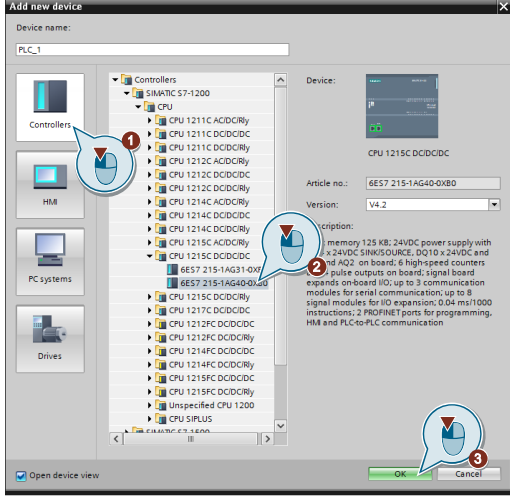
4 Configuration and Settings

The step tables below describe how to configure the S7-1200 and the SINAMICS G120 drive. The configuration of the operator panel is not described in this chapter.

A requirement is that the software listed in [Table 2-2](#) is installed on your PC/PG.

4.1 Creating the project configuration

Table 4-1: Creating the project configuration

No.	Action	Remark
1.	Open TIA Portal and create a new project.	
2.	Double-click on "Add new device".	
3.	Add your desired controller: 1. Select "Controller". 2. Select the desired CPU. 3. Then click on "OK".	

4 Configuration and Settings

No.	Action	Remark
4.	<p>Open the device configuration of the CPU and configure the PROFINET interface:</p> <ol style="list-style-type: none"> 1. Open the “Properties” of the CPU. 2. Select “Ethernet addresses”. 3. Add a new subnet. 4. Enter the desired IP address and subnet mask. 5. You can also specify the PROFINET device name in this mask. 	

Configuring the SINAMICS drive

Table 4-2: Adding the drive

No.	Action	Remark
1.	<p>Select the desired SINAMICS drive:</p> <ol style="list-style-type: none"> 1. In the “devices and networks” editor, go to the “Network view”. 2. Now drag the desired PROFINET-capable SINAMICS drive into the graphic area. 	
2.	<p>Connect the Ethernet connections of the SIMATIC controller and the SINAMICS drive with each other.</p>	
3.	<p>Assign a power module to the drive added in the network view. (This step is not necessary when using a G120C drive):</p> <ol style="list-style-type: none"> 1. Open the “Device view”. 2. Select a power module from the hardware catalog and add it to the drive. 	

4 Configuration and Settings

No.	Action	Remark
4.	<p>Configure the PROFINET interface of the drive:</p> <ol style="list-style-type: none"> 1. Open the "Properties" of the drive. 2. You can set the IP address and the device name in the "PROFINET interface" settings. 	
5.	<p>For data exchange between CPU and drive, leave the setting at standard telegram 1 unchanged. The standard telegram 111 required for the "SINA_POS" block can only be configured after the basic positioner has been activated.</p>	

Adding the HMI (optional)

Table 4-3: Adding the HMI

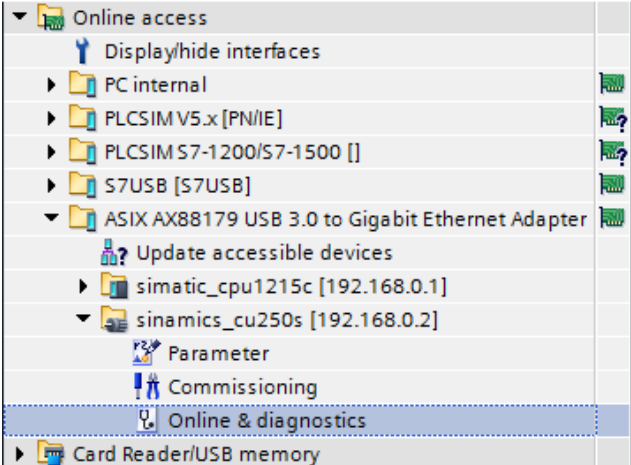
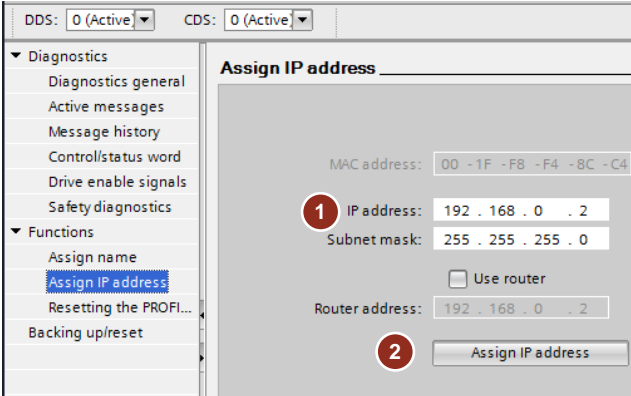

No.	Action	Remark
1.	Add the HMI in the "Network view".	
2.	Configure an HMI connection between CPU and HMI.	
3.	Then, check the PROFINET addresses set.	

4.2 Commissioning the SINAMICS drive

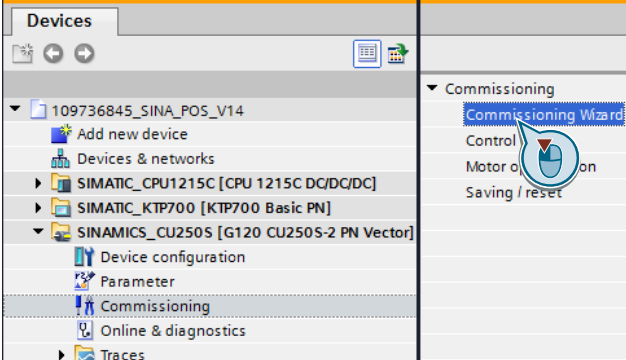
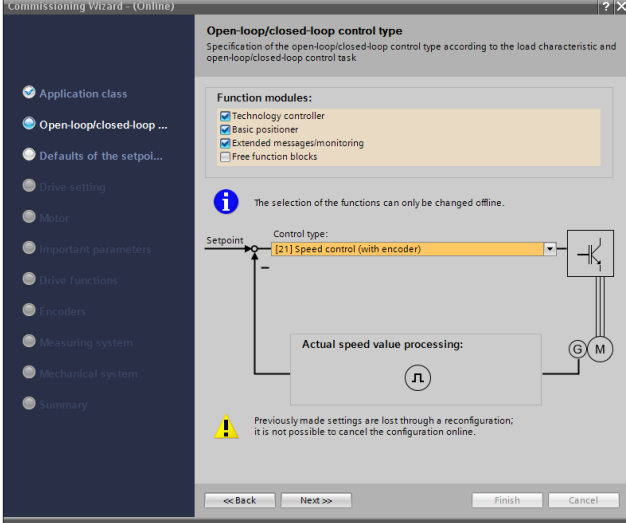
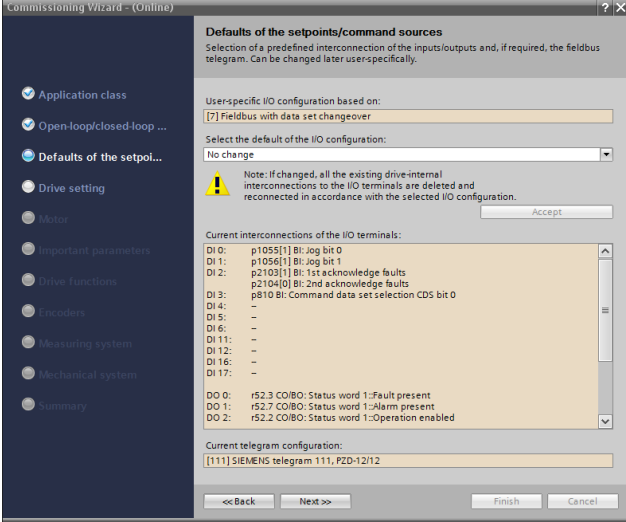
After generating the project configuration, you have to commission the SINAMICS G120 drive. When doing so, the commissioning wizard in Startdrive is followed.

Note Information on the configuration and commissioning of drives can be found in the TIA Portal online help.

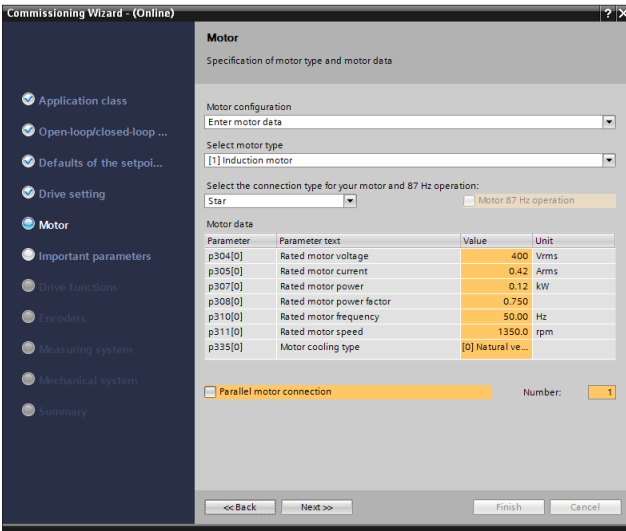
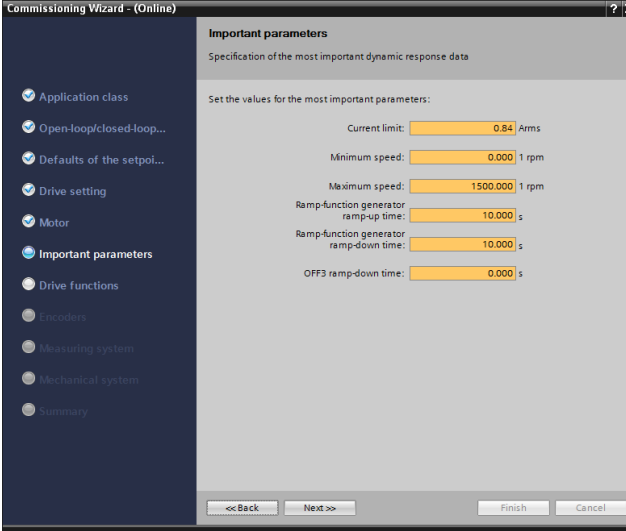
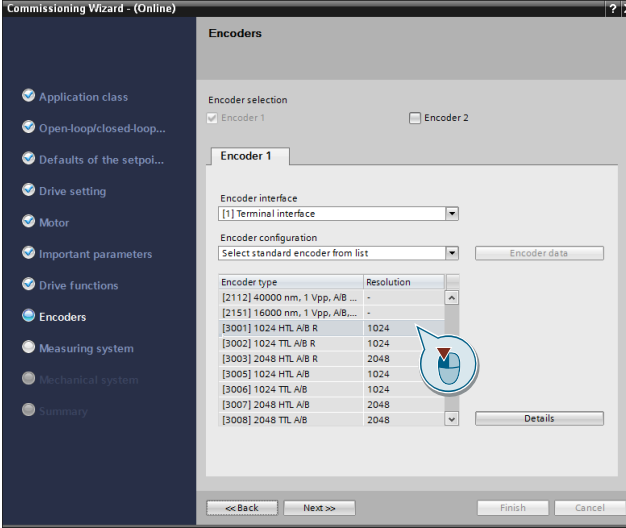
Table 4-4: Commissioning the drive

No.	Action	Remark
1.	<p>The drive must be assigned the device name to be able to establish an online connection to the drive. To do this, select the interface used in the “Online access” folder. Once the available participants have been updated (Update accessible devices), the devices connected to PROFINET are displayed. For drives, there is the option to assign IP address and device name in the “Online & diagnostics” menu sub-item.</p>	
2.	<p>You can assign IP address and device name in the “Online & diagnostics” menu sub-item.</p> <ol style="list-style-type: none"> 1. Enter the IP address or the device name in the respective field. 2. Then, assign the drive the address or device name. 	
3.	<p>When the assigned data (IP address and device name) is identical with the configuration of the drive (chapter 4.1), Startdrive can be used to establish an online connection to the drive. To do so, select the drive in the project tree and click “Go online” in the toolbar.</p>	

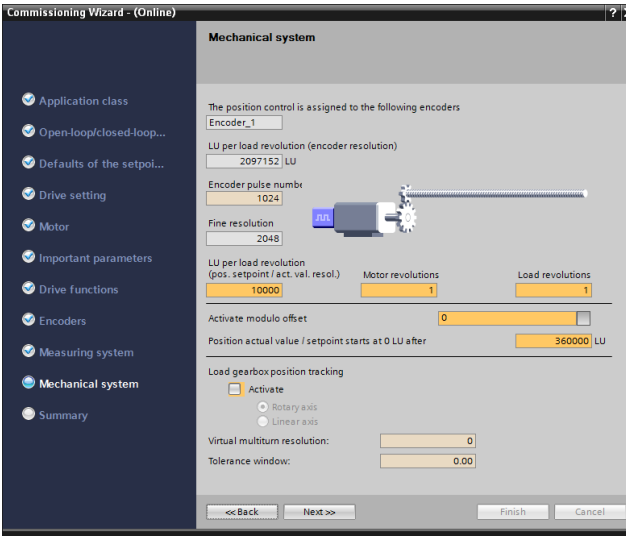
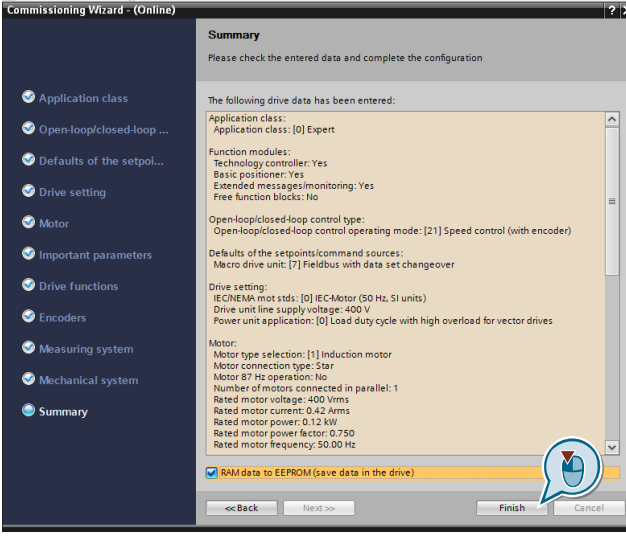
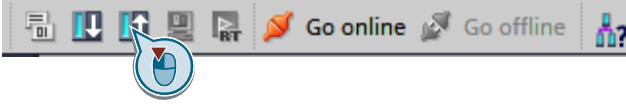
4 Configuration and Settings

No.	Action	Remark
4.	The Commissioning Wizard can be found in the drive folder under "Commissioning".	
5.	<p>Follow the Commissioning Wizard in the "Expert" application class. For tips, please refer to the TIA Portal online help.</p> <p>Activate the Basic positioner and select "Speed control (with encoder)" as control mode.</p>	
6.	Configure standard telegram 111 to control the communication.	

4 Configuration and Settings

No.	Action	Remark																																
7.	Enter the motor data of the motor you are using.	 <table border="1" data-bbox="933 488 1353 622"> <thead> <tr> <th>Parameter</th> <th>Parameter text</th> <th>Value</th> <th>Unit</th> </tr> </thead> <tbody> <tr> <td>p304[0]</td> <td>Rated motor voltage</td> <td>400</td> <td>Vrms</td> </tr> <tr> <td>p305[0]</td> <td>Rated motor current</td> <td>0.42</td> <td>Arms</td> </tr> <tr> <td>p307[0]</td> <td>Rated motor power</td> <td>0.12</td> <td>kW</td> </tr> <tr> <td>p308[0]</td> <td>Rated motor power factor</td> <td>0.750</td> <td></td> </tr> <tr> <td>p310[0]</td> <td>Rated motor frequency</td> <td>50.00</td> <td>Hz</td> </tr> <tr> <td>p311[0]</td> <td>Rated motor speed</td> <td>1350.0</td> <td>rpm</td> </tr> <tr> <td>p333[0]</td> <td>Motor cooling type</td> <td>[0] Natural ve...</td> <td></td> </tr> </tbody> </table>	Parameter	Parameter text	Value	Unit	p304[0]	Rated motor voltage	400	Vrms	p305[0]	Rated motor current	0.42	Arms	p307[0]	Rated motor power	0.12	kW	p308[0]	Rated motor power factor	0.750		p310[0]	Rated motor frequency	50.00	Hz	p311[0]	Rated motor speed	1350.0	rpm	p333[0]	Motor cooling type	[0] Natural ve...	
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p333[0]	Motor cooling type	[0] Natural ve...																																
8.	The ramp-up and ramp-down times stated under "Important parameters" have no relevance for the basic positioner.	 <table border="1" data-bbox="1029 918 1284 1086"> <thead> <tr> <th>Parameter</th> <th>Value</th> <th>Unit</th> </tr> </thead> <tbody> <tr> <td>Current limit</td> <td>0.84</td> <td>Arms</td> </tr> <tr> <td>Minimum speed</td> <td>0.000</td> <td>1 rpm</td> </tr> <tr> <td>Maximum speed</td> <td>1500.000</td> <td>1 rpm</td> </tr> <tr> <td>Ramp-function generator ramp-up time</td> <td>10.000</td> <td>s</td> </tr> <tr> <td>Ramp-function generator ramp-down time</td> <td>10.000</td> <td>s</td> </tr> <tr> <td>OFF3 ramp-down time</td> <td>0.000</td> <td>s</td> </tr> </tbody> </table>	Parameter	Value	Unit	Current limit	0.84	Arms	Minimum speed	0.000	1 rpm	Maximum speed	1500.000	1 rpm	Ramp-function generator ramp-up time	10.000	s	Ramp-function generator ramp-down time	10.000	s	OFF3 ramp-down time	0.000	s											
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Current limit	0.84	Arms																																
Minimum speed	0.000	1 rpm																																
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Ramp-function generator ramp-up time	10.000	s																																
Ramp-function generator ramp-down time	10.000	s																																
OFF3 ramp-down time	0.000	s																																
9.	Enter the data of the encoder you are using. If the used encoder is not included in the list, switch to "Enter encoder data" in the encoder configuration. Now you can enter encoder data.	 <table border="1" data-bbox="949 1624 1348 1780"> <thead> <tr> <th>Encoder type</th> <th>Resolution</th> </tr> </thead> <tbody> <tr> <td>[2112] 40000 nm, 1 Vpp, A/B ...</td> <td>-</td> </tr> <tr> <td>[2151] 16000 nm, 1 Vpp, A/B, ...</td> <td>-</td> </tr> <tr> <td>[3001] 1024 TTL A/B R</td> <td>1024</td> </tr> <tr> <td>[3002] 1024 TTL A/B R</td> <td>1024</td> </tr> <tr> <td>[3003] 2048 TTL A/B R</td> <td>2048</td> </tr> <tr> <td>[3005] 1024 TTL A/B</td> <td>1024</td> </tr> <tr> <td>[3006] 1024 TTL A/B</td> <td>1024</td> </tr> <tr> <td>[3007] 2048 TTL A/B</td> <td>2048</td> </tr> <tr> <td>[3008] 2048 TTL A/B</td> <td>2048</td> </tr> </tbody> </table>	Encoder type	Resolution	[2112] 40000 nm, 1 Vpp, A/B ...	-	[2151] 16000 nm, 1 Vpp, A/B, ...	-	[3001] 1024 TTL A/B R	1024	[3002] 1024 TTL A/B R	1024	[3003] 2048 TTL A/B R	2048	[3005] 1024 TTL A/B	1024	[3006] 1024 TTL A/B	1024	[3007] 2048 TTL A/B	2048	[3008] 2048 TTL A/B	2048												
Encoder type	Resolution																																	
[2112] 40000 nm, 1 Vpp, A/B ...	-																																	
[2151] 16000 nm, 1 Vpp, A/B, ...	-																																	
[3001] 1024 TTL A/B R	1024																																	
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[3003] 2048 TTL A/B R	2048																																	
[3005] 1024 TTL A/B	1024																																	
[3006] 1024 TTL A/B	1024																																	
[3007] 2048 TTL A/B	2048																																	
[3008] 2048 TTL A/B	2048																																	

4 Configuration and Settings

No.	Action	Remark
10.	Use the "Mechanical system" configuration display to enter the "LU per load revolution". This setting is used as the calculation basis for defining velocity and position values.	
11.	As a last step of the commissioning wizard, you have to save the drive settings. To do so, check the "RAM data to EEPROM" checkbox and finish the wizard.	
12.	Then disconnect the online connection to the drive and load the configuration stored in the drive into the offline project.	
13.	Save the TIA Portal project.	-

4.3 Basic positioner

The Basic positioner (EPos) moves an axis to a target position on a position-controlled basis.

Note

A description of the basic positioner can be found in the Function Manual "SINAMICS G120, Basic Positioner (EPos) for CU250S-2 Control Units".

<https://support.industry.siemens.com/cs/ww/en/view/109483005>

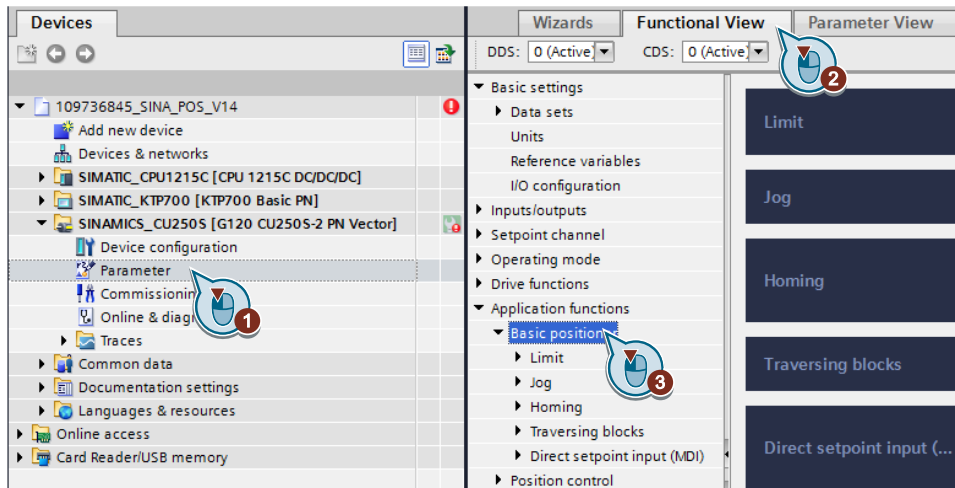
The basic positioner contains the following operating modes:

Table 4-5: EPos operating modes

Operating mode	Meaning
Enter setpoint value directly (MDI)	The external control specifies the position setpoint for the axis.
Selecting traversing blocks	The converter has position setpoints stored in different traversing blocks. The external control selects a traversing block.
Referencing	A homing run creates a reference for position measurement in the converter to the machine.
Jog mode (JOG)	This function is used to move the axis in increments (during setup).

When the drive is configured, some settings of the basic positioner can be made in the functional view of the drive parameters.

Figure 4-1: EPos Setting options



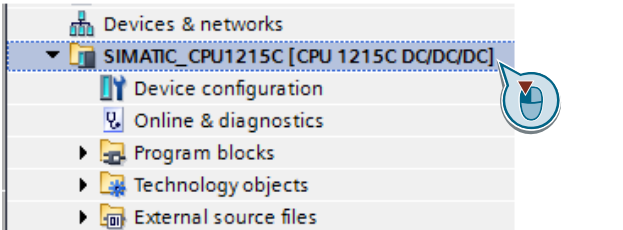
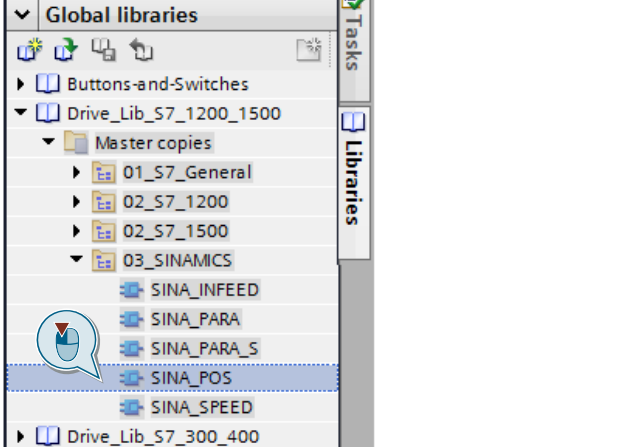
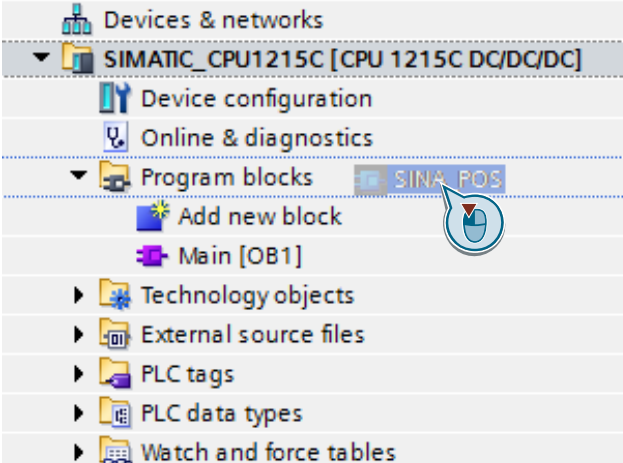
Note

Useful support on the setting options of the basic positioner under Startdrive can be found in the TIA Portal online help.

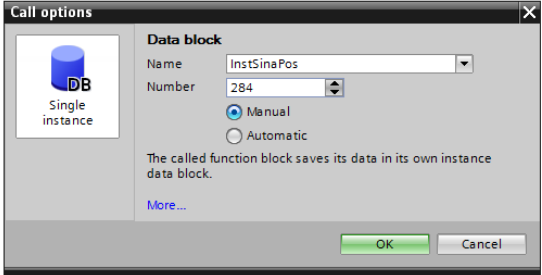
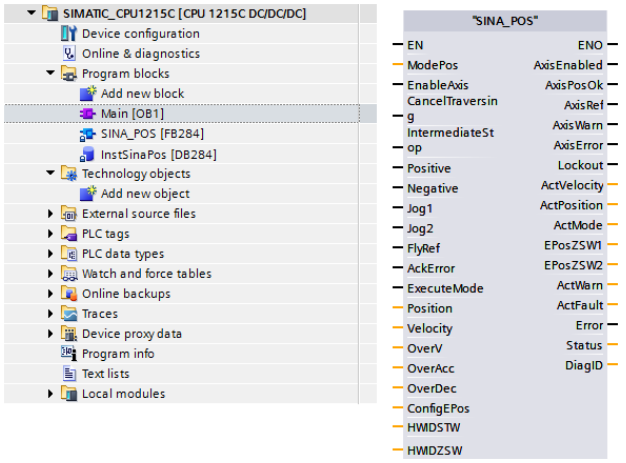
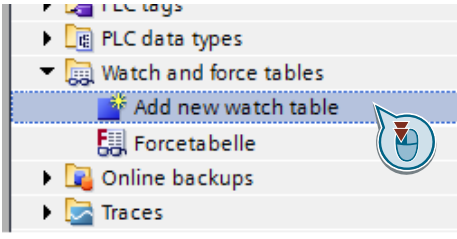

4.4 Configuring the S7 program

The following step table shows how to configure a S7 program with the “SINA_POS” function block.

Table 4-6: Configuring the S7 program

No.	Action	Remark
1.	Select the S7-1200 in the project tree.	 <p>The screenshot shows the 'Devices & networks' folder expanded to show 'SIMATIC_CPU1215C [CPU 1215C DC/DC/DC]'. Below it are sub-folders for 'Device configuration', 'Online & diagnostics', 'Program blocks', 'Technology objects', and 'External source files'. A callout bubble points to the selected CPU entry.</p>
2.	Open the libraries and select the “SINA_POS” block from the DriveLib library matching the SIMATIC controller used.	 <p>The screenshot shows the 'Global libraries' pane. Under 'Drive_Lib_S7_1200_1500', the 'SINA_POS' block is selected. Other blocks like SINA_INFEED, SINA_PARA, SINA_PARA_S, and SINA_SPEED are also visible. A callout bubble points to the selected SINA_POS block.</p>
3.	Then add the block the “Program blocks” folder in the controller.	 <p>The screenshot shows the 'Program blocks' folder expanded under 'SIMATIC_CPU1215C'. The 'SINA_POS' block is now present in this folder. A callout bubble points to the added block.</p>

4 Configuration and Settings

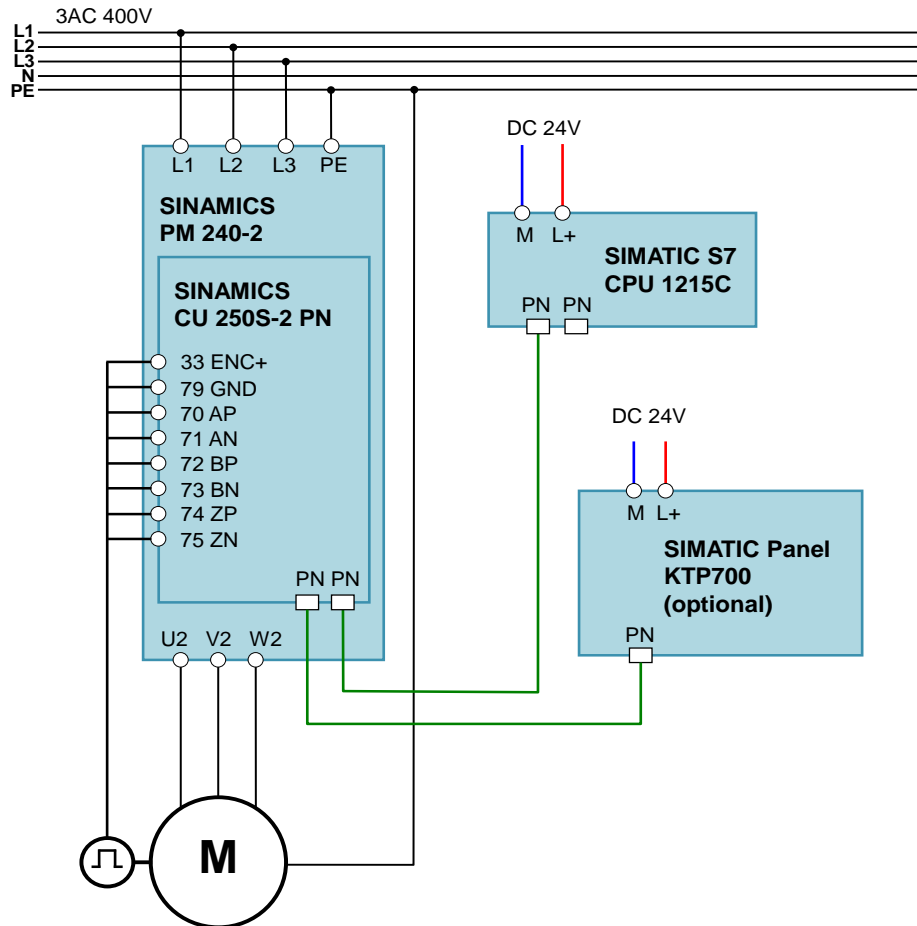
No.	Action	Remark
4.	Call the "SINA_POS" block in the Main OB (OB1). Assign the function block an instance data block. The number of the instance data block can be selected by the user.	
5.	Connect the inputs and outputs of the "SINA_POS" function block as described in chapter 3.2.	
6.	It is recommended to copy the inputs and outputs of the block "SINA_POS" into a control panel. (see Figure 6-11)	
7.	Save the project and load the program into the controller.	

5 Installation and Commissioning

5.1 Installing the hardware

The figure below shows the hardware configuration of the application.

Figure 5-1: Hardware setup



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Note

The setup guidelines for SINAMICS drives and SIMATIC controllers must generally be followed.

5.2 IP addresses and device names

The following IP addresses and device names are used in the application example. Subsequent changes can be made at any time.

Table 5-1: IP addresses and device names

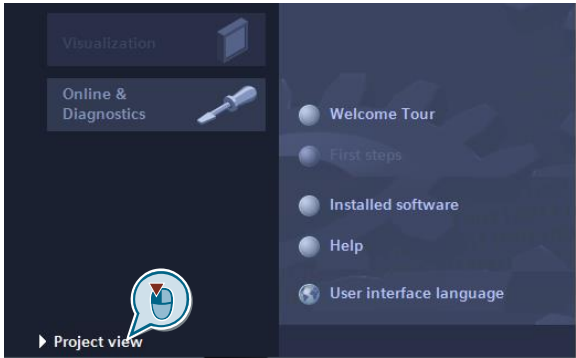
Components	Device name	IP address
SIMATIC S7-1200	SIMATIC_CPU1215C	192.168.0.1
SINAMICS G120	SINAMICS_CU250S	192.168.0.2
SIMATIC KTP700	SIMATIC_KTP700	192.168.0.10
PG/PC	-	192.168.0.200

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

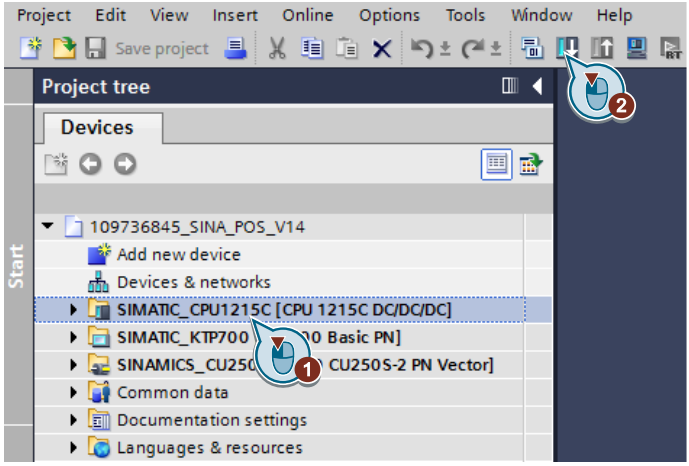
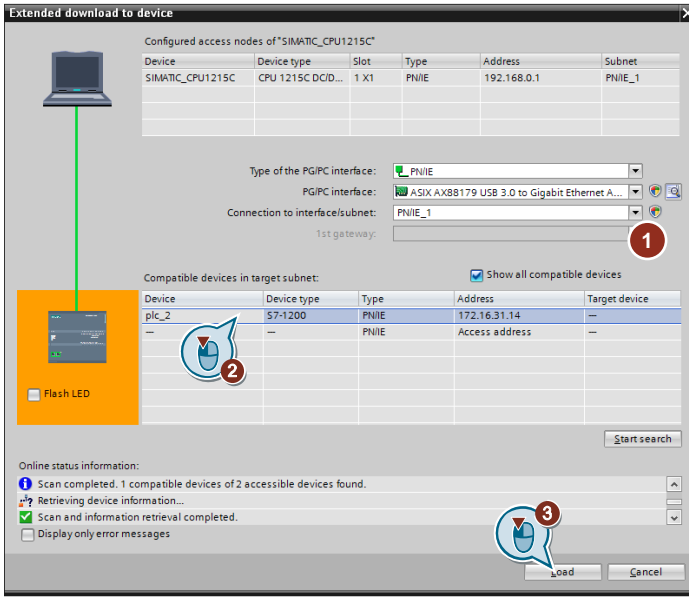
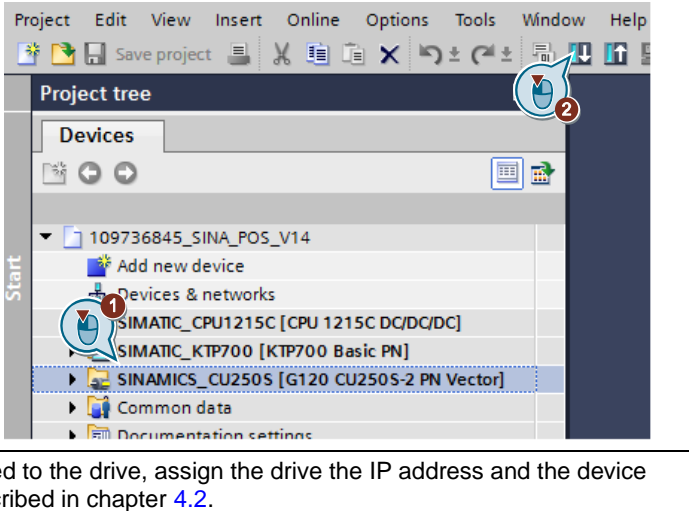
5.3 Download the project to the components

The steps listed in the following table show how to load the individual programs of the application example into the components.

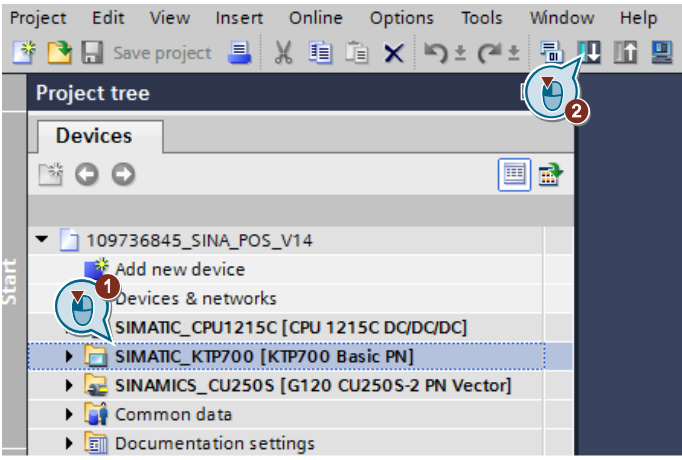
Table 5-2: Downloading to the components

No.	Action	Remark
1.	Retrieve the project contained in the zip file "109736845_G120_CU250S2 PN_at_S7_1200_SINA_POS_v10.zip" to a local directory.	-
2.	Double-click the ap14 file in the project folder just retrieved in order to open the project in TIA Portal.	-
3.	If TIA Portal opens in the Portal view, go to the bottom left to switch to the "Project view".	

5 Installation and Commissioning

No.	Action	Remark
4.	<p>Download the program of the SIMATIC controller</p> <ol style="list-style-type: none"> 1. Select the S7 controller in the project tree 2. Load the project into the controller 	 <p>The screenshot shows the SIMATIC Manager interface with the 'Project tree' pane. The 'Devices' folder is expanded, and 'SIMATIC_CPU1215C [CPU 1215C DC/DC/DC]' is selected. A red circle with the number '1' highlights the selection. Another red circle with the number '2' highlights the 'Download' icon in the top toolbar.</p>
5.	<p>As soon as the “Extended download to device” dialog box opens, proceed as follows:</p> <ol style="list-style-type: none"> 1. Select the settings necessary for your online connection 2. Select the CPU 3. Load the configuration 	 <p>The screenshot shows the 'Extended download to device' dialog box. It contains a table for 'Configured access nodes of "SIMATIC_CPU1215C"', a dropdown for 'Type of the PG/PC interface' set to 'PNIE', and a 'Connection to interface/subnet' dropdown set to 'PNIE_1'. A red circle with the number '1' highlights the 'Connection to interface/subnet' dropdown. Below, there is a table for 'Compatible devices in target subnet:' with a 'Flash LED' checkbox and a 'Start search' button. A red circle with the number '2' highlights the 'Start search' button. At the bottom, there is a 'Load' button highlighted with a red circle and the number '3'.</p>
6.	<p>Load the configuration into the drive.</p>	 <p>The screenshot shows the SIMATIC Manager interface with the 'Project tree' pane. The 'Devices' folder is expanded, and 'SINAMICS_CU250S [G120 CU250S-2 PN Vector]' is selected. A red circle with the number '1' highlights the selection. Another red circle with the number '2' highlights the 'Download' icon in the top toolbar.</p> <p>When no connection is established to the drive, assign the drive the IP address and the device name. To do so, proceed as described in chapter 4.2.</p>

5 Installation and Commissioning

No.	Action	Remark
7.	Load the configuration of the HMI (optional).	
		<p>You have to set the correct IP address in the SIMATIC HMI in order to load successfully. Information on how to enter the network settings of the HMI can be found in the user manual V7.</p>

6 Operating the Application Example



WARNING

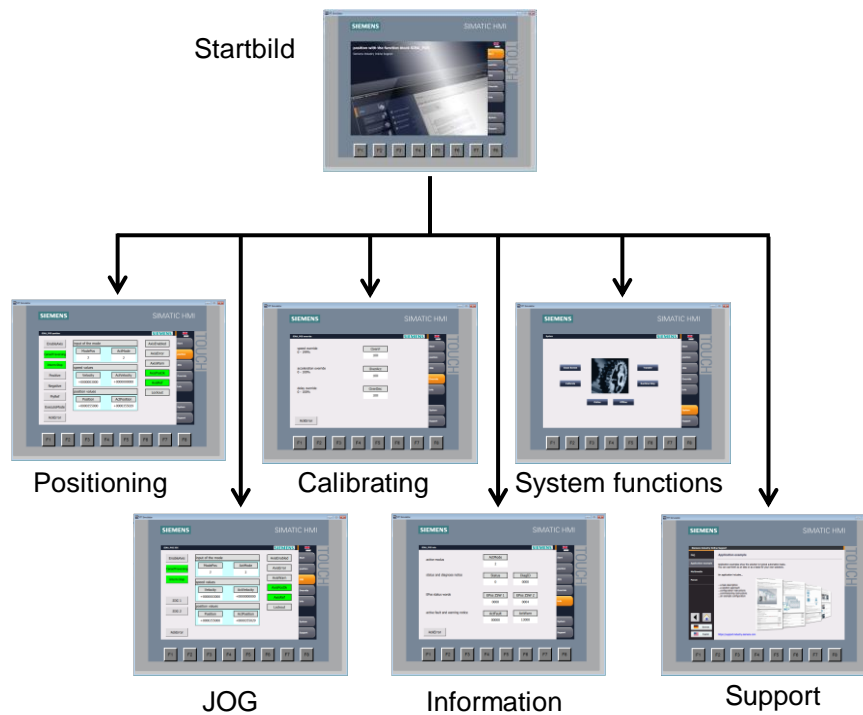
Make sure that no persons or system components are endangered by the moving drive.

Take appropriate measures to prevent the drive from exceeding technical or mechanical limits.

6.1 Operation via HMI

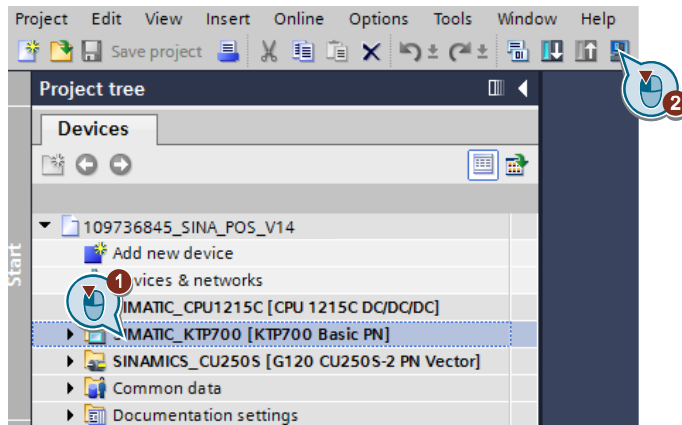
The following operator screens are available in the HMI project for operating the application example. The structure of these operator screens is shown in the figure below.

Figure 6-1: Overview of the operator screens



If there is no SIMATIC HMI available, the operator screens can be used in simulation mode. In the simulation mode, the runtime of the operator panel is displayed in a TIA framework.

Figure 6-2: Starting simulation mode



6.1.1 Start screen


When activating the SIMATIC HMI or the simulation, the start screen is first displayed.

Figure 6-3: Start screen



A navigation bar is located on the right side of the screen. It is used to go to more operator screens.

Table 6-1: Buttons in the navigation bar

Operation	Action
	Switch between German and English
Start	Back to the start screen
Positioning	Positioning the axes
JOG	Moving the axis in jog mode (JOG)
Override	Entering override values
Information	Displaying status words, fault and warning numbers
System	Operating the HMI system functions
Support	Support information

6.1.2 Operating the "SINA_POS" block

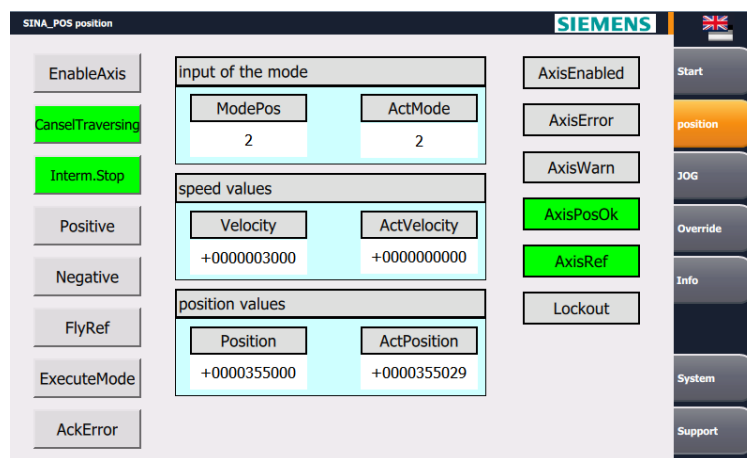
The operation of the "SINA_POS" function block is divided into four operator screens. These are used to control or supply the inputs and outputs of the block.

Note A detailed description of the inputs and outputs of the block can be found in chapter 3.2 or in the TIA online help.

Positioning operator screen

This operator screen summarizes all inputs and outputs required to position the axis.

Figure 6-4: "Positioning" operator screen



The block inputs with BOOLEAN data type are displayed on the left edge of the operator screen. Active inputs are highlighted in green here.

The middle of the operator screen displays the required analog values:

- Pre-selected and current mode of the block
- Setpoint and actual velocity of the axis
- Setpoint and actual position of the axis

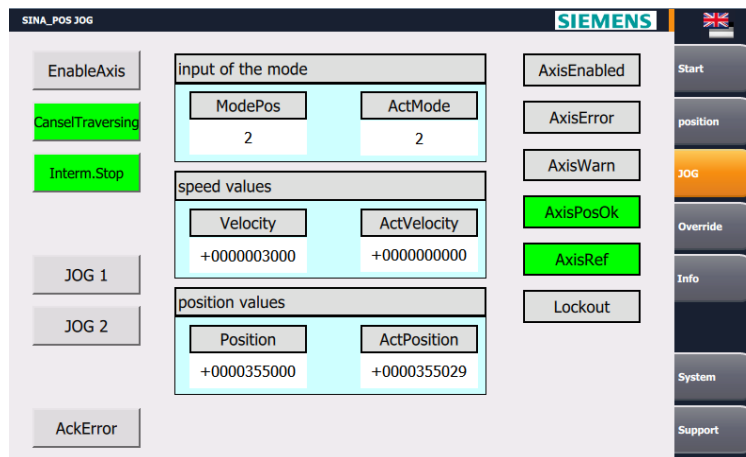
The block outputs with BOOLEAN data type are displayed on the right edge of the operator screen. Active outputs are highlighted with colors:

- Status in green
- Faults in red
- Warnings in orange

Jog mode operator screen

The "JOG" operator screen has the same structure and function principle as the "Positioning" operator screen. Only the block inputs "JOG 1" and "JOG 2" are displayed for enabling job mode.

Figure 6-5: "JOG" operator screen

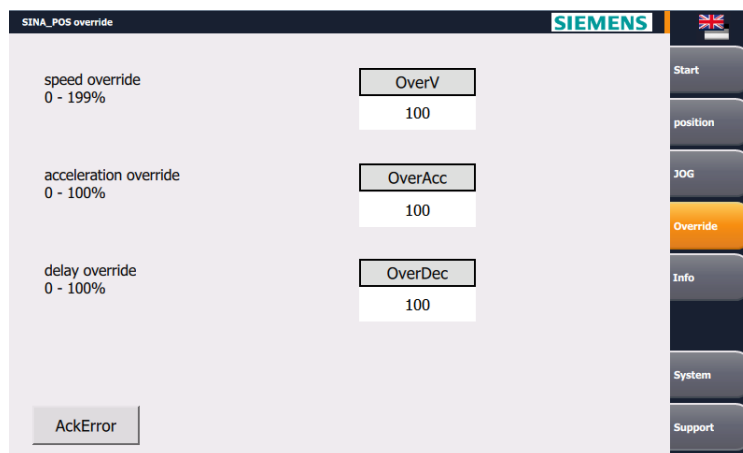


Override operator screen

You can set the following standards in the "Override" operator screen:

- Speed override
- Acceleration override
- Delay override

Figure 6-6: "Override" operator screen

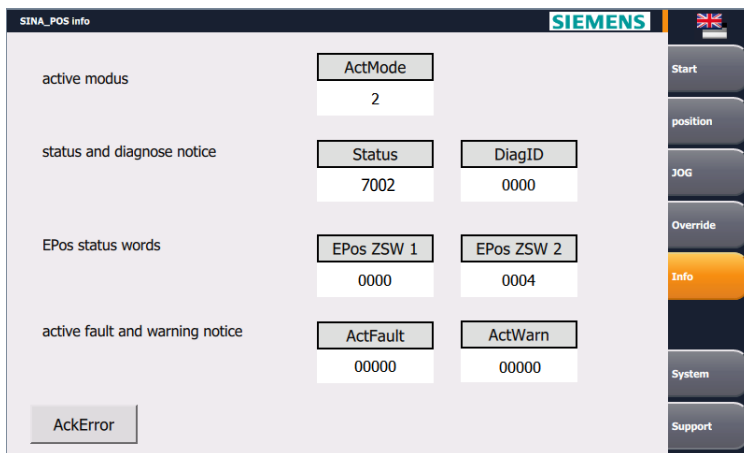


Info operator screen

The "Info" operator screen displays the following information:

- Current active mode of the block
- Current status and diagnose notice
- Values of EPos status words
- Active fault and warning notices

Figure 6-7: "Info" operator screen



6.1.3 System functions

The system functions of the HMI can be accessed in the "System" operator screen.

Figure 6-8: "System" operator screen



Table 6-2: System function buttons

Operation	Action
Clean screen (Clean Screen)	Activate cleaning screen of the HMI
Calibrate touchscreen (Calibrate)	Activation of the calibration of the HMI touchscreen
Online	Activation of the "Online" mode
Offline	Activation of the "Offline" mode
Stop runtime (Runtime Stop)	Terminate runtime
Transfer	Start the program transfer to the HMI

6.1.4 Support information

The "Support" operator screen contains information on the service range of the Siemens Industry Online Support.

Figure 6-9: Support information

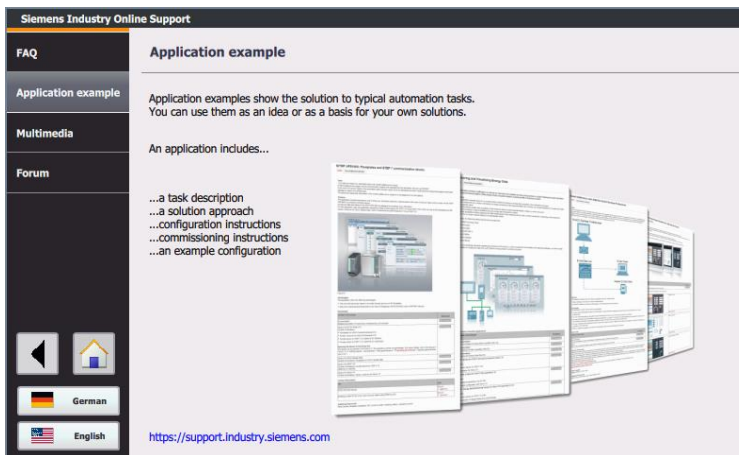


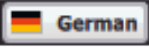
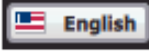


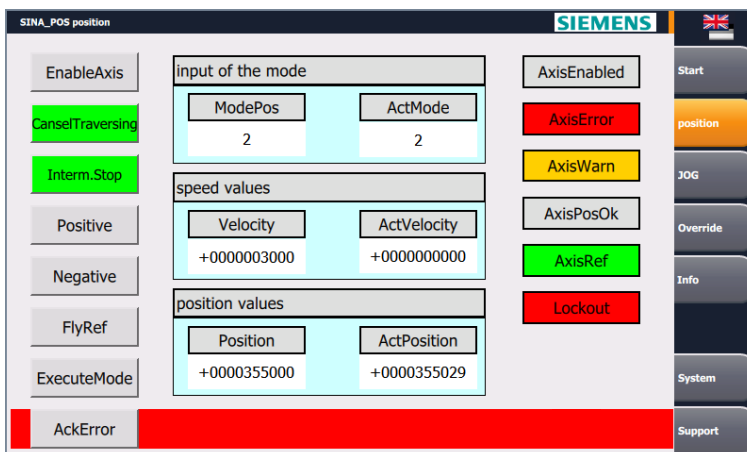
Table 6-3: Buttons in the support information

Operation	Action
	Activating the start screen
	Activating the previous screen
	Switch language to German
	Switch language to English

6.1.5 Display of faults

Active faults and warnings are indicated by a color marking of the respective block outputs.

Figure 6-10: Display of faults



If a fault is active, a red bar on the bottom edge is displayed in all operator screens of the "SINA_POS" block.

The current fault and warning numbers can be found in the "Info" operator screen.

6.2 Operation via the watch table

You can also use the application example without an HMI. The watch table “ControlSinaPos” has already been created in the project. The tags you can monitor or control are the same which are also displayed at the operator panel.

Figure 6-11: Watch table “ControlSinaPos”

	Name	Address	Display format	Monitor value	Modify value	
1	*InstSinaPos*.ModePos		DEC+/-	2	2	<input checked="" type="checkbox"/>
2	*InstSinaPos*.EnableAxis		Bool	<input type="checkbox"/> FALSE	FALSE	<input checked="" type="checkbox"/>
3	*InstSinaPos*.CancelTraversing		Bool	<input checked="" type="checkbox"/> TRUE		<input type="checkbox"/>
4	*InstSinaPos*.IntermediateStop		Bool	<input checked="" type="checkbox"/> TRUE		<input type="checkbox"/>
5	*InstSinaPos*.Positive		Bool	<input type="checkbox"/> FALSE		<input type="checkbox"/>
6	*InstSinaPos*.Negative		Bool	<input type="checkbox"/> FALSE		<input type="checkbox"/>
7	*InstSinaPos*.Jog1		Bool	<input type="checkbox"/> FALSE		<input type="checkbox"/>
8	*InstSinaPos*.Jog2		Bool	<input type="checkbox"/> FALSE		<input type="checkbox"/>
9	*InstSinaPos*.FlyRef		Bool	<input type="checkbox"/> FALSE		<input type="checkbox"/>
10	*InstSinaPos*.AckError		Bool	<input type="checkbox"/> FALSE		<input type="checkbox"/>
11	*InstSinaPos*.ExecuteMode		Bool	<input type="checkbox"/> FALSE	FALSE	<input checked="" type="checkbox"/>
12	*InstSinaPos*.Position		DEC+/-	355000	355000	<input checked="" type="checkbox"/>
13	*InstSinaPos*.Velocity		DEC	3000	3000	<input checked="" type="checkbox"/>
14	*InstSinaPos*.OverV		DEC+/-	100		<input type="checkbox"/>
15	*InstSinaPos*.OverAcc		DEC+/-	100		<input type="checkbox"/>
16	*InstSinaPos*.OverDec		DEC+/-	100		<input type="checkbox"/>
17	*InstSinaPos*.ConfigEPos		Hex	16#0000_0003		<input type="checkbox"/>
18						<input type="checkbox"/>
19	*InstSinaPos*.Error		Bool	<input type="checkbox"/> FALSE		<input type="checkbox"/>
20	*InstSinaPos*.Status		Hex	16#7002		<input type="checkbox"/>
21	*InstSinaPos*.DiagID		Hex	16#0000		<input type="checkbox"/>
22	*InstSinaPos*.AxisEnabled		Bool	<input type="checkbox"/> FALSE		<input type="checkbox"/>
23	*InstSinaPos*.AxisError		Bool	<input type="checkbox"/> FALSE		<input type="checkbox"/>
24	*InstSinaPos*.AxisWarn		Bool	<input checked="" type="checkbox"/> TRUE		<input type="checkbox"/>
25	*InstSinaPos*.AxisPosOk		Bool	<input checked="" type="checkbox"/> TRUE		<input type="checkbox"/>
26	*InstSinaPos*.AxisRef		Bool	<input checked="" type="checkbox"/> TRUE		<input type="checkbox"/>
27	*InstSinaPos*.ActVelocity		DEC+/-	0		<input type="checkbox"/>
28	*InstSinaPos*.ActPosition		DEC	4_294_949_127		<input type="checkbox"/>
29	*InstSinaPos*.ActMode		DEC+/-	2		<input type="checkbox"/>
30	*InstSinaPos*.Lockout		Bool	<input type="checkbox"/> FALSE		<input type="checkbox"/>
31	*InstSinaPos*.EPosZSW1		Hex	16#0000		<input type="checkbox"/>
32	*InstSinaPos*.EPosZSW2		Hex	16#0304		<input type="checkbox"/>
33	*InstSinaPos*.ActWarn		DEC	13000		<input type="checkbox"/>
34	*InstSinaPos*.ActFault		DEC	0		<input type="checkbox"/>

7 Appendix

7.1 Service and Support

Industry Online Support

Do you have any questions or need assistance?

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

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 at:

<https://support.industry.siemens.com>

Technical Support

The Technical Support of Siemens Industry provides fast and competent support regarding all technical queries with numerous tailor-made offers

– ranging from basic support to individual support contracts. Please send your queries to the Technical Support via the web form:

www.siemens.com/industry/supportrequest

Service offer

Our range of services includes, inter alia, the following:

- Product Training
- Plant Data Services
- Spare Parts Services
- Repair Services
- Field & Maintenance Services
- Retrofit & Modernization Services
- Service Programs & Agreements

You can find detailed information on our range of services in the service catalog:

<https://support.industry.siemens.com/cs/sc>

Industry Online Support app

You will receive optimum support wherever you are with the "Siemens Industry Online Support" app. The app is available for Apple iOS, Android and Windows Phone:

<https://support.industry.siemens.com/cs/ww/en/sc/2067>

7.2 Links and Literature

Table 7-1

No.	Topic
\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/109736845
\3\	SINAMICS G120 with CU240B/E-2 Operating instructions https://support.industry.siemens.com/cs/ww/en/view/109744796 List manual https://support.industry.siemens.com/cs/ww/en/view/109482961
	SINAMICS G120 with CU250S-2 Operating instructions https://support.industry.siemens.com/cs/ww/en/view/109482997 List manual https://support.industry.siemens.com/cs/ww/en/view/109482981
	SINAMICS G120C Operating instructions https://support.industry.siemens.com/cs/ww/en/view/109744769 List manual https://support.industry.siemens.com/cs/ww/en/view/109482977
\4\	SINAMICS G120 Power Module PM240-2 https://support.industry.siemens.com/cs/ww/en/view/109482011
\5\	Speed Control of a G110M / G120 (Startdrive) with S7-1500 (TO) via PROFINET or PROFIBUS with Safety Integrated (via Terminal) and HMI https://support.industry.siemens.com/cs/ww/en/view/78788716
\6\	SIMATIC S7-1200 System Manual https://support.industry.siemens.com/cs/ww/en/view/109478121
\7\	SIMATIC HMI Operating Instructions https://support.industry.siemens.com/cs/ww/en/view/90114350
\8\	SIMATIC G120 EPOS Function Manual https://support.industry.siemens.com/cs/ww/en/view/109483005

7.3 Change documentation

Table 7-2

Version	Date	Modifications
V1.0	06/2017	First version