SINAMICS S: Positioning an S120 with S7-300/400 via PROFINET in Step7 with Safety Integrated via terminal

SINAMICS S120 SIMATIC S7-300/400

Application description • September 2013

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SIEMENS

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1 Task

Several axes connected to a drive system are to be operated with positioning functionality.

The drive should be connected to a SIMATIC control system via PROFINET. Safety functions are to be controlled via terminals.

Overview of the automation task

The following diagram provides an overview of the automation task:



Requirements placed on the automation task

Table 1-1

| Requirement | Explanation |
|------------------------|--|
| Access to process data | The SINAMICS S120 is to position several axes based on control words from the SIMATIC control system. |
| Access to parameters | Parameters in the SINAMICS S120 are to be accessed from the S7-300/400. (e.g. reading and writing traversing blocks) |
| Safety functions | Safety functions (Emergency Off) are to be controlled via terminal in the SINAMICS S120 drive |

2.1 Overview of the overall solution

2 Solution

The application example shows how a SINAMICS S120, with the basic positioner function module, is connected to a SIMATIC S7 300 CPU via PROFINET.

Up to six axes with basic positioner can be operated at a SINAMICS S120 Control Unit CU320-2 PN. In this example, two axes are used.

Setpoints and actual values are transferred with SIEMENS telegram 111. Blocks are used, such as the FB283. These can be directly used in your own application.

2.1 Overview of the overall solution

Schematic

The following schematic figure shows the most important components of the solution.



The example shows you how...

- ...the S7 300/400 control system is parameterized.
- ...communication is programmed in the S7-300/400 control system.
- ...the SINAMICS S120 converter is parameterized using STARTER.
- ...the basic positioner of the SINAMICS S120 is used.

2.2 Description of the core functionality

2.2 Description of the core functionality

2.2.1 Parameterizing the communication

TIA (Totally Integrated Automation)

The SIMATIC S7-300/400 program and the SINAMICS S120 parameter assignment are centrally saved in a STEP 7 project. The required editors are called from the SIMATIC Manager.

SIMATIC S7-300/400

In this example, the SIMATIC S7-300/400 is programmed using STEP 7 V5.

In the hardware configuration (HW Config), the SIMATIC S7 and the stations connected via PROFINET, are configured, e.g. the SINAMICS S120 and the communication. When inserting the SINAMICS S120 in the SIMATIC project, the peripheral addresses are also defined, which the SIMATIC S7 300/400 should use to access the SINAMICS S120.

SINAMICS S120

The SINAMICS S120 is parameterized using the STARTER commissioning tool.

For SINAMICS S120, one of several telegram types can be selected for cyclic data exchange. This defines which data are sent or received in which sequence. It is important that when parameterizing the SIMATIC S7-300/400, the same telegram type is selected as in the SINAMICS S120 drive.

2.2.2 Data exchange

Data exchange between SINAMICS S120 and SIMATIC S7-300/400 is realized in two areas:

- Process data, cyclic communication
 i.e. control word(s) and setpoint(s) or status word(s) and actual value(s)
- Parameter area, acyclic communication i.e. reading/writing parameter values

2.2 Description of the core functionality

Cyclic process data exchange

The process data are cyclically transferred, i.e. in each bus cycle. As a consequence, they are transferred as quickly as possible.

The SIMATIC S7-300/400 sends control words and setpoints to the SINAMICS S120 drives and receives from them the status words and actual values.

Depending on the particular telegram type, additional setpoints or actual values and/or extended control and/or status words can be transferred.

SIEMENS telegram 111 is used in this example.

The FB283 uses a data block for each drive, the axis DB; it takes data from this to be sent to the SINAMICS S120, and the received data are also saved here.

The process data are automatically internally interconnected in the SINAMICS S120 when selecting the telegram.

Acyclic data exchange (parameter access)

In order to be able to transfer parameters, telegram types have also been defined in which there are four additional words to transfer parameters. As these four words are always sent, just like the process data, a permanent communication load is obtained, although the parameters themselves are generally only infrequently transferred.

In addition to cyclic data exchange, PROFINET also offers the possibility of acyclic data exchange, which is only inserted when required. As a consequence, it is possible to acyclically transfer the parameter area when required, without creating a permanent communication load (communication overhead). Acyclic process data transfer takes longer than cyclic data transfer.

FB283 is used for acyclic communication in this example. Individual or also several parameters can be written or read in one operation. FB283 also allows traversing blocks to be written and read or fault and alarm buffers to be read out.

2.3 Basic positioner

The basic positioner (EPOS) in the SINAMICS S120 is used to position linear and rotary axes in absolute/relative terms with motor encoder (indirect measuring system) or machine encoder (direct measuring system). EPOS is available in the servo and vector modes. For the basic positioner functionality, the STARTER commissioning tool provides graphic support when configuring and commissioning – and for diagnostic functions. A control panel in STARTER supports you when operating the basic positioner and when operating in the closed-loop speed controlled mode. The position control is automatically activated when activating the basic positioner using the commissioning wizards of STARTER. The required internal interconnections are automatically made.

2.4 Hardware and software components used

The application was created with the following components.

SIMATIC hardware components

Tabelle 2-1 HW-Komponenten

| Component | Qty | Order number | Note |
|--|-----|---------------------|--|
| CPU 315-2 DP/PN | 1 | 6ES7315-2EH14-0AB0 | or other S7-300/400 CPU with PROFIBUS |
| PS307 24V/5A POWER SUPPLY | 1 | 6ES7307-1EA01-0AA0 | or another 24 V DC power supply |
| MMC 128kB | 1 | 6ES7 953-8LG20-0AA0 | or larger MMC |
| SIMATIC panel KTP600 basic color PN | 1 | 6AV6647-0AD11-3AX0 | |
| PROFINET connectors | 6 | 6GK1901-1BB10-2AA0 | |
| PROFINET cable | | 6XV1840-2AH10 | |

Hardware components, drive system

The SINAMICS S120 training case 6ZB2480-0CN00 can also be used.

| Component | Qty | Order number | Note |
|--------------------------------|-----|--------------------|----------|
| Control Unit CU320-2 PN | 1 | 6SL3040-1MA01-0AA0 | |
| CompactFlash card; basic | 1 | 6SL3054-0EF00-1BA0 | |
| Smart Line Module 5.00 kW | 1 | 6SL3130-6AE15-0AB0 | |
| Line reactor | 1 | 6SL3000-0CE15-0AA0 | |
| 3.00 A Double Motor Module | 1 | 6SL3120-2TE13-0AA3 | |
| SMC 20 Sensor Module | 1 | 6SL3055-0AA00-5BA3 | |
| 0.40 kW synchronous servomotor | 1 | 1FK7022-5AK71-1LG0 | SERVO_02 |
| 0.40 kW synchronous | 1 | 1FK7022-5AK71-1AG3 | SERVO_03 |

2 Solution

2.4 Hardware and software components used

| Component | Qty | Order number | Note |
|---------------------------------------|-----|--------------------|-------------------------|
| servomotor | | | |
| Motor power cable, 1m | 2 | 6FX5002-5CS01-1AB0 | |
| Signal cable, 1m | 1 | 6FX5002-2CA31-1AB0 | SMC encoder |
| DRIVE-CLiQ cable, IP20/IP20 0,16 m | 1 | 6SL3060-4AD00-0AA0 | CU 320-2 PN - DMM |
| DRIVE-CLiQ cable, IP20/IP20 0.60 m | 1 | 6SL3060-4AU00-0AA0 | DMM – SMC (SERVO_03) |
| DRIVE-CLiQ cable, IP20/IP67 1.0m | 1 | 6FX5002-2DC10-1AB0 | DMM – SMI (SERVO_02) |

Software components

Table2-3 SW-Cmponents

| Component | Qty Order number | | Note |
|-------------------------------------|------------------|--|-------------------------------------|
| SIMATIC STEP 7 V5.5 SP2 | | Floating license 6ES7810-4CC10-0YA5 | |
| STARTER V4.3.1.2 | | 6SL3072-0AA00-0AG0 | Free of charge download: see /6/ |
| WinCC flexible Version: 2008 SP3 | | 6AV6613-0AA51-3CA5 | |

Sample files and projects

The list below contains all the files and projects used in this example 14/.

Table 2 4 Sample files and projects

| Component | Note |
|---|--|
| 67261457_SINAMICS_S120-PN_Positionieren_at_S7-300_v11.zip | This zipped file contains the STEP 7 project with SINAMICS S120 and HMI. |
| 67261457_SINAMICS_S120_at_S7-300400_SHORT-DOKU_v11_de.pdf | Brief documentation for experienced users |
| 67261457_SINAMICS_S120-PN_at_S7-300400_DOKU_v11_de.pdf | This document |

CAUTION The project sample is designed for use with the component samples listed in Chapter 2.4. If other SINAMICS S120 components are used or other motors connected without adapting the corresponding parameters, the converter and/or motor could be damaged or destroyed.

3.1 Wiring

3 Configuring and commissioning the application

3.1 Wiring

The following diagram shows the power cables, the encoder connection, the DRIVE-CLiQ wiring and the configuration of the SINAMICS S120 used. Fig. 3-1



3.1 Wiring

The 24 V wiring, the fieldbus wiring and safety wiring of the configuration is shown in the following diagram.



Notes

•

The installation guidelines in the SINAMICS S120 manuals (see /7/) and the SIMATIC must always be taken into consideration.

3.2 IP addresses and PN names

3.2 IP addresses and PN names

The following IP addresses and device names are used in the example:

| _ | | | - | |
|----|---|---|----|---|
| Та | b | e | 3- | 1 |

| IP | Component | Device Name |
|---------------|---------------|----------------|
| 192.168.0.1 | S7 CPU | S7 CPU |
| 192.168.0.2 | SINAMICS S120 | S120-CU320-2PN |
| 192.168.0.3 | KTP600 | KTP600 |
| 192.168.0.200 | PG/PC | |

3.3 Settings at the PG/PC

Table 3-2

| Action | Remark |
|---|--|
| In the Window settings for the network card to be used, set the fixed TCP/IP address 192.168.0.200 and the network mask 255.255.255.0. You can also use any other free IP address (192.168.0.x). | Internet Protocol (TCP/IP) Properties ? × 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. © Obtain an IP address automatically • Use the following IP address: IP address: 192.168.0.200 Subnet mask: 255.255.0 Default gateway: • • • • • • • • • • • • • • • • • • • |

3.4 Loading the SIMATIC program

3.4 Loading the SIMATIC program

This chapter describes the steps involved when installing the sample code into the SIMATIC S7-300/400.

Table 3-3

| No. | Action | Remark |
|-----|--|--|
| 1. | Connect the S7-300/400 with the PG/PC using a network cable. | You can connect the two devices directly with one another or via a switch. |
| 2. | Start the SIMATIC Manager. | |
| 3. | Using "Tools > Set PG/PC interface", open the settings of the online interface. Select "TCP/IP -> <i>Network card</i> " with the network card that you are using. | Set PG/PC Interface X Access Path LLDP Access Point of the Application: S70NLINE (STEP 7) -> TCP/IP -> RD9700 USB2.0 To Fast. (Standard for STEP 7) Interface Parameter Assignment Used: TCP/IP -> RD9700 USB2.0 To Fast <a< td=""> Properties Image: NETLink PR0(PR0FIBUS) Diagnostics Image: S7USB Copy Image: TCP/IP -> RD9700 USB2.0 To Fast Delete Image: S7USB Copy Image: S7USB</a<> |
| 4. | Call the dialog "Edit Ethernet Node". | SIMATIC Manager File PLC View Options Window Help Display Accessible Nodes PROFIBUS Image: Comparison of the period of t |

3.4 Loading the SIMATIC program

| No. | Action | Remark |
|-----|---|---|
| 5. | Click "Browse" Select the "S7-300" CPU and click OK. | Edit Ethernet Node X Ethernet node Nodes accessible online MAC address: Browse Set IP configuration Browse Network - 2 Nodes Start I IP address MAC address Start 0.00.0 00-1B:1B:1B:57:441 S7:300 Stop 0.00.0 00-1F:FB:08:8F:0F S1NAMICS S IV Fast search I IP address INAMICS S |
| | | Flash MAC address: 00-1B-1B-57-AF OK Cancel Help Reset to factory settings Reset Close Help |
| 6. | Reset the IP configuration to the factory setting. Confirm the notes. | Edit Ethernet Node X Ethernet node Nodes accessible online MAC address: 00-1B-1B-57-AF Browse |
| | | Set IP configuration |
| | | Obtain IP address from a DHCP server Identified by Orient ID O MAC address O Device name Client ID: Assign IP Configuration Assign IP configuration |
| | | Device name: s7-cpu Assign Name Reset to factory settings Reset Close Help |

3 Configuring and commissioning the application

3.4 Loading the SIMATIC program

| No. | Action | Remark |
|-----|---|--|
| 7. | Enter the IP address 192.168.0.1 and the network mask 255.255.255.0, and click on "Assign IP Configuration". | Edit Ethernet Node Ethernet node Nodes accessible online MAC address: 00-1B-1B-57-AF Browse Cset IP configuration |
| | Enter the device name: "S7□CPU" and click on "Assign name" | Use IP parameters Gateway Go not use router Subnet mask: 255.255.0 C Use router Address: |
| | Click "Close" to exit the dialog. | Obtain IP address from a DHCP server Identified by O Client ID O MAC address O Device name Client ID: |
| | | Assign IP Configuration Assign device name Device name: S7-cpu Assign Name |

3.4 Loading the SIMATIC program

| No. | Action | Remark |
|-----|---|---|
| 8. | Click "Accessible Nodes". | SIMATIC Manager File PLC View Options Window Help Display Accessible Nodes PROFIBUS • Edit Ethernet Node Update the Operating System |
| 9. | Select all blocks in the CPU using <ctrl><a> and delete them.</ctrl> Acknowledge that system blocks and system data cannot be deleted. | Accessible Nodes System data 0B1 0B86 0 Image: Solution of the second sec |
| 10. | If you have still not dearchived the project, under "File > Dearchive", select the project file (see Table 2-4) and dearchive this. | SIMATIC Manager File PLC View Options Window Help New Ctrl+N 'New Project' Wizard Open Open Ctrl+O S7 Memory Card > Memory Card File > Delete Reorganize Manage Archive Page Setup Page Setup Retrieve (3280:754) |
| | Confirm that you want to open the project | The following objects were retrieved: Projects: S120-at-S7 Libraries: None Do you want to open these now? |
| 11. | Select the SIMATIC 300 station Load the project to the CPU. | SIMATIC Manager - [S120-at-S7 C:\Programme\Siemens\Step7\S7Pr File Edit Insett PLC View Options Window Help SI20-at-S7 SI20-at-S7 SIMATIC 300-Station SIMATIC 300-Station CPU315-2 PN/DP CPU315-2 PN/DP CPU315-2 PN/DP |
| 12. | Restart the CPU after loading. | |

3.5 Loading the SINAMICS parameterization

3.5 Loading the SINAMICS parameterization

Downloading the parameterization to the SINAMICS S120

Table 3-4

| N 0. | Action | Remark |
|---------|--|---|
| 1. | Connect the SINAMICS S120 Control Unit to the SIMATIC S7- 300/400 CPU using a PROFINET cable, and connect the SIMATIC S7 to the PG/PC using a network cable. | |
| 2. | Open the SIMATIC Manager. | |
| 3. | Call the dialog "Edit Ethernet Node". | SIMATIC Manager File PLC View Options Window Help Display Accessible Nodes PROFIBUS Edit Ethernet Node Edit Ethernet Node Update the Operating System Update the Operating System Image: Comparison of the operating System |

Notes If you wish to use other components, then you must parameterize these yourself. Then follow the instructions in Chapter 6 "Configuration and project engineering", especially 6.2 Configuration of the SINAMICS S120 drive.

3 Configuring and commissioning the application 3.5 Loading the SINAMICS parameterization



| N 0. | Action | Remark |
|---------|---|--|
| 4. | Click "Browse" Select the "SINAMICS S" CPU and click OK. | Edit Ethernet Node X Ethernet node Nodes accessible online MAC address: Browse Set IP configuration Browse Network - 2 Nodes Start I IP address MAC address Start I Start INAMICS S |
| | | Flash MAC address: 00-1F-F8-08-8F-0F OK Cancel Help Reset to factory settings Reset Close Help |
| 5. | Enter the IP address 192.168.0.2 and the network mask 255.255.255.0, and click on "Assign IP Configuration". | Edit Ethernet Node Image: Comparison of the second sec |
| | Enter the device name: "S120- CU320-2PN" and click on "Assign name" | IP address: Subnet mask: 500 mot use router 500 mot use router 500 mot use router 500 mot use router 500 mot use router |
| | Click "Close" to exit the dialog. | Close Help |
| 6 | Open the sample project | |

3 Configuring and commissioning the application

3.5 Loading the SINAMICS parameterization

| N o. | Action | Remark |
|---------|---|--|
| 7. | Select the SINAMICS S120 in the project tree of the SIMATIC project Open STARTER by double clicking on commissioning | SIMATIC Manager - [S120-at-S7 D:\Temp\S120-a~1] Pile Edit Insert PLC View Options Window Help Pile Silverator SIMATIC 300-Station Pile SIMATIC 300-Station Pile SIMATIC 300-Station Pile Silverator CPU315-2 PN/DP S120-cu320-2PN |
| 8. | Select the SINAMICS S120 in the project tree of STARTER Go online | Project Edit Paste Target system View Options Window Help Project Edit Paste Target system View Options Window Help S120-at-S7 Insert SIMOTION device Insert SIMOTION device Insert single drive unit Configure drive unit Overview |
| 9. | Load the configuration into the SINAMICS S120 | S120-at-S7 S120-at-S7 Insert SIMOTION device Insert single drive unit Automatic Configuration |
| 10. | Select that the parameters will be saved. Start the download | Download (WABS:41732) XI Image: Constraint of the second and the drive unit data downloaded to the target device! Image: Constraint of the target device Image: Constraint of the target device Image: Constraint of the target device Image: Constraint of the target device Image: Constraint of the target device Image: Constraint of the target device Image: Constraint of the target device Image: Constraint of the target device Image: Constraint of the target device Image: Constraint of the target device Image: Constraint of the target device Image: Constraint of the target device Image: Constraint of the target device Image: Constraint of the target device Image: Constraint of target device Image: Constraint of target device Image: Constraint of target device Image: Constraint of target device Image: Constraint of target device Image: Constraint of target device Image: Constraint of target device Image: Constraint of target device Image: Constraint of target device Image: Constraint of target device Image: Constraint of target device Image: Constraint of target device Image: Constraint of target device Image: Constraint of target device Image: Constraint of target device Image: Constraint device Image: |

3.6 Loading the HMI

3.6 Loading the HMI

| No. | Action | Remark |
|-----|--|--|
| 1. | Connect the S7-300/400 CPU with the KTP600 HMI using a network cable. | |
| 2. | Assign the HMI IP address 192.168.0.3. | |
| 3. | In the SIMATIC Manager project tree, open KTP_600 HMI. Open WinCC flexible with "Open Object" in the shortcut menu of "WinCC flexible RT" | SIMATIC Manager - [S120-at-S7 D:\Temp\S120-a^1] File Edit Inset PLC View Options Window Help Sile Edit Inset PLC PL Sile Edit Inset PLC View Options Window Help Sile Edit Inset PLC View Options View Options View Optio |
| 4. | The configuration of the HMI opens with WinCC flexible. | WindCt flexible Advanced - S120-at-S7 - K1P_600 Project Edit View Inset Earnalt Faceplates Options Window Help I: New - Im Right Advanced - S120-at-S7 - K1P_600 Geman (Germany) I: Sprache Project |
| | Luau the configuration. | |

4.1 Preconditions

4 Using the application

The application can be operated using the variable tables of the sample project or via the $\ensuremath{\mathsf{HMI}}$

4.1 Preconditions

In the sample project, basic safety functions are activated in the SINAMICS S120.

In order to be able to switch on the SINAMICS S120, 24 V must be available at the EP terminals of the motor module X21.3 and X22.3 as well as at the Control Unit X122.1.

Otherwise, the SINAMICS S120 converter pulses are inhibited.

4.2 Using the application via HMI

4.2.1 Basic screen

| Fig. 4-1 | | |
|----------|-------------------|---------------|
| SIEMENS | | SIMATIC PANEL |
| | | |
| | Change Language | DUCH |
| | Start Exit | |
| | F1 F2 F3 F4 F5 F6 | |

The language can be selected in the basic screen.

Exit: exits the runtime

Start: Changes to the start screen for the basic positioner

4.2.2 Selecting the axis

In all of the following screens, the axis can be selected in the topmost line. To the right of the selection, the number of the axis DB of the selected axis is displayed. The axis selection can also be changed in the other screens.

All inputs and displays are only for the displayed axis.

4.2.3 Start screen, basic positioner

| | Selecting the axis |
|----------|---|
| Fig. 4-2 | |
| SIEMENS | SIMATIC PANEL |
| | Fault: 0 |
| | Ack Vact [1000 LU/min] 0 |
| | MDI activ Xact Jog active [LU] Traversing Blocks active |
| | Homing Jog Trav. Blocks MDI |
| | F1 F2 F3 F4 F5 F6 |
| | |

Active faults and alarms of the SINAMICS S120 are displayed in the upper section of the screen with number and in plain text.

Active faults can be acknowledged with the "Ack" button.

The active operating modes of the basic positioner are displayed at the left.

The actual position and actual velocity of the basic positioner are displayed at the right.

The screens for the operating modes can be called in the lower section. You can return to the basic screen using the "Home symbol".

4.2.4 Homing

| Fig. 4-3 | | |
|----------|--|-----------|
| SIEMENS | SIMATIC PA | NEL |
| | | |
| | Absolute Value Calibration SERVO_03 DB 172 | \supset |
| | Absolute Value Calibration RD/WR | - |
| | Reference point busy O | |
| | coordinate done O | P |
| | calibration error O | |
| | Absolute Value Calibration | |
| | Start Homing | |
| | Set Reference point | |
| | reference point set | |
| | Back | |
| | | |
| | | |
| | F1 F2 F3 F4 F5 F6 | |
| | | |

Absolute encoder adjustment

Absolute encoders, as in the example for SERVO_02, must be adjusted once after commissioning. When adjusting an absolute encoder, the position actual value is set to the specified reference point coordinate.

Absolute encoder adjustment is initiated using acyclic jobs in SINAMICS S120. The status of the acyclic job is displayed at the left below "RD/WR".

While an order has the status "busy", the buttons for initiating new orders are hided.

When using incremental encoders, as in the example for SERVO_03, absolute encoders cannot be adjusted.

Homing

When using incremental encoders, SINAMICS S120 must be homed after each warm restart. For SERVO_03, a reference point approach to the encoder zero mark is parameterized.

Initiating the reference point approach:

Switch on the SINAMICS S120 with "On". If the SINAMICS S120 is on, the button has a green background, and the text changes to "Off".

Press "Start Homing" until "Reference point set" is lit.

Using the button "Set Reference point", the reference point can be set to the actual position Xact".

4.2.5 Jogging

| Fig. 4-4 | | | |
|----------|---------------------|---------------------------|---------------|
| SIEMENS | | | SIMATIC PANEL |
| | | | |
| | Jogging | SERVO_03 DB 172 | |
| | Jog 1 | Jog active 🔵 | |
| | Jog 2 | Vact [1000 LU/min] 300 | |
| | Jogging incremental | Xact [LU] 1419 | |
| | | Off Ack | |
| | | Back | |
| | | | |
| | F1 F2 F3 | F4 F5 F6 | |
| | | | |

Using the "Jog 1" and "Jog 2" buttons, the SINAMICS S120 is traversed with the parameterized speed. Incremental jogging is selected by pressing the "Jogging incremental" button.

The drive can be switched on and switched off using the "On" button.

"Xact" displays the actual position in LU

"Vact" displays the actual velocity in 1000 LU/min

Faults in the SINAMICS S120 are acknowledged using the "Ack" button.

4.2.6 Traversing blocks

| Fig. 4-5 | | | |
|----------|---|--|-----------|
| SIEMENS | | SIMA | TIC PANEL |
| | | | |
| | Trav. Blocks | SERVO_03 DB 172 | |
| | no intermediate stop | Vact [1000 LU/min] | |
| | reject task Blocknumber select | Xact [LU] 0 | |
| | Start | Blocknumber active 0 | |
| | Off Ack | Traversing Blocks active O Targetposition reached O | |
| | | Edit Back | |
| | | | |
| | F1 F2 F3 | F4 F5 F6 | |
| | | | |

Parameterized traversing profiles can be started from this screen.

Starting traversing tasks

In the Traversing blocks screen, the basic positioner can be operated in the traversing block mode.

For traversing motion, the "No intermediate stop" and "No reject task" must be selected.

"Block number select" sets which traversing block should be started.

The SINAMICS S120 can be switched on and switched off using the "On" button.

Faults in the SINAMICS S120 are acknowledged using the "Ack" button.

The traversing block with the selected block number is started using the "Start" button.

"Xact" displays the actual position in LU

"Vact" displays the actual velocity in 1000 LU/min

"Block number active" indicates the number of the active traversing block.

The screen to read and write traversing books is called with "Editor".

The timing of the control and status signals of a traversing profile can be seen in the following diagram. The traversing profile comprises individual traversing blocks. Progressing (advancing) between the traversing blocks is "Continue with stop"

Fig. 4-6

| | Controlsignals |
|---|----------------|
| ON/OFF1 | |
| Intermediate stop (0 signal) | |
| Reject traversing task (0 signal) Trav. Block selection Bit 0 | |
| Trav. Block selection Bit 1 | |
| Trav. Block selection Bit 2 | |
| Trav. Block selection Bit 3 | |
| Activate traversing task | |
| | Statussignals |
| Operation enabled | |
| Traversing command active | |
| Target position reached | |
| Trav. block active bit 0 | |
| Trav. block active bit 1 | |
| Trav. block active bit 2 | |
| Trav. block active bit 3 | |

Reading and writing traversing blocks

| Fig. 4-7 | | |
|----------|---|---------------|
| SIEMENS | | SIMATIC PANEL |
| | | |
| | | |
| | Edit Traversing Blocks SERVO_03 | DB 172 |
| | IndexSave b | usy 🔿 🔰 🦰 |
| | - 1 - Write d | one 🔘 🛛 🖳 |
| | block e | rror O |
| | No. Job Mode: Position | Veloc. |
| | Positioning Absolute(0) | 600 |
| | | |
| | Accel. Deccel. <u>Advance</u> <u>Hide</u> | |
| | 100.0 100.0 End (0) display | |
| | Parameter | |
| | 0 | |
| | | |
| | Help | Back |
| | | |
| | | |
| | | |
| | F1 F2 F3 F4 F5 | F6 |
| | | |
| | | |

Using the editor, traversing blocks can be read and written to using acyclic jobs.

- Reading out traversing blocks: The index to be read out is set using the "-" and "+" buttons. The read job is immediately started when pressing one of the two buttons. The data of the traversing block that has been read out are displayed in the relevant fields.
- Writing a traversing block: First, select the index into which the traversing block should be written. Then enter the other data in the appropriate fields. The write job is started by pressing the "Write traversing block" button.
- Copying a traversing block: Read out the traversing block to be copied. Enter the new index using the screen keyboard, when doing this do not use the "-" or "+" buttons. The write job is started by pressing the "Write block" button.

The drive parameters are backed up in the ROM by pressing the "Save drive" button.

The status of the acyclic job is displayed with "busy" and "done" and "error". While an order has the status "busy", the buttons for initiating new orders are hided.

4.2.7 Direct setpoint specification / MDI

. .

| Fig. 4-8 | | | |
|----------|--------------------------------|-----------------------------------|--------------|
| SIEMENS | | S | IMATIC PANEL |
| | | | |
| | | | |
| | MDI / Direct Setpoint Specific | cation SERVO_03 DB 172 | |
| | no intermediate stop | Vact 0 | |
| | no | | |
| | reject task | | |
| | relative Pos. Edge | | |
| | | Targetposition reached \bigcirc | |
| | | MDI activ 🔘 | |
| | neg. Start | MDI Setup 🔿 | |
| | Acc. Vset | | |
| | 100 % 500 1000 LU/m | in Off | |
| | Dec. Xset | Ack | |
| | 100 % 0 LU | | |
| | | Back | |
| | | | |
| | | | |
| | | | |
| | F1 F2 F3 | F4 F5 F6 | |
| | | | |
| | | | |

In the MDI screen, the basic positioner can be operated in the MDI / direct setpoint specification mode.

For traversing motion, the "No intermediate stop" and "No reject task" must be selected.

The positioning mode is set to either relative or absolute using the "relative" button. Positioning or setting up is selected using the "Pos." button.

The setpoint transfer type is set to signal edge or continuous using the "Edge" button.

The operating mode MDI/direct setpoint specification is activated using the "MDI_selection" button.

In the setting-up mode, the direction of rotation is specified using "pos." or "neg.". The acceleration and deceleration override are specified in the "Acc." and "Dec." fields.

For "Vset", the setpoint velocity is entered in 1000 LU/min.

For "Xset", the setpoint position is entered in LU.

The SINAMICS S120 can be switched on and switched off using the "On" button.

Faults in the SINAMICS S120 are acknowledged using the "Ack" button.

For setpoint transfer with signal edge, positioning is started using the "Start" button. "Xact" displays the actual position in LU

"Vact" displays the actual velocity in 1000 LU/min

The timing of the control and status signals for absolute positioning can be seen in the following diagram. The setpoint is accepted with a positive signal edge of "Setpoint acceptance".

Fig. 4-9

| | (| Control | signals | |
|---|---|---------------|---------|--|
| ON/OFF1 | | | | |
| Intermediate stop (0 signal) Reject traversing task (0 signal) | | | | |
| MDI selection | | | | |
| Positioning type | | | | |
| Setpoint acceptance | | | | |
| Position setpoint | 0 | \rightarrow | 1800 | |
| Velocity setpoint | 0 | | 1000 | |

Statussignals

| Operation enabled | |
|-------------------------|--|
| MDI active | |
| Traversing command | |
| Target position reached | |

4.3 Variable tables

Commenting out permanently controlled signals

Several signals are permanently controlled in the FB1 network 4. If these signals are to be controlled using variable tables, then the corresponding lines must be commented out.

Fig. 4-10

| Netzwerk 4 | Permanente | Freigaben setzen |
|------------|-------------|-------------------|
| S | DBX 173.1 | AUS2 |
| S | DBX 173.2 | AUS3 |
| S | DBX 173.3 | Betriebsfreigabe |
| S | DBX 172.2 | Führung durch PLC |
| | | |
| L | #DBNr | #DBNr AchsDBNr |
| Т | #DB_int | #DB_int |
| AUF | DB [#DB_int | #DB_int |
| s | DBX 173.1 | |
| S | DBX 173.2 | |
| S | DBX 173.3 | |
| s | DBX 172.2 | |
| | | |

After changes are made in FB1, the block must be loaded into the SIMATIC S7-300/400 control.

4.3 Variable tables

4.3.1 Reading and writing traversing blocks

Traversing blocks can be read out and written to acyclically using the variable tables "VAT72_TVBsingle" and "VAT72_TVBblock".

| Fig. | 4-11 | VAT72 | TVBsingle |
|------|------|-------|-----------|
| | | | |

| Operand | | Symbol | Anzeigeformat | Statuswert | Steuerwert |
|-----------|------|--|---------------|-----------------------|-----------------------|
| DB72.DBW | 16 | "Axis_TVB+MDI_TLG111".Basis.single.tasksi | DEZ | 30000 | 30000 |
| DB72.DBVV | 18 | "Axis_TVB+MDI_TLG111".Basis.single.Ind | DEZ | 8 | 8 |
| DB72.DBX | 14.0 | "Axis_TVB+MDI_TLG111".Basis.single.RD | BOOL | false | false |
| DB72.DBX | 14.1 | "Axis_TVB+MDI_TLG111".Basis.single.WR | BOOL | false | false |
| DB72.DBX | 14.2 | "Axis_TVB+MDI_TLG111".Basis.single.Done | BOOL | true | |
| DB72.DBX | 14.3 | "Axis_TVB+MDI_TLG111".Basis.single.busy | BOOL | false | |
| DB72.DBD | 20 | "Axis_TVB+MDI_TLG111".Basis.single.Data | DEZ | L#6 | //L#45 |
| DB72.DBX | 14.7 | "Axis_TVB+MDI_TLG111".Basis.single.Error | BOOL | false | |
| DB72.DBW | 24 | "Axis_TVB+MDI_TLG111".Basis.single.ErrorNumbr | HEX | VV#16#0000 | |
| D872.D88 | 134 | | BIN | 2#1111_111 | //2#1111_111 |
| DB72.DBW | 136 | "Axis_TVB+MDI_TLG111".Basis.TraVerBlockSet.block_no | DEZ | 8 | 8 |
| DB72.DBD | 138 | "Axis_TVB+MDI_TLG111".Basis.TraVerBlockSet.position | DEZ | L#1800 | L#1800 |
| DB72.DBD | 142 | "Axis_TVB+MDI_TLG111".Basis.TraVerBlockSet.velocity | DEZ | L#300 | L#300 |
| DB72.DBD | 146 | "Axis_TVB+MDI_TLG111".Basis.TraVerBlockSet.accel_over | GLEITPUNKT | 100.0 | 100.0 |
| DB72.DBD | 150 | "Axis_TVB+MDI_TLG111".Basis.TraVerBlockSet.decel_over | GLEITPUNKT | 100.0 | 100.0 |
| DB72.DBW | 154 | "Axis_TVB+MDI_TLG111".Basis.TraVerBlockSet.command | DEZ | 1 | 1 |
| DB72.DBD | 156 | "Axis_TVB+MDI_TLG111".Basis.TraVerBlockSet.command_par | DEZ | L#O | L#0 |
| DB72.DBW | 160 | "Axis_TVB+MDI_TLG111".Basis.TraVerBlockSet.mode | BIN | 2#0000_0010_0010_0000 | 2#0000_0010_0010_0000 |
| | | 1 | | | |

You can use variable table VAT72_TVsingle to read or write a traversing block in SINAMICS S120.

Writing

- Job "30000" must be located in DBW 16
- The index of the traversing block is specified in DBW 18 (n+1)
- The bits of DBW 134 are used to select which data should be transferred.
- The traversing block number is specified in DBW 136.
- The position setpoint is specified in DBD 138
- The velocity setpoint is specified in DBD 142.
- The acceleration is specified in DBD 146
- The deceleration is specified in DBD 150
- The job of the traversing block is specified in DBW 154 (see the following tables)
- The job parameter is specified in DBD 156 (see the following tables)
- The traversing block mode is specified in DBW 160 (see the following tables)
- After all data has been written to the blocks, writing can be started with a positive edge of DBX 14.1

Reading

- Job "30000" must be located in DBW 16
- The index of the traversing block is specified in DBW 18 (n+1)
- The read job is started with a positive edge at DBX 14.0.
- The values are saved in the same data area as where they were saved for the write job.

Table 4-1 Significance of DBW 154 and DBD 156

| Job | Job parameter |
|-----------------|----------------------------------|
| 0 = error | |
| 1 = positioning | |
| 2 = fixed stop | [clamping torque in Nm] |
| 3 = endless_pos | |
| 4 = endless_neg | |
| 5 = wait | [Wait time in ms] |
| 6 = goto | [jump destination] |
| 7 = set_O | [set digital output] |
| 8 = reset_O | [reset digital output] |
| 9 = jerk | jerk limitation 0 = off / 1 = on |

Table 4-2 Significance of DBW 160

| Bit 15-12 | Bit 11-8 | Bit 7-4 | Bit 3-0 | Significance |
|-----------|----------|---------|---------|-----------------------------|
| 0000 | 0000 | 0000 | 0000 | |
| XXXX | XXXX | XXXX | xxx0 | Show traversing block |
| XXXX | XXXX | XXXX | xxx1 | Hide traversing block |
| XXXX | XXXX | 0000 | XXXX | End (0) |
| хххх | XXXX | 0001 | XXXX | Continue with stop (1) |
| хххх | хххх | 0010 | XXXX | Continue flying (2) |
| хххх | хххх | 0011 | XXXX | Continue external (3) |
| хххх | хххх | 0100 | XXXX | Continue external wait (4) |
| хххх | XXXX | 0101 | XXXX | Continue external alarm (5) |
| хххх | 0000 | XXXX | XXXX | Absolute (0) |
| хххх | 0001 | XXXX | XXXX | Relative (1) |
| хххх | 0010 | XXXX | XXXX | ABS_POS (2) |
| XXXX | 0011 | XXXX | XXXX | ABS_NEG (3) |
| XXXX | XXXX | XXXX | XXXX | No significance |

Further information in this regard may be found in the documentation of the FB283. (See /8/)

4.3 Variable tables

4.3.2 Reading and writing drive parameters

Traversing blocks can be read out and written to acyclically using the variable tables "VAT72_Parameter" and "VAT72_Para_1_10".

Further information in this regard may be found in the documentation of the FB283. $\ensuremath{\sc /8}\xspace$

4.3.3 Reading out the fault memory

The fault memory of the SINAMICS S120 can be read out using the "VAT72_Faultbuffer" variable table.

Further information in this regard may be found in the documentation of the FB283. $\ensuremath{/8}\xspace$
5 Functional mechanisms of this application

5.1 Functions of the SIMATIC S7-300/400

5.1.1 Overview



The SIMATIC S7-300/400 program comprises the following areas:

• Data exchange with the SINAMICS S120:

Cyclic process data exchange

In this area, process data are sent to the SINAMICS S120 (e.g. on command and position setpoint) or received (status and actual values)

Acyclic parameter access

Parameters of the SINAMICS S120 are accessed in this area. (e.g. reading or writing traversing blocks)

Preparing data

Converting the actual velocity for display on the HMI

Splitting the traversing job parameters for display and selection on the HMI

5.1 Functions of the SIMATIC S7-300/400

5.1.2 FC72: Communication using FB283 and SIEMENS telegram 111

Telegram 111 includes 2 communication options. One option is pure cyclic communication using the system functions. The option involves the FB 283 available to the application, which in addition to the cyclic also has an acyclic communication option.

Communication with the FB283 is discussed in this example.

So that the acyclic interface is executed only once at the same time, the "busy" feedback of both axes will be checked in network 1. If an acyclic order is active at an axis, the buttons for initiating new acyclic orders at the HMI become hided.

Fig. 5-2 FC72 Network 1

```
      0
      "Axis_TVB+MDI_TLG111_S2".Basis.single.busy
      DB72.DBX14.3

      0
      "Axis_TVB+MDI_TLG111_S3".Basis.single.busy
      DB172.DBX14.3

      =
      "ParameterAnzeige".HideAcyclic
      DB11.DBX6.2
```

For every axis one instance DB from FB283 is generated. When calling the FB283, the following data are specified for each axis:

| NR_ACHS_DB: | Number of the axis DB |
|----------------------|--|
| LADDR: LADDR_DIAG | Start of the I/O address Diagnostics address of the drive |
| WR_PZD: | Target area (control words/setpoints) |
| RD_PZD: | Target area (status words/actual values) |
| AXIS_NO: | Axis No. (Number of the DriveObject) |

Fig. 5-3 FC72 Network 2

```
CALL "SINA_FB", DB283

NR_ACHS_DB:=72

LADDR :=256

LADDR_DIAG:=2038

WR_PZD :="Axis_TVB+MDI_TLG111_S2".MDI_Positioning.WR_PZD_POSBETR

RD_PZD :="Axis_TVB+MDI_TLG111_S2".MDI_Positioning.RD_PZD_POSBETR

CONSIST :=TRUE

RESTART :=TRUE

AXIS_N0 :=B#16#2
```

Note In this example, for the first axis "SERVO_02", the instance 283 and axis DB72 are used. For the second axis "SERVO_03" are used the instance DB284 and DB172 as axis DB.

Start of the I/O address and diagnostics address is in HW Config.

Additional information about calling FB283 is provided in the block description. /8/

5.1 Functions of the SIMATIC S7-300/400

Cyclic communication with FB283

OB1 only calls the FC 72. In FC 72, FB283 is called for each axis.

The structure for sending and receiving is saved in the user-defined data type (UDT_30008 _TLG111).

The variable tables, prepared with the application, are available to control the SINAMICS S120.

Operate the 1st axis in the traversing block mode (VAT72_TVB)

Operate the 2nd axis in the MDI mode (VAT72_MDI)

Acyclic communication with FB283

Acyclic communication is based on the FB 283 internal interface "single". It is only permissible to execute this once simultaneously. This is the reason that the corresponding buttons are interlocked on the HMI while the interface is communicating.

Using this job interface, it is possible:

- To read/write individual parameters
- Read out the fault memory (special job: tasksi= 30002)
- Read/write individual traversing blocks (special job: tasksi= 30000)
- Read/write traversing blocks (special job: tasksi=30001)
- Pre-assign traversing blocks 0...63 (special job: tasksi= 30011)
- Read/write up to 10 parameters (special job: tasksi= 30010)

Further, for individual special jobs, additional entries are required or outputs possible. A description can be found on the specified pages 13 - 15 of the FB 283 documentation. /8/

Within the context of the application, four prepared variable tables are available for **parameter / traversing blocks, read and write function**. Depending on the required function/display, these tables can also be edited.

- 1. Reading/writing parameters (VAT72_Parameter)
- 2. Reading/writing several parameters (VAT72_Para_1_10)
- 3. Reading/writing individual traversing blocks (VAT72_TVBsingle)
- 4. Reading/writing several traversing blocks (VAT72_TVBblock)

5.1.3 FB1: Preparing data for display on the HMI

Actual velocity

The speed actual value is transferred, scaled. The scaled value is converted into the actual velocity of the basic positioner in FB1.

To do this, when calling FB1, in addition to the number of the axis DB, the gearbox ratio, the position actual value resolution and the reference speed of the SINAMICS S120 must be specified.



| CALL FB | 1 , DB1 | gear fact | or |
|-----------|-------------------|-----------|--------------------------|
| i_Getrieł | e:=1.000000e+000 | LU per l | oad revolution in 1000LU |
| LU_rot | :=1.000000e+001 🗲 | | |
| n_Bezug | :=6.000000e+003 ← | reference | e speed |
| DBNr | :=72 | – axis-DB | |
| | | | 1 |

Note

The specified values must coincide with the parameters in the SINAMICS S120!

The gearbox ratio is determined by the ratio between parameters p2504 and p2505.

The position actual value resolution is in parameter p2506.

The reference speed is in parameter p2000.

FC2 and FC3: splitting the traversing job parameters

FB283 transfers the job type, the advance (continue) condition and the visibility of a traversing block in a word. The word is split in order that these values can be individually displayed and selected. The individual values are buffered in DB11.

FC2 reads the DBW160 word of the axis DBs and writes the values into DB11.

FC3 reads the values from DB11, and writes them into word DBW160 of the axis DB.

5.2 Basic positioner

5.2.1 Tasks that can be addressed with the basic positioner

The basic positioner (EPOS) is a very comprehensive and powerful function module for closed-loop position controlled traversing of an electric drive.

It is used to position linear and rotary axes (modulo) in absolute/relative terms with motor encoder (indirect measuring system) or machine encoder (direct measuring system).

It can be activated in the SINAMICS S120 as function module.

User-friendly configuration, commissioning, and diagnostic functions for the EPOS functionality are also available in the STARTER parameterizing software.

Using the STARTER control panel, commissioning and diagnostic functionality can be controlled from a PG/PC. It is also very helpful, especially when getting to know the individual operating modes also testing the function without having to control it from a higher-level automation system.

The position controller is also activated when activating the basic positioner. This is automatically run from the STARTER drive wizard. Further, the necessary "internal interconnections" (BICO technology) are automatically established, which are required between the EPOS and position controller (e.g. setpoints from the EPOS for closed-loop position control, axis cycle correction, etc.).

The position controller essentially comprises the following parts:

- Position actual value sensing (including the lower-level measuring input evaluation and reference mark search)
- Position controller (including limits, adaptation and pre-control calculation)

• Monitoring functions (standstill, positioning and dynamic following error monitoring, cam signals)

In addition, the following functions can be carried out using the basic positioner: Mechanical system:

- Backlash compensation
- Modulo correction
- Position tracking

Limits:

- Velocity/acceleration/deceleration limits
- Software limit switches (traversing range limitation using position setpoint evaluation)
- Stop cams (traversing range limitation using hardware limit switch evaluation)
- Positioning/standstill monitoring
- Following error monitoring
- Two cam switching signals

5.2.2 Properties

Outstanding properties include:

- "flying" and "continuous" mode/setpoint changes while traversing
 - Without having to use handshaking
 - Including easy to use/connect
 - Including "process-shortening" transitions without axes coming to a standstill
- Can be simply connected to higher-level SIMATIC S7-300/400 control systems, also as described in this application
- Can be simply adapted as part of the application engineering and handled
- Simple traversing block handling and implementation of "fixed" traversing blocks
- Graphic configuring, commissioning and operating screen forms (tool including control panel)

5.2.3 Operating modes

EPOS has the following four operating modes (which can be toggled between for a "stationary" axis):

- Jogging (position controlled)
- Reference point approach
- Traversing blocks
- MDI/direct setpoint specification

Including subordinate "flying homing" in the "jog", "traversing blocks" and "MDI/direct setpoint specification" modes.

Priority of the operating mode with respect to one another when simultaneously selected:

Jog > Reference point approach > MDI > Traversing blocks

If a different operating mode is selected while one is already active, then an alarm is issued.

Jogging

This involves position-controlled traversing of an axis with two modes that can be toggled between

- 1. Modes: Endless, position controlled with v set input (where the sign is evaluated)
- 2. Modes: Incremental jog (= where the axis is traversed through a specified "increment")

...In the two modes, two selectable setpoints are available (jog 1 / 2)

Reference point approach

This is also known as "active homing".

Properties:

Fully automatic search and detection of the reference point for incremental measuring systems (encoders).

The following homing options are available:

- "Cam and encoder zero mark", "encoder zero mark" and "external zero mark (Bero)"
- "Set reference point" is also possible without travel. In this case, all operating modes must be deselected.
- Reversing cam functionality for the "cam and encoder zero mark" mode
- The start direction for the reference point approach can be specified
- Different approach velocities can be specified ("to the cams", "to the reference mark", "to the reference point"), e.g. to increase the precision for the reference mark detection
- Monitoring using maximum traversing distances/tolerance bands that can be specified, e.g. to the cam, between the cams and zero mark, distance to the zero mark
- Automatic travel for "reference point offset" regarding the reference mark and reference point coordinates that can be changed using BICO
- Automatic direction of rotation reversal at the reference cams, which means that, for example: Reversal cams or hardware limit switches (when STOP cam functionality is deactivated) can be used as reference cams (this reduces hardware costs)
 (in the start direction, which can be appeified, the zero merk in front of the

(in the start direction, which can be specified, the zero mark in front of the reference cam is valid as reference mark)

Flying homing ("passive homing")

This is also known as "passive homing"

Properties:

- Homing the axis during "standard" traversing using probe (standard setting) including possible continuous "post homing"
- This can be executed as <u>subordinate</u> function in the "jog", "traversing blocks" and "MDI/direct setpoint specification" modes

- Can be selected for incremental and absolute measuring systems (encoder)
- Probe selection can be switched over (2 probe inputs, pos./neg. edge can be selected)
- With "flying homing" during RELATIVE positioning, you can select whether the offset value is to be taken into account for the travel path or not.
- Possible for "post homing" evaluation of a "real/incorrect" BERO signal (inner/outer position difference "window")

Traversing blocks

They support positioning using traversing blocks saved in the device (for a homed axis). It is also possible to write the traversing blocks from the SIMATIC S7-300/400 into the drive and read these out.

Here, 64 traversing blocks are possible, including continue (advance) conditions and specific jobs.

Properties:

- User-friendly traversing block editor
- For instance, position, velocity, acceleration and deceleration override can be separately set for each block.
- Jobs; for example:

"Absolute/relative positioning", "ABS_POS/_NEG" (forced direction of rotation specification for modulo axes), "Endless pos / neg", "Wait" (wait time), "GOTO" (block jump), "SET_O / RESET_O" (set/reset up to two digital outputs), set jerk value, travel to fixed stop using EPOS

- It is possible to "skip" traversing blocks
- By activating a new traversing block, a block being executed can be canceled and a flying change made into the new traversing block.

The traversing blocks can also be changed when a SINAMICS S120 is operational. The changes are directly transferred the next time that the traversing block is called.

MDI/direct setpoint specification

Properties:

Positioning/setting up with direct setpoint specifications (e.g. process data of the SIMATIC S7-300/400); continuous influence during traversing is also possible.

"Flying and continuous" setpoint transfer while an axis is moving is possible, i.e. position, velocity setpoint and override, acceleration, deceleration, forced direction of rotation specification can be changed during operation.

"Flying" change between the modes is possible while an axis is traversing:

- Mode: Setting up (endless, closed-loop position controlled, v-set input)
- Mode: Absolute/relative positioning (for modulo, also: specified direction of rotation or the shortest path)

In this mode, also in the setting up or relative positioning mode, a non-homed axis can also be traversed.

Note The screen forms of the position controller and basic positioner are discussed in more detail in Chapter 6.4.

6.1 Configuring the SIMATIC S7-300/400 CPU

6 Configuration and project engineering

If you only wish to load the sample program and commission it, then follow the instructions in Chapter 3 "Configuring and commissioning the application.

The following stepping tables describe what you must do if you do not wish to/cannot use the sample code and you wish to/must configure the SINAMICS S120 and the SIMATIC S7 CPU yourself.

6.1 Configuring the SIMATIC S7-300/400 CPU

This chapter describes how the SIMATIC S7-300/400 should be configured for the sample program. Integrating the HMI and the detailed programming of the SIMATIC S7-300/400 are not explained in this chapter.

| No. | Action | Remark |
|-----|---|--|
| 1. | Start STEP 7 V5.5 | SIMATIC STEP 7 Version 5.5 SIMATTIC SIEMENS |
| 2. | Create a new project with "File", "New". | SilvATIC Manager File PLC View Crint New Project Wazad Open Crint Open Crint New Project Wazad Delet Reorganize New Project Wazad Manage Archive Reorganize Manage Archive Retrieve Page Setup 1 S120-4x57 (Projekt) - D-VS120-CU3 2 Test_CU320-ZPM MLFB (Projekt) - D-VS120-CU3 2 3 S120-4x57 (Projekt) - D-VS120-2x1 4 4 Erreichbare Teilnehmer INDUSTRIAL ETHERNET Est |

Table 6-1

Note

| No. | Action | Remark |
|-----|---------------------------------|--|
| 3. | Enter a name for the project | New Project |
| | "S120-CU320PN-at-S7-300"). | User projects Libraries Multiprojects |
| | Acknowledge with "OK" | Name Storage path By CU240D D:\Cu240d |
| | | S120-at-S7 D:\Temp\S120-a~1 S120-CU320PN-at-S7 D:\S120-CU3 |
| | | S7_Pro1 D:\S7_Pro1 D:\S7_Pro1 D:\Test_CU320-2PN MLFB D:\Test_C_1 |
| | | Test_CU320PN D:\Test_CU3 |
| | | Add to current multiproject |
| | | Name: Type: |
| | | S120-CU320PN Project |
| | | Storage location (path): |
| | | D:\ Browse |
| | | OK Cancel Help |
| 4. | Insert an "SIMATIC 300 station" | SIMATIC Manager - [S120-CU320PN D:\S120-C_1] |
| | | File Edit Insert PLC View Uptions Window Help |
| | | Subnet C SIMATIC 300 Station |
| | | S7 Software 5 SIMATIC PC Station |
| | | S7 Block. 6 Other Station M7 Software 7 SIMATIC S5 |
| | | Symbol Table 8 PG/PC |
| | | External Source |
| | | WinCC flexible RT |
| 5 | Open HW Config with a double | Shared Declarations Shared De |
| 0. | click on "Hardware" | File Edit Insert PLC View Options Window Help |
| | | L 2 3 3 3 3 4 1 1 2 2 3 4 1 1 2 3 4 1 1 2 3 4 1 1 2 3 4 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 |
| | | Image: SIMATIC 300(1) |
| | | |
| | | |

| No. | Action | Remark |
|-----|---|---|
| 6. | In the catalog under "SIMATIC 300" "Rack 300", select the mounting rail and drag this into the work cell | ■ 00 UF Profile Standard 1 2 2 3 3 4 4 5 5 5 5 6 7 7 8 9 9 10 11 11 11 11 11 ✓ PROFIBUS PA ⊕ PROFIBUS PA ⊕ ⊕ PROFIBUS PA 10 11 |
| 7. | Select the SIMATIC CPU being used in the catalog, and drag this to the mounting rail | ■ ● ○ |
| 8. | A window then opens with the Ethernet properties Create a subnet with "New". | Properties - Ethernet interface PN-10 (R0/S2.2) General Parameters If a subnet is selected, the next available addresses are suggested. |
| | Close the two Windows by clicking "OK" | IP address: |

6 Configuration and project engineering

| No. | Action | Remark |
|-----|---|--|
| 9. | In the Catalog, select the SINAMICS S120 Control Unit being used with the firmware that has been sent. This is in "PROFINET IO" "Drives" "SINAMICS" "SINAMICS S120" "S120 CU320-2 PN" | Image: Constant of the Devices Image: Constant of the Devices Image: Constant of the Devices Devices Image: Consteve Devices |
| | Drag these to the PROFINET line | |
| | The firmware release must match the firmware release on the CF card of the SINAMICS S120, otherwise an online connection will not be able to be established | |
| 10. | A window opens with the Ethernet properties | Properties - Ethernet interface \$120xCU320x2xPN X General Parameters X |
| | Assign the SINAMICS S120 IP address 192.168.0.2. | |
| | Close the window with "OK" | IP address: Subnet mask: Subnet: Sub |
| | | OK Cancel Help |

| No. | Action | Remark |
|-----|--|---|
| 11. | Confirm the next window with | Properties - S120_CU320_2_PN |
| | "OK" | Drive Unit / Bus Address |
| | | Device family: SINAMICS |
| | | Device: SINAMICS S120 |
| | | Device characteristic: CU320-2 PN |
| | | Version: |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | OK Cancel Help |
| 12. | Open the properties of the new | |
| | object by double-clicking on | 2 CPU 315-2 PN/DP Ethema(1) PROFINET 40-System (100) X7 MP/DP DPV/D Table 10-System (100) Table 10-System (10-System (10-System (10-System (10-System (10-System (10-System |
| | "Standard telegram " | X2P1R Port X2P2R Port 3 3 |
| | | 4 5 6 |
| | | 7 8 9 |
| | | |
| | | |
| | | 2 |
| | | III 5120xCU320x2xFN Ski I Module Order number I address D address Diagnostics address Comment Access |
| | | 0 5206U32024PN 551300-1MA01-04ser[CU] 2000" Full NM PU1020024PN 551300-1MA01-04ser[CU] 2003" Full NM Pu1020024PN 551300-1MA01-04ser[CU] 2003" Full NM Pu1020024PN 551300-1MA01-04ser[CU] 2003" Full |
| | | N/S Part 2/4/1* Fill 1 Drive object 2038* |
| 13. | | Properties - Standard message frame 1 |
| - | Under the "Telegrams" tab, as | General Message Frames |
| | pre-assignment, select "SIEMENS telegram 111" | Default: SIEMENS message frame 111, PZD-12/12 |
| | | |
| | Acknowledge with "OK" | |
| | | |
| | | _ Inputs |
| | | Not used Address: 256 Length: 12 Word Process image: |
| | | |
| | | Outputs |
| | | Not used |
| | | Address: [256 Length: [12 Word Process image: |
| | | OK Cancel Help |

| No. | Action | Remark |
|-----|--|---|
| 14. | Insert into slot 2 by right clicking on an object. | Image: |
| 15. | Select "V4.5" and then "Drive object" | Image: State of the second s |
| 16. | Open the properties of the new object by double-clicking on "Standard telegram 1" Under the "Telegrams" tab, as pre-assignment, select "SIEMENS telegram 111". Acknowledge with "OK" | Properties - SIEMENS message frame 111 General Message Frames Default Inputs Inputs Notused Address: 280 Length: 12 Word Process image: Outputs Notused Address: 280 Length: 12 Word Process image: OK Cancel |
| 17. | Click on "Save and compile" You can close HW Config. | Image: Weight of the second |



| Action | Remark |
|---|--|
| If the STARTER commissioning software has not been installed, install it (also see <u>/6/</u>). | |
| Connect the SINAMICS S120 to the SIMATIC S7-300 using a PROFINET cable – and your PG/PC to the SIMATIC S7-300. | |
| Start the SIMATIC Manager and open the project created in Chapter 6.1. | SIMATIC STEP 7 Version 5.5 SIMATIC SIEMENS |
| In the SIMATIC Manager tree | © Server Ac 1995-2011. All Byte Reserved |
| select the SINAMICS S120 and open STARTER by double- clicking on the commissioning symbol. | Image: 10 20 accr D tranpto 120 acr 1 Image: 10 20 acr D tranpto 120 acr 1 Image: 10 20 acr Image: 10 20 acr 1 Image: 10 20 acr Image: 10 20 acr 1 Image: 10 20 acr Image: 10 20 acr 1 Image: 10 20 acr Image: 10 20 acr 1 Image: 10 20 acr Image: 10 20 acr 1 Image: 10 20 acr Image: 10 20 acr 1 Image: 10 20 acr Image: 10 20 acr 1 Image: 10 20 acr Image: 10 20 acr 1 Image: 10 20 acr Image: 10 acr 1 Image: 10 20 acr Image: 10 acr 1 Image: 10 acr Image: 10 acr 1 1 Image: 10 acr Image: 10 acr 1 1 1 Image: 10 acr Image: 10 acr 1 1 1 1 Image: 10 acr Image: 10 acr <td< td=""></td<> |
| Select the SINAMICS S120 in the project tree of STARTER Go online | Project Edit Paste Target system View Options Window Help Project Edit Paste Target system View Options Window Help Start Sindow Bare Si |
| | Action If the STARTER commissioning software has not been installed, install it (also see <u>/6/</u>). Connect the SINAMICS S120 to the SIMATIC S7-300 using a PROFINET cable – and your PG/PC to the SIMATIC S7-300. Start the SIMATIC Manager and open the project created in Chapter 6.1. In the SIMATIC Manager tree, select the SINAMICS S120 and open STARTER by double-clicking on the commissioning symbol. Select the SINAMICS S120 in the project tree of STARTER Go online |

| No. | Action | Remark |
|-----|---|---|
| 6. | If a target device has still not | Target Device Selection |
| | been selected, a window opens | Devices that go online with "Connect to selected target devices": |
| | Select the SINAMICS S120, set the access point to S7_ONLINE | Target device Access pert |
| | Confirm the window with "OK" | |
| | | Select all Deselect all All S70NLINE All Device Establish state Devices not supported by SCDUT: |
| | | |
| 7. | Start the automatic configuration with a double click | Project Edit Paste Target system View Options Window Help |
| 8. | Confirm the note with "Configure" | Automatic Configuration Image: Configure drive unit automatically The DRIVE-CLiQ topology is determined and the electronic type plates are read out. The data is then loaded to the PG and replaces the configuration in the project. Status of the drive unit: |
| | | Running operation: Waiting for START |
| | | |

| No. | Action | Remark |
|-----|--|---|
| 9. | It is not necessary to back up the factory settings in the ROM. Acknowledge with "OK" | Restore Factory Settings Do you really want to restore the factory settings? Bus address and baud rate will not be reset. Restore factory settings Save factory settings to ROM |
| 10. | Create the drives as "Servo" | OK Cancel Automatic Commissioning During the automatic commissioning, components have been found that cannot be clearly assigned to a drive object type. |
| | | Please select the drive object type that is to be created for the components. Default setting for all components: Component Drive Object Type Identification Drive 1 Servo Identification via LED Drive 2 Servo Identification via LED |
| | | Create |
| 11. | Go offline after completing the automatic configuration | Automatic Configuration Image: Automatic configuration completed Please remember also to complete the configuration of the motors on the following drives or the infeed: SERVD_03 To do this, go offline and run through the relevant wizard. If there is an infeed, configure further properties (e.g. line filter). |
| | | Do you want to go OFFLINE (only with this drive unit)? Go OFFLINE Stay ONLINE |

6.2 Configuration of the SINAMICS S120 drive

12. Open SERVO_02 with a double S120457 S120457 S120457 S120457 S120457 S12045 S click Display data sel Drive data set: DDS 0 Configure DD: mand data set: CDS 0 Con Start the configuration wizard ion Drive data sets Comm indidata sets | Units | Refe setting Blocked lis Configu Name SERV0_02 Drive objects type: with "Configure DDS" 2 Control type: Drive object no Function modules / tech. packages... PROFIdrive r SERVO_02.Motor_Module_2 (Power_unit) Component number: Power unit type: Double Order no.: 6SI SERVO_02 □ Inseit drive □ 1 SERVO_02 Component Encoder ev Double motor module (X1) 6SL312D-2TE13-0Avec Configuration Sepert list Drive navigator Control logic Type: Order no.: Power unit rated current Power unit rated power: 3.00 Arms 1.60 kW Configuration - S120-CU320-2PN - Control structure 13. Activate the "Basic positioner" function module Drive: SERVO 02, DDS 0 Motor Motor holding brake Encoder Process data exchang Function modules Extended setpoint channel Technology controller Summary Basic positioner Change to the next window with Extended messages/monitoring "Next" Closed-loop control Setpoint n/M control -IK, Control type: Þ -[21] Speed control (with encoder) ©(м) Actual speed value preparation (л) Next > Cancel Help

Configuring SERVO_02 with electronic rating plate

| 14. | The automatic configuration has | Configuration - S120-CU320-2PN - Power unit |
|-----|---|--|
| | already selected the power unit | Control structure Drive: SERV0_02, DDS 0 |
| | being used. | Power unit Power unit BIC0 Configure the power section component: |
| | | Motor_Module_2 Motor_Module_2 |
| | | Encoder Connection voltage: 510 - 720 VDC |
| | | Mechanics Cooling method: Internal air cooling Process data exchang |
| | "Next". | Summary Type: Double motor modules |
| | | Power unit selection: |
| | Confirm the note that the | Order no. Rated power Rated curr Execution 6SL3420-2TE11-7Axx 1 kW 1.7 A/1.7 A DC/AC |
| | operating signal must be wired. | SSL3120-2TE13-0Axx 1.6 kW 3.A/3.A DC/AC SSL3120-2TE13-0Axx 1.6 kW 3.A/3.A DC/AC SSL3120-2TE15-0Axx 2.7 kW 5.A/5.A DC/AC SSL3120-2TE15-0Axx 2.7 kW 5.A/5.A DC/AC SSL3120-2TE15-0Axx 2.7 kW 5.A/5.A DC/AC SSL3120-2TE21-0Axx 4.8 kW 9.A/9.A DC/AC SSL3120-2TE21-0Axx 9.7 kW 18.A/18.A DC/AC |
| | | |
| | | <back next=""> Cancel Help</back> |
| | | |
| 15. | The operating signal is permanently interconnected to "1" as in the configuration used, the infeed is always operational. | Configuration - \$120-CU320-2PN - Power unit BIC0 ✓ Control structure ✓ Control structure ✓ Power unit BIC0 Ower unit BIC0 Motor holding brake Cencoder Measurement system Process data exchang Summary |
| 15. | The operating signal is permanently interconnected to "1" as in the configuration used, the infeed is always operational. Change to the next window with "Next". | Configuration - S120-CU320-2PN - Power unit BIC0 ✓ Control structure ✓ Control structure ✓ Power unit BIC0 Ower unit BIC0 Motor holding brake Conder Mechanics Process data exchang Diffeed in operation Diffeed in operation Diffeed in operation Diffeed in operation Diffeed in operation Diffeed in operation Diffeed in operation Diffeed in operation Diffeed in operation |
| 15. | The operating signal is permanently interconnected to "1" as in the configuration used, the infeed is always operational. Change to the next window with "Next". | Configuration - S120-CU320-2PN - Power unit BIC0 Control structure Control structure Conver unit BIC0 Convert unit BIC0 Conver |
| 15. | The operating signal is permanently interconnected to "1" as in the configuration used, the infeed is always operational. Change to the next window with "Next". | Configuration - \$120-CU320-2PN - Power unit BIC0 Control structure Power unit |



| 18. | Select "No motor holding brake available" Change to the next window with "Next". | Configuration - \$120-CU320-2PN - Motor holding brake Power unit Power unit Power unit BICD Power unit BICD Power unit BICD Power unit BICD Power unit Commetor Mator Poccess data exchang Poccess data exchang Drive: \$ERVD_02, DDS 0 Holding brake configuration: Incoder Poccess data exchang Process data exchang Drive: SERVD_02, DDS 0 |
|-----|---|--|
| 19. | Change to the next window with "Next". | < Back Next> Cancel Help Configuration - S120-CU320-2PN - E ncoder Power unit Drive: SERV0_02, DDS 0, MDS 0 Power unit Concel Process data exchange Encoder 1 Encoder name: Encoder_8 Encoder type Code number Identity encoder 10000 Detais Detais |



| 22. | Select "SIEMENS telegram 111" | Configuration - S120-CU320-2PN - Process data exchange (drive) |
|-----|--------------------------------|---|
| | | Control structure Drive: SERVD_02, DDS 0 |
| | | Power unit BICO Power unit connection Select the PROFIdrive message frame: |
| | "Next". | Motor holding brake Encoder (111) SIEMENS telegram 111, PZD-12/12 |
| | | Measurement system Mechanics Process data exchange |
| | | Summary Input data / actual values: 12 |
| | | Output data / setpoints: |
| | | |
| | | Notes: I. The PROFIdrive process data will be interconnected to BICO |
| | | parameters in accordance with the selected message frame type. These BICO parameters cannot be subsequently changed. |
| | | 2. These data refer to interface 1 in accordance with the settings on the control unit. |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | <back next=""> Cancel Help</back> |
| | | |
| 23. | Close the wizard with "Finish" | Configuration - S120-CU320-2PN - Summary |
| 23. | Close the wizard with "Finish" | Configuration - S120-CU320-2PN - Summary |
| 23. | Close the wizard with "Finish" | Configuration - S120-CU320-2PN - Summary Control structure Power unit BICD Power unit BICD Motor Motor Motor |
| 23. | Close the wizard with "Finish" | Configuration - S120-CU320-2PN - Summary Control structure Power unit Power unit Structure: Power unit Control structure: Power unit Control structure: Power unit Structure: Motor Motor holding brake Proceder Measurement system |
| 23. | Close the wizard with "Finish" | Configuration - S120-CU320-2PN - Summary Control structure Power unit Power unit Connection Motor Motor Motor Measurement system Mechanics Process data exchang Symmary |
| 23. | Close the wizard with "Finish" | Configuration - S120-CU320-2PN - Summary Control structure Power unit Power unit BICD Motor Motor Motor Measument system Power unit: Component name: Motor, Module_2 Component name: Motor, Module_2 Component name: Motor, Module_2 Component name: Motor, Module_2 Summary Power unit: Prover unit: Power unit: |
| 23. | Close the wizard with "Finish" | Configuration - S120-CU320-2PN - Summary Control structure Power unit Power unit connection Motor Motor holding brake Motor holding brake Mechanics Process data exchang Summary Brooder Wechanics Summary Brooder Wechanics Brower unit BICD: process data exchang Summary Motor Methanics Work in the following data of the drive has been entered: Demonstructure: Control structure: Control structure: Control or module: Data prover unit: Component type: Double motor module Order no: 5613120-2TE13:0Axx Rated current: 3 A/3 A Power unit BICD: po864 (B): Infeed operation): 1 Power unit module operation): 1 Power unit bio type: 2(1) intertace |
| 23. | Close the wizard with "Finish" | Configuration - S120-CU320-2PN - Summary Configuration - S120-CU320-2PN - Summary Control structure Power unit Power unit BLO Power unit system Motor holding brake Prower unit system Measurement system Mechanics Summary Summary Power unit Component type: Double motor module Option for the system Mechanics Summary Power unit Component type: Double motor module Order on: SB3120-27E13-00xx Rated power: 1.6 kW Rated power: 1.6 kW Power unit BICO: p0864 (B): Inteed operation; 1 power unit BICO: p0864 (B): Motor with DRIVE-CLiQ interface Motor type: Motor with DRIVE-CLiQ interface Motor holding brake: Motor holding brake: Motor holding brake: Motor holding brake: Not available |
| 23. | Close the wizard with "Finish" | Configuration - S120-CU320-2PN - Summary |
| 23. | Close the wizard with "Finish" | Configuration - S120-CU320-2PN - Summary Control structure Power unit Power unit BIC0 Power unit BIC0 Motor holding brake Prooder Measurement system Mechanics Process data exchang Summary Summary Motor holding brake Component type: Double motor module Order on SSL3120-27E13-0Axx Rated power: 1.6 kW Rated power: 1.6 kW |
| 23. | Close the wizard with "Finish" | Configuration - S120-CU320-2PN - Summary Control structure Power unit Power unit BICD Power unit connection Motor holding brake Motor holding brake Control structure: <p< th=""></p<> |
| 23. | Close the wizard with "Finish" | Configuration - S120-CU320-2PN - Summary Configuration - S120-CU320-2PN - Summary Control structure Power unit Power unit BICO Power unit BICO Motor holding brake Process data exchang Process data exchang Stommay Motor holding brake Process data exchang Motor nonules: Data to the ding brake Process data exchang Motor nonule Order on SS1310-27E13-0Axx Rated power: 1.6 kW |
| 23. | Close the wizard with "Finish" | Configuration - S120-CU320-2PN - Summary Control structure Power unit Power unit BICD Motor holding brake Measurement system Measurement system Messender Summery Bower unit Control structure: Control structure: Control structure: Control structure: Messurement system Messurement system Summery Downer unit Component name: Motor_Module_2 Power unit BICD: power unit BICD: power Motor with DRIVE-CLiQ interface Motor type: Motor with DRIVE-CLiQ interface Motor tolding brake: Motor tolding brake: Motor tolding brake: Motor tolding brake: Motor type: Incoder 1: Encoder_8 Encoder 1: Encoder 1: SMI20_7 Name Encoder 1: Encoder 1: Benetermodus Process data exchange (dirwe) |
| 23. | Close the wizard with "Finish" | Contriguration - S120-CU320-2PN - Summary Control structure Power unit BIC0 Power unit BIC0 Motor holding brake Mater holding brake Mechanics Power unit Power unit BIC0 Motor holding brake Mechanics Power unit Component name: Motor_Module_2 Component type: Double motor module Order unit BIC0: power unit |
| 23. | Close the wizard with "Finish" | Configuration - S120-CU320-2PN - Summary Control structure Power unit Power unit BICO Motor holding brake Measurement system Measurement system Measurement system Mechanics Power unit BICO: Motor holding brake Measurement system Measurement system Measurement system Measurement system Summary Image: State acchange Motor holding brake Component trame: Motor_Module_2 Component trame: Motor_Module_1 Option is SI3120-2721F13-0&xx Rated power in State acchange Motor type: Motor who DRIVE-CLiQ interface Motor holding brake: Motor toget was for the type in conder 1: SM120_7 Name Encoder 1: Encoder_8 Encoder type Encoder 1: SigNIX excessor Order no. encoder 1: SigNIX excessor Prover unit UU - Expertenmodus Prover unit UU - Expertenmodus Prover unit Signition unit: UU - Expertenmodus Prover unit signitum Prover unit signitum Prover unit connectin unit: UI - Expertenmodus |
| 23. | Close the wizard with "Finish" | Contriguration - S120-CU320-2PN - Summary Control structure Power unit Power unit BICD Motor holding brake Machanics Machanics Summary Image: Summary |

6.2 Configuration of the SINAMICS S120 drive

😢 Project Edit P. ste Target system View Options Window Help 24. Open SERVO_03 with a double click S120-at-S7 Inset SIMOTION device Inset single drive unit Inset single drive unit S120-CL320-ZPN Devices Device SIMOTION SIMOTION Device SIMOTION SI Display data set Drive data set: DDS 0 Command data set: CDS 0 Start the configuration wizard Configuration Drive data sets Command data sets Units Reference vari les - setting | Blocked lis with "Configure DDS" SERVO_03 Drive objects type: Name: Drive object no 3 Control type Function modules / tech. packages... PROFIdrive Function exte 🦲 Dr SERVD_03.Motor_Module_3 (Pow Component number: unit) Power unit type: Order no.: Power unit rated current: Power unit rated power: SERV0_03 Double motor module (X2) cha Configuratio 6SL3120-2TE13-0Axx 3.00 Arms 1.60 KW 25. Configuration - S120-CU320-2PN - Control stru Activate the "Basic positioner" ucture function module Drive: SERVO_03, DDS 0 Function modules Extended setpoint channel Technology controller otor holding brake Encoder Process data exchang Summary Basic positioner Change to the next window with Extended messages/monitoring "Next". Closed-loop control Setpoint n/M control C Control type: • [21] Speed control (with encoder) (G) Μ Actual speed value preparation **(**-,

Configuring SERVO_03 without electronic rating plate

Next>

Cancel

Help

SERVO_0

Componer Encoder e

Type: Order no

| 26. | The automatic configuration has | Configuration - S120-CU3 | 320-2PN - Power unit |
|-----|---|---|--|
| | already selected the power unit | Control structure | Drive: SERVO_03, DDS 0 |
| | being used. | Power unit Motor | Configure the power section component: |
| | | Encoder | Component name: Motor_Module_3 |
| | | Mechanics | Connection voltage: 510 - 720 VDC |
| | | | Cooling method: Internal air cooling |
| | Change to the next window with | | Type: Double motor modules |
| | Next. | | |
| | | | Power unit selection: |
| | Confirm the note that the | | Order no. Rated power Rated curr Execution |
| | operating signal must be wired | | 6SL3420-2TE11-7Axx 1 kW 1.7 A/1.7 A DC/AC 6SL3120-2TE13-0Axx 1.6 kW 3 A/3 A DC/AC |
| | oporating orginal materies wheat | | 6SL3420-2TE13-0Axx 1.6 kW 3A/3A DC/AC 6SL3120-2TE15-0Axx 2.7 kW 5A/5A DC/AC |
| | | | 6SL3420-2TE15-0Axx 2.7 kW 5A/5A DC/AC 6SL3120-2TE21-0Axx 4.8 kW 9A/9A DC/AC |
| | | | 65L3120-2TE21-8Axx 9.7 kW 18 A/18 A DC/AC |
| | | = | |
| | | | X D |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | <back next=""> Cancel Help</back> |
| | | | |
| 07 | The second frequencies of the | Configuration C120 CU | 220 2DM Demosrumit DICO |
| 27. | The operating signal is | Configuration - S120-CU | 320-2PN - Power unit BICO |
| 27. | The operating signal is permanently interconnected to "1" as in the configuration used, | Configuration - S120-CU: | 320-2PN - Power unit BICO Drive: SERVO_03, DDS 0 |
| 27. | The operating signal is permanently interconnected to "1" as in the configuration used, the infeed is always operational. | Configuration - S120-CU3 | 320-2PN - Power unit BICO Drive: SERVO_03, DDS 0 |
| 27. | The operating signal is permanently interconnected to "1" as in the configuration used, the infeed is always operational. | Configuration - S120-CU: Control structure Power unit Power unit BICO Power unit BICO Motor Motor holding brake Encoder | 320-2PN - Power unit BICO Drive: SERVO_03, DDS 0 Infeed in operation Drive in |
| 27. | The operating signal is permanently interconnected to "1" as in the configuration used, the infeed is always operational. | Configuration - S120-CU: Control structure Control structure Power unit Power unit BIO Power unit connection Motor holding brake Encoder Measurement system Mechanics | 320-2PN - Power unit BICO Drive: SERVO_03, DDS 0 |
| 27. | The operating signal is permanently interconnected to "1" as in the configuration used, the infeed is always operational. | Configuration - \$120-CU: Control structure Power unit Power unit BICO Power unit connection Motor Motor Motor Motor holding brake Encoder Mechanics Process data exchang Summary | 320-2PN - Power unit BICO Drive: SERVO_03, DDS 0 |
| 27. | The operating signal is permanently interconnected to "1" as in the configuration used, the infeed is always operational. | Configuration - \$120-CU: Control structure Power unit Power unit BICO Power unit BICO Motor holding brake Encoder Measurement system Mechanics Process data exchang Summary | 320-2PN - Power unit BICO Drive: SERVO_03, DDS 0 |
| 27. | The operating signal is permanently interconnected to "1" as in the configuration used, the infeed is always operational. Change to the next window with | Configuration - S120-CU: Control structure Power unit Power unit BCO Power unit BCO Motor Motor holding brake Encoder Measurement system Mechanics Process data exchang Summary | 320-2PN - Power unit BICO Drive: SERVO_03, DDS 0 Infeed in operation p0864 ON commands and enables |
| 27. | The operating signal is permanently interconnected to "1" as in the configuration used, the infeed is always operational. Change to the next window with "Next". | Configuration - S120-CU: Control structure Power unit Power unit BIO Power unit BIO Motor Motor holding brake Encoder Measurement system Mechanics Process data exchang Summary | 320-2PN - Power unit BICO Drive: SERVO_03, DDS 0 |
| 27. | The operating signal is permanently interconnected to "1" as in the configuration used, the infeed is always operational. Change to the next window with "Next". | Configuration - S120-CU Control structure Power unit Power unit BIO Power unit connection Motor Motor holding brake Encoder Measurement system Mechanics Process data exchang Summary | 320-2PN - Power unit BICO Drive: SERVO_03, DDS 0 |
| 27. | The operating signal is permanently interconnected to "1" as in the configuration used, the infeed is always operational. Change to the next window with "Next". | Configuration - S120-CU: Control structure Power unit Power unit BICO Power unit BICO Motor Motor holding brake Encoder Measurement system Mechanics Process data exchang Summary | 320-2PN - Power unit BICO Drive: SERVO_03, DDS 0 |
| 27. | The operating signal is permanently interconnected to "1" as in the configuration used, the infeed is always operational. Change to the next window with "Next". | Configuration - S120-CU Control structure Conver unit BCO Power unit BCO Motor Motor holding brake Process data exchang Summary | 320-2PN - Power unit BICO Drive: SERVO_03, DDS 0 Infeed in operation p0864 ON commands and enables |
| 27. | The operating signal is permanently interconnected to "1" as in the configuration used, the infeed is always operational. Change to the next window with "Next". | Configuration - S120-CU Control structure Control structure Power unit Power unit BIO Hotor Motor holding brake Encoder Measurement system Measurement system Process date exchang Summary | 320-2PN - Power unit BICO Drive: SERVO_03, DDS 0 Infeed in operation p0864 p0864 ON commands and enables |
| 27. | The operating signal is permanently interconnected to "1" as in the configuration used, the infeed is always operational. Change to the next window with "Next". | Configuration - S120-CU Control structure Power unit Neter unit Structure Power unit Structure Measurement system Measurement system Measurement system Process data exchang Summary | 320-2PN - Power unit BICO Drive: SERVO_03, DDS 0 Infeed in operation p0864 p0864 ON commands and enables |
| 27. | The operating signal is permanently interconnected to "1" as in the configuration used, the infeed is always operational. Change to the next window with "Next". | Configuration - S120-CU Control structure Power unit Neter Measurement system Mechanics Process date exchang Summary | 320-2PN - Power unit BICO Drive: SERVO_03, DDS 0 Infeed in operation p0864 p0864 ON commands andON commands and |
| 27. | The operating signal is permanently interconnected to "1" as in the configuration used, the infeed is always operational. Change to the next window with "Next". | Configuration - S120-CU Control structure Control structure Power unit Notor Information Measurement system Measurement system Measurement system Process data exchang Summary | 320-2PN - Power unit BICO Drive: SERVO_03, DDS 0 Infeed in operation p0964 ON commands and enables |
| 27. | The operating signal is permanently interconnected to "1" as in the configuration used, the infeed is always operational. Change to the next window with "Next". | Configuration - S120-CU Control structure Power unit E00 Motor holding brake Encoder Measurement system Measurement system Process date exchang Summary | 320-2PN - Power unit BICO Drive: SERVO_03, DDS 0 Infeed in operation p0864 ON commands and enables |
| 27. | The operating signal is permanently interconnected to "1" as in the configuration used, the infeed is always operational. Change to the next window with "Next". | Configuration - S120-CU Control structure Power unit Noter unit EIO Metor Metor and connection Metoranics Process data exchang Summary | 320-2PN - Power unit BICO Drive: SERVO_03, DDS 0 Infeed in operation p0864 p0864 ON commands and enables |
| 27. | The operating signal is permanently interconnected to "1" as in the configuration used, the infeed is always operational. Change to the next window with "Next". | Configuration - \$120-CU Control structure Power unit Power unit BIO Hotor Hotor Heasurement system Measurement system Process data exchang Summary | 320-2PN - Power unit BICO Drive: SERVO_03, DDS 0 Infeed in operation p0864 p0864 on commands and enables |
| 27. | The operating signal is permanently interconnected to "1" as in the configuration used, the infeed is always operational. Change to the next window with "Next". | Configuration - \$120-CU Control structure Power unit Neter init Connection Metor Measurement system Mechanics Process date exchang Summary | 320-2PN - Power unit BICO Drive: SERVO_03, DDS 0 Infeed in operation p0864 ON commands and enables Cancel Link |



30. Select "No motor holding brake Configuration - S120-CU320-2PN - Motor holding brake available" Drive: SERVO_03, DDS 0 ontrol structure >>>> wer unit wer unit BICO wer unit connection Motor holding brake activation: C Use a motor holding brake (internal or external) Do not use a motor holding brake leasurement system Motors with internal motor holding brake: Change to the next window with Mechanics Process data exchang Summary 1FK7xxx-xxxxx-xxBx 1FK7xxx-xxxxx-xxHx "Next". Motors without internal motor holding brake: 1FK7xxx-xxxxx-xxAx 1FK7xxx-xxxxx-xxGx • , Holding brake configuration: [0] No motor holding brake available -Extended brake control Help <Back Next> Cancel Configuration - S120-CU320-2PN - End 31. Select the encoder being used based on the motor order Drive: SERVO_03, DDS 0, MDS 0 Control structure wer unit number wer unit BICO wer unit connection Which encoder do you want to use? Encoder 1 Encoder 2 Encoder 3 Motor holding brake urement syster Encoder 1 Confirm the encoder selection Encoder Selection via Motor Order Numb × with "OK" The encoders listed below are available for the selected listed motor. Select the relevant encoder via the motor order number. Motor encoder selection: Order no. Encoder type Resolution Code number Sin/cos incremental C/D EnDat absolute EnDat absolute 2048 S/R 2048 S/R 32 S/R 512 S/R 1FK7xxx-xxxxx-xAxx 2001 1FK7xxx-xxxxx-xExx 1FK7xxx-xxxxx-xGxx 2051 2052 ⊡ 1FK7xxx-xxxxx-xHxx 1FK7xxx-xxxxx-xJxx 1FK7xxx-xxxxx-xSxx 1FK7xxx-xxxxx-xTxx EnDat absolute 2053 EnDat absolute EnDat absolute Resolver Resolver 2053 2054 1003 1001 16 S/R n-speed 1-speed ► OK Cancel Resolver 4 speed 1004 -<Back Next> Cancel Help



6.2 Configuration of the SINAMICS S120 drive

| 34 | Define the mechanical system. | Configuration - S120-CU320-2PN - Mechanics |
|-----|---|--|
| | If you are using a gearbox | Control structure Drive: SERV0_03, DDS 0 Power unit Control Structure Drive: SERV0_03, DDS 0 |
| | enter the ratio with "Motor | Power unit control of the post control has been assigned the foll. encoder: Encoder_5 Motor Motor holding brake |
| | revolutions". | Encoder Measurement system Uper load revolution (Encoder resolution) Medennes Process data exchang Summan Lu Load revolutions |
| | Specify the "Pos. stpt/act. val. resolution" in "LU per load revolution". | |
| | LU = Length Unit (artificial unit) | Fine resolution Motor revolutions 1000 |
| | (e.g. 3600 LU per load revolution 1LU | Activate modulo correction |
| | □ 0.1° 360 LU per load revolution 1LU □ 1.0°) | Act. pos. val. / setpt. starts again at 0 LU On after S50000 LU |
| | | Load gear position tracking |
| | correction with "1" | C Robary axis C Linear axis |
| | Change to the next window with | Virtual multitum resolution: 0 Tolerance window: 0.00 |
| | Next. | < Back Next > Cancel Help |
| | | |
| 35 | Soloct "SIEMENS tologram 111" | Configuration - \$120-CU320-2PN - Process data exchange (drive) |
| 35. | Select "SIEMENS telegram 111" | Configuration - S120-CU320-2PN - Process data exchange (drive) |
| 35. | Select "SIEMENS telegram 111" | Configuration - S120-CU320-2PN - Process data exchange (drive) Control structure Power unit Power unit connection Power unit connection Select the PR0FIdrive message frame: |
| 35. | Select "SIEMENS telegram 111" Change to the next window with "Next". | Configuration - \$120-CU320-2PN - Process data exchange (drive) Control structure Power unit Select the PROFIdrive message frame: Masurement system Measurement system |
| 35. | Select "SIEMENS telegram 111" Change to the next window with "Next". | Configuration - \$120-CU320-2PN - Process data exchange (drive) Control structure Power unit Power unit < |
| 35. | Select "SIEMENS telegram 111" Change to the next window with "Next". | Configuration - \$120-CU320-2PN - Process data exchange (drive) Control structure Power unit Power unit connection Motor Motor holding brake Motor holding brake Mechanics Mechanics Summary Length (words) Input data / actual values: 12 |
| 35. | Select "SIEMENS telegram 111" Change to the next window with "Next". | Configuration - \$120-CU320-2PN - Process data exchange (drive) Control structure Power unit Power unit Connection Motor Motor Motor of Motor Mechanics Infracest data exchange Infracest data exchange Input data / actual values: 12 Output data / setpoints: 12 Notes: |
| 35. | Select "SIEMENS telegram 111" Change to the next window with "Next". | Configuration - \$120-CU320-2PN - Process data exchange (drive) Control structure Control structure Power unit Power unit BLOD Power unit connection Motor Motor Motor Mechanics Introcest data exchange Length (words) Input data / actual values: Cutput data / setpoints: Input data Input da |
| 35. | Select "SIEMENS telegram 111" Change to the next window with "Next". | Configuration - \$120-CU320-2PN - Process data exchange (drive) Image: Control structure Image: Control structure Power unit Power unit connection Motor Motor holding brake Image: Control structure Motor holding brake Motor holding brake Mechanics Image: Control structure Mechanics Image: Control structure Image: Control structure |
| 35. | Select "SIEMENS telegram 111" Change to the next window with "Next". | Configuration - \$120-CU320-2PN - Process data exchange (drive) Image: Control structure Power unit Power unit Concert Motor Motor holding brake Encoder Mechanics Image: Summary Image: Summary Length (words) Input data / actual values: Image: Control structure Image: Summary Length (words) Input data / actual values: Image: Control structure Image: Control structure |



| 39. | Go online again | Project Edit Paste Target system View Options Window Help Project Edit Paste Target system View Options Window Help Project Edit Paste Target system View Options Project Edit Past |
|-----|---|---|
| 40. | Load the configuration into the SINAMICS S120 | S120-at-S7 S120-at-S7 Insert SIMOTION device Switchover Insert SIMOTION device Comman S120-at-S7 Size of the unit Size of the unit Comman Automatic Configuration Comman |
| 41. | Select "After loading, copy RAM to ROM" Confirm the window with "Yes" | Download (WWBS:41732) X Image: Constraint of the served and the drive unit data downloaded to the target device Image: Constraint of the target device Image: Constraint of the target device Image: Constraint of the target device Image: Constraint of the target device Image: Constraint of the target device Image: Constraint of the target device Image: Constraint of the target device Image: Constraint of the target device Image: Constraint of target device Image: Constraint of target device Image: Constraint of target device Image: Constraint of target device Image: Constraint of target device Image: Constraint of target device Image: Constraint of target device Image: Constraint of target device Image: Constraint of target device Image: Constraint of target device Image: Constraint of target device Image: Constraint of target device Image: Constraint of target device Image: Constraint of target device Image: Constraint of target device Image: Constraint of target device Image: Constraint of target device Image: Constraint of target device Image: Constraint of target device Image: Constraint of target device Image: Constraint of target device Image: Constraint device Image: Constraint of target devi |

Loading the configuration

Mechanical settings for SERVO_02



6.2 Configuration of the SINAMICS S120 drive

Activating the Safety Integrated functions

| 43. | From the project tree, open the "Safety Integrated" screen form of SERVO_02 Click on "Change settings" | 3 3120-457 In Intel SMOTION device In Intel SMOTION device Intel Single dow und Sately Intel Society Intel Single dow und No sately function |
|-----|---|--|
| 44. | Select "Basic functions via onboard terminals" | Safety Integrated Safety checksums Safety Integrated Safety Integr |
| 45. | Interconnect the Control Unit terminal to DIO | Salety Integrated Salety checksum Salety Integrated Salety checksum Basic functions via orobeart emmals Salet torque off (ST0). Sale back control (SBC). Sale stop 1 (SS1) Putre disable Chernel 1 active Delay Inte Delay Inte Del |
| 46. | Click on "Copy parameters" and then on "Activate settings" | Copy parameters Activate settings Change password |
| 47. | You will then be prompted to change the password. The initial password is "0" In the sample project, the password was changed to "1". | Safety password (ISCMA:15649) Password Please change password! Close |



Backing up the configuration in the project

| 49. | Select the S120 in the project tree. | 한 Project Edit Paste Target system View Options Window Help |
|-----|---|---|
| | Load the configuration from the SINAMICS S120 to the PG/PC. | Safety Integrated Safety checksums Safety Integrated Safety checksums Insert SIMOTION device Insert single drive unit Safety Integrated Safety checksums Safety function sele Safety Integrated Safety checksums Safety function sele Safety function sele Safety checksums Safety function sele Safety checksums Safety checksums Safety function sele Safety checksums Saf |
| | Save the project | |

6.3 Adding an additional SINAMICS drive to the project

6.3 Adding an additional SINAMICS drive to the project

You can carry out the following steps if you wish to add additional drives to the SINAMICS S120. Otherwise, the configuration has already been completed with Chapters 6.1 and 6.2.

6.3.1 Changes to the SINAMICS S120

6.3.1.1 Changes to the configuration

Connect the additional components to the existing configuration.


6.3 Adding an additional SINAMICS drive to the project

6.3.1.2 Changes to the configuration

Table 6-3

| 1. | Open the existing project with STARTER Insert a new drive by double clicking on "Insert single drive unit" | Project Edit Paste Target system Project Edit Paste Target system S120-at-S7 S120-at-S7 Insert SIMOTION device Insert single drive unit S120-CU320-2PN S120-CU320-2PN S120-CU320-2PN Overview S120-CU320-2PN S120-CU |
|----|--|--|
| 2. | Run the Wizard. Depending on the power unit and motor being used, the same steps are required as listed in Chapter 6.2. Activate the "Basic positioner" function module Select SIEMENS telegram 111 | Insert Drive X Image: SERV0_04 Name: SERV0_04 General Technology Packages Drive object no. Drive objects type: Servo Author: Version: Vers |
| 3. | After the Wizard has been completed, load the configuration into the SINAMICS S120 Back up the data from "RAM to ROM" | |

6.3 Adding an additional SINAMICS drive to the project

| 4. | If required, you can now activate the Safety Integrated functions as shown in Chapter 6.2. | |
|----|--|--|

6.3.2 Changes to the SIMATIC S7-300/400

| Tal | ble | 6-4 |
|-----|-----|-----|
| | | • • |

| 1. | Open HW Config | |
|----|---|--|
| 2. | Select the SINAMICS S120 | Image: Second |
| 3. | A selection list opens by right clicking on the first free slot. Click on "Insert object" | Init S120xCU320x2xPN Order number I address O address Diagnostics address 7 5120xCU320x2xPN ESL3 040-1MA01-04xx (CU) 2040° 2040° XH Privin 2040° 2040° 2040° 1 Drive object 2030° 2040° 2040° 12 StEMENTS message frame 111 256.279 256.279 2030° 13 Drive object 2030° 2030° 2030° 24 StEMENTS message frame 111 280303 280303 2030° 25 StEMENTS message frame 111 280303 280303 2030° 24 |
| 4. | Click on the symbol "V4.5" and then on "drive object" | (1) S120xCU320x2xPN Slot Module Order number I address O address 0 S120xCU320x2xPN 6SL3 040-1MA01-084xx (CU. |

| 6.3 Adding an additional SINAMICS drive to the pr | oject |
|---|-------|
|---|-------|

| 5. | Open the properties of the new object by double-clicking on "Standard telegram 1" Change to the Telegrams tab. For the pre-assignment, select "SIEMENS telegram 111". Exit the window with "OK" | Properties - Standard message frame 1 X General Message Frames |
|----|---|---|
| 6. | Note down the starting I/O address and the diagnostics address | Z.3 Drive object 2035 31 Models access point 2036° 32 SIEMENS message hame 111 304,027 33 34327 |
| 7. | Click on "Save and compile" Load the HW configuration into the module Restart the SIMATIC CPU after loading. You can close HW Config | Image: Hw Config - [SIMATIC 300(1) (Configuration) S120-CU320PN] Image: Station Edit Insert PLC View Options Window Help Image: Im |
| 8. | Open the block folder of the SIMATIC CPU Copy DB72 When inserting the DB, you must rename it. Call it DB272, for example | Insert Data Block The object 'DB72' already exists. Do you want to rename it? Rename Adjust.Attributes Yes No |

6 Configuration and project engineering

Properties - Data Block 9 Open the object properties of the × new DB272 General - Part 1 General - Part 2 Calls Attributes You can assign a symbolic name Name: DB272 here. Symbolic Name: Axis_TVB+MDI_TLG111_S4 For example: Symbol Comment: "Axis_TVB+MDI_TLG111_S4" Created in Language: DB S120-CU320PN\SIMATIC 300(1)\CPU 315-2 PN/DP\S7 Program(1)\Blocks\DB272 Project Path: Exit properties with "OK" Storage location of project: D:\S120-C_1 Code Interface 02/06/2013 04:18:37 PM Date created: Last modified: 10/25/2007 03:20:52 PM 10/25/2007 03:18:52 PM Comment: -ΟK Help Cancel 10. Open the FC72 Network 1: Schaltflächen ausblenden Comment: Enlarge the locking in network 1 "Axis_TVB+MDI_TLG111_82".Basis.single.busy "Axis_TVB+MDI_TLG111_83".Basis.single.busy "Axis_TVB+MDI_TLG111_84".Basis.single.busy "ParameterAnzeige".HideAcyclic 0 DB72.DBX14.3 with the "busy" signal from the DB172.DBX14.3 new axis. 0 DB272.DBX14.3 DB11.DBX6.2 Copy network 3 and reinsert it as network 4. ork 4 : Title: After inserting, change the following data: CALL "SINA_FB", DB285 NR_ACHS_DB:=272 LADDR :=304 LADDR_DIAC:=2036 WR_PZD :="Axis_TWB+F RD_PZD :="Axis_TWB+F CONSIST :=TRUE RESTART :=TRUE NATE NO. -DB1644 FR283 New instance DB 285 v.-2036 :="Axis_TVB+HDI_TLG111_S4".HDI_Positioning.UR_PZD_POSBETR :="Axis_TVB+HDI_TLG111_S4".HDI_Positioning.RD_PZD_POSBETR :=TEUB :=TEUB :=B\$16\$4 • Number of the axis DB to 272 P#DB272.DBX172.0 P#DB272.DBX212.0 I/O address of the axis to 304 AXIS NO • The diagnostics address to 2036 • Pointer to the target areas for reading and writing to DB272 • Number of the drive object of the axis to 4 11. KAD/STL/FBD - [FC72 -- S120-CU320PN\SIMATIC 300(1)\CPU 315-2 Save the block. 🕞 File Edit Insert PLC Debug View Options Window Help L 🛩 음·(묘) 중 🐰 🖻 🖺 🗠 여 여 (개🌚) 🔁 음. 😥 Close the FC72

6.3 Adding an additional SINAMICS drive to the project

| 12. | Open OB1 Insert a new network. In the new network, call FB1 with DB3. | CAD/STL/FBD - [081 - "Cycle Execution" - S120-CU320PN\SIMATIC 300[1]\CPU 315-2 PN/DP\\OE File Edit Inset PLC Debug View Options Window Help Image: State of the edit Inset PLC Debug View Options Window Help Image: State of the edit Inset PLC Debug View Options Window Help Image: State of the edit Inset PLC Debug View Options Window Help Image: State of the edit Inset PLC Debug View Options Window Help Image: State of the edit Inset PLC Debug View Options Window Help Image: State of the edit Inset PLC Debug View Options Window Help Image: State of the edit Inset PLC Debug View Options Window Help Image: State of the edit Inset PLC Debug View Options Window Help Image: State of the edit Inset PLC Debug View Options Window Help Image: State of the edit Inset PLC Debug View Options Window Help Image: State of the edit Inset PLC Debug View Options Window Help Image: State of the edit Inset PLC Debug View Options Window Help Image: State of the edit Inset PLC Debug View Options Window Help Image: State of the edit Inset PLC Debug View Options View Opt |
|-----|---|--|
| 13. | Generate the instance DB DB3 with "Yes" | LAD/STL/FBD (30:150) Image: A constraint of the instance data block DB 3 does not exist. Do you want to generate it? Image: A constraint of the instance data block DB 3 does not exist. Do you want to generate it? Image: A constraint of the instance data block DB 3 does not exist. Do you want to generate it? Image: A constraint of the instance data block DB 3 does not exist. Do you want to generate it? Image: A constraint of the instance data block DB 3 does not exist. Do you want to generate it? Image: A constraint of the instance data block DB 3 does not exist. Do you want to generate it? Image: A constraint of the instance data block DB 3 does not exist. Do you want to generate it? Image: A constraint of the instance data block DB 3 does not exist. Do you want to generate it? Image: A constraint of the instance data block DB 3 does not exist. Do you want to generate it? Image: A constraint of the instance data block DB 3 does not exist. Do you want to generate it? Image: A constraint of the instance data block DB 3 does not exist. Do you want to generate it? Image: A constraint of the instance data block DB 3 does not exist. Do you want to generate it? Image: A constraint of the instance data block DB 3 does not exist. Do you want to generate it? Image: A constraint of the instance data block DB 3 does not exist. Do you want to generate it? |
| 14. | Enter the gearbox ratio position actual value resolution reference speed and the number of the axis DB. | Netzwerk 4 : Titel: Kommentar: |
| 15. | Save the block and close OB1 | Image: State Sta |
| 16. | Load the changed project in the SIMATIC | |

6.3 Adding an additional SINAMICS drive to the project

6.3 Adding an additional SINAMICS drive to the project

6.3.3 Changes to the HMI

| | | - |
|-----|-----|-----|
| Tał | ble | 6-5 |

| 17. | Open the project with WinCC flexible | |
|-----|--|---|
| 18. | Open the text lists with a double click Select the "Drive" list | WinCC flexible Advanced - \$120-at-\$7 - KTP_600 Project Earman (Germany) Image: Sprace Image: Sprace German (Germany) Image: Sprace Project Image: Sprace Image: Sprace Image: Sprace Image: Sprace </td |
| 19. | Write the data for the new axis in the first free line of the list entries Value: Number of the instance DB of FB1, in this case, 3 Entry: Name of the axis | Name Selection Comment Antrieb Range () Auftrag Range () Auftrag_Par_Text Range () Auftrag_Par_Text Range () |
| 20. | Save the changes. Load the project into the HMI | WinCC flexible Advanced - \$120-at-\$7 - KTP_600 Project Edit View Insert Format Faceplates Options Window Help !: New • > German (Germany) . Project Project |

6.4 Position controller and basic positioner settings

This chapter describes the screen forms for the position controller and basic positioner settings

6.4.1 Overview and settings of the position controller screen forms

For each axis of the SINAMICS S120, the position controller settings can be found under the main item Technology.

It is subdivided into four points.



6.4.1.1 Mechanical system

The mechanical settings were already carried out when commissioning. As a consequence, no changes have to be made here.



| ig. 0 Z | |
|---|---|
| Mechanics | |
| The pos. control has been assigned the foll. encoder: | r_8 |
| LU per load revolution (Encoder resolution) | Edit |
| Load revolutions Encoder PPR 512 Fine resolution 2048 Motor revolutions | LU per load revolution (Pos. setpoint / act. val. res.) 10000 |
| Deactivated —— Modulo range 360000 LU — Activate modulo correction | Position values |
| Load gear position tracking Activate Rotary axis Linear axis Virtual multitum resolution: Tol. window: Edit | Backlash: 0 LU |

In addition to the settings already made in the quick commissioning, when required, you can change the backlash value, which is then taken into account for the closed-loop position control.

What is important for the absolute encoder is the position tracking; this ensures that encoder overruns are counted, and even for encoder overruns, the system can be correctly positioned.

For both of these topics, you can find detailed information in the SINAMICS S120 Function Manual. $\ensuremath{\textit{/7}}\xspace$

6.4.1.2 Actual position value processing

You can make various settings to adapt the position actual value in the position actual value conditioning. However, adaptations are not required for this example. Generally, when using EPOS only a few changes are required in this screen form. The reason for this is that EPOS has its own reference system, to which it refers.



6.4.1.3 Position controller

The position controller has two tabs.

- Setpoints, position controller
- Position controller.

You can adapt the setpoint sources and position actual value source under the "Setpoint position controller" tab. As we are using EPOS, EPOS already preassigned these values, and they should not be changed.



- Using the position setpoint filter, the position setpoint is filtered with a PT1 element with the set time constant. This reduces precontrol dynamic response and provides jerk limiting.
- For the precontrol, a percentage value (0 200 %) can be entered, with which the position setpoint pre-controls a speed at the speed controller, bypassing the position controller. (0 % = deactivated)
- For the precontrol symmetrization (balancing), the position setpoint signal can be filtered again in order to emulate the response of the speed control loop. To do this, a dead time filter (0.0 – 2.0), which represents a factor of the sampling time of the position controller (1s), and a PT1 element (0 – 100 ms) are available.

Under the position controller tab, you can adapt the settings of the position controller, assign the controller enable and interconnect the outputs of the position controller.



- You can optimize the position controller using the P gain and the integral time.
- Further, you can change the P component through adaptation. Here, the P gain can be variably scaled. This means that various position controller settings can be made to address different situations.
- The maximum permissible traversing velocity is set for the limitation.

6.4.1.4 Monitoring

The monitoring function comprises three tabs:

- Position and standstill monitoring
- Following error monitoring
- Output cam

The position monitoring can be set using these screen forms.

Note The default values refer to a mechanical system with 10000 LU per load revolution (position setpoint/actual value resolution). They must be adapted to the mechanical system being used (position setpoint/actual value resolution).

6 Configuration and project engineering

6.4 Position controller and basic positioner settings

The relevant monitoring functions can be deactivated by entering a 0.

The corresponding values should be parameterized under the "Positioning/standstill monitoring" tab.





Note

The maximum difference between the setpoint and actual value is set under the "Following error monitoring" tab.

If the "Travel to fixed stop" function is used, if the following error is exceeded, an error is not output, but the "Fixed stop reached" bit is set.



Two cam positions can be set under the "Cams" tab.



The cams provide a feedback signal" 1" if the actual position is less than the value of the cam or 0, if the actual position is greater than the set value.



Only after the axis has been homed, is it guaranteed that the cam switching signals really do have a "true" position reference when output.

6.4.2 Overview and settings of the basic positioner screen forms

For EPOS, five sub points are available, which are used to configure the individual functions.



6.4.2.1 Limiting

The limit screen form has two tabs. One for the traversing range limitation and one for the traversing profile limitation.

The software limit switch and the stop cams are parameterized under the traversing range limitation tab. This parameterization is only necessary if you wish to use the associated functions.

The limit switches can be activated using the "Software limit switch activation" function; however, only if the modulo correction is not active and the axis was homed. When using telegram 111, the software limit switch is activated using bit 14 of the positioning control word 2.



For the software limit switches, end positions are specified in LU, which the drive must not pass over. Generally, these end positions are located in front of the stop cams.

The software limit switches issue various alarms:

| • | A7469 or A7470 | Target position in a traversing range exceeds the software limit switch range in the negative/positive direction. |
|---|----------------|---|
| | | |

- A7477 or A7478 Target position for the actual traversing motion is less than/greater than the negative/positive end position.
- A7479 or A7480 Axis is located at the negative/positive limit switch an active traversing block was canceled.
- F7481 or F 7482 Software limit switch negative/positive was passed over

There are also the stop cams. These are generally connected with sensors to the digital inputs. The drive is stopped with a fault if the stop cams are passed over.

Note Using p2118 and p2119, the standard response "Fault" can be changed to an alarm in the expert list.

The stop cams can be activated using "Stop output cam activation. For telegram 111 this is realized using bit 15 of the positioning control word 2. In the axis DB, the stop cams can be activated with a bit 176.7.

The limits for the maximum velocity, acceleration, deceleration and jerk can be entered in the traversing profile limits tab. Just the same as for the monitoring,

these values must be adapted. This is because a different resolution is involved than in the basic settings. Because the mechanical load is low when the motor is operating under no-load conditions, the positioning velocity can be set to the maximum speed without any problems; the acceleration and deceleration can also be appropriately increased.

CAUTION When the mechanical system is coupled, the load limits of the mechanical system must also be taken into account.

The maximum velocity must be set so that the corresponding maximum speed lies below the maximum motor speed (p1082). The value converted into speed as well as the maximum speed are displayed in the screen form. Fig. 6-11



The maximum velocity can be calculated using the following formula:



The acceleration allows you to define how quickly the drive accelerates. This is comparable with the ramp-up time. If you wish to convert the acceleration into a ramp-time, then you must make the following calculation:

Fig. 6-11



$$\frac{\max. Geschwindigkeit\left[\frac{1000 \ LU}{\min}\right]}{60\left[\frac{s}{\min}\right] \bullet \max. Beschleunigung\left[\frac{1000 \ LU}{s^2}\right]} = Hochlaufzeit [s]$$

The deceleration is analogous to the acceleration. This can be converted into a ramp-down time using the same formula.

The jerk limiting defines the permissible amount of jerk when a drive accelerates. This must be separately activated as it is not active in the default setting. If it is active, then it rounds off the ramps. You can calculate the rounding time as follows:

$$\frac{\max . Beschleunigung\left[\frac{1000 LU}{s^{2}}\right]}{\max . Ruck\left[\frac{1000 LU}{s^{3}}\right]} = Verrundungszeit [s]$$

6.4.2.2 Jogging

Here, there are two tabs; one for configuring and one for diagnostics.

In the jog/configuration tab, using the selection at the top left you can toggle between the digital and analog inputs/outputs of the jog function. All settings in this screen form have already been correctly set when selecting the telegram, and must not be changed.

| Jog/configuration Jo | g/diagnostics | | | |
|----------------------|---|----------------------------|--|--|
| Jog/configuration | g/diagnostics Analog signals EPOS jog 1 signal source [72090.8: 80: PROFIdive P2D11rec + EPOS jog 2 signal source [72090.9: 80: PROFIdive P2D11rec + EPOS jogging incremental [72092.5: 80: PROFIdive P2D31rec + | Configure ing setpoints | Tracking mode active p2084(0), BI: Binector-connector col Velocity limiting active p2084(1), BI: Binector-connector col Setpoint available p2084(2), BI: Binector-connector col Axis moves torwards p2084(1), BI: Binector-connector col Axis moves torwards p2084(1), BI: Binector-connector col p2084(1), BI: Binector-connector col p2084(1), BI: Binector-connector col Software limit switch minus reached p2084(1), BI: Binector-connector col Software limit switch plus reached p2084(1), BI: Binector-connector col Software limit switch plus reached p2084(1), BI: Binector-connector col Software limit switch plus reached p2084(1), BI: Binector-connector col Software limit switch plus reached p2080(11), BI: Binector-connector col Beference point set p2080(11), BI: Binector-connector col Jekt limiting active | |

The configuration for the jog setpoints is opened when clicking on the jog block. Here, you can adapt the values to the mechanical system being used.





You can define the traversing velocity in the jog mode using the setpoint velocity values.

The traversing distance settings specify how far the drive is traversed for incremental jogging. The incremental jogging must be activated using "EPOS incremental jog"; however, it is then controlled just like normal jogging using the same inputs. (see Figure 6-13)

In the ramp-function generator, you can set an up ramp that is only applicable in the jog mode.

An overview of all of the analog and digital inputs and outputs is displayed under the "Jog/diagnostics" tab.

| Fig. 6-15 | |
|--|--|
| Jog/configuration Jog/diagnostics | |
| Inputs | Outputs |
| EPOS jog 1 signal source | Tracking mode active |
| EPOS jog 2 signal source | Velocity limiting active |
| EPOS jogging incremental | Setpoint available |
| 100 % velocity override | Axis moves forwards |
| 0 LU reference point coordinate, signal so | Axis moves backwards |
| | Software limit switch minus reached |
| | Software limit switch plus reached |
| | Reference point set |
| | Jerk limiting active |
| | In_actl < speed threshold value 3 |
| | Flying referencing active |
| | Printing mark outside outer window |
| | Axis accelerating |
| | Axis decelerating |
| | STOP cam minus active |
| | STOP cam plus active |
| | I arget position reached |
| | Iraversing command active |
| | U LU position setpoint |
| | U LU LA position actual value, LH position actual value, LH position |
| | 0 1000 LU/min Velocity setpoint |
| | 100 LOVIIII Ch velocity actual value, choop posicili |
| | 0 backlash compensation value |
| | actual operating mode actual position setpoint |
| | 0 1000 LU/min actual velocity setpoint |
| | 0.0 % actual acceleration override |
| | 0.0 % actual deceleration override |
| | 0.000 % velocity override effective |
| | 0 LU residual distance to go |
| | 0 LU LR following error actual |
| | |

6.4.2.3 Homing

For incremental encoders, the tabs of the Homing screen have a similar structure to that for jog.

If an absolute encoder is being used, then the absolute encoder must be adjusted once.

Two additional inputs are available, which are not covered by the standard telegram 111 in the homing/configuration tab.

These are used for the reversing cams. Here, when a search is active, the drive changes its direction and searches for the reference point in the other direction. However, the reversing cams are not used in the example.



The homing type can be set by opening the homing block.

In the example, active homing is used and as homing mode, the encoder zero mark. In this case, when selecting homing, the drive is automatically traversed in order to search for the reference point, which is the encoder zero mark.

On the other hand, for passive homing, the axis is homed during normal traversing when the reference signal is detected.

Incremental encoders

The following screen form is used for active homing **Incremental encoders**. Fig. 6-17



Here, you can select between different homing types (1.) and homing modes (2.).

The possible homing types are active (specific, automatic reference point approach) and passive (the drive is automatically homed during normal traversing)

For the homing mode, the following reference signals can be selected:

- Reference cam and encoder zero mark
- Encoder zero mark
- External zero mark

The settings for the approach velocities should be set corresponding to the mechanical system.

There are two options for correcting the position value to the required value:

- 1. Reference point/coordinate
 - The value is specified that the position actual value has at the zero mark. This means that for active homing, the motor remains stationary at the encoder zero mark which represents the reference point.

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2. Reference point offset

It is specified by how many LU the reference point is away from the zero mark in the positive direction.

Absolute encoder

For **absolute encoders** in the "Active homing" screen form, there is only one button – "Absolute encoder adjustment" – as well as an input field for the reference point coordinate. Absolute encoders have the advantage that they do not have to be re-homed after each switch on.

The absolute encoder must be adjusted once when commissioning the system.

Passive homing is also possible for absolute encoders.

The screen form for passive homing is the same for absolute and incremental encoders; however, it is not used for the example.



For passive homing, two probes can be parameterized as reference point source for passive homing. For telegram 111, the active probe is selected via the fieldbus. You can set whether the probes are used high active or low active via the edge evaluation.

You can set whether the position actual value correction is taken into account for relative positioning, or only for absolute positioning.

Note

You can set separate correction values when entering the inner and outer windows. This allows you to compensate for the probe width. Otherwise, this would lead to different zero positions, depending on the direction of travel.

An overview of all of the analog and digital inputs and outputs is displayed under the "Homing/diagnostics" tab.

6.4.2.4 Traversing blocks

For the traversing blocks, there is one tab for configuring and one for diagnostics. When selecting the telegram, all of the settings for this screen form have already been correctly set, and should not be changed.





With the block for the traversing blocks you can access the traversing block screen form.

Here, you can parameterize the traversing blocks. Parameters that are not required are grayed out. The sequence is defined by the block number, and not the sequence in the list. This means that for subsequent changes, a new line can be be simply inserted with the appropriate number.

| | GITTE | umber or blocks | 1 | | | | | | | | |
|------|-------|-----------------|-----------|--------------|----------|----------|--------------|--------------|----------|------|----------|
| [64] | | V | Edit | | | | | | | | |
| ndex | No. | Job | Parameter | Mode | Position | Velocity | Acceleration | Jeceleration | Advance | Hide | _ |
| | 0 | POSITIONING | 0 | ABSOLUTE (0) | 0 | 600 | 100 | 100 | CONTINUE | Г | - |
| 2 | 1 | POSITIONING | 0 | RELATIVE (1) | 10000 | 200 | 100 | 10 | CONTINUE | Π | 1 |
| 3 | 2 | POSITIONING | 0 | ABSOLUTE (0) | 30000 | 600 | 100 | 100 | CONTINUE | | 1 |
| 4 | 3 | WAITING | 500 | ABSOLUTE (0) | 0 | 600 | 100 | 100 | CONTINUE | | 1 |
| 5 | 4 | POSITIONING | 0 | ABSOLUTE (0) | 0 | 600 | 100 | 100 | END (0) | | 1 |
| 6 | -1 | POSITIONING | 0 | ABSOLUTE (0) | 0 | 600 | 100 | 100 | END (0) | | 1 |
| , | -1 | POSITIONING | 0 | ABSOLUTE (0) | 0 | 600 | 100 | 100 | END (0) | | 1 |
| 3 | -1 | POSITIONING | 0 | ABSOLUTE (0) | 0 | 600 | 100 | 100 | END (0) | | 1 |
| 9 | -1 | POSITIONING | 0 | ABSOLUTE (0) | 0 | 600 | 100 | 100 | END (0) | | 1 |
| 10 | -1 | POSITIONING | 0 | ABSOLUTE (0) | 0 | 600 | 100 | 100 | END (0) | | 1 |
| 11 | -1 | POSITIONING | 0 | ABSOLUTE (0) | 0 | 600 | 100 | 100 | END (0) | |] |
| 12 | -1 | POSITIONING | 0 | ABSOLUTE (0) | 0 | 600 | 100 | 100 | END (0) | | |
| 13 | -1 | POSITIONING | 0 | ABSOLUTE (0) | 0 | 600 | 100 | 100 | END (0) | |] _ |
| 14 | -1 | POSITIONING | 0 | ABSOLUTE (0) | 0 | 600 | 100 | 100 | END (0) | | |
| 15 | -1 | POSITIONING | 0 | ABSOLUTE (0) | 0 | 600 | 100 | 100 | END (0) | | |
| 16 | -1 | POSITIONING | 0 | ABSOLUTE (0) | 0 | 600 | 100 | 100 | END (0) | | |
| 17 | -1 | POSITIONING | 0 | ABSOLUTE (0) | 0 | 600 | 100 | 100 | END (0) | | |
| 18 | -1 | POSITIONING | 0 | ABSOLUTE (0) | 0 | 600 | 100 | 100 | END (0) | | |
| 19 | -1 | POSITIONING | 0 | ABSOLUTE (0) | 0 | 600 | 100 | 100 | END (0) | | |
| 20 | -1 | POSITIONING | 0 | ABSOLUTE (0) | 0 | 600 | 100 | 100 | END (0) | | |
| 21 | -1 | POSITIONING | 0 | ABSOLUTE (0) | 0 | 600 | 100 | 100 | END (0) | | |
| 22 | -1 | POSITIONING | 0 | ABSOLUTE (0) | 0 | 600 | 100 | 100 | END (0) | | |
| 23 | -1 | POSITIONING | 0 | ABSOLUTE (0) | 0 | 600 | 100 | 100 | END (0) | | - |
| 24 | -1 | POSITIONING | 0 | ABSOLUTE (0) | 0 | 600 | 100 | 100 | END (0) | | - |
| 25 | -1 | POSITIONING | 0 | ABSOLUTE (0) | 0 | 600 | 100 | 100 | END (0) | | - |
| 26 | -1 | POSITIONING | 0 | ABSOLUTE (0) | 0 | 600 | 100 | 100 | END (0) | | |
| 27 | -1 | POSITIONING | U | ABSOLUTE (U) | U | 600 | 100 | 100 | END (U) | | |
| 28 | -1 | POSITIONING | 0 | ABSOLUTE (0) | 0 | 600 | 100 | 100 | END (0) | | - |
| 29 | -1 | POSITIONING | 0 | ABSOLUTE (0) | 0 | 600 | 100 | 100 | END (0) | | . 💌 |
| | | | | | | | | | | _ | |

The example shown is only intended to show just how the traversing blocks could look like

The traversing blocks can also be written from the SIMATIC S7-300/400 into the SINAMICS S120. See Chapter 4.3.1

More detailed information on creating traversing programs is provided in the SINAMICS S120 Function Manual /7/.

The traversing block diagnostics tab shows all of the quantities that are relevant for the operating mode. This provides an overview and a diagnostic capability for the current state of the traversing blocks mode.

6.4.2.5 Direct setpoint specification / MDI

The direct setpoint specification / MDI is, just the same as the previous points, split up into two tabs for configuration and diagnostics.

When selecting the telegram, all of the settings for this screen form have already been correctly set, and should not be changed.

You can enter the input signals for MDI in the "MDI/configuration" tab. All inputs are pre-assigned as default setting via fieldbus.





When selecting the "Positioning MDI" block, you can set 4 fixed setpoints, which are active if a setpoint is not entered via the bus. Fig. 6-22

| Configure positioning MDI | / fixed setpoints | | 1 | ? × |
|---------------------------|-------------------|----------|------------|-----|
| Position setpoint | 0 LU | <u>.</u> | | |
| Velocity setpoint | 600 1000 LU/min | | | |
| Acceleration override | 100.000 % | | | |
| Deceleration override | 100.000 % | | | |
| | | | | |
| | | | Close Help | |

In this screen form, you can set setpoints, which are used if the setpoints are not entered externally. In this example, the SINAMICS S120 receives its setpoints from the control system (telegram 111); this means that changes in this screen form do not influence this particular example.

All variables relevant for the operating mode are displayed in the "MDI/configuration" tab. This provides an overview and a diagnostic capability for the current state of the direct setpoint specification/MDI mode.

7 Contact person

Siemens AG Industry Sector I DT MC PMA APC Frauenauracher Strasse 80 D - 91056 Erlangen, Germany E-mail: tech.team.motioncontrol@siemens.com

8 References

This list does not purport to be complete and merely reflects a selection of suitable information.

Table 8-1

| | Торіс | Title/link |
|-----|--|--|
| /1/ | | Automation with STEP 7 in STL and SCL Author: Hans Berger Publicis MCD Verlag ISBN: 978-3-89578-397-5 |
| /2/ | STEP 7 SIMATIC S7- 300/400 | Automation with STEP 7 in LAD and FBD Author: Hans Berger Publicis MCD Verlag ISBN: 978-3-89578-296-1 |
| /3/ | | Reference manual System and Standard Functions for S7-300/400 Volume 1/2 http://support.automation.siemens.com/WW/view/de/44240604 |
| /4/ | Reference to the article | http://support.automation.siemens.com/WW/view/de/67261457 |
| /5/ | Siemens Industry Online Support | http://support.automation.siemens.com |
| /6/ | STARTER | http://support.automation.siemens.com/WW/view/en/26233208 |
| /7/ | SINAMICS S120 | SINAMICS S120 Getting Started: http://support.automation.siemens.com/WW/view/de/61604910 List Manual (parameter and error list): http://support.automation.siemens.com/WW/view/de/49383082 Drive Functions Function Manual http://support.automation.siemens.com/WW/view/de/59737625 Control Units and Additional System Components Manual http://support.automation.siemens.com/WW/view/de/59714694 Booksize Power Units Manual http://support.automation.siemens.com/WW/view/de/59715084 Commissioning Manual http://support.automation.siemens.com/WW/view/de/61616686 |
| /8/ | FB283 | Toolbox V2.1 http://support.automation.siemens.com/WW/view/de/25166781 |

9 History

Table 9-1

| Version | Date | Change |
|---------|---------|-----------------------------------|
| V1.0 | 02/2013 | First edition |
| V1.1 | 09/2013 | Locking of acyclic orders changed |