SIEMENS

SIMATIC

S7-300
Connecting the SIMODRIVE 611U to the Technology CPU

Product Information

03/2008
A5E00272066-05

Safety Guidelines

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

⚠DANGER

indicates that death or severe personal injury **will** result if proper precautions are not taken.

⚠WARNING

indicates that death or severe personal injury **may** result if proper precautions are not taken.

⚠CAUTION

with a safety alert symbol, indicates that minor personal injury can result if proper precautions are not taken.

CAUTION

without a safety alert symbol, indicates that property damage can result if proper precautions are not taken.

NOTICE

indicates that an unintended result or situation can occur if the corresponding information is not taken into account.

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

Qualified Personnel

The device/system may only be set up and used in conjunction with this documentation. Commissioning and operation of a device/system may only be performed by **qualified personnel**. Within the context of the safety notes in this documentation qualified persons are defined as persons who are authorized to commission, ground and label devices, systems and circuits in accordance with established safety practices and standards.

Prescribed Usage

Note the following:

⚠WARNING

This device may only be used for the applications described in the catalog or the technical description and only in connection with devices or components from other manufacturers which have been approved or recommended by Siemens. Correct, reliable operation of the product requires proper transport, storage, positioning and assembly as well as careful operation and maintenance.

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Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

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Definitions and warnings

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1.1 Qualified personnel

Description

Qualified personnel in the context of the documentation are personnel who are familiar with the assembly, installation, commissioning, operation and maintenance of the SIMODRIVE 611U product and who have the following qualifications:

- Trained and authorized to energize, de-energize, clear, ground and tag circuits and equipment in accordance with established safety procedures.
- Trained in the proper care and use of protective equipment in accordance with established safety procedures.
- First aid training.

Warnings are not explicitly given in this documentation. However, you are strongly advised to note the warnings contained in the operating instructions for each product from the SIMODRIVE series.

1.2 Description

Contents

This document describes the most important standard application options for the SIMODRIVE 611U used on the technology CPU. Although additional functions can be executed with the SIMODRIVE 611U, these must be examined on an individual basis.

This description does not replace the device documentation for the SIMODRIVE 611U. A complete functional description of the SIMODRIVE 611U can be found in the Description of Functions for SIMODRIVE 611 Universal "Closed-Loop Control Components for Closed-Loop Speed Control and Positioning".

POSMO C and POSMO S

POSMO C and POSMO S drives can also be used on the technology CPU.

These drives belong to the SIMODRIVE 611U family and are parameterized with the same commissioning tools. The adaptation to the technology CPU is comparable to the approach described for the SIMODRIVE 611U. However, the functional scope is different and is contained in the corresponding device description.

Hardware Requirements

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2.1 Converter

611U converter

- SIMODRIVE 611U closed-loop control module
- Optional PROFIBUS DP3 module for isochronous PROFIBUS

Closed-loop control module options:		
2axis	for sin/cos 1 Vpp speed setpoint encoder	6SN1118-0NH0x-0AAx
2axis	for sin/cos 1 Vpp positioning encoder	6SN1118-1NH0x-0AAx
2axis	for n-set resolver	6SN1118-0NK0x-0AAx
2axis	for resolver positioning	6SN1118-1NK0x-0AAx
1axis	for n-set resolver	6SN1118-0NJ0x-0AAx
1axis	for resolver positioning	6SN1118-1NJ0x-0AAx
Optional module	PROFIBUS DP3	6SN1114-0NB01-0AA0

Note

As a general principle, a closed-loop control card for speed setpoint operation is sufficient for operation with the technology CPU. This is also the case when DSC is used.

If you want to use an external encoder on the axis, you must select a 2-axis closed-loop control module, whereby the second axis cannot be used to control a motor.

POSMO SI

SIMODRIVE POSMO SI is a complete 1-axis function unit. It consists of the following:

- Power section
- Control electronics
- Motor

Order number: 6SN2 4xx-2BF00-0Gxx

POSMO CD/CA

SIMODRIVE POSMO CD/CA is a complete 1-axis function unit. It consists of the following:

- Power section
- Control electronics

Order numbers:

POSMO CD: 6SN2 703-2AAxx-0xA0

POSMO CA: 6SN2 703-3AAxx-0BA0

Note

The following sections refer only to the SIMODRIVE 611U. The described approach also applies to POSMO S and POSMO C.

Software Requirements

3

3.1 Converter

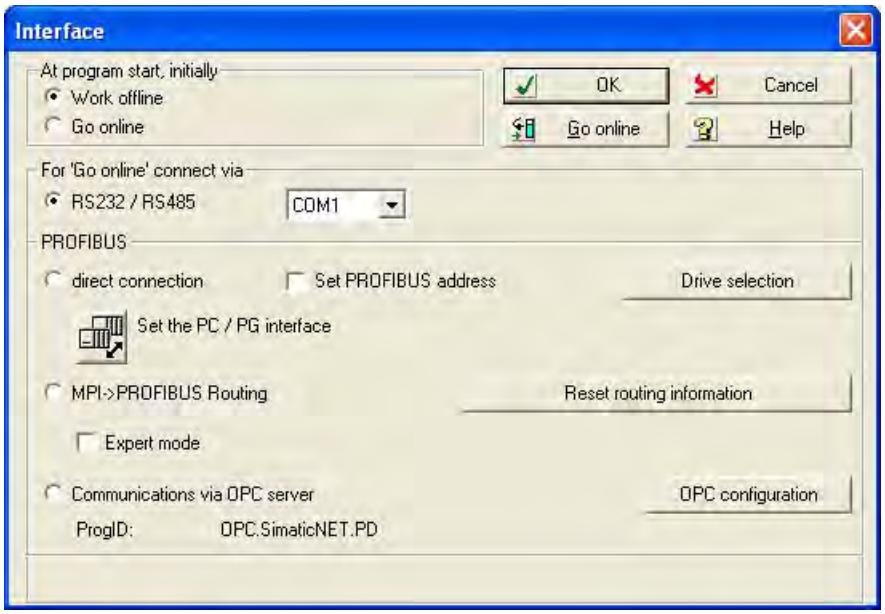
3.1.1 Software upgrade

Note

The SimoCom U must not be connected using PROFIBUS DP when the software upgrade is performed!

Procedure

1. Connect SimoCom U to the drive via the V24 interface.



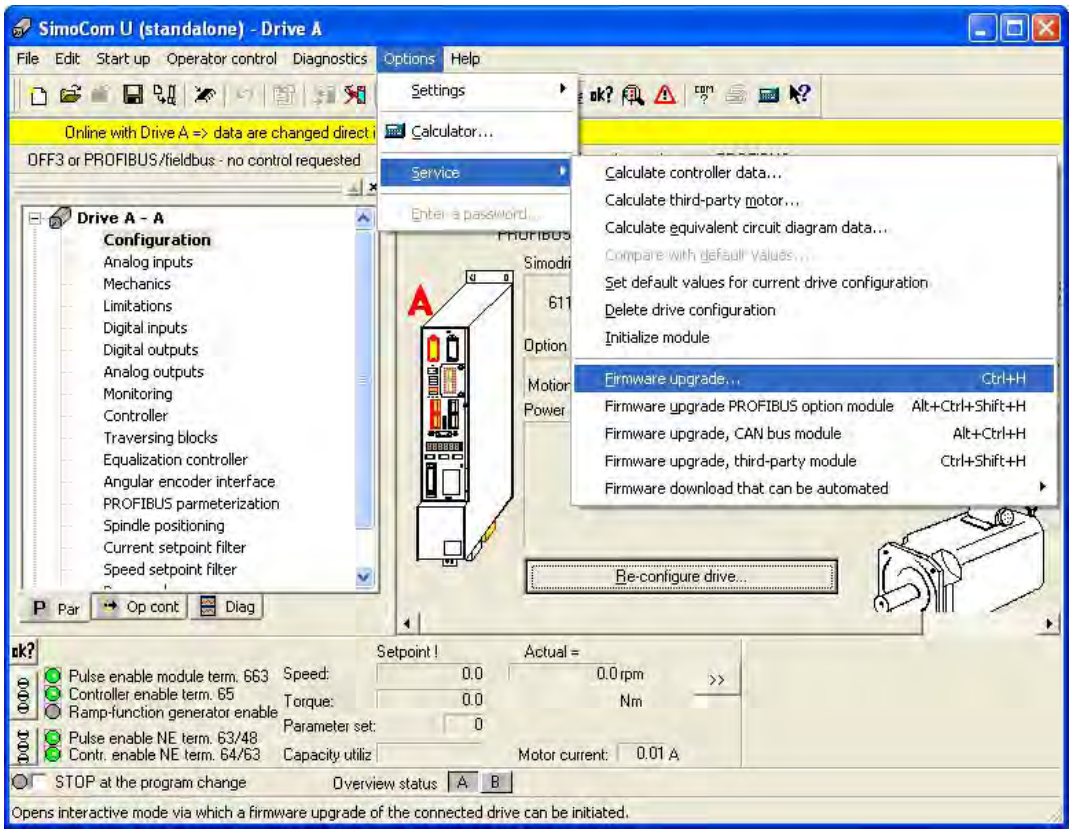
2. Open the firmware download window.

   If you want to upgrade the drive yourself, select the menu command **Options > Service > Firmware upgrade**. If you want to upgrade the PROFIBUS module, select the menu command **Options > Service > Firmware upgrade of PROFIBUS option module**.

You will be guided through the upgrade. Confirm the prompts and notes in the following windows.

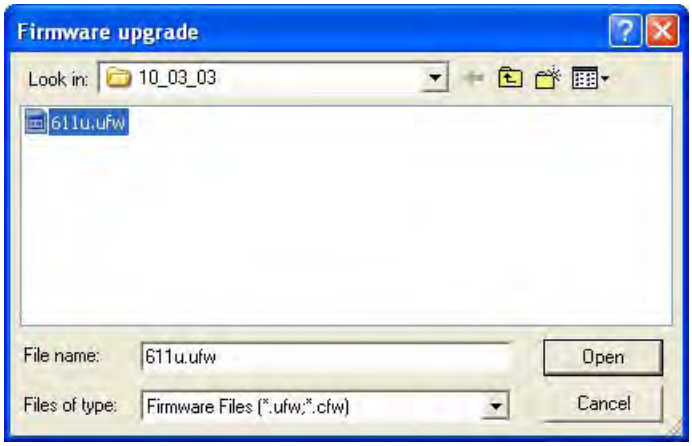
Note

This example shows the procedure for upgrading the firmware of the drive.



3. Confirm the following information message:

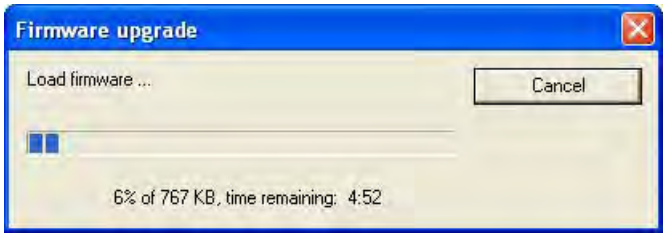
4. Select the file with the desired firmware, e. g. the "611u.ufw" file and confirm your input with **Open**.



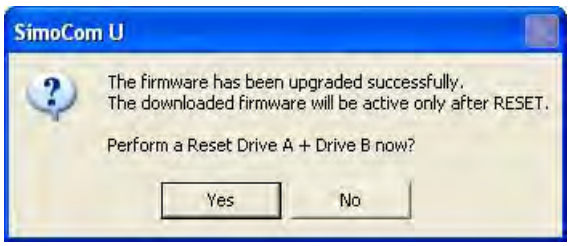
5. Wait until the firmware has been fully loaded.

Note

Do not cancel the downloading operation or interrupt the online connection to the SIMODRIVE 611U under any circumstances.



6. Confirm the prompt with Yes. The drive executes a RESET.



Result

The firmware upgrade for the drive is completed. If required, you can now perform the firmware upgrade for the PROFIBUS module.

Commissioning

4

4.1 Introduction

Overview

This section describes the standard commissioning procedure using a sample configuration. The settings required in the technology CPU and in the SIMODRIVE 611U are explained. The sample configuration is based on the control of two position-controlled axes with DSC. Control is via PROFIBUS message frame 105, and a SIMODRIVE 611U double-axis module is used as drive.

If you use another axis or message frame type or another SIMODRIVE 611U closed-loop control module, the structure of the input windows may differ from those described below. However, the principle approach remains the same.

Moreover, you can use additional functions of the SIMODRIVE 611U in the user program (for example, reading of operating modes, etc.). Information on this can be found in the "Expert functions" section.

Note

These instructions ensure only the connection of the SIMODRIVE 611U converter to the technology CPU. The guide does not describe how to optimize the controller; it is assumed that this has already been carried out.

4.2 Commissioning procedure

Operational sequence

The commissioning procedure is divided into two parts:

In the first part, a STEP 7 project is created and the S7T Config program and the hardware manager are used to enter the settings of the technology CPU for the attached hardware. The settings that have to be made both in the technology CPU and in the SIMODRIVE 611U are given special attention.

In the second part, the SIMODRIVE 611U is parameterized. The basic device commissioning for connection to the technology CPU is used for this.

Various parameter settings for the SIMODRIVE 611U are derived from the technology CPU settings. The table contains in Section 1.2 an overview of the functions and settings which have to be entered in both the technology CPU and the SIMODRIVE 611U. The settings that have been made can be entered in the table. These settings are explained in detail in the following sections for both the technology CPU and the SIMODRIVE 611U.

4.3 Table of the settings

Settings for the commissioning

You require this data for the following commissioning steps. You can prepare the values using this table.

DP cycle	_____ ms
Specify encoder	❑ Incremental encoder ❑ Absolute encoder
Homing mode	❑ Homing cam + encoder zero mark ❑ Only encoder zero mark ❑ Only homing cam ❑ 1. Zero position at the right of the homing cam ❑ 1. Zero position at the left of the homing cam
"Measuring" function	❑
Encoder type (order number)	1Fxxxxx- _ xxxx-x _ xx
Motor rated speed/max. speed axis	_____ rpm
Master application cycle/position control cycle clock	_____
Message frame (see decision table)	_____
PROFIBUS address	_____

Message frame decision table

By default, the SIMODRIVE 611U is connected to the technology CPU via PROFIBUS DP. Depending on the desired axis functionality, this connection can be made using various device-specific message frames. The following selection table shows the options for the individual message frame types:

	Sign-of-life monitoring (SoLmon)	1. Encoders Measuring	2. Encoders	Dynamic servo control (DSC)	Torque reduction (Mred)	Required message frame
Speed-controlled axis						1
	x					2
	x				x	101
Position axis/following axis	x	x				3
	x	x	x			4
	x	x		x		5
	x	x	x	x		6
	x	x			x	102
	x	x	x		x	103
	x	x		x	x	105
	x	x	x	x	x	106

Note

The message frame types < 100 are standard message frames. These are standardized via the PROFIdrive profile. The message frame types > 100 are device-specific message frame types for the SIMODRIVE 611U.

4.4 Setting up a STEP 7 project

4.4.1 Performing the hardware configuration

Introduction

In this step, the technology CPU (in this example, the CPU 317T 2 DP), the bus system and the connected devices, here the SIMODRIVE 611 universal, are configured in STEP 7 using the **hardware configuration** program and **S7T Config**.

Procedure

- After starting the SIMATIC manager, you must first create a new project (e.g. with the name *DSC_SIMODRIVE*):

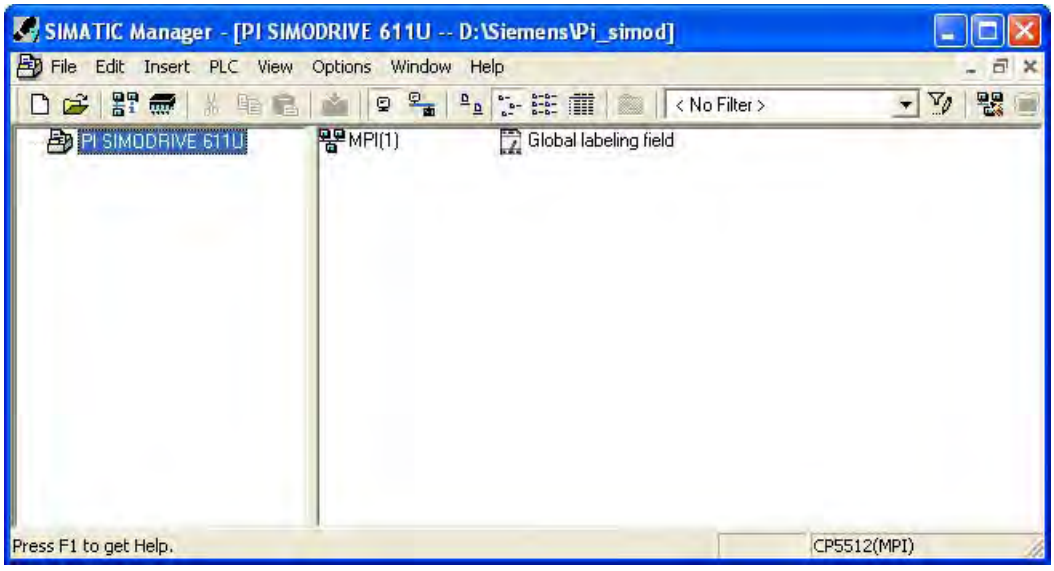


Figure 4-1 Creating a project

- A new S7 300 station is created in the **Insert > Station > SIMATIC 300 Station** menu.

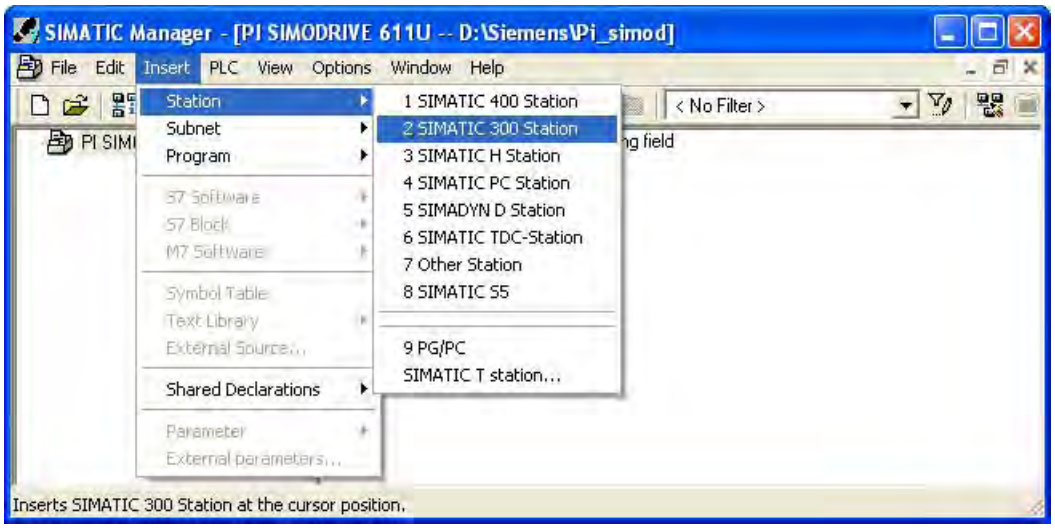


Figure 4-2 Inserting a SIMATIC station 300

- A double-click on the **Hardware** element in the SIMATIC 300 station opens the **hardware configuration**:

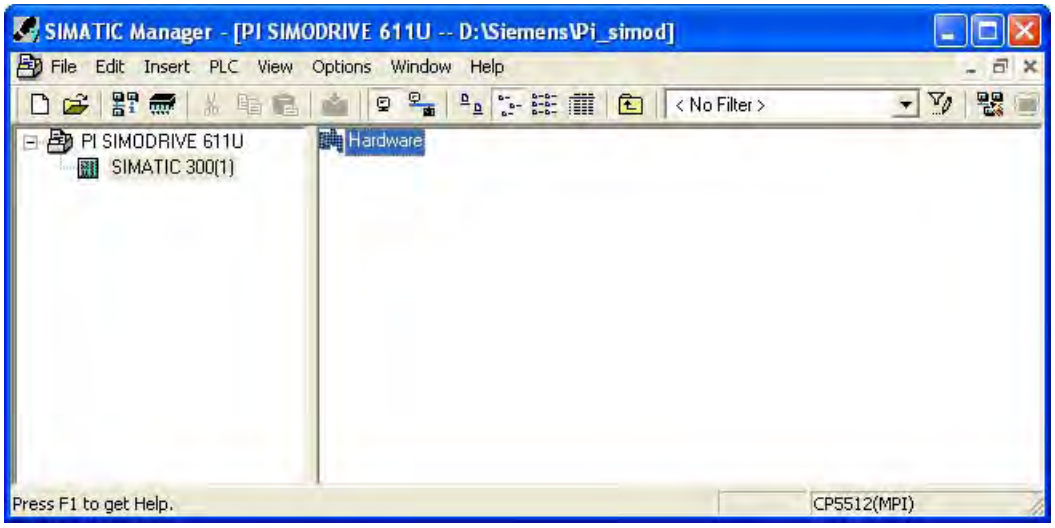


Figure 4-3 Open the hardware configuration

The **HW Config** application starts and opens the empty SIMATIC 300 station. Now select the mounting channels from the **SIMATIC Technology CPU** hardware catalog and add them to the configuration using drag-and-drop. Add the **CPU 317T-2 DP** at slot 2 of the mounting channels.

- Read carefully the information for downloading the system data and then click **OK** to confirm.

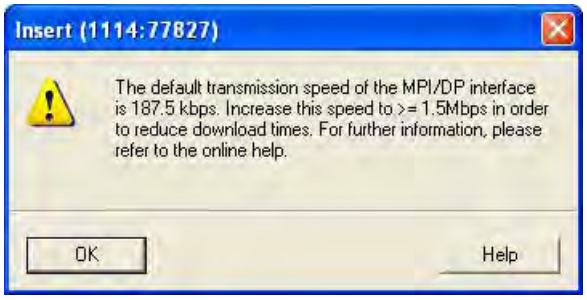


Figure 4-4 Information for downloading the system data

The Properties - PROFIBUS Interface DP(DRIVE) (R0/S3.1) window is displayed.

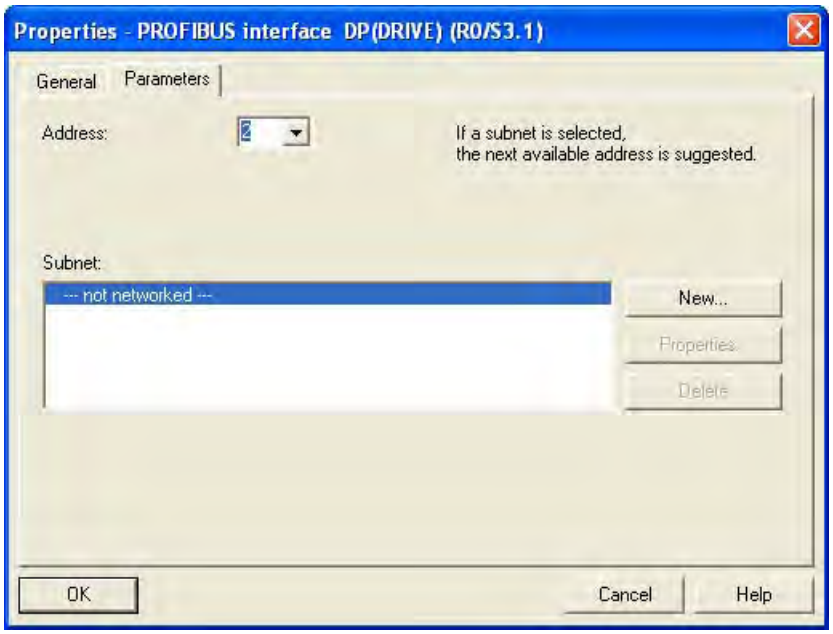


Figure 4-5 PROFIBUS interface DP(DRIVE) properties

- Click the **New** button in the **Properties - PROFIBUS Interface DP(DRIVE) (S0/S3.1)** window to assign a network to the DP drive interface. The PROFIBUS configuration is set in the displayed dialog. Select the Network Settings tab for this purpose.
  - Set "2" as the largest PROFIBUS address
  - Set a transmission rate of **12 Mbit/s** on the bus and **DP** as profile.

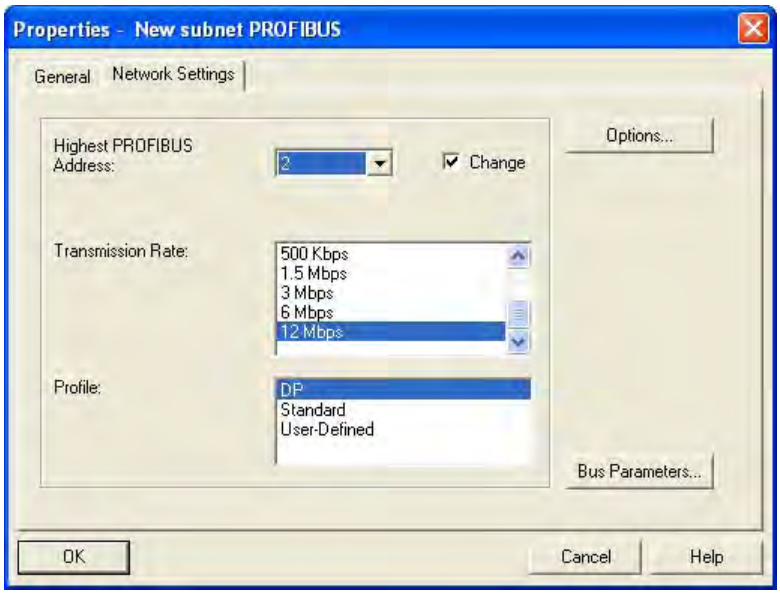


Figure 4-6 PROFIBUS subnet properties

- Click the **Options** button and activate the **Activate equidistant bus cycle** checkbox in the **Constant Bus Cycle Time** tab.

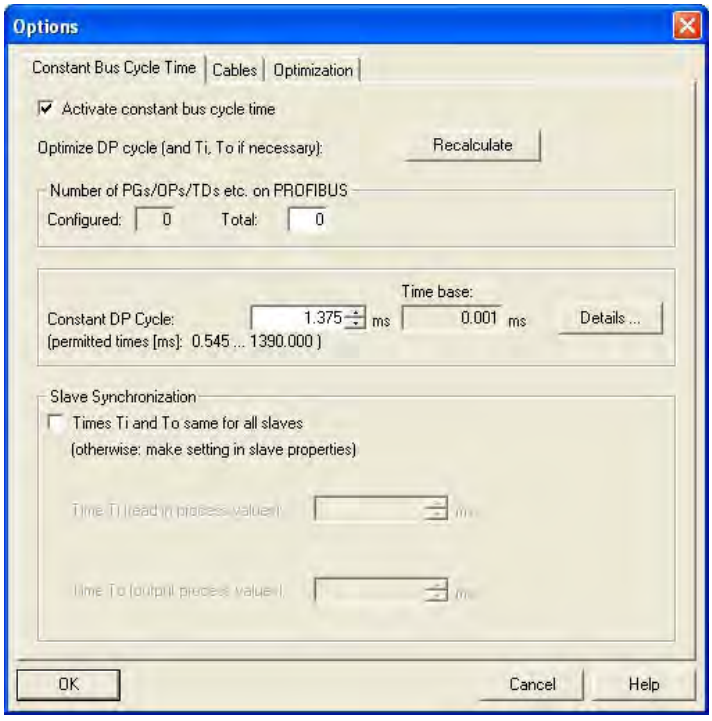


Figure 4-7 Activate isochronous bus cycle

- Enter the desired cycle time, e.g. 3 ms in the isochronous DP cycle field. The other described settings are all shown for a DP cycle of 3 ms.
- Click on OK to confirm your settings. The configured objects are then added to the SIMATIC 300 station.

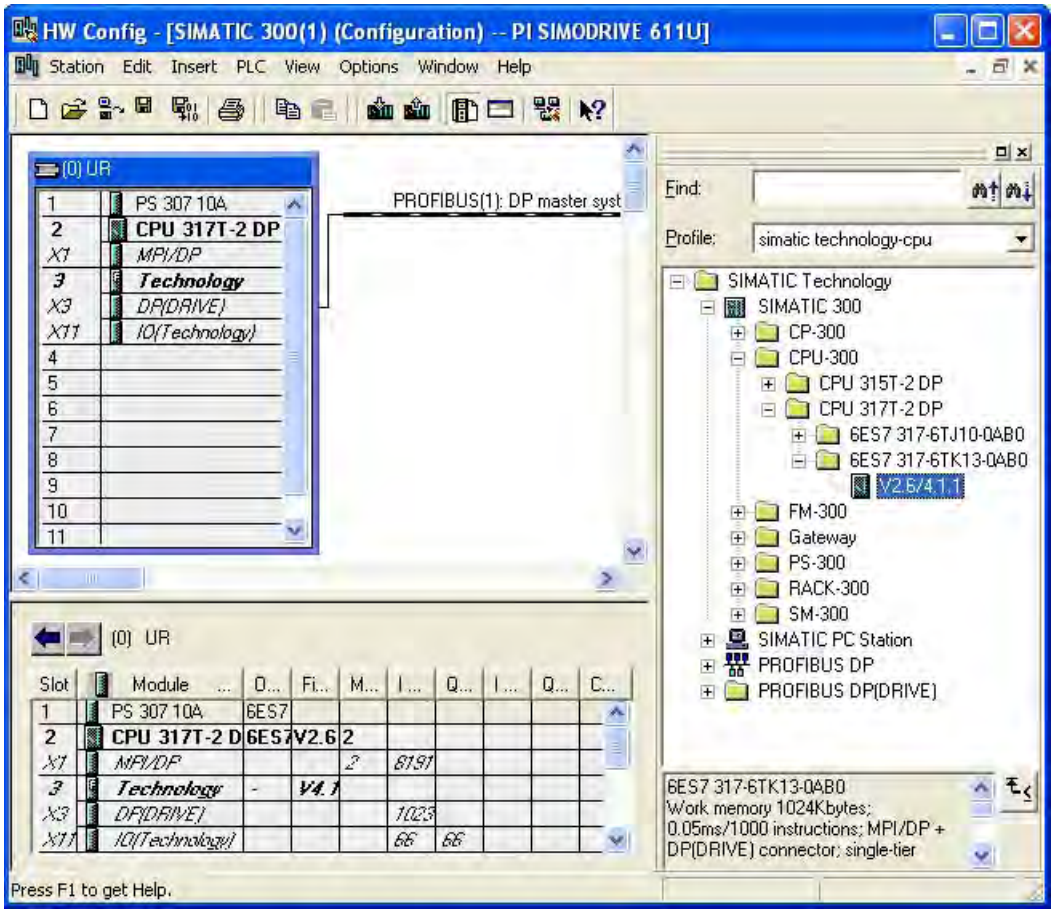


Figure 4-8 SIMATIC 300 Station

Note

The X1-MPI/DP interface in the rack is not networked for this example. It is set by default for MPI communication at 187.5 Kbaud. To load the technology system data to the module, the transmission speed of the interface should be set to ≥ 1.5 Mbaud.

- Configure on the PROFIBUS a SIMODRIVE 611 universal (e.g. with address 3) that is contained in the hardware catalog at CPU 317T\PROFIBUS DP(DRIVE)\Drives\SIMODRIVE.

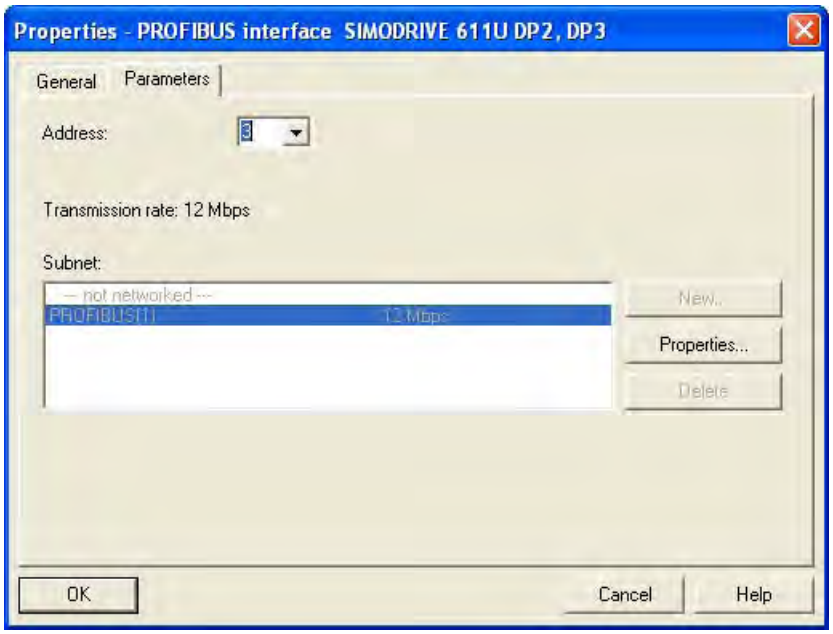


Figure 4-9 Adding a SIMODRIVE 611 universal to the PROFIBUS

Set the PROFIBUS address of the SIMODRIVE 611U

The PROFIBUS address must be set in the SIMODRIVE 611U in the **P918** parameter. With SimoCom U, the entry can be made in the **PROFIBUS Parameterization** window.

- Click **OK** to confirm the **Properties - Drive** window.
- In the Configuration tab of the DP Slave Properties window, select the required PROFIBUS message frame for the connection. In this example, a 611U double-axis module connected via message frame 105 is selected. The subsequent axis motion will be position-controlled.

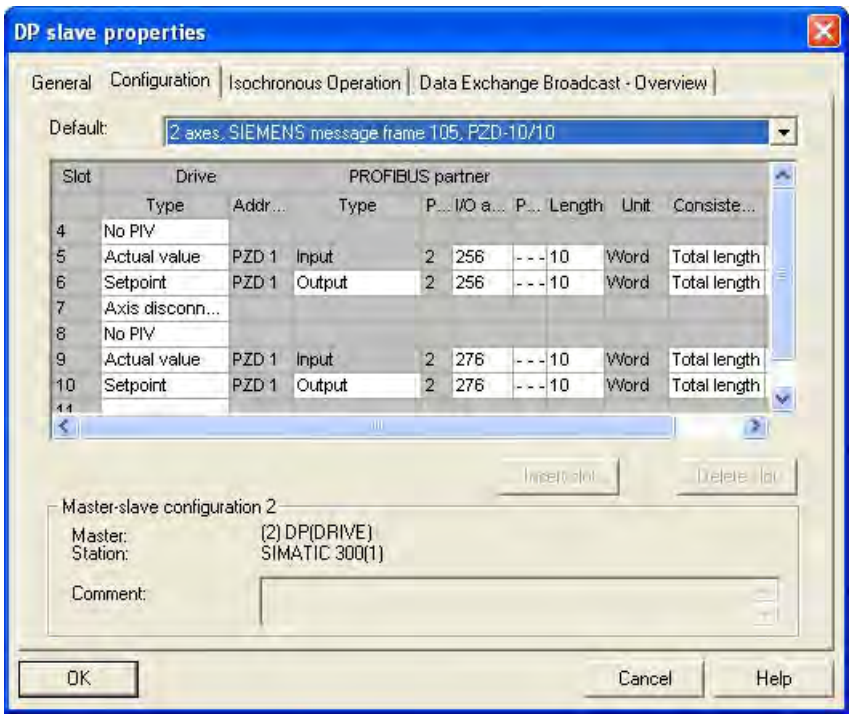


Figure 4-10 Set message frame 105 on the slave

The required message frame can be selected using the "message frame type decision table".

Technology CPU

The message frame selected here is specified again when the axis is subsequently created. The setting is automatically taken over from the hardware configuration when the axis is created.

SIMODRIVE 611U

The message frame selected here must be set in the **P922** parameter in the SIMODRIVE 611U. With SimoCom U, the entry can be made in the **PROFIBUS Parameterization** window.

- Make the following settings in the **Clock-synchronized operation** tab:

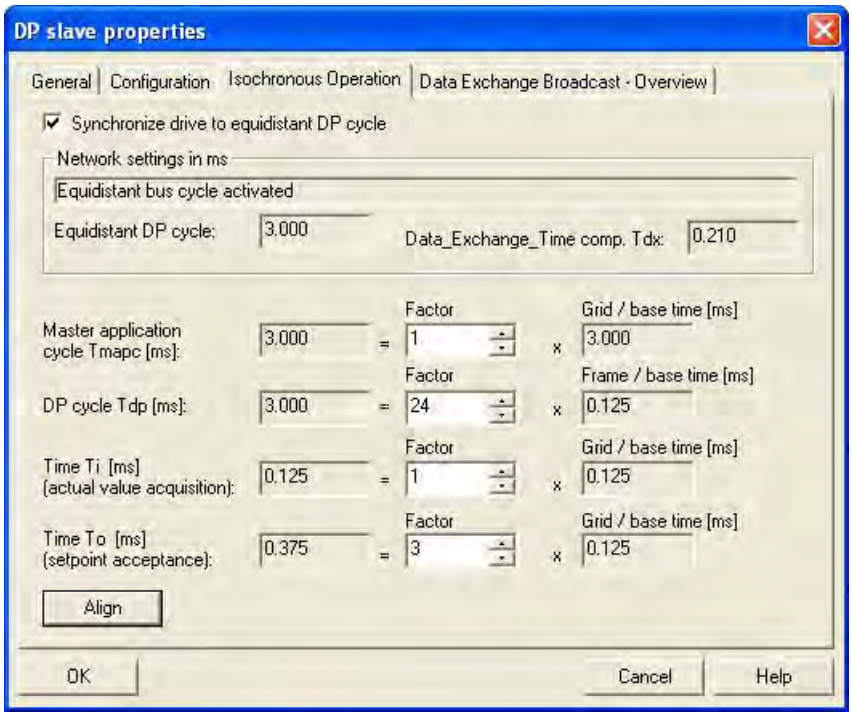


Figure 4-11 Activate clock-synchronized operation

- Select **Synchronize drive with equidistant DP cycle**.
  - DP cycle:
    Bus clock cycle: depends on the number of slaves (minimum 1.5 ms)
  - Master application cycle:
    Here, you specify the cycle clock in which the master is to supply new values to the SIMODRIVE 611U. For the CPU 317T-2 DP, this is the position control cycle clock (servo). You must note this value and enter it later when configuring the system clocks as position control cycle clock.

    Note

    It is mandatory that the master application cycle match the position control cycle clock of the CPU!

  - Setpoint acceptance:
    Setpoint is output in the SIMODRIVE 611U as soon as possible after the DP clock cycle. The time depends on the number of isochronous slaves. It must be ensured that the last slave has also received the setpoint values in the current DP cycle. Otherwise, the drive signals it is "not isochronous with the master".
  - Actual-value acquisition

    Measured value is latched in the SIMODRIVE 611U as soon as possible before the DP cycle clock (Input 1: → 0.125 ms before the next DP cycle clock).
- Perform match. Clicking the button causes the following settings to be made:·
  - The equidistant bus cycle will be activated·
  - The DP cycle in the master system will be matched to the drive properties and set to 2000 ms
  - All drive components of the same family receive the same parameterization
- You must then save and compile the project (**Station > Save and compile)**. The consistency must also be tested (**Station > Test consistency**).

  Once these steps have been performed without error, you must load the hardware configuration into the CPU 317T-2 DP (**Target system > Load into the module**).

  If you have changed the transmission speed of the MPI/DP interface, you must modify the interface parameters in the PG/PC interface in order to subsequently load to the technology system data to the module.

The hardware configuration thus does not contain any technology system data. The creation of this data will be activated separately in the hardware configuration. To do this, double-click Index 3 (**Technology)** in the mounting channels of the SIMATIC 300 station and switch to the "Technology system data" tab. Activate **Generate technology system data**, save and compile the configuration, and reload it into the CPU.

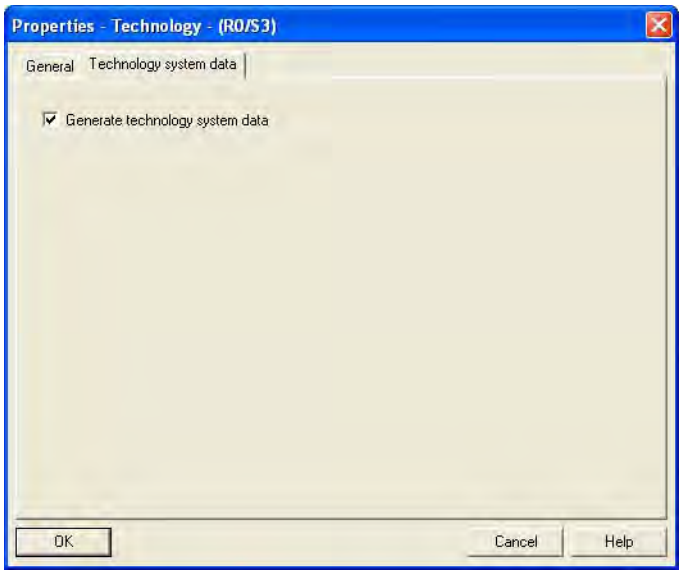


Figure 4-12 Activate generate technology system data

Note

It is also possible to download the technology system data with the hardware configuration in a single step in order to avoid the need for the second download. The described procedure has the advantage that the download of the technology system data uses the higher transmission speed of the communication connection and thus takes less time.

If the load process has completed successfully, only the green and the yellow LEDs illuminate. The red BF 3 LED (the mode selector switch is at the STOP position). The bus error occurs if the PROFIBUS address configured in HW Config or the selected message frame type have not yet been set in the SIMODRIVE 611U.

If communication between the two devices is to be checked at this point, then the basic functions of the SIMODRIVE 611U must have been commissioned as specified in the "Create STEP 7 Project" section.

If the settings in the CPU 317T-2 DP and the SIMODRIVE 611U match, the BF 3 error does not occur and the LED on the PROFIBUS module of the SIMODRIVE 611U is green.

Result

This completes the hardware configuration of the station and the window can be closed.

4.4.2 Create axis

Introduction

This step describes the procedure for creating an axis in S7T Config. Because the SIMODRIVE 611U double-axis module is used in the hardware configuration, two axes must be created and the procedure described here performed twice.

Note

Using a double-axis module

If a double-axis module is used, either both axes must be set up as TO, or both axes must be addressed by the user program via the PZD interface. Mixed operation is not possible.

To deactivate: Both TOs of a double-axis module must be deactivated at the same time. It is not possible to deactivate just the TO of one of the axes.

Procedure

- A double-click on the **Technology objects** entry in the Technology folder in the created SIMATIC 300 station starts the Technology Object Management application in the SIMATIC Manager.

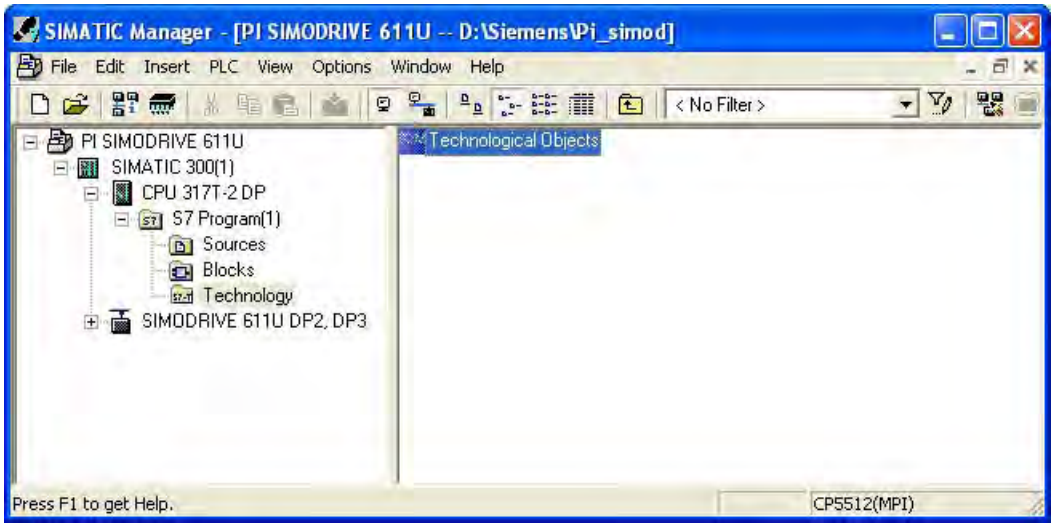


Figure 4-13 Technology objects in the SIMATIC Manager

The Technology Object Management application opens. If no technology objects have been configured, then S7T Config is automatically started. Otherwise start S7T Config by selecting the **Options > Configure technology**menu command in the Technology Object Management.

Note

Alternatively, you can also run S7T Config without starting the Technology Objects Management. To do this, select the object **Technology objects** in the folder **Technology** of theTechnology CPU and start the S7T Config using the menu command **Tools > Configure technology**. This procedure is particularly useful when no new technology objects are to be created and consequently no technology data blocks need to be created.

- In S7T Config, open the **Axes** folder:

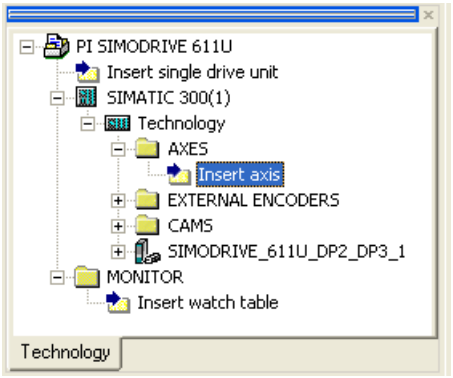


Figure 4-14 Inserting an axis

- The following window opens after double clicking on **Insert axis** :

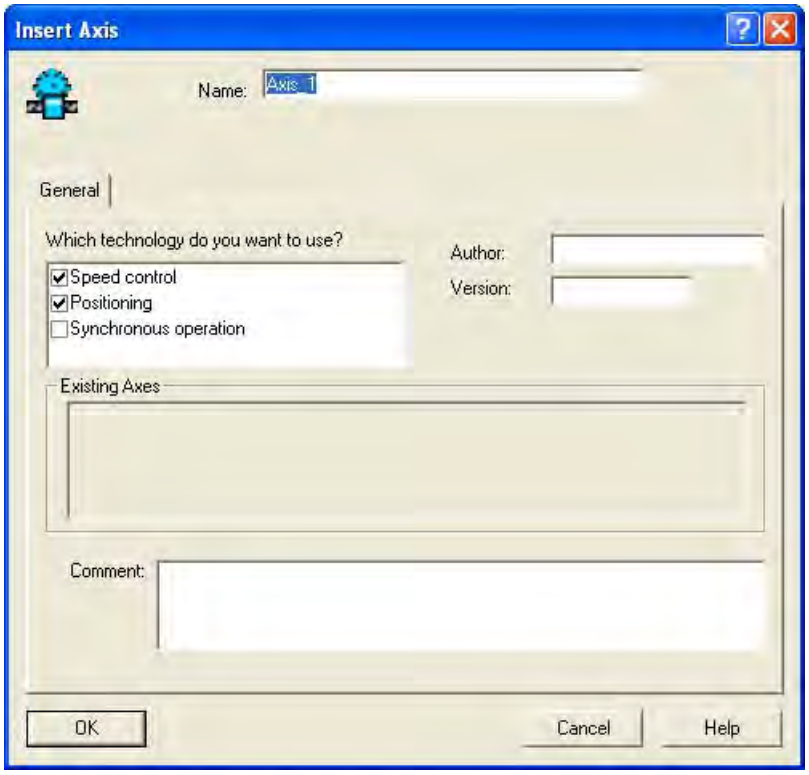


Figure 4-15 1st window of the axis configuration

- Click OK to open the Axis configuration - Axis type window. Specify the axis type here. In the example, the linear axis setting is retained:

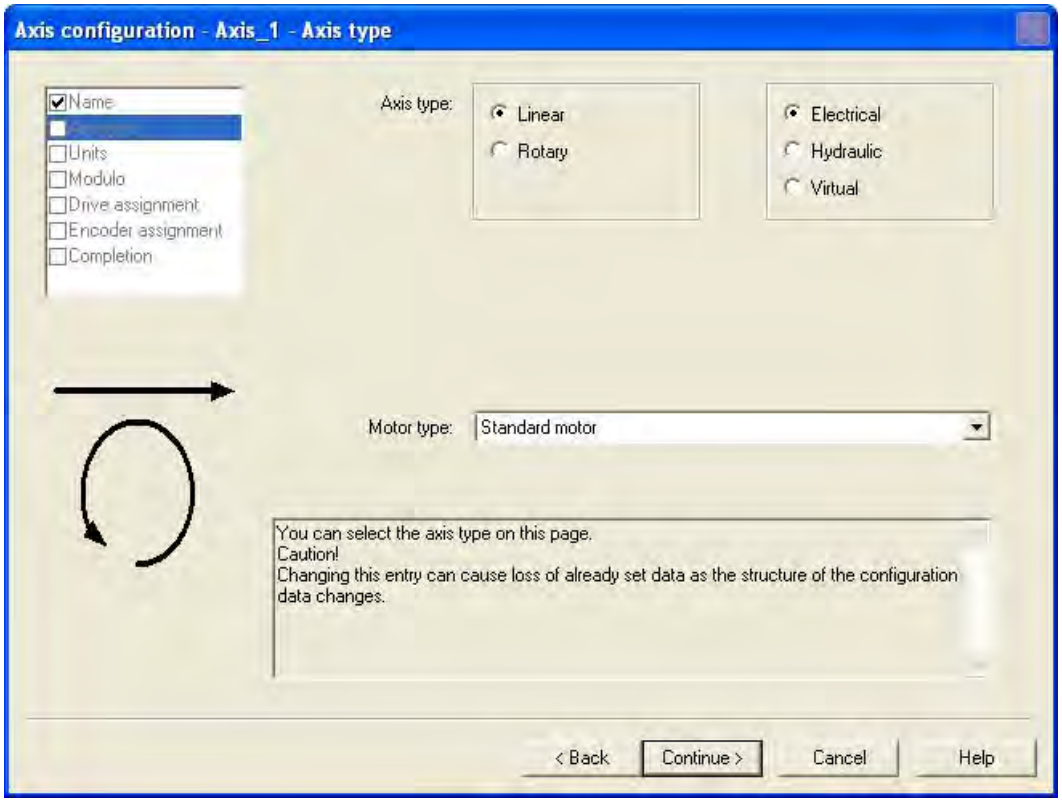


Figure 4-16 2nd window of the axis configuration

- Click **Next** to open the Axis configuration - Units window. The physical quantities are specified there. Do not change anything and click on **Continue**.

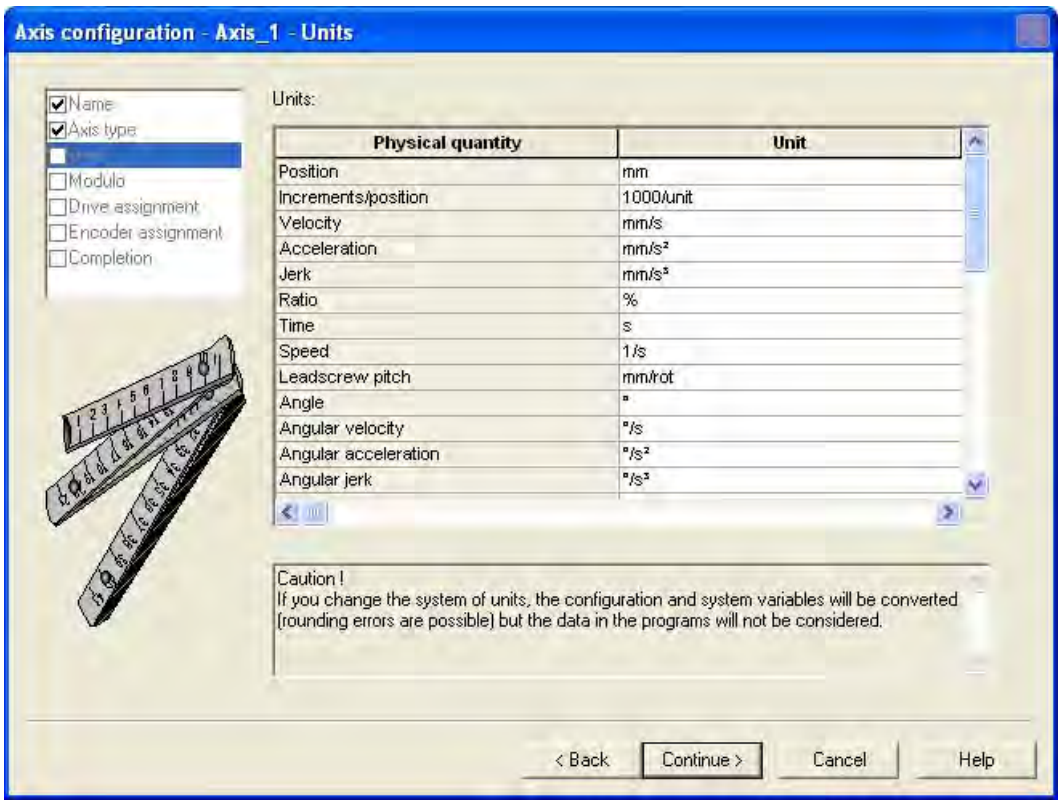


Figure 4-17 3rd window of the axis configuration

- The window for configuring the modulo axes opens. If necessary, activate the modulo axis and click on **Continue**.

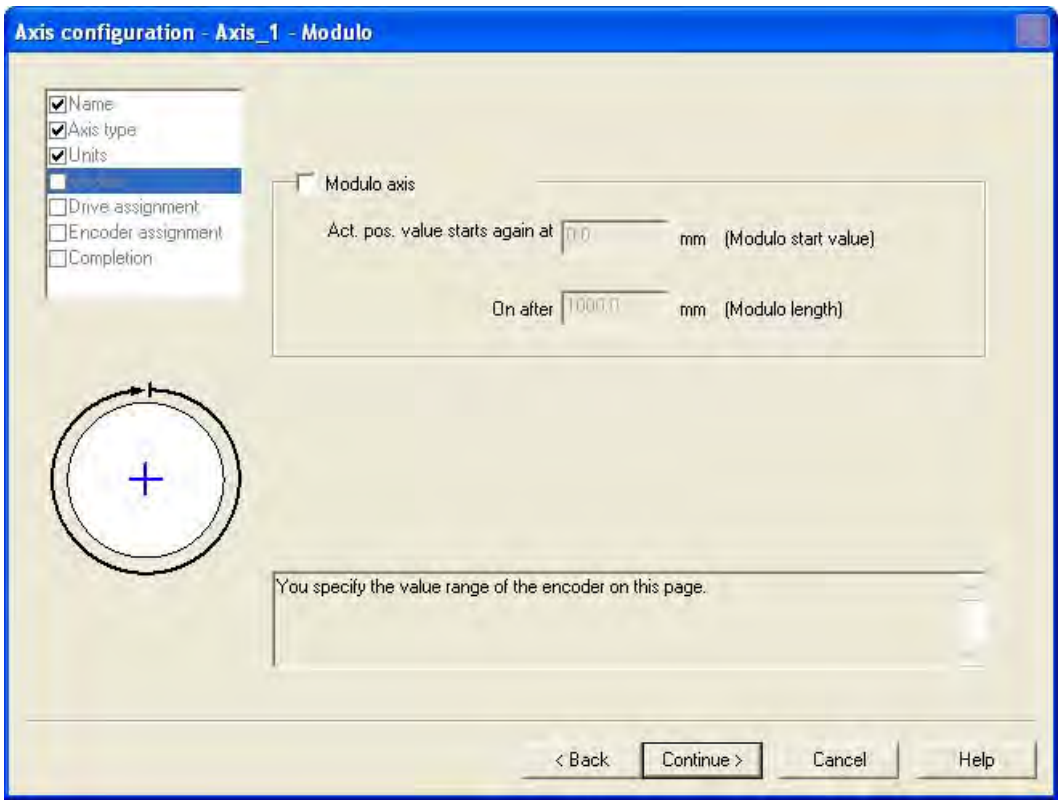


Figure 4-18 4th window of the axis configuration

- The hardware configuration will then be loaded automatically and you can select in the Drive window the **SIMODRIVE 611U drive A or B** parameterized in HW Config. The **message frame 105** that you specified previously in HW Config is set as default message frame. The maximum motor speed in this example is 6000 RPM. Select the function **Dynamic drive control (DSC)**:

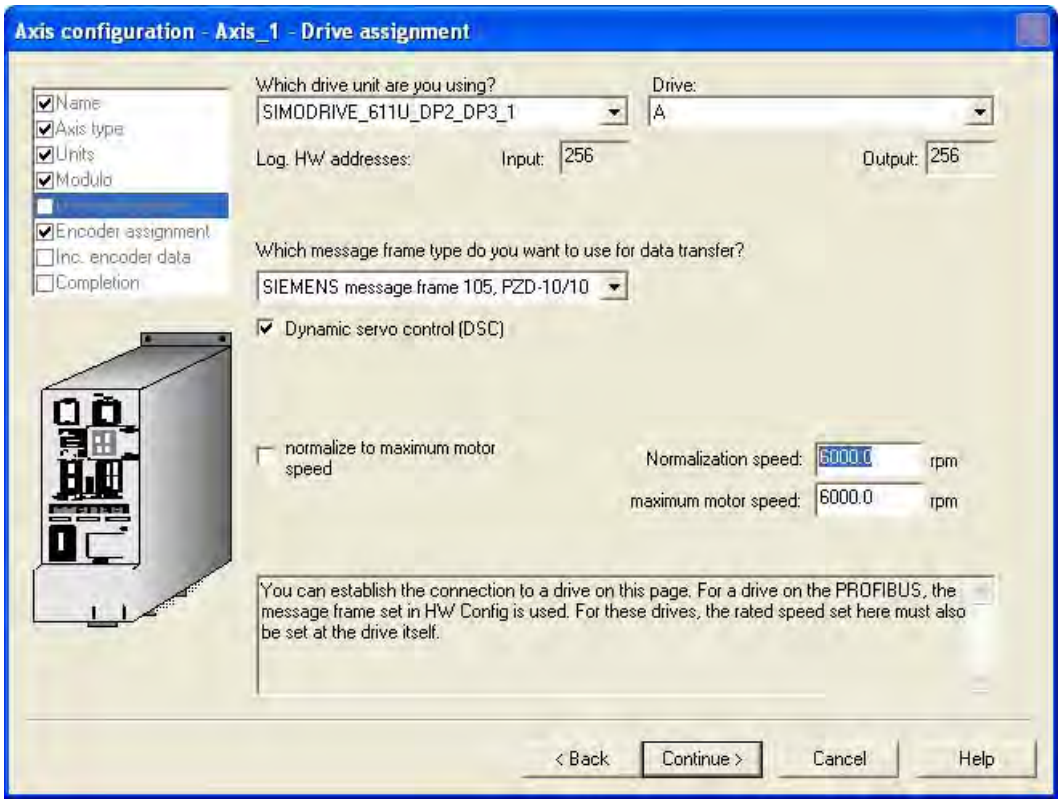


Figure 4-19 5th window of the axis configuration

Specifying the maximum motor speed

The motor speed is set in the Technology CPU and in SIMODRIVE (rated speed). This value is used to determine the maximum speed (→ maximum possible speed) at the axis and the scaling of the PROFIBUS speed value in the SIMODRIVE 611U.

Technology CPU

The maximum motor speed normally corresponds to the rated speed of the motor used. All specified speeds of the axis are based on this maximum speed.

SIMODRIVE 611U

This speed must be specified in the **P880** parameter.

This specifies the scaling of the PROFIBUS speed value. For the maximum speed, a setpoint NSET = 4000 0000 hex is transferred to the drive via the PROFIBUS. The P880 parameter is used to inform the SIMODRIVE 611U which speed should be set when NSET = 4000 0000 hex.

- The encoder is configured in the next windows.

The absolute value encoder must be configured as ENDAT encoder, e.g. EQN 1325 as ENDAT (refer to the following two figures).

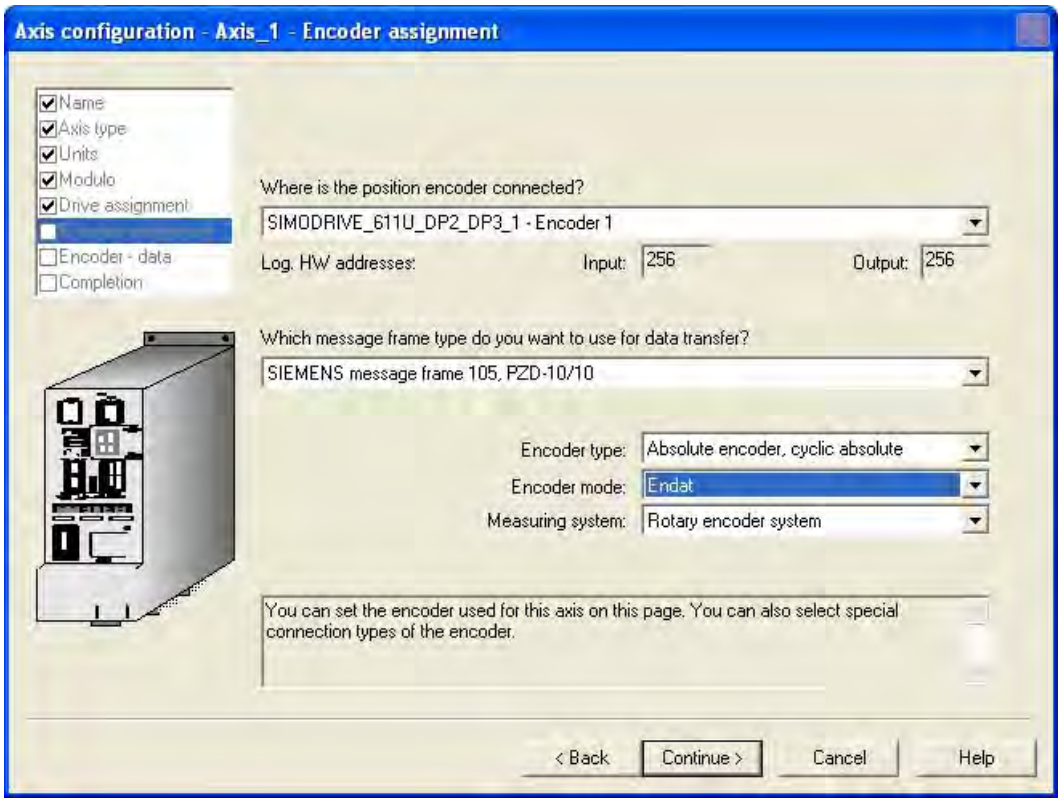


Figure 4-20 Axis configuration in S7T Config (selects the encoder type for absolute encoders)

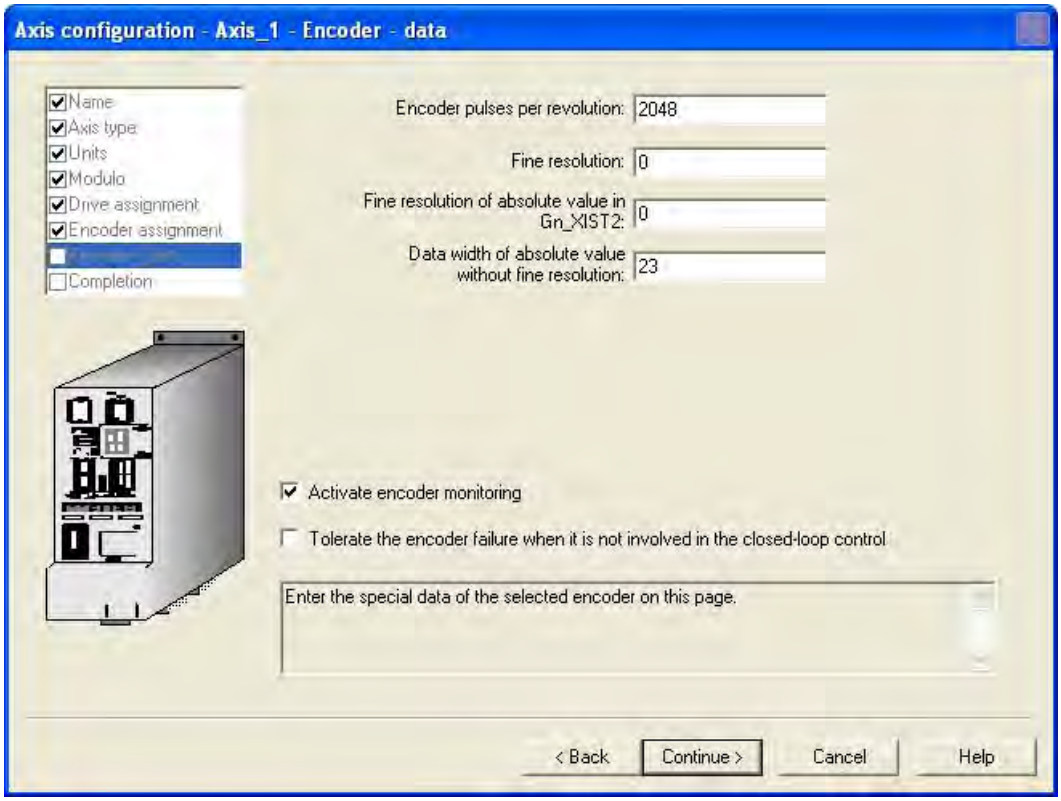


Figure 4-21 Axis configuration in S7T Config (enters the resolution of the absolute encoder)

Incremental encoders will be set appropriately (square TTL, sine, resolver) and the resolution entered using the manufacturer's data (refer to the following two figures).

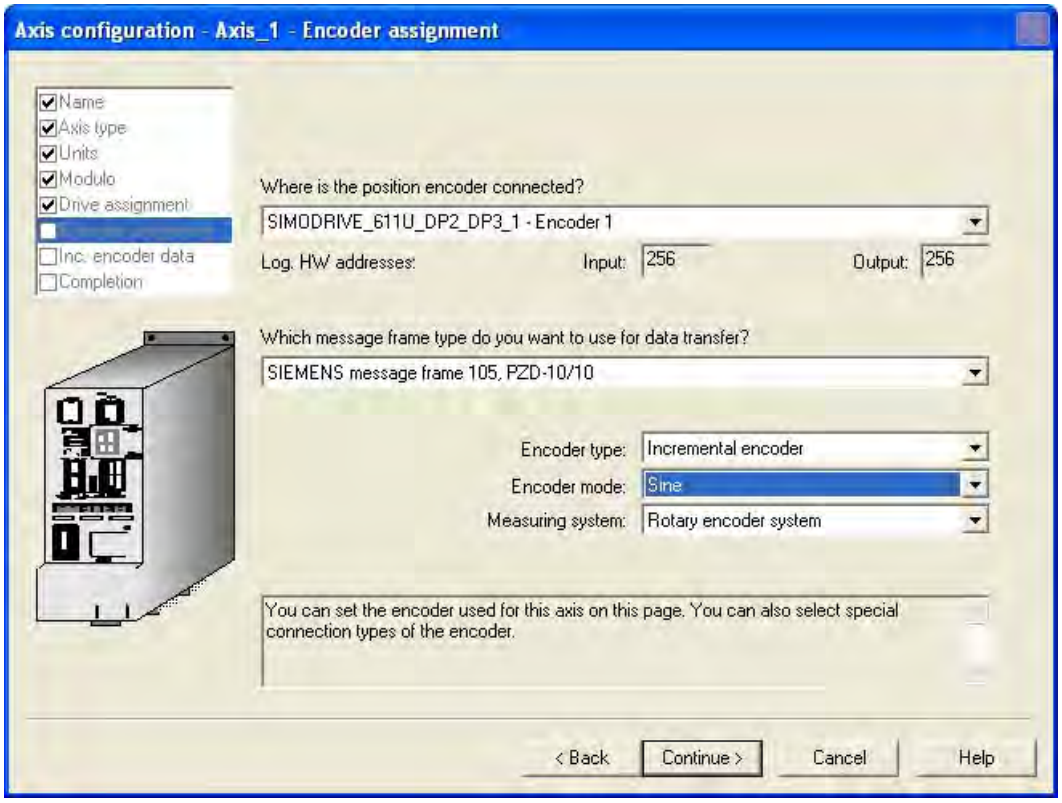


Figure 4-22 Axis configuration in S7T Config (selects the encoder type for incremental encoders)

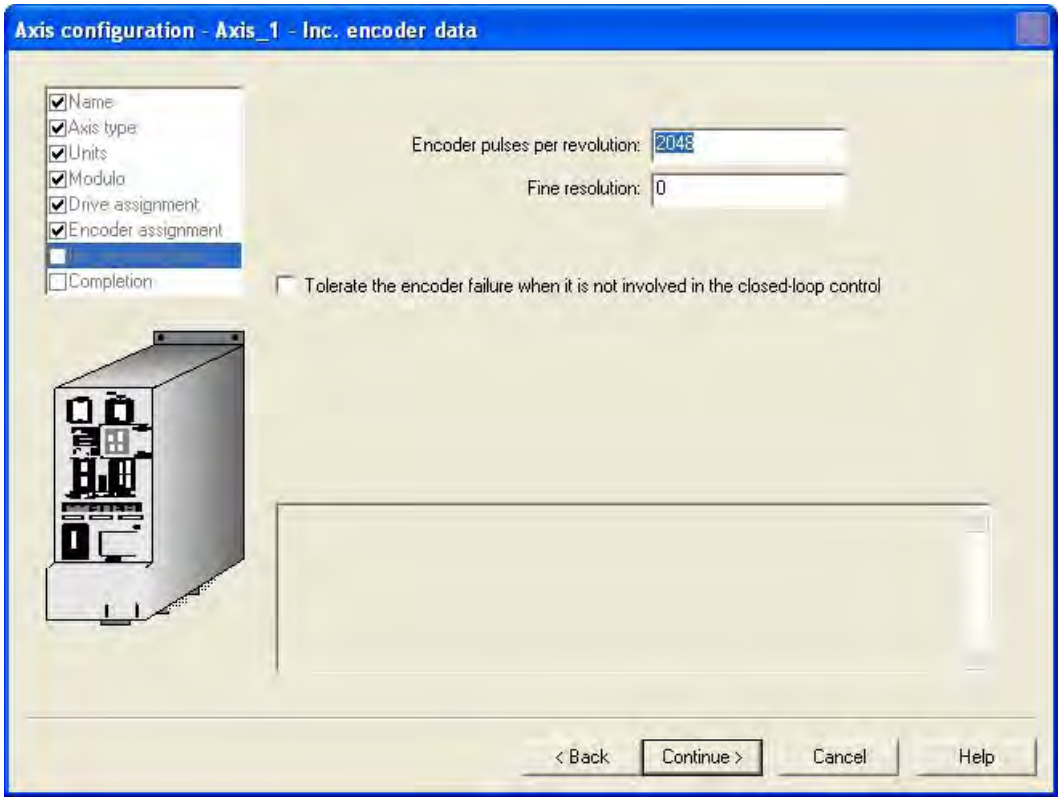


Figure 4-23 Axis configuration in S7T Config (enters the resolution of incremental encoders)

Specifying the encoder and the resolution

The encoder and the resolution are specified in the Technology CPU and in the SIMODRIVE 611U.

SIMODRIVE 611U

The encoder used for the drive configuration is selected using the order number (motor rating plate).

Technology CPU

The data of the encoder used that is necessary to make the settings for the Technology CPU is shown in the following section. Only the listed input values are evaluated for the respective encoder.

The following settings refer to the input value for the fine resolution 0.

If a fine resolution 0 (standard) is set in the Technology CPU, this means a fine resolution of 2^{11} = 2048. If a different value is set (e.g. 1024), this means the actual fine resolution.

Encoder parameters in SIMOTION are specified using parameters in the axis configuration windows or using the configuration data in the expert list as "TypeOfAxis.NumberOfEncoders.Encoder_1.xxx". The following assignments apply to the axis configuration windows:

Parameter	Meaning
Encoder type	TypeOfAxis.NumberOfEncoders.Encoder_1.encoderType
Encoder mode	TypeOfAxis.NumberOfEncoders.Encoder_1.encoderMode
Resolution	TypeOfAxis.NumberOfEncoders.Encoder_1.IncEncoder.IncResolution TypeOfAxis.NumberOfEncoders.Encoder_1.AbsEncoder.AbsResolution
Number of data bits	TypeOfAxis.NumberOfEncoders.Encoder_1.AbsEncoder.AbsDataLength
Multiplication factor of the cyclic encoder actual value	TypeOfAxis.NumberOfEncoders.Encoder_1.IncEncoder.IncResolutionMultiplierCyclic TypeOfAxis.NumberOfEncoders.Encoder_1.IncEncoder.AbsResolutionMultiplierCyclic
Multiplication factor of the absolute encoder actual value	TypeOfAxis.NumberOfEncoders.Encoder_1.AbsEncoder.AbsResolutionMultiplierAbsolute

Encoder settings

Encoder type	Vendor	SIMODRIVE 611U-relevant settings
Endat motor encoder	Endat 2048 pulses/rev 1Fxxxxx-xxxxx-xExx Encoder system for motors with DRIVE-CLiQ interface: 1Fxxxxx-xxxxx-xFxx	**611U parameters:** Encoder lines (1005): 2048 Encoder fine resolution (1042):=11 Encoder fine resolution absolute (1043):=9 **SIMOTION:** Encodersystem:=rotatory_system Encodertype:=sensor_absolute_cyclic encoderMode=ENDAT AbsEncoder. Absresolution:=2048 Absdatalength:=23 AbsResolutionMultipliercyclic:=2048 (0) AbsResolutionMultiplierabsolute:= 512 (0)

Encoder type	Vendor	SIMODRIVE 611U-relevant settings
Endat motor encoder	Endat 512 pulses/rev 1Fxxxxx-xxxxx-xHxx Encoder system for motors with DRIVE-CLiQ interface: 1Fxxxxx-xxxxx-xLxx	**611U parameters:** Encoder lines (1005): 512 Encoder fine resolution (1042):=11 Encoder fine resolution absolute (1043):=9 **SIMOTION:** Encodersystem:=rotatory_system Encodertype:=sensor_absolute_cyclic encoderMode=ENDAT AbsEncoder. Absresolution:=512 Absdatalength:=21 AbsResolutionMultipliercyclic:=2048 (0) AbsResolutionMultiplierabsolute:= 512 (0)
Endat motor encoder	Endat 32 pulses/rev 1Fxxxxx-xxxxx-xGxx	**611U parameters:** Encoder lines (1005): 32 Encoder fine resolution (1042):=11 Encoder fine resolution absolute (1043):=9 **SIMOTION:** Encodersystem:=rotatory_system Encodertype:=sensor_absolute_cyclic encoderMode=ENDAT AbsEncoder. Absresolution:=32 Absdatalength:=17 AbsResolutionMultipliercyclic:=2048 (0) AbsResolutionMultiplierabsolute:= 512 (0)
Incremental sin/cos motor encoder	optical incremental encoder sin/cos 1 Vpp 2048 pulses/rev ERN1381 / 1387 1Fxxxxx-xxxxx-xAxx Encoder system for motors with DRIVE-CLiQ interface: 1Fxxxxx-xxxxx-xDxx	**611U parameters:** Encoder lines (1005): 2048 Encoder fine resolution (1042):=11 Encoder fine resolution absolute (1043):=9 **SIMOTION:** Encodersystem:=rotatory_system Encodertype:= sensor_incremental encoderMode=sinus_vpp IncEncoder.IncResolution:=2048 IncResolutionMultipliercyclic:= 2048(0) For incremental encoders, a fine resolution of 0 (default value) in the IncResolutionMultipliercyclic parameter means a fine resolution of 2^{11} = 2048

Encoder type	Vendor	SIMODRIVE 611U-relevant settings
Resolver	2-pin: 1Fxxxxx-xxxxx-xTxx Multi-pin: 1Fxxxxx-4xxxx-xSxx Encoder system for motors with DRIVE-CLiQ interface: 2-pin: 1Fxxxxx-xxxxx-xPxx Multi-pin: 1Fxxxxx-4xxxx-xUxx	**611U parameters:** Resolver pole pair count:=1,2,3 or 4 **SIMOTION:** Encodersystem:=rotatory_system Encodertype:= sensor_incremental encoderMode= RESOLVER IncEncoder.Incresolution:= *) IncResolutionMultipliercyclic:= 2048(0) *) Depending on the value of 611U parameter P1011.2, the following setting applies **P1011.2=0:** IncResolution :=1024 (2-pole) =2048 (4-pole) =3072 (6-pole) =4096 (8-pole) **P1011.2=1:** IncResolution :=4096 (2-pole) =8192 (4-pole) =12288 (6-pole) =16384 (8-pole) For incremental encoders, a fine resolution of 0 (default value) in the IncResolutionMultipliercyclic parameter means a fine resolution of 2^{11} = 2048

Note:

For the encoders, a fine resolution of 0 (default value)

- in the TypeOfAxis.NumberOfEncoders.Encoder_1.IncEncoder.IncResolutionMultiplierCyclic parameter, a fine resolution of 2^{11} = 2048
- in the TypeOfAxis.NumberOfEncoders.Encoder_1.IncEncoder.IncResolutionMultiplierAbsolute parameter, a fine resolution of 2^{9} = 512

  Differences between ABS and CYCLE_ABS:

  – In the case of ABS, the absolute actual position of the encoder is assumed after powering up the Technology CPU or following an encoder error.

  – In the case of CYCL_ABS, overflows of the encoder ranges are tracked in the NVRAM and taken into account when the cycle is resumed.

    The encoder must be calibrated after the initial loading.

    If the settings for the absolute encoder are modified, the encoder must also be re-adjusted.

    With the CPU switched off, the encoder may only be moved a maximum distance ≤ "half the encoder range" in both traversing directions in order to still be able to detect the exact position.

Completing the axis configuration

- Finally click on **Complete**. The set data will be summarized:

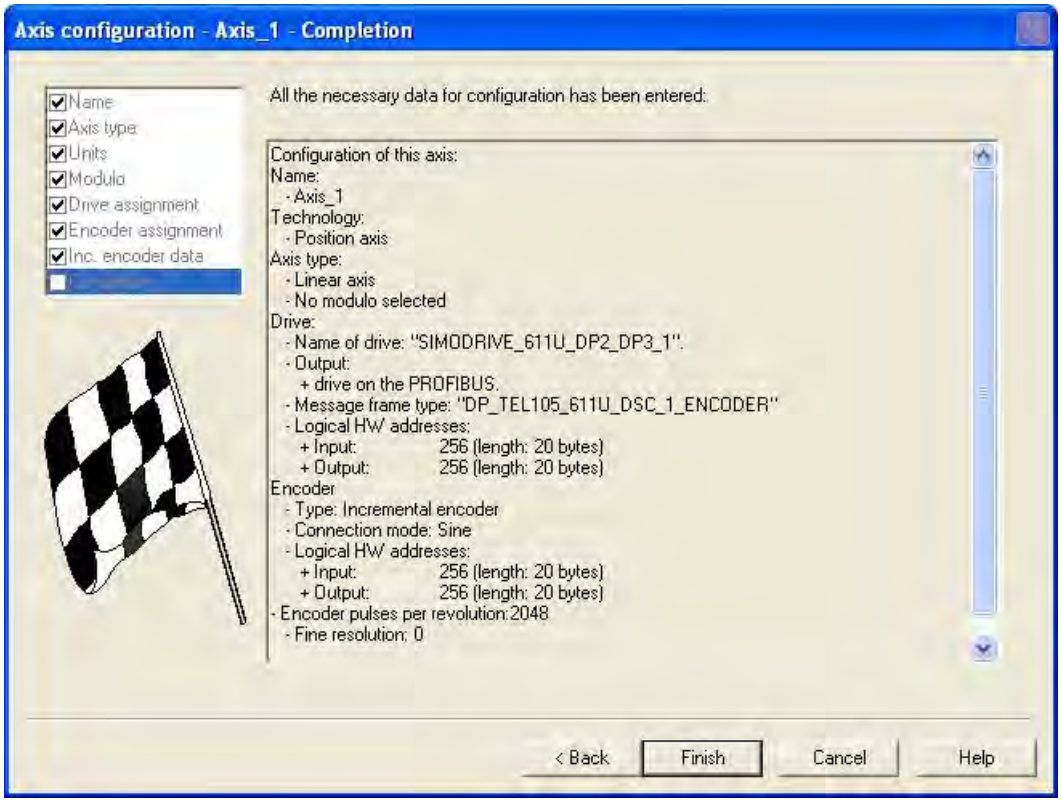


Figure 4-24 Last window of the axis configuration

After the axis is created, a few more settings have to be made to optimize the interaction between Technology CPU and SIMODRIVE 611U.

Following error monitoring

To prevent the following error monitoring interrupting an axis motion, it can be set to a higher value or deactivated. A high following error can occur, for example, as a result of a missing drive optimization.

This causes the **Monitoring** window of the created axis to be called and the **Dynamic following error monitoring active** setting deselected in the **Following error monitoring** tab (refer to the following figure).

The following error monitoring should, of course, be matched to the requirements and mechanical system of the plant when commissioning an application.

⚠ WARNING

If the following error monitoring is increased or deactivated, larger incorrect motions can also occur on the axis in the case of an error (e.g. incorrect position control direction). This is particularly important, for example, when the axis only has a limited traversing range.

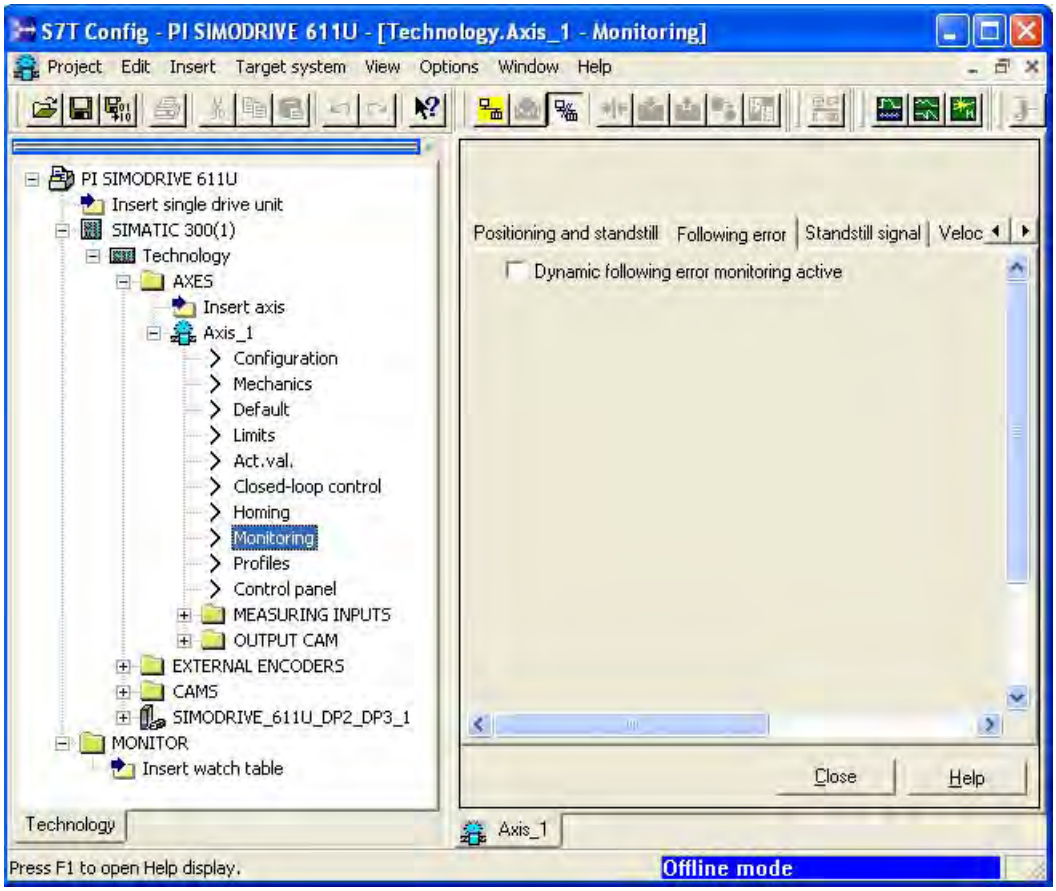
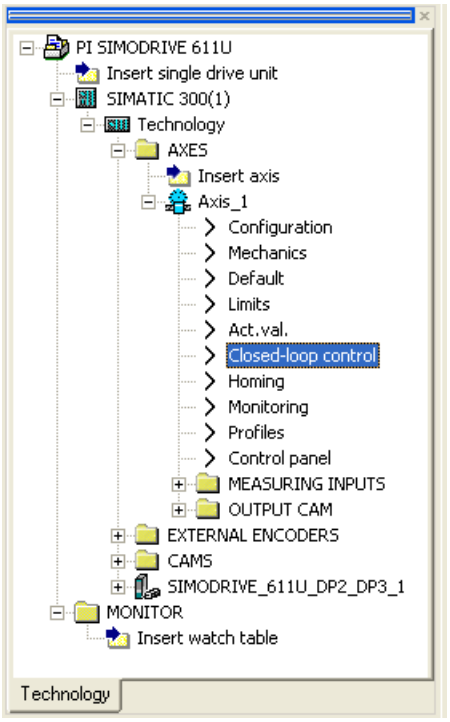


Figure 4-25 Deactivate following error monitoring

Position controller configuration

In S7T Config, select the control of Axis_1.



The window of the **Position controller** is opened and the K_v factor, the speed pre-control and the velocity-dependent interpolation are set. The **Dynamic drive control (DSC)** function remains selected:

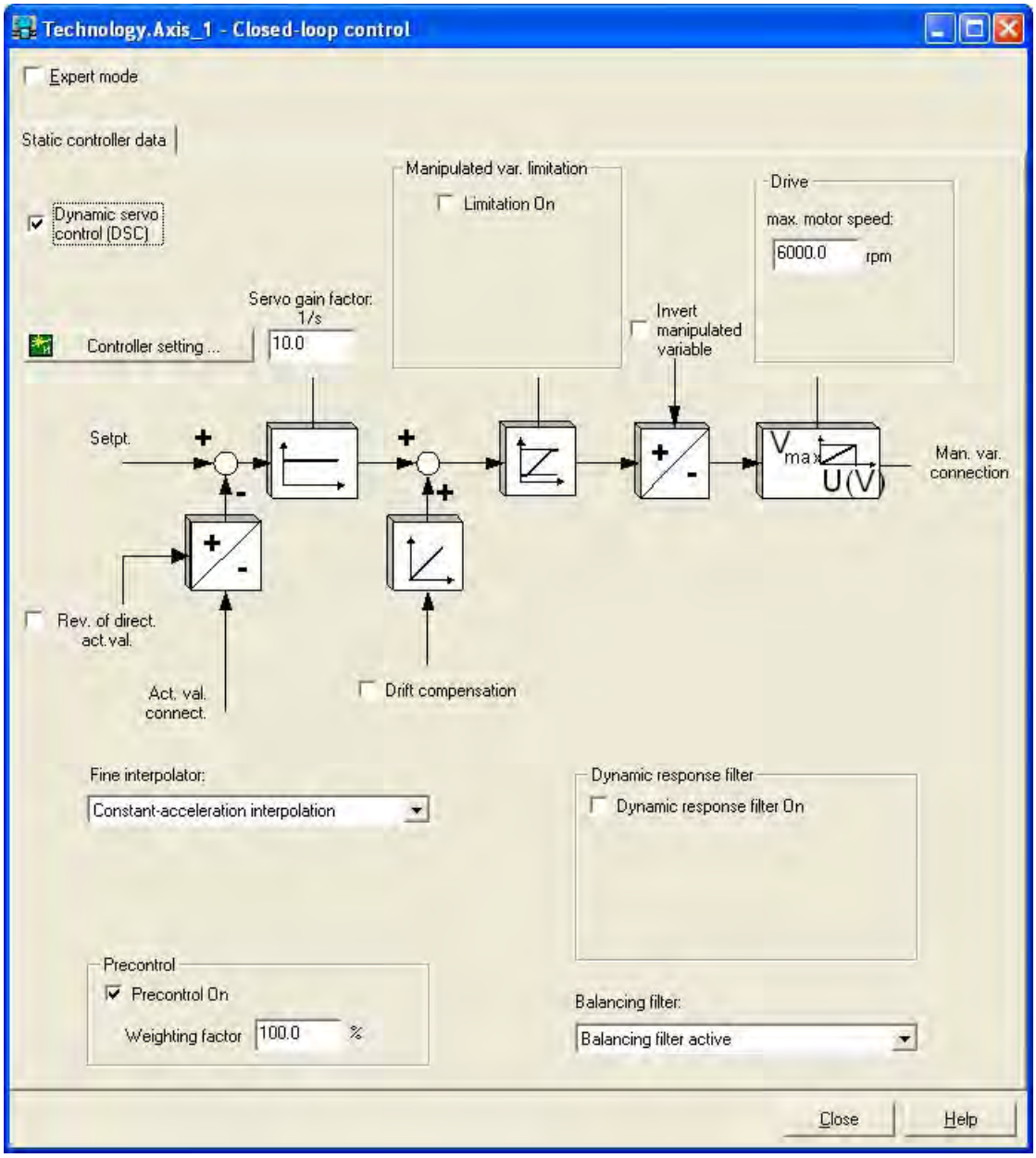


Figure 4-26 Position controller configuration

Setting the system clock cycles

Right-click **Technology** and select the **Set system clock cycles** entry in the context menu. The following window opens:

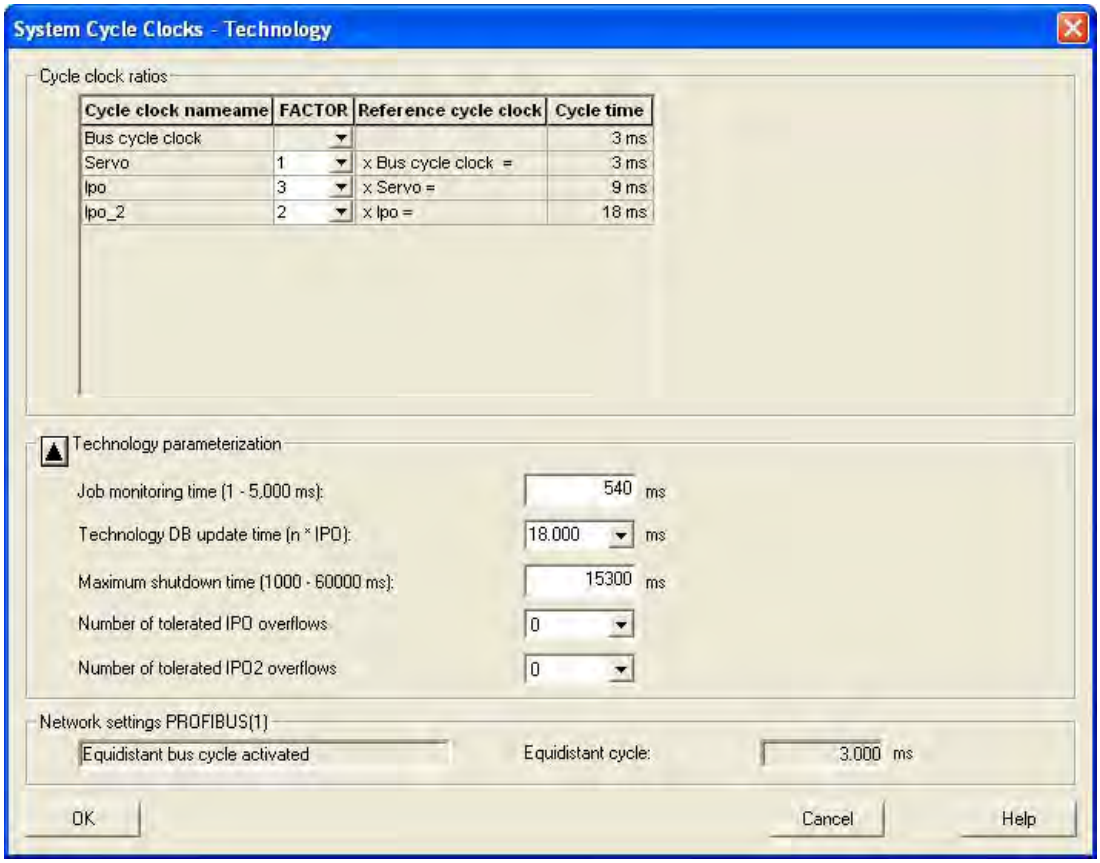


Figure 4-27 Set system clock cycles

Specifying the system clock cycles

The specifications for system clock cycles in the Technology CPU affect the position setpoint adjustment in the SIMODRIVE 611U.

Technology CPU

The ratio of DP clock cycle to position controller clock cycle and to interpolator clock cycle (refer to the "Set system clock cycles" figure) is set to 1:1:3, for example. This represents a DP clock cycle of 3 ms, a position controller clock cycle of 3 ms and an interpolator clock cycle of 9 ms.

Note

The position controller clock cycle entered here must match the master application cycle in the **HW Config**!

For instructions on how to activate and use interpolator clock cycle 2, see the online documentation in S7T Config.

Task monitoring time

The task monitoring time monitors the processing of the Motion Control jobs.

Technology DB update

The setting for the time of the technology DB update determines the time intervals in which the technology DBs in the S7 will be updated.

Maximum task processing

The time monitoring for the processing of jobs for the RUN/STOP transition of the CPU.

Number of the tolerated IPO and IPO2 overflows

An "IPO overflow" will occur if the processing of the interpolator (IPO or IPO2) lasts longer than the configured interpolator clock cycle. In this case the following interpolator cannot be started in the selected cycle and will be omitted. If the processing of the interpolator is completed at the next cycle, it will be started as usual.

Each omitted interpolator will be counted as "IPO overflow". Set in the selection list how many successive "IPO overflows" are tolerated before the Technology CPU switches to the STOP operation mode.

The S7T Config project is now configured. Provided the axis does not need to be homed and you do not use the Measurement function on the axis, you can continue with the configuration of the SIMODRIVE 611U.

4.4.3 Referencing

Specification of the homing mode

If the connected axis is to be homed, the homing mode must be specified in the technology CPU. Depending on the mode selected, settings may also be necessary in the SIMODRIVE 611U.

Homing mode "External zero mark only"

Operational sequence:

- When a defined edge of the zero mark is crossed, the position is accepted.

Hardware structure:

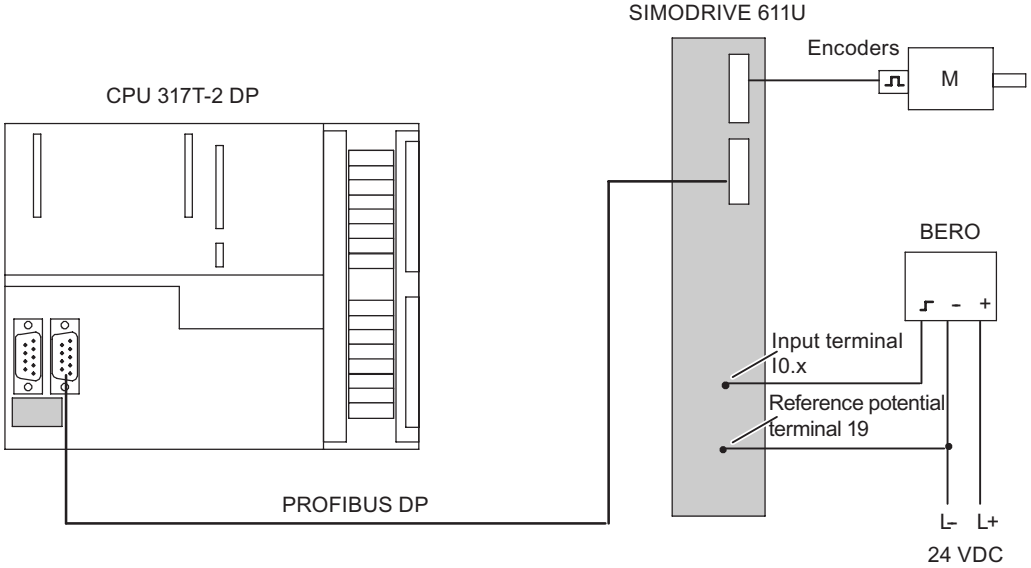


Figure 4-28 Homing (External zero mark only)

Technology CPU

If **External zero mark only** is selected as the homing mode (see figure below), the approach direction can be selected by means of **Start homing**.

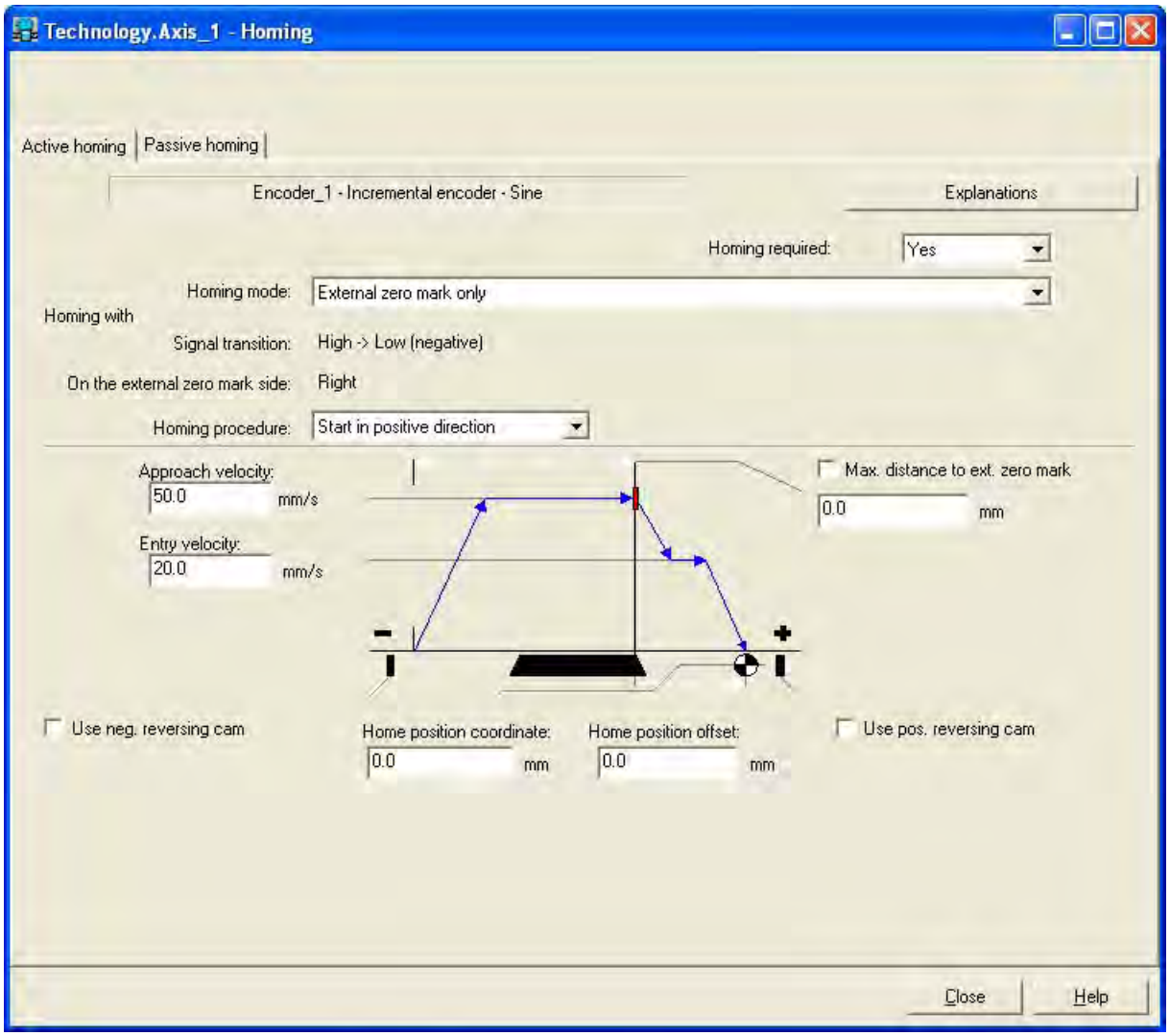


Figure 4-29 Axis homing in STEP 7 (homing mode only external zero mark)

SIMODRIVE 611U

The homing cam on the SIMODRIVE 611U must be placed at the I0.x input (x: drive A or B).

Parameterize the I0.x input with the **Equivalent zero mark** function. You must enable the equivalent zero mark via parameter **P879 Bit 13**.

Follow the procedure outlined in the section below on "Standard commissioning of SIMODRIVE 611U" for the parameterization of input I0.x.

Comment for the 611U edge detection:

- For travel in the positive direction, only the signal change 1 → 0 is recognized as equivalent zero mark. For travel in the negative direction, only the 0 → 1 edge is recognized as equivalent zero mark. As a result, not all of the approach directions that can be selected in the technology CPU in combination with SIMODRIVE 611U can be used.

Homing mode "Encoder zero mark only"

Operational sequence

A homing cam signal is not necessary. The position is accepted at the next zero mark of the encoder.

Technology CPUs

If **Encoder zero mark only** is selected as the homing mode (see following figure), the approach direction can be selected by means of **Start homing**.

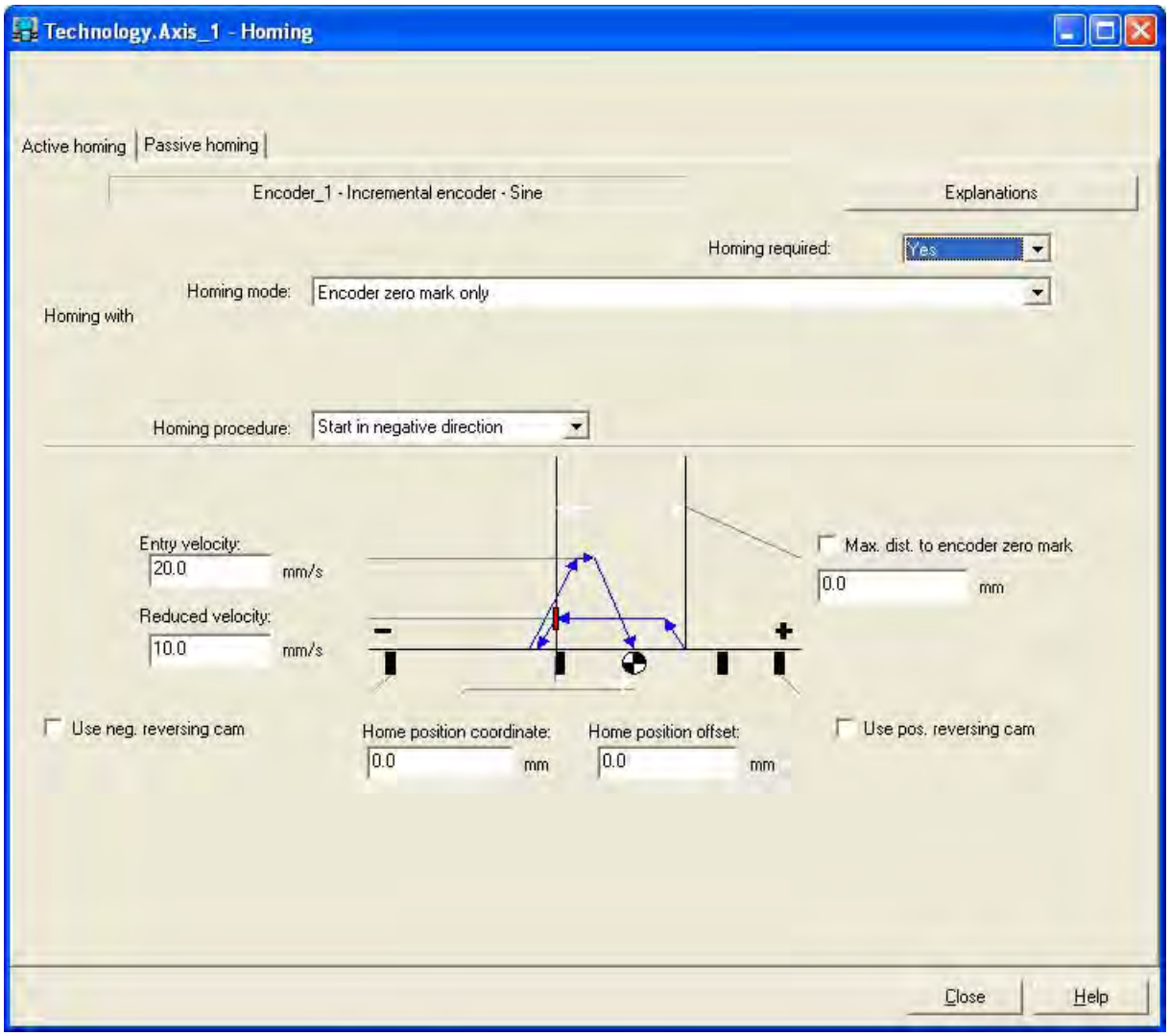


Figure 4-30 Axis homing in STEP 7 (homing mode only encoder zero mark)

SIMODRIVE 611U

If zero mark only is selected as the homing mode, a motor with an incremental encoder or resolver must be connected on the SIMODRIVE 611U. Otherwise, no additional settings are necessary.

Homing mode "Homing output cam and encoder zero mark"

Operational sequence

The axis traverses in the specified homing direction. Once the homing cam signal is reached, the velocity of the axis switches from the homing approach velocity to the homing reduced velocity. Once the homing cam is left, the axis is homed at the next detected zero mark of the encoder.

Hardware configuration

The homing cam is connected to a free SIMATIC peripheral input (either on the integrated input of the technology CPU or on the remote input on the DP(DRIVE)).

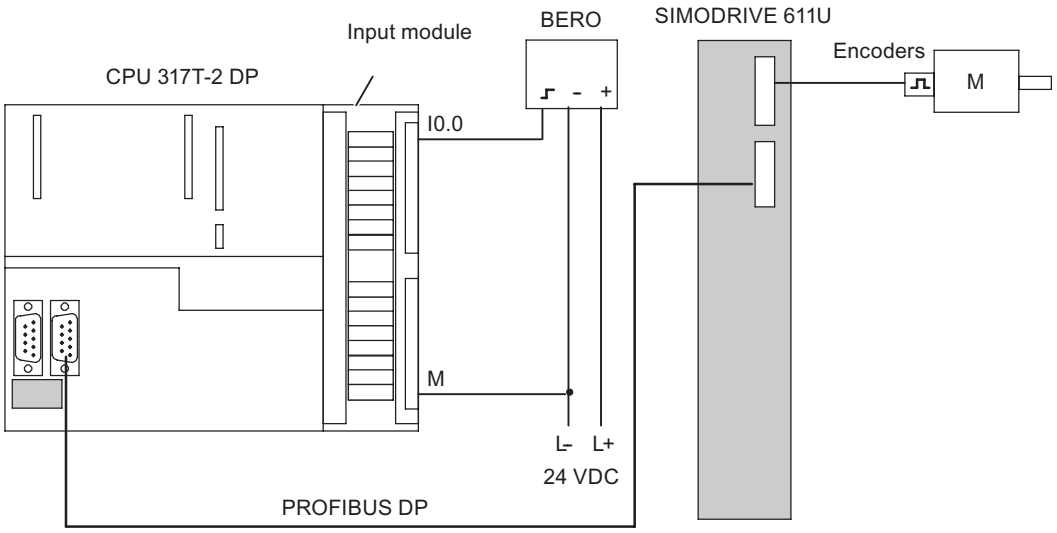


Figure 4-31 Homing (Homing output cam and encoder zero mark)

Technology CPU

If **"Homing output cam and encoder zero mark"** is selected as the homing mode (refer to the following two figures), the evaluation position of the zero mark can be selected via zero mark and the approach direction via **Start homing**.

The homing cam must be applied at a freely selected digital input of the SIMATIC that was configured in the Axis homing window (refer to the following two figures). When this homing cam is reached, homing is enabled in the drive.

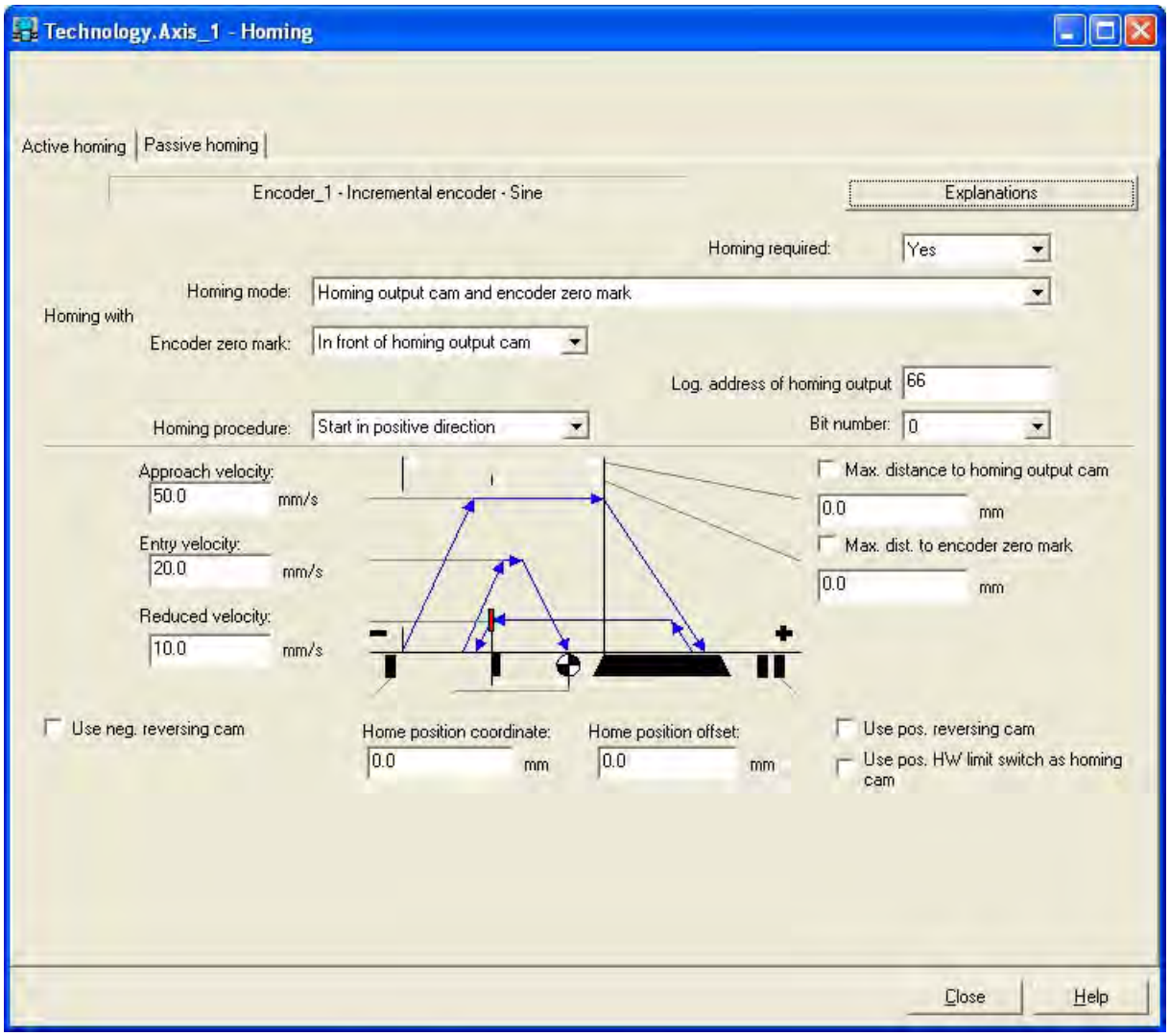


Figure 4-32 Axis homing in STEP 7 (homing cam homing mode and encoder zero mark)

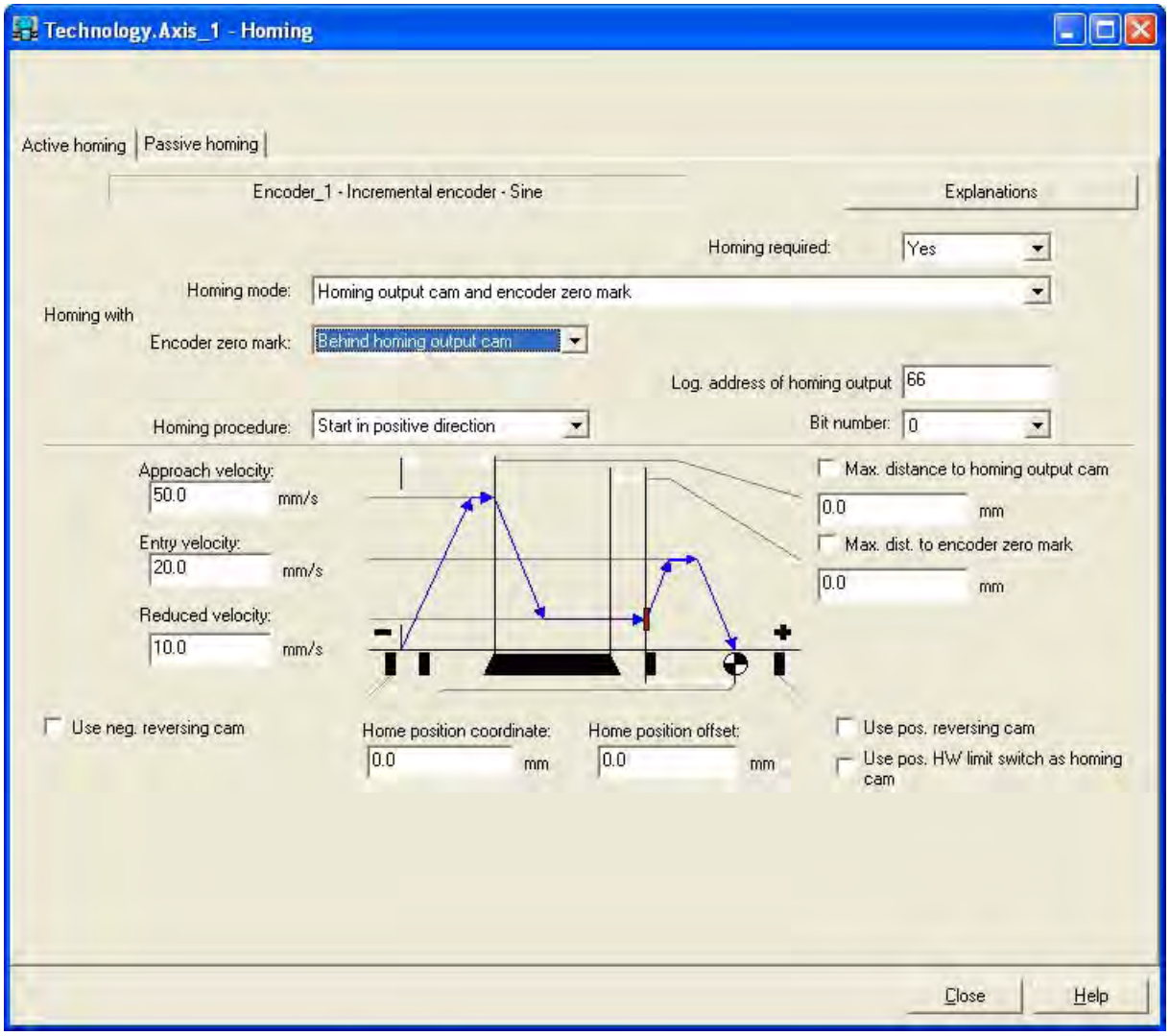


Figure 4-33 Axis homing in STEP 7 (homing cam homing mode and encoder zero mark)

SIMODRIVE 611U

With this mode, a motor with an incremental encoder or resolver must be connected on the SIMODRIVE 611U. Otherwise, no additional settings are necessary.

4.4.4 "Measuring" function

Description

You can use the "measuring" function to acquire the actual position of an axis at any time. A typical application is the acquisition of a print mark for the purpose of synchronizing the axis to this mark.

Hardware configuration

The measuring input must be connected to the fast input I0.x. The input is isolated. This enables more than one input to be switched in parallel, whereby the reference potential of the 24 V supply of the measuring input (for example, from the network supply) must also be wired.

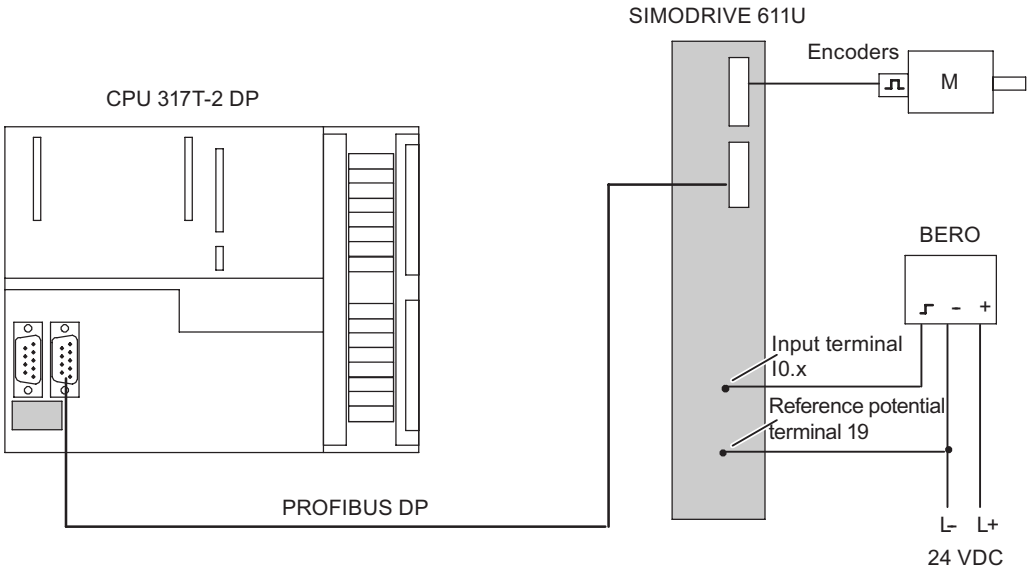


Figure 4-34 Measuring

Technology CPU

Add a measuring input in the "Measuring input" folder below the axis.

→ Inserting a measuring input

Leave the measuring input number and the system number at the value 1. This is no way to assign several measuring inputs on the drive (max. number per 611U axis = 1).

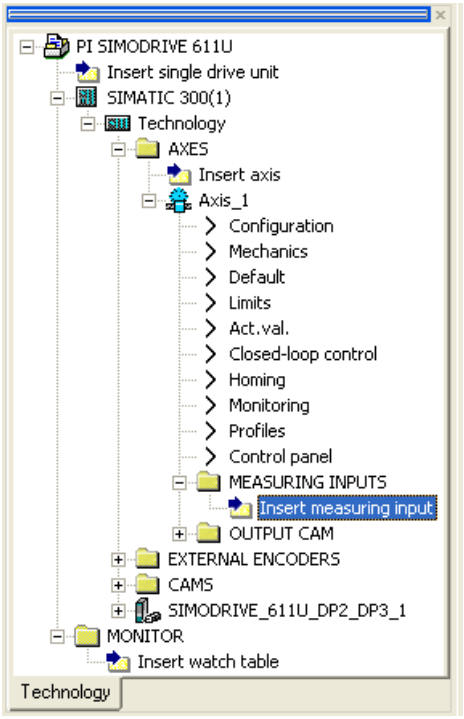


Figure 4-35 Inserting a measuring input

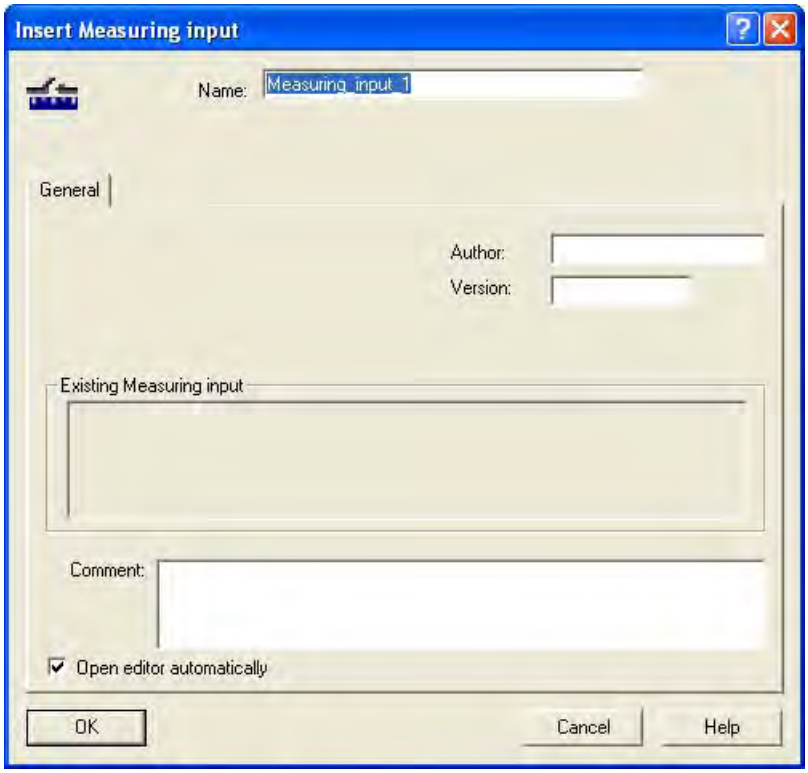


Figure 4-36 Inserting a measuring input

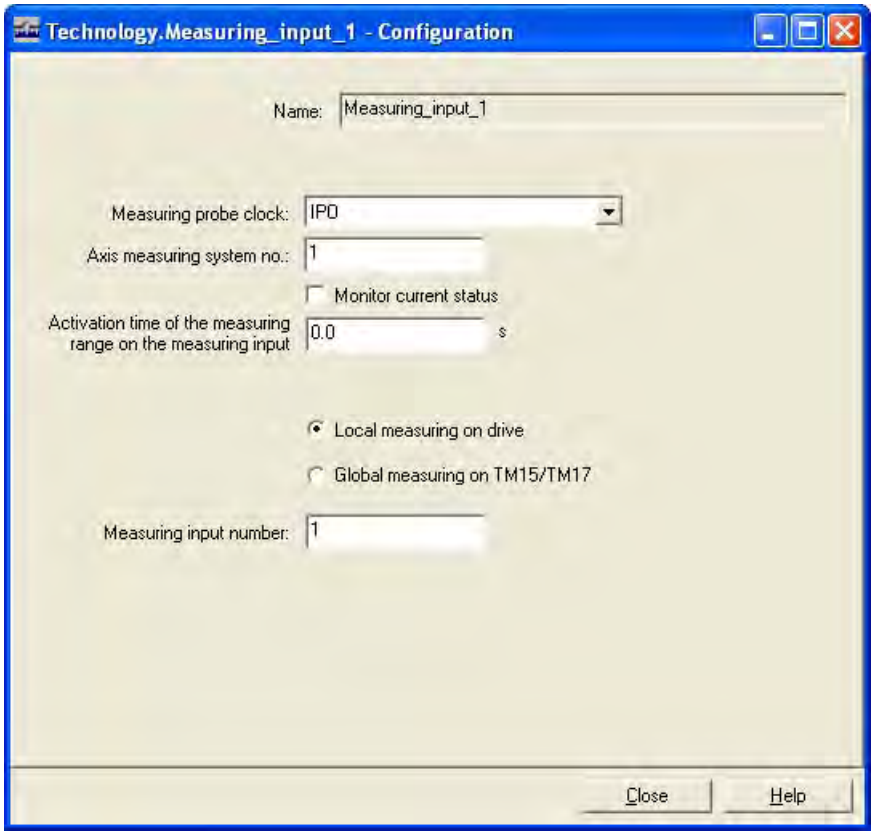


Figure 4-37 Measuring Input Configuration

SIMODRIVE 611U

Parameterize the SIMODRIVE 611U with SimoCom U so that input I0.x addresses the measuring input.

Use the MC_MeasuringInput technology function in the user program to make the edge selection:

- positive edge
- falling edge

If you select another setting, the last valid value is taken over (rising or falling).

Comment on 611U-internal edge detection in HW versions up to 6SN1118-xxxxx--xxx1:

- For travel in the positive direction, only the 1 → 0 signal change is detected as a measuring signal. For travel in the negative direction, only the 0 → 1 edge is recognized as measuring signal. You must take this into account when activating the measuring input.

Response times for the measuring function

The technology CPU can be used for measuring with different configurations. Depending on the connection of the axis (using PROFIBUS DP) and the processing level (position control cycle clock or interpolator cycle clock), you must allow for different response times for the Measurement function in the application.

The measurement in the user program is controlled by calling the **MC_MeasuringInput** function block. You can specify when the measuring function is to be active during the call:

- immediately (without measuring window / triggering range)

  StartPosition = EndPosition

- within a position-dependent measuring window

  StartPosition < > EndPosition

For the **Measurement without measuring window**, MC_MeasuringInput immediately activates the measuring input.

A configuration-dependent delay elapses before the measuring edge is evaluated at the hardware input (refer to the "Measurement without measuring window" table). To be certain to detect the measuring edge, you must ensure that MC_MeasuringInput is executed earlier by this amount of runtime in the user program.

When **measuring with measuring window**, the job is first only registered in the system with MC_MeasuringInput. The measuring input is activated only when the axis has reached the start of the measuring window.

A configuration-dependent delay elapses after reaching the start position of the measuring window on the axis (mechanical construction) before the measuring edge is evaluated at the hardware input (refer to the "Measurement with measuring window": Measuring edge is detected in the window" table). To ensure that the measuring input is active when the required start position of the measuring window is reached, you must move forward the start of the measuring window depending on the axis speed and the response time when the function is called.

The same applies to the end of the measuring window. It is important that the measuring input is no longer active when the end of the measuring window on the axis (mechanical) is crossed (for the run times, see "Measuring with measuring window: no measuring edge in the window" table).

These run times can be compensated using the MeasuringRange.activationTime configuration data ("Measuring input configuration", "Activation time of the triggering range on the measuring input" figure).

Note

The offset of the measuring window only functions reliably when the axis velocity

- Within the measuring window is constant and
- Known before the function call.

You can determine the response times for your configuration using the following tables. The values in the tables refer to set system cycle clocks. By using the actual times, you can calculate the response time in milliseconds.

The following abbreviations are used in the tables:

- (IS): Interpolator or position control cycle clock (can be selected for the configuration of the measuring input)
- (DP): cycle time on the PROFIBUS DP
- (DR) Cycle time in the drive (time slice in which the measuring function is evaluated)

Table 4-1 Measuring without measuring window

	SIMODRIVE 611U
MC_MeasuringInput → Ready to detect the measuring edge	3 (IS) +7 (DP)
Detection of the measuring edge → Result in the technology CPU for further processing	2 (IS) +10 (DP)
Total Minimum time between two measurements *)	5 (IS) +17 (DP)
*): In addition, the restrictions of the system must be taken into account.	

Table 4-2 Measuring with measuring window: Measuring edge is detected in the window

	SIMODRIVE 611U
MC_MeasuringInput → Ready for the evaluation of the measuring range (start of the measuring window)	2 (IS)
Start of the measuring window on the axis (mechanical) reached → Ready to detect the measuring edge	2 (IS) +7 (DP)
Detection of the measuring edge → Result in the technology CPU for further processing	2 (IS) +10 (DP)
Total Minimum time between two measurements *)	5 (IS) +17 (DP)
*): In addition, the restrictions of the system must be taken into account.	

Table 4-3 Measuring with measuring window: No measuring edge in the window

	SIMODRIVE 611U
MC_MeasuringInput → Ready for the evaluation of the measuring range (start of the measuring window)	2 (IS)
Start of the measuring window on the axis (mechanical) reached → Ready to detect the measuring edge	2 (IS) +7 (DP)
Start of the measuring window on the axis (mechanical) reached → Reset: "Ready to detect the measuring edge"	2 (IS) +7 (DP)
Reset the measurement readiness → Confirmation in the technology CPU for further processing	2 (IS) +10 (DP)
Total Minimum time between two measurements *)	7 (IS) +24 (DP)
*): In addition, the restrictions of the system must be taken into account.	

Load the program into the technology CPU and switch to RUN

Save and compile the technological settings.

The mode selector switch of the technology CPU is still at the STOP position.

Use **Technology > Connect with the target system** to establish the connection to the technology CPU.

Use **Technology > Load into the target system** to load the project into the technology CPU.

Once the project has been loaded into the target system, use the mode selector switch to switch the technology CPU to **RUN**.

Creating the technology DBs (TO-DBs)

Once the configuration with S7T Config has been completed, technology DBs must be produced for the created technology objects (e.g. axes, cams, output cams, measuring inputs). The "Technology Object Management" is used here.

Switch to the "Technology Object Management" if it is not yet open. Otherwise, double-click on the Technology objects entry in the Technology folder of the SIMATIC station to start the "Technology Object Management".

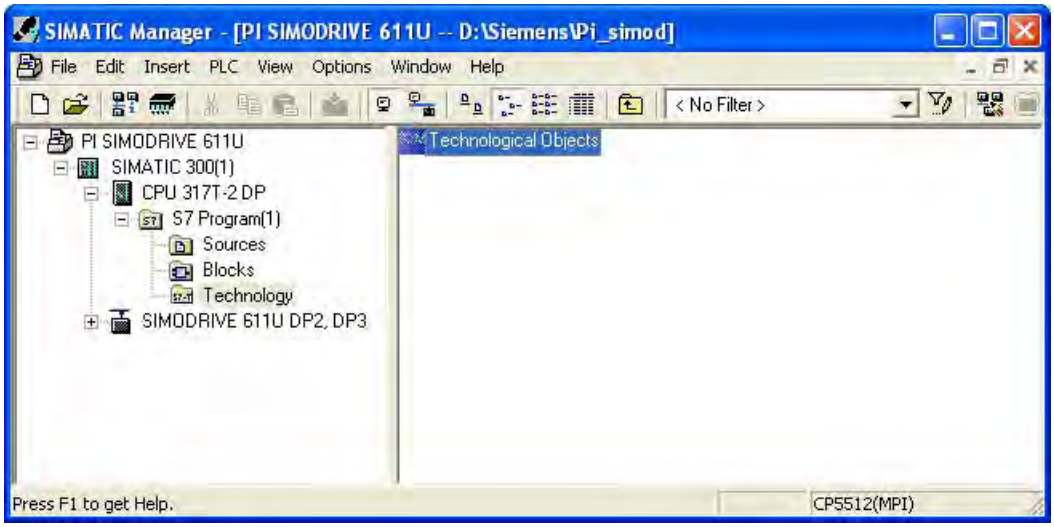


Figure 4-38 Start TOM from the SIMATIC Manager

The "Technology Object Management" starts with the following dialog.

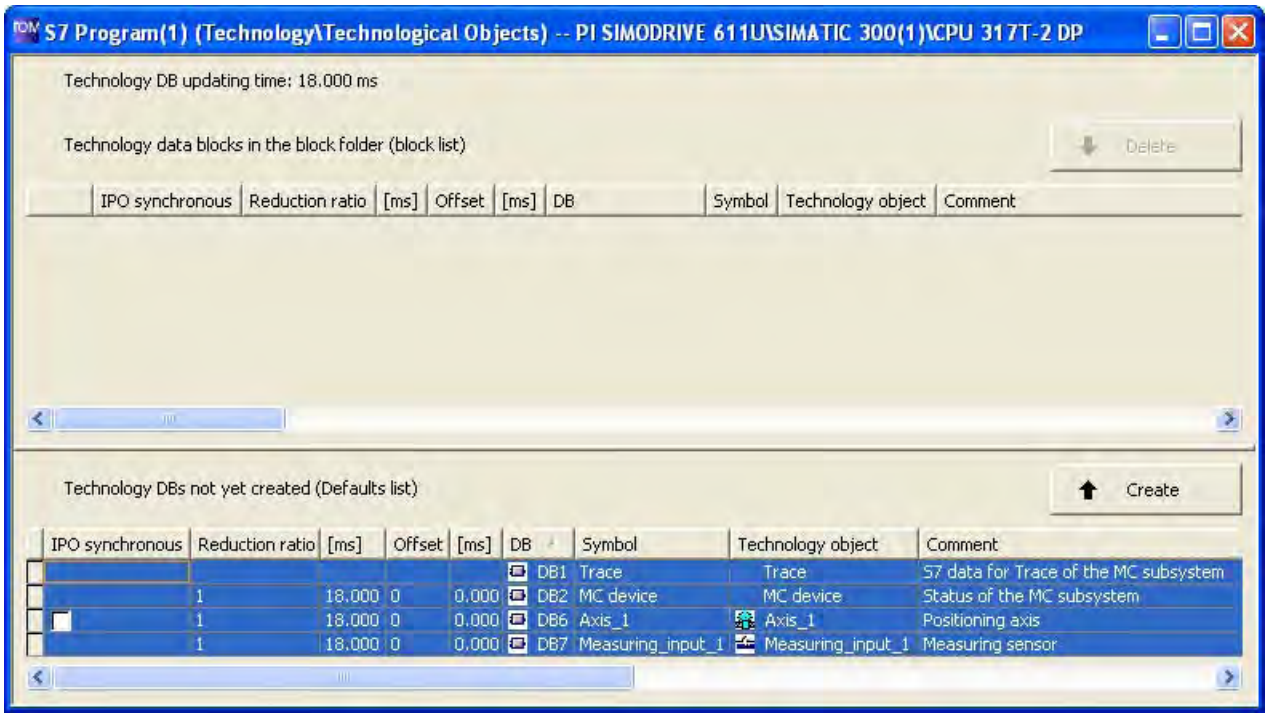


Figure 4-39 Technology Object Management

The lower window half of the dialog shows the technology objects that have been configured in S7T Config or are present as standard, but for which no TO DB exists. If necessary, change the data block numbers of the TO DBs and click **Create** to generate the DBs.

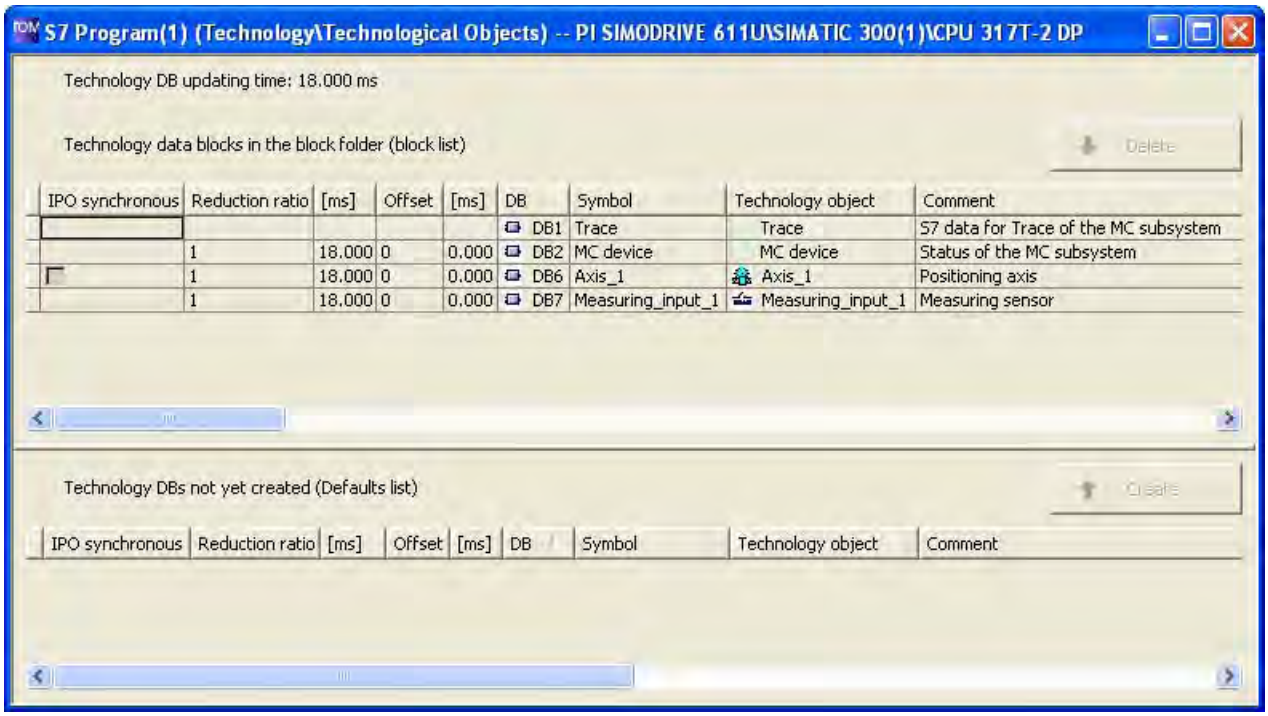


Figure 4-40 Create TO DBs

If TO DBs have been generated for the existing technology objects, they will be displayed in the upper window half of the "Technology Objects Management". The tool can now be closed.

The created TO DBs are now contained in the Modules folder of the SIMATIC 300 station. The icons for the DBs will be derived from the designations in the configuration, if necesssary, the UDTs will be extended.

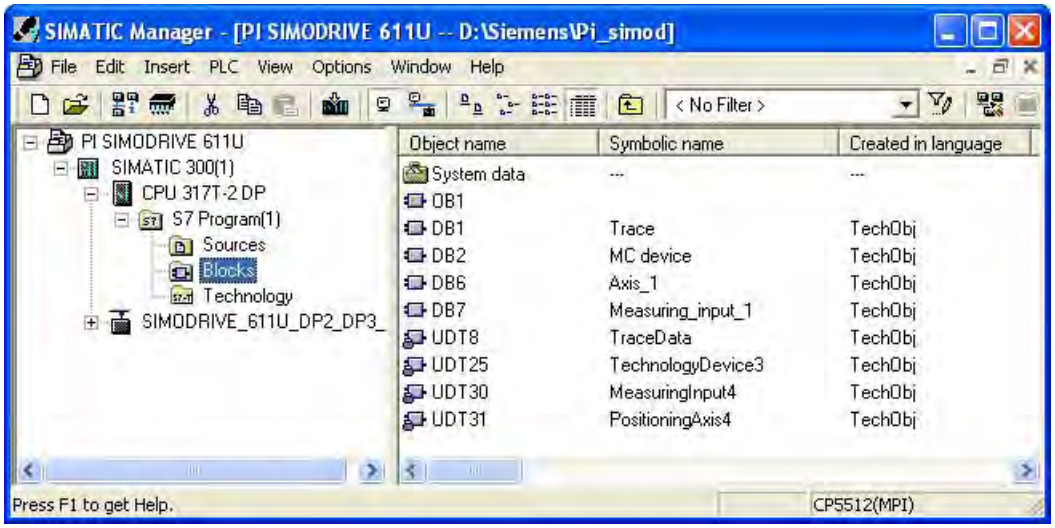


Figure 4-41 TO DBs in the SIMATIC Manager

4.5 Drive configuration for SIMODRIVE 611U

Procedure

The SimoCom U commissioning tool is used for commissioning the SIMODRIVE 611U. This SimoCom U commissioning tool is intuitive for the most part. You are guided through the individual steps.

The connection to the drive can either be made via a serial interface or PROFIBUS DP.

First, the drive configuration prompting is used to configure the hardware (associated power section, motors, encoders, etc.), the PROFIBUS interfaces, etc.

- Once you have started SimoCom U, you will be prompted in the first window where you want to change the data for the drive.

  Establish a connection (serial, PROFIBUS DP) between SimoCom U and the drive and select "Find online drives...". This has the advantage that you do not need to enter the data for the closed-loop control card and the PROFIBUS module. This data is read out and displayed by SimoCom U.

Note

To allow you to operate the SIMODRIVE 611U PROFIDrive-conform, the following parameters have been added or extended with the software version from 06.02.2003:

- P1012.2 → must be set
- P1012.12 → must be set
- P1012.13 → must be set
- P1012.14 → may not be set

The help for P878 provides further information.

Figure 4-42 SimoCom U: Option boxes

- In the basic window of the SimoCom U, call the Configuration > Reconfigure drive menu items to select the prompted drive configuration.

Note

If you use a double axis module, you must perform the following procedure twice, for Drive A and Drive B. However, you must ensure that the PROFIBUS address setting is applicable to both drives. In addition, the same PROFIBUS message frame must be used for both drives.

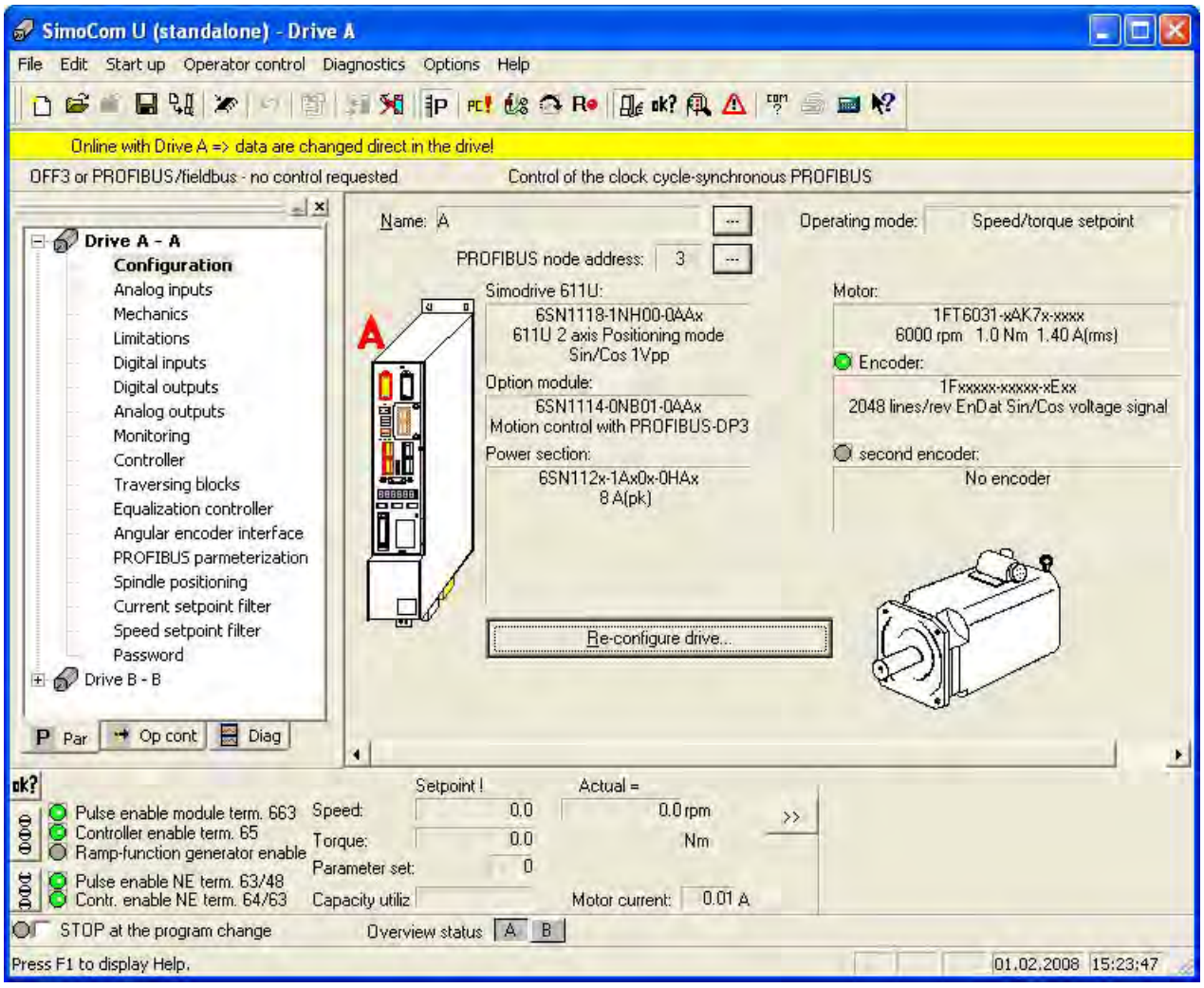


Figure 4-43 SimoCom U: Basic window

- You can enter in this window an arbitrary name for the axis:

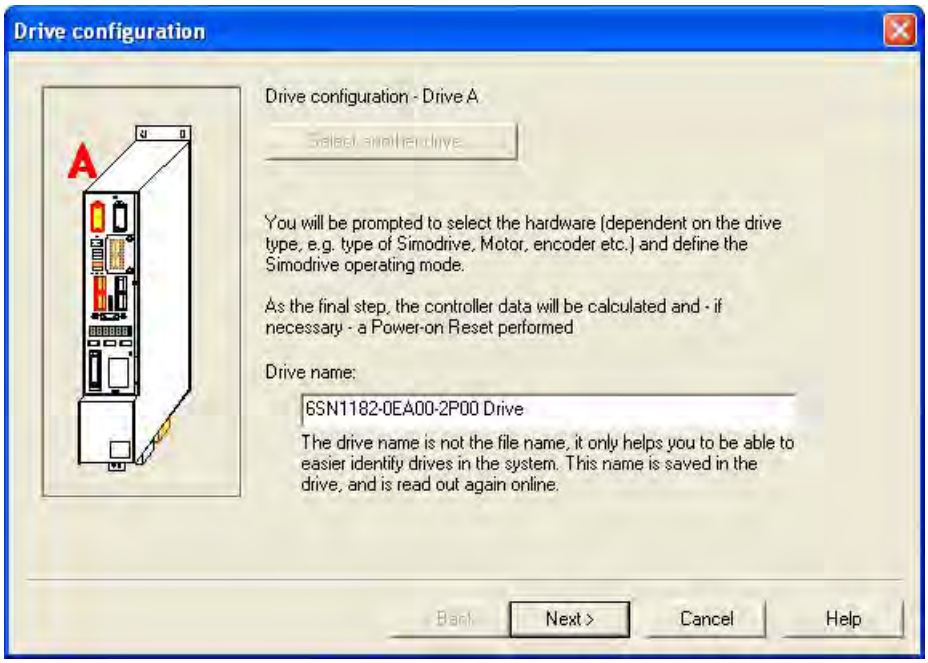


Figure 4-44 Drive configuration window

- In the **Select SIMODRIVE** window, the order numbers of the controller module and the PROFIBUS module are displayed with a gray background, as you are connected online with the SIMODRIVE 611U. These input values cannot be changed.

  In this window, specify the PROFIBUS address. The address must agree with the bus address specified in the STEP 7 hardware configuration.

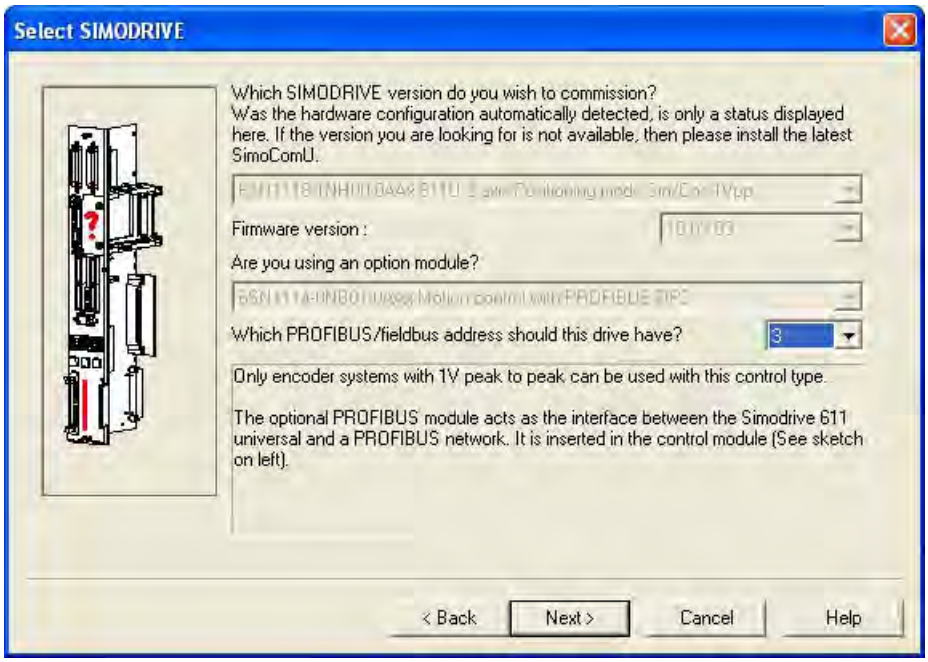


Figure 4-45 SIMODRIVE selection

- Select the connected motor in the following **Motor selection** window. The data can be found on the name plate of the motor.

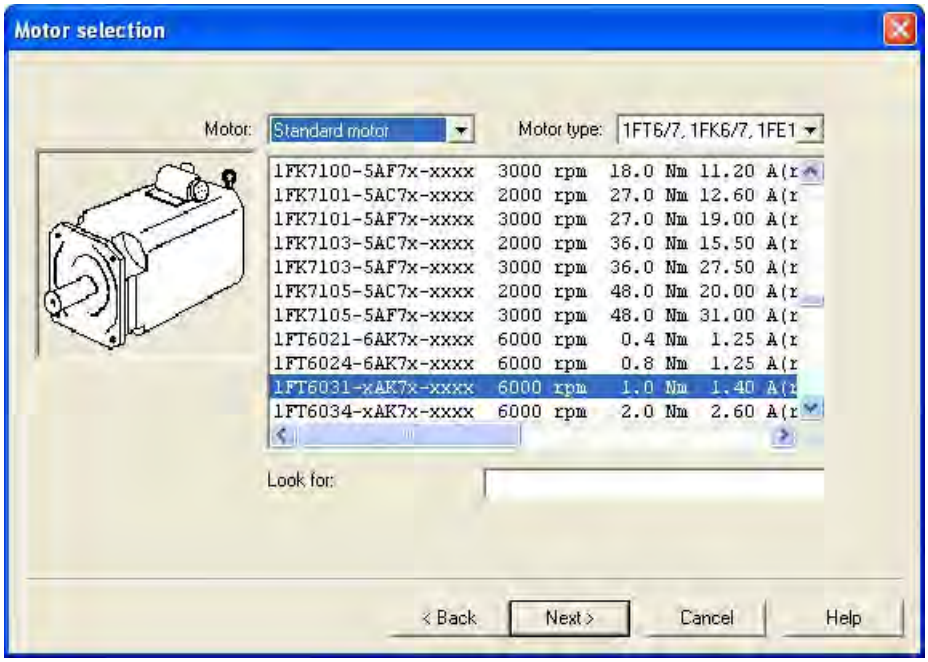


Figure 4-46 Motor selection window

- Select the connected motor encoder in the **Measuring system/encoder** window. The data can be found on the name plate of the motor.

Technology CPU

You require this data to adjust the encoder when you commission the axis. Use this number to find the corresponding input values for the S7T Config DP axis configuration in the "List of encoder data".

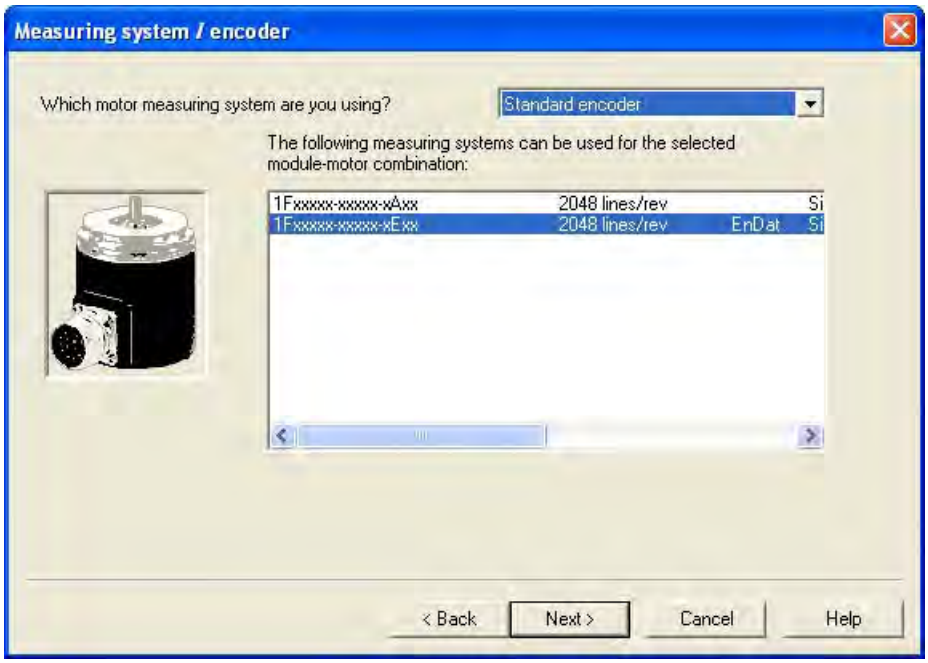


Figure 4-47 Measuring system/encoder window

- In the **Operating Mode** window, you must select the **speed/torque setpoint**. This option is only available for the 611U closed-loop control modules that are also capable of positioning operation.

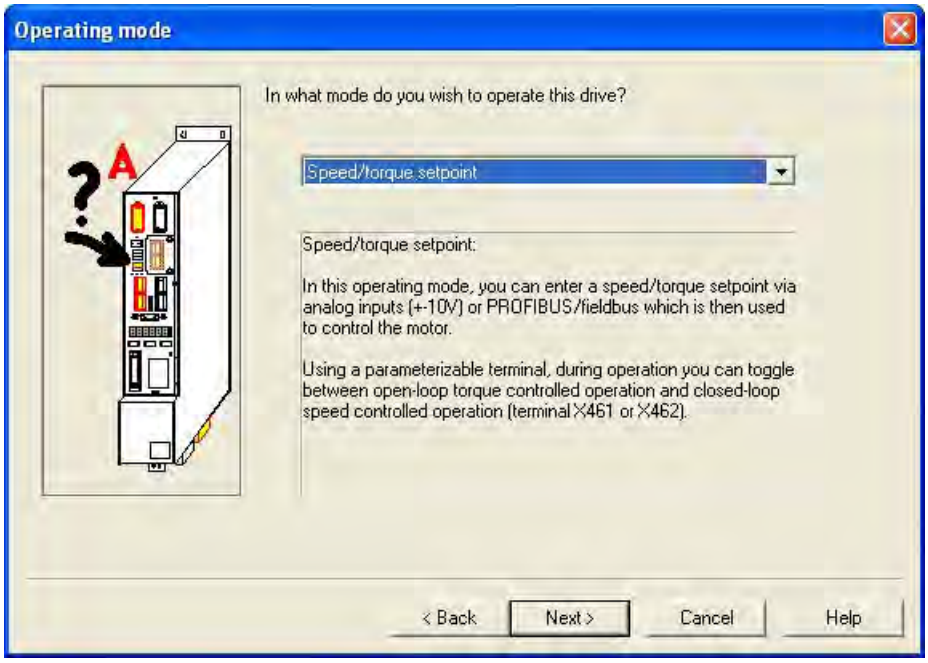


Figure 4-48 Operating mode

- You can select an external encoder in the **Direct measuring system/encoder** window. This encoder can only be measured on a double-axis module via the measuring input for Axis B. As a result, Axis B is no longer available for controlling an axis.

  If you use the direct measuring system, you must select a PROFIBUS message frame that contains a second encoder. In the technology CPU, you can assign this encoder for the position control or create an external encoder that accesses this actual value.

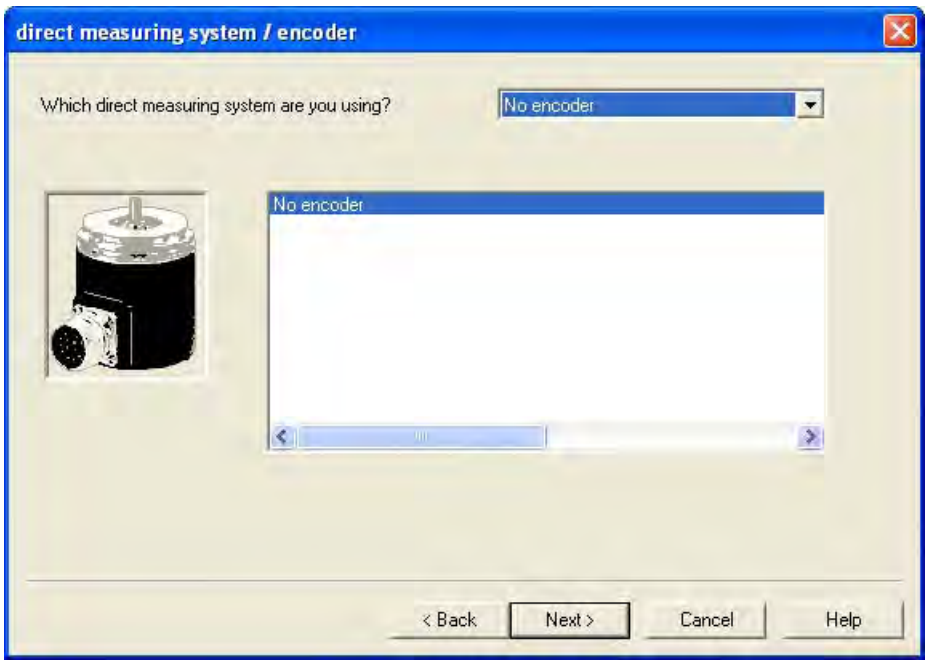


Figure 4-49 Direct measuring system/encoder

- The **Completion of drive configuration** window displays a summary of the inputs. Finally, click the **Calculate controller data, save, reset** button to confirm.

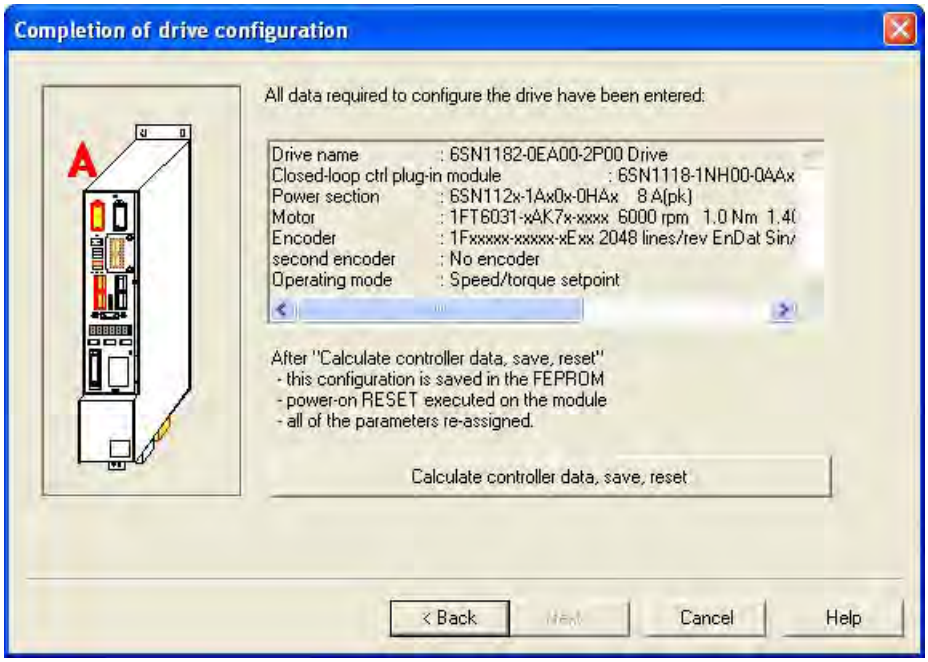


Figure 4-50 Completion of the drive configuration

- Then select the **PROFIBUS Parameterization** window. Here you can select the PROFIBUS address of the drive, 3 in this example, and the message frame, 105 in this example.

Technology CPU

Specify this data during the hardware configuration to adjust the drive.

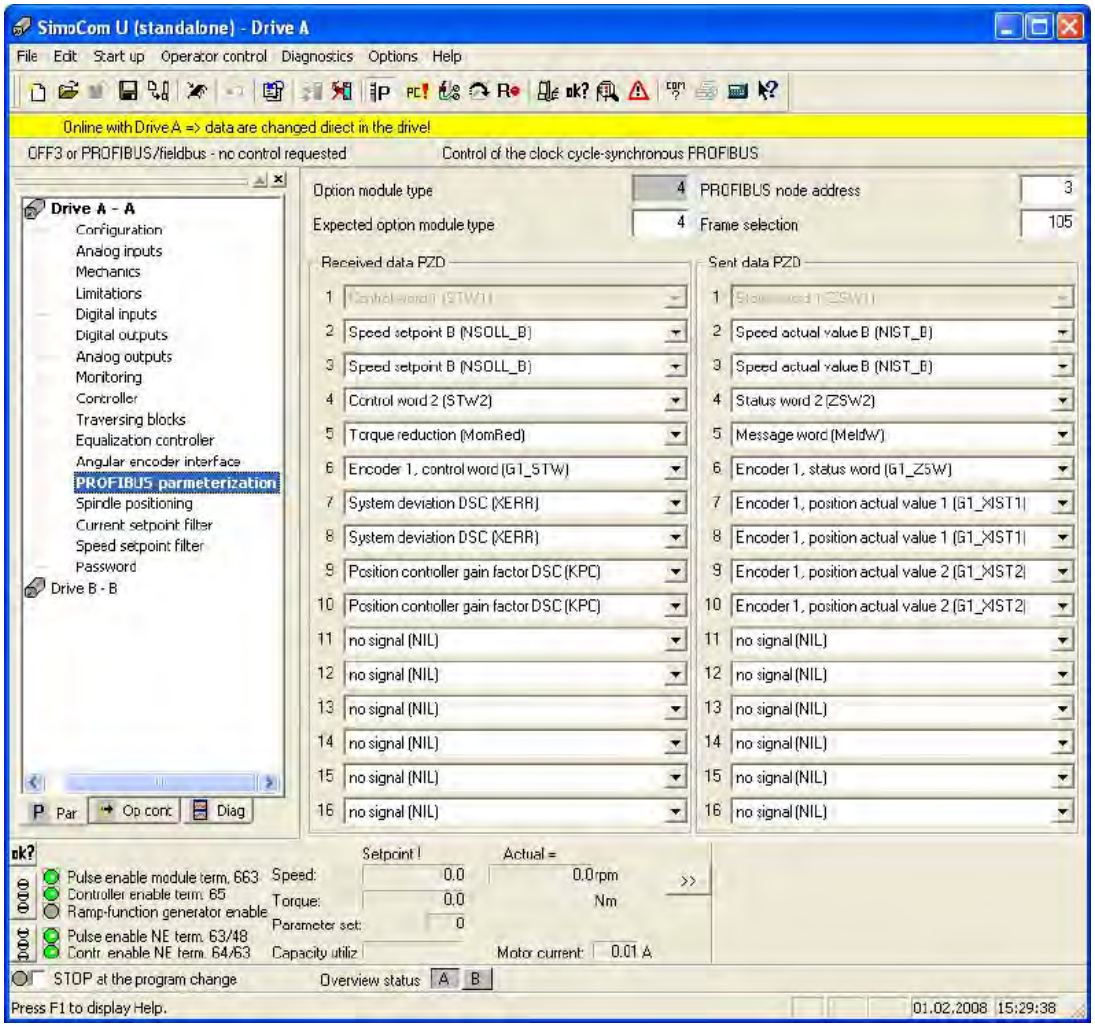


Figure 4-51 SimoCom U - Drive A

- Optional: Select the **Digital inputs** window. Here you can define the function of input I0.x.

  If you want to use the "measuring function" in the technology CPU, you must select the "Flying measurement/length measurement" function here.

  If you want to use the "Homing only homing cam" function in the technology CPU, you must select the "Equivalent zero mark" function here. In addition, you must enable the equivalent zero mark function via parameter **P879 Bit 13**.

Note

You cannot have "measuring" and "equivalent zero mark" active on a drive at the same time, because you may only select the functions on input I0.x. If you need both functions on a drive, you must switch the function. The section on "Expert functions" describes how you can write (switch) parameters in the drive from the user program.

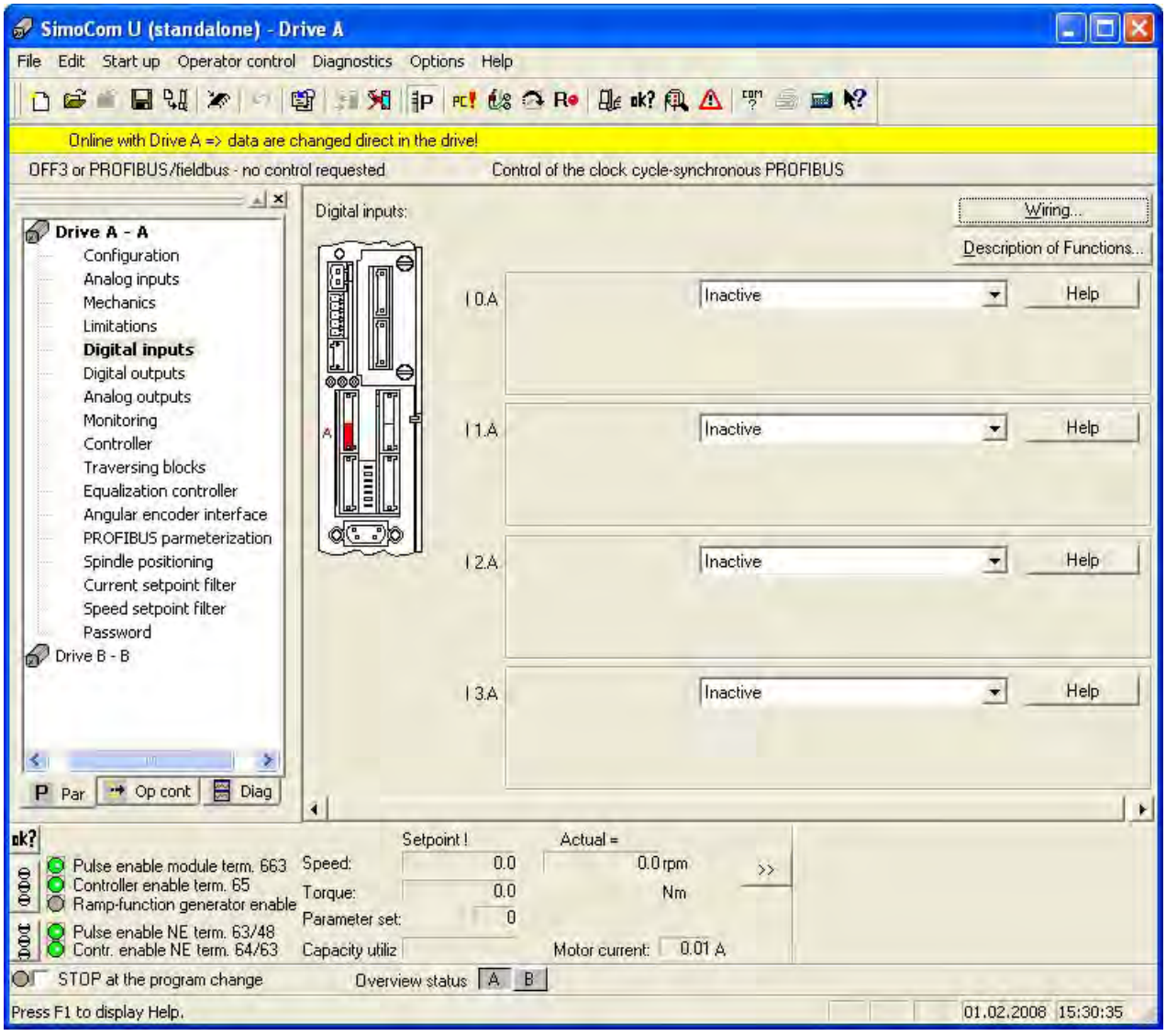
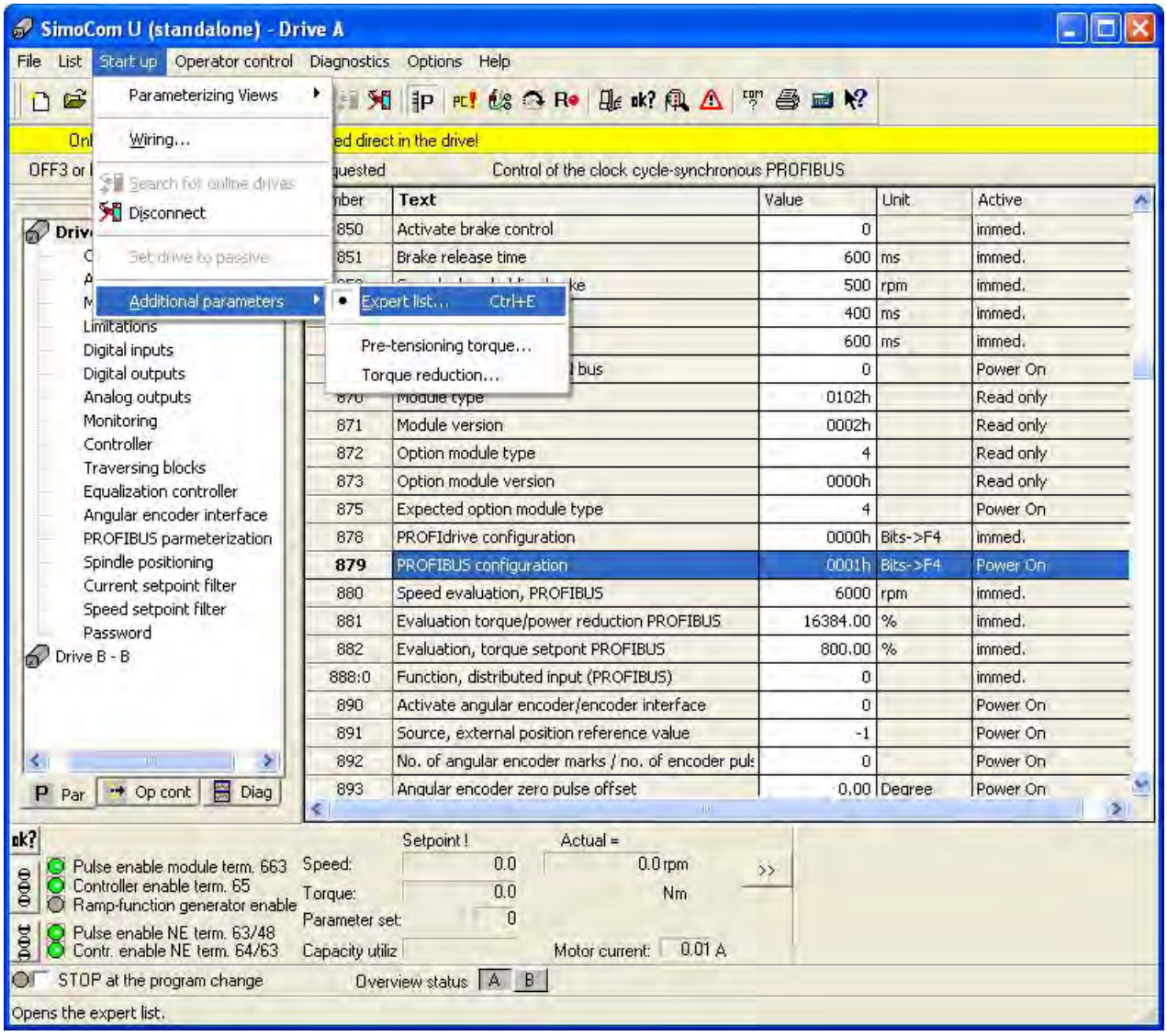


Figure 4-52 Digital inputs

- Not all of the parameters for the SIMODRIVE 611U can be specified by means of technology screen forms. To enter parameters directly (e.g. parameter P879), open the **expert list**. Here you can select and modify the relevant parameters.



Parameters to be entered directly:

– *P879 bit 13:*

Enable the Equivalent zero mark function. This setting is necessary if you use the Homing only homing cam" function. In addition, you must select the equivalent zero mark function for input I0.x.

– *P880:*

This specifies the scaling of the PROFIBUS speed value. For the maximum speed, a setpoint NSET = 4000 0000 hex is transferred to the drive via the PROFIBUS. The P880 parameter is used to inform the SIMODRIVE 611U which speed should be set when NSET = 4000 0000 hex. This speed must agree with the "maximum motor speed" value specified when the axis is created (**Window axis configuration - Axis 1 - Encoder number**).

- This concludes the drive configuration. If there are no errors, the green 5 VDC LED and the yellow STOP LED are now illuminated on the technology CPU (the operating mode switch is in the STOP position). The LED on the PROFIBUS module of the SIMODRIVE 611U is illuminated green.

The standard commissioning is now completed.

If you would like to use special functions of the SIMODRIVE 611U from the user program, you should also read the Expert functions section.

See also

Important parameters on the SIMODRIVE 611U (Page 74)

Expert functions

5

5.1 Introduction

Contents

This section explains functions that can be used in conjunction with the SIMODRIVE 611U and that go beyond the standard connection. These functions primarily involve evaluating or influencing data of the SIMODRIVE 611U in the user program.

Furthermore, you can make certain operational settings on the SIMODRIVE 611U, such as control of just one axis with the double axis module, or utilize functions, such as using unassigned analog inputs and outputs, in the user program.

Note

This section assumes that you are well-acquainted with the SIMODRIVE 611U. The function options are only briefly presented. For more information, refer to the Description of Functions for SIMODRIVE 611 Universal "Closed-Loop Control Components for Closed-Loop Speed Control and Positioning".

5.2 Important parameters on the SIMODRIVE 611U

Description

This table lists the parameters of the SIMODRIVE 611U that are evaluated in connection with the technology CPU or must be taken into account during adaptation to the technology CPU.

Some of the listed parameters are supplied during the standard commissioning (see the "Commissioning" section). Some of the parameters can also be entered using the configuration screen forms.

Drive parameters can also be written via the user program. For further information, refer to the "S7 Technology" Manual, "Technology functions - basic functions, FB 454 MC_WriteRecord - write data record" section.

Table 5-1 Important parameters and their meaning

Parameter	Meaning
P 660	Function selection for input I0.x • **79** Zero mark substitute If the encoder zero mark cannot be evaluated when homing, then a signal supplied from a mounted sensor can be fed via this input as "zero mark equivalent". • **80** Measuring input maximum number of measuring inputs with SIMODRIVE 611U = 1; caution: Measuring can only be performed via this input (I0.x).
P 700	Operating mode For 2-axis module only: Axis B can be deselected.
P 875	Expected optional module type PROFIBUS communication for Drive B can be deactivated here, if only one axis is operated on the 2-axis module.
P 879	Sign-of-life monitoring in the drive is active Bits 0, 1, 2: permitted sign-of-life error Bit 8: deselect the sign-of-life monitoring Bit 12: activate the direct measuring system Bit 13: use incremental measuring system with zero mark equivalent
P 880	Specifies scaling of the speed for motion with PROFIBUS DP. Here you specify the maximum speed of the motor. You must also enter this speed in S7T Config when the Axis technology object is created.
P 881	Specifies scaling of torque reduction for motion with PROFIBUS DP.
P 915	PROFIBUS process data setpoint assignment
P 916	PROFIBUS process data actual value assignment
P 918	DP slave address as specified in the STEP 7 project with HW Config.
P 922	Message frame type as specified in the Axis technology object. Also refer to the "Adapting message frames individually" item.
P 1001	Speed ctrl clock cyc Input value 4 → 4 x 31.25 µs = 125 µs for sin/cos 1 Vpp drives Input value 16 → 16 x 31.25 µs = 500 µs for resolver drives
P 1042 P 1044	Fine resolution absolute track G1_XIST1 → fixed input value: 11 Fine resolution absolute track G2_XIST1 → fixed input value: 11
P 1043 P 1045	Fine resolution absolute track G1_XIST2 → fixed input value: 9 Fine resolution absolute track G2_XIST2 → fixed input value: 9
P 1795	Firmware for option module
P 1799	Firmware for closed-loop controller

5.3 PROFIBUS message frame

Message frame structure

Depending on the application, it is possible that certain drive functions must be used, e.g. the torque reduction. Using the message frame structure, you can see which data and thus which functions are available by default for the respective message frame.

	PZD 1	PZD 2	PZD 3	PZD 4	PZD 5	PZD 6	PZD 7	PZD 8	PZD 9	PZD 10	PZD 11	PZD 12	PZD 13	PZD 14	PZD 15	PZD 16
TEL_1 Planned	STW 1	NSOLL_A														
TEL_1 Actual	ZSW 1	NIST_A														
TEL_2 Planned	STW 1	NSOLL_B		STW 2												
TEL_2 Actual	ZSW 1	NIST_B		ZSW 2												
TEL_3 Planned	STW 1	NSOLL_B		STW 2	G1_ STW											
TEL_3 Actual	ZSW 1	NIST_B		ZSW 2	G1_ ZSW	e.g. G1_XIST1		e.g. G1_XIST2								
TEL_4 Planned	STW 1	NSOLL_B		STW 2	G1_ STW	G2_ STW										
TEL_4 Actual	ZSW 1	NIST_B		ZSW 2	G1_ ZSW	e.g. G1_XIST1		e.g. G1_XIST2		G2_ ZSW	e.g. G2_XIST1		e.g. G2_XIST2			
TEL_5 Planned	STW 1	NSOLL_B		STW 2	G1_ STW	XERR		KPC								
TEL_5 Actual	ZSW 1	NIST_B		ZSW 2	G1_ ZSW	e.g. G1_XIST1		e.g. G1_XIST2								
TEL_6 Planned	STW 1	NSOLL_B		STW 2	G1_ STW	G2_ STW	XERR		KPC							
TEL_6 Actual	ZSW 1	NIST_B		ZSW 2	G1_ ZSW	e.g. G1_XIST1		e.g. G1_XIST2		G2_ ZSW	e.g. G2_XIST1		e.g. G2_XIST2			
TEL101 Planned	STW 1	NSOLL_B		STW 2	M_R ed	DAU 1	DAU 2									
TEL101 Actual	ZSW 1	NIST_B		ZSW 2	Msg. W	ADU 1	ADU 2	Ausl	Pactive	Mset						
TEL102 Planned	STW 1	NSOLL_B		STW 2	M_R ed	G1_ STW										
TEL102 Actual	ZSW 1	NIST_B		ZSW 2	Msg. W	G1_ ZSW	e.g. G1_XIST1		e.g. G1_XIST2							
TEL103 Planned	STW 1	NSOLL_B		STW 2	M_R ed	G1_ STW	G2_ STW									
TEL103 Actual	ZSW 1	NIST_B		ZSW 2	Msg. W	G1_ ZSW	e.g. G1_XIST1		e.g. G1_XIST2		G2_ ZSW	e.g. G2_XIST1		e.g. G2_XIST2		
TEL104 Planned	STW 1	NSOLL_B		STW 2	M_R ed	G1_ STW	G3_ STW									
TEL104 Actual	ZSW 1	NIST_B		ZSW 2	Msg. W	G1_ ZSW	e.g. G1_XIST1		e.g. G1_XIST2		G3_ ZSW	e.g. G3_XIST1		e.g. G3_XIST2		
TEL105 Planned	STW 1	NSOLL_B		STW 2	M_R ed	G1_ STW	XERR		KPC							
TEL105 Actual	ZSW 1	NIST_B		ZSW 2	Msg. W	G1_ ZSW	e.g. G1_XIST1		e.g. G1_XIST2							
TEL106 Planned	STW 1	NSOLL_B		STW 2	M_R ed	G1_ STW	G2_ STW	XERR		KPC						
TEL106 Actual	ZSW 1	NIST_B		ZSW 2	Msg. W	G1_ ZSW	e.g. G1_XIST1		e.g. G1_XIST2		G2_ ZSW	e.g. G2_XIST1		e.g. G2_XIST2		
TEL107 Planned	STW 1	NSOLL_B		STW 2	M_R ed	G1_ STW	G3_ STW	XERR		KPC						
TEL107 Actual	ZSW 1	NIST_B		ZSW 2	Msg. W	G1_ ZSW	e.g. G1_XIST1		e.g. G1_XIST2		G3_ ZSW	e.g. G3_XIST1		e.g. G3_XIST2		

Figure 5-1 Message frame structure

5.4 Adapting message frames individually

Introduction

The drive may require additional functions, beyond the predefined message frames, for an application. It is possible to expand the predefined message frame for this purpose. These additional values can be used in the user program by the MC_ReadPeriphery/MC_WritePeriphery technology functions or by other technology objects (output cams). The "axis" technology object does not access this data.

Note

The described procedure concerns only the peripherals on the DP(DRIVE).

Proceure for expanding the message frame

- Find the message frame type required for your axis type from the table above.
- Then in HW Config, append the desired number of additional words **after the last word** of the selected message frame.

  Supplementary conditions for the address assignment for the message frame expansion:

Address in the DP(DRIVE) peripheral image	Use
0 - 63	The data can only be processed using the MC_ReadPeriphery and MC_WritePeriphery technology functions, e.g. to use the analog output on the drive. Technology objects cannot access this data.
>= 64	The data can be used by other technology objects, e.g. to use the integrated outputs of the drive as output cam outputs. The data cannot be used in the user program.
(Remark: As the message frame structure no longer corresponds to the selected message frame type, another message frame or "no message frame" is displayed.)	

- When creating the technology object in S7T Config, you must specify the originally selected message frame type. The technology object evaluates only the number of words corresponding to the specified message frame type. The additional data can be processed in the user program using the MC_ReadPeriphery and MC_WritePeriphery technology functions or by other technology functions.
- In the SIMODRIVE 611U, you must generate the desired message frame structure manually using the signal numbers. To do this, set parameter P922 to 0. You can use parameter P915 Index 1 to 16 and parameter P916 Index 1 to 16 to enter the signal numbers corresponding to the message frame.
- A maximum of 16 process data words can be read or written.

Note

The data area for message frame extensions or for the data exchange with DPV0 slaves on the DP(DRIVE) is limited in the technology CPU to 64 bytes (I/O address 0 - 63). The data made available using this address area can be read or written in the user program using the MC_ReadPeriphery or MC_WritePeriphery technology functions, respectively.

5.5 Example: Expanding the process data area

Introduction

The signals of the process data area are updated in the PROFIBUS cycle clock. The evaluation takes place on the SIMODRIVE 611U in the speed control cycle clock (standard 125 µs). The reading and writing of the signals are performed asynchronously using the technology functions.

Task specification

- Based on the desired axis functionality, message frame 102 is to be used to connect the SIMODRIVE 611U.
- Both of the analog inputs of the SIMODRIVE 611U are to be read in the user program.
- An analog value of 0 to 10 V is to be output via the two analog outputs.
- The actual torque value of the drive is to be evaluated in the user program.

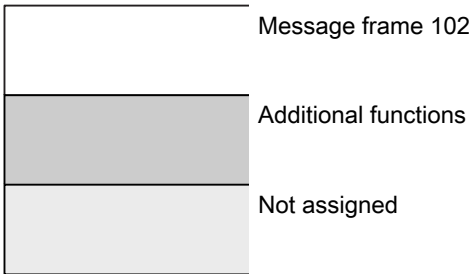
Note

The analog channels on the SIMODRIVE 611U are not required for the PROFIBUS connection, and the user can make use of these as desired.

In order to utilize the function, message frame 102 must be expanded as follows:

	PZD 1	PZD 2	PZD 3	PZD 4	PZD 5	PZD 6	PZD 7	PZD 8	PZD 9	PZD 10	PZD 11	PZD 12	PZD 13	PZD 14-16		
TEL Planned	STW1	NSOLL_B		STW2	M_Red	G1_STW	DAU1	DAU2								
P915 (611U)	50001	50007	5007	50003	50101	50009	50103	50105								
TEL Actual	ZSW1	NIST_B		ZSW2	Message W	G1_ZSW	G1_XIST1		G1_XIST2		ADU1	ADU2	Mset			
P916 (611U)	50002	50008	50008	50004	50102	50010	50011	50011	50012	50012	50104	50106	50114			

Figure 5-2 Message frame 102



Adaptations for SIMODRIVE 611U with SimoCom U

Settings differ from those described in the section on "Commissioning" as follows:

Call up the Analog outputs menu item in the SimoCom U. Parameterize the following functions:

- First output: DAU1 signal from PROFIBUS PPO
- Second output: DAU2 signal from PROFIBUS PPO

Then expand the PROFIBUS message frame using the expert list.

- How to Proceed:
  - P922 = 102

    This results in a standard assignment of the P915 and P916 parameters corresponding to message frame 102.
  - P922 = 0

    This setting enables you to freely set up the message frame using the P915 and P916 parameters. The standard assignment (step 1) is still available, i.e. you only have to enter the additional signals.

    P915:1 to P915:6 → standard assignment in accordance with message frame 102

    Setpoints

    P915:7 = 50103 → analog output 1 (DAU1)

    P915:8 = 50105 → analog output 2 (DAU2)

    P916:1 to P916:10 → standard assignment in accordance with message frame 102

    Actual values

    P916:11 = 50104 → analog input 1 (ADU1)

    P916:12 = 50106 → analog output 2 (ADU2)

    P916:13 = 50114 → smoothed torque setpoint (Mset)

Settings in S7T Config

Settings differ from those described in the section on "Commissioning" as follows:

Configuring the hardware

- Message frame selection:
  Select message frame 102
- Configure a new setpoint slot using the following data:
  Drive type: Setpoint
  PROFIBUS partner type: Output
  Address: 0
  Length: 2
  (Two additional words, DAU1 and DAU2)
- Configure a new actual value slot using the following data:
  Drive type: Actual value
  PROFIBUS partner type: Input
  Address: 0
  Length: 3
  (Three additional words, ADU1, ADU2 and Mset)

Message frame configuration overview:

Slot	Drive		PROFIBUS partner						
	Type	Addr...	Type	P...	I/O a...	P...	Length	Unit	Consiste...
4	No PIV								
5	Actual value	PZD 1	Input	2	256	- - -	10	Word	Total length
6	Setpoint	PZD 1	Output	2	256	- - -	6	Word	Total length
7	Axis disconn...								
8	No PIV								
9	Actual value	PZD 1	Input	2	276	- - -	10	Word	Total length
10	Setpoint	PZD 1	Output	2	276	- - -	6	Word	Total length
11									

Ensure for the configuration that the expansion in the sequence of the process data lies after the message frame data (this can be seen in the Drive and Address column).

Note

Due to this change, the message frame structure no longer corresponds to message frame 102. For this reason, "No message frame" or another message frame type is displayed after the change. You can ignore this change. You address the drive using the originally intended message frame type (102 in our example).

Creating the TO axis

- Axis configuration:

  The drives created in the HW configuration can be selected here. Select the desired drive.
- Message frame:

  Specify message frame type 102. The part of the message frame relevant for the Axis technology object, corresponds to message frame 102.

Access in the user program

The MC_ReadPeriphery and MC_WritePeriphery technology functions are used to process in the user program the data made available in the message frame expansion. The technology functions are processed asynchronously.

Call the MC_ReadPeriphery technology function to read the values of the analog inputs and the torque actual value:

```
CALL "MC_ReadPeriphery" , "IDB_FB450"
      Enable :=M10.0
      InputOutput :=FALSE
      ByteAddress :=0
      Data :=P#DB100.DBX 0.0 WORD 3
      DataValid :=M10.1
      Busy :=M10.2
      Error :=M10.3
      ErrorID :=MW12
```

When the technology function (Enable = TRUE input) is started, starting at address 0, three words will be read from the DP(DRIVE) peripheral image and saved at the address specified in the ANY pointer.

Call the MC_WritePeriphery technology function to write the setpoints for the two analog outputs:

```
CALL "MC_WritePeriphery" , "IDB_FB451"
      Execute :=M20.0
      ByteAddress :=0
      Data :=P#DB100.DBX 0.0 WORD 2
      DoneFlag :=
      Done :=M20.1
      Busy :=M20.2
      Error :=M20.3
      ErrorID :=MW22
```

When the technology function (Execute FALSE -> TRUE input) is started, the two words specified in the ANY pointer will be written in the DP(DRIVE) peripheral image starting at address 0 and thus sent to the drive.

5.6 Disable the sign-of-life monitoring

Introduction

The PROFIBUS connection between the technology CPU and the SIMODRIVE 611U is monitored using the sign-of-life. As a general principle, sign-of-life monitoring must be active during operation. Sign-of-life monitoring is automatically selected when the axis is created. In case of problems (for example, alarm 832 on the SIMODRIVE 611U), the sign-of-life monitoring can be deactivated temporarily for diagnostic purposes.

Technology CPU

The parameters for the sign-of-life monitoring can be selected or deselected on the TOaxis via Expert list > Configuration data ....lifeSignCheck.

SIMODRIVE 611U

The sign-of-life monitoring can be deactivated using the **P879 Bit 8** parameter.

5.7 Activate the second encoder

Introduction

In the technology CPU, you can use the second encoder input on the SIMODRIVE 611U double-axis module for the actual value acquisition. Axis B of the SIMODRIVE 611U cannot then be used to control a motor.

Technology CPU

A PROFIBUS message frame must be used for the second encoder (refer to the "Message frame type" decision table in the "Settings Table" section).

SIMODRIVE 611U

When axis A is created: Create the second encoder by specifying **Which direct measuring system are you using? > Enter data**. Then enter the required encoder type. Depending on the configuration of the SIMODRIVE 611U, it is necessary to adapt the following parameters:

Parameter P879 Bit 12 = 1 -> Enable direct measuring system (Axis A)

Parameter P922 -> PROFIBUS message frame type (Axis A)

Parameter P700 = 0 -> Deselect Axis B (Axis B)

Parameter P875 = 0 -> Expected option module type (Axis B)

5.8 Activating a brake

5.8.1 Vertical axis application case

Introduction

When a braking sequential control is used in conjunction with a vertical axis, the axis should remain at its position when the system is shutdown or in a fault situation.

The axis enable can be reset by an alarm in the technology CPU or by disabling the MC_Power function (Enable input = false).

The extended brake control should allow the ON/OFF1, OFF2, OFF3 and enable operation (enable pulse) bits to be switched off sequentially. This ensures that the brake is already closed when the pulse enable for the axis is disabled, thus preventing the axis from twisting / sagging.

5.8.2 Universally activating the braking control in the SIMODRIVE 611

Introduction

To universally activate the braking control of the SIMODRIVE 611 you must set the P0850 to 1.

Procedure

Activating the braking control

The following parameters are available for the "motor holding brake" function:

Parameter	Meaning
P0850	Activates the braking control
P0851	Brake opening time
P0852	Speed - close holding brake (SRM, ARM), motor speed - close holding brake (SLM)
P0853	Brake delay time
P0854	Controller disabling time

Allocating the brake activation function to the digital output

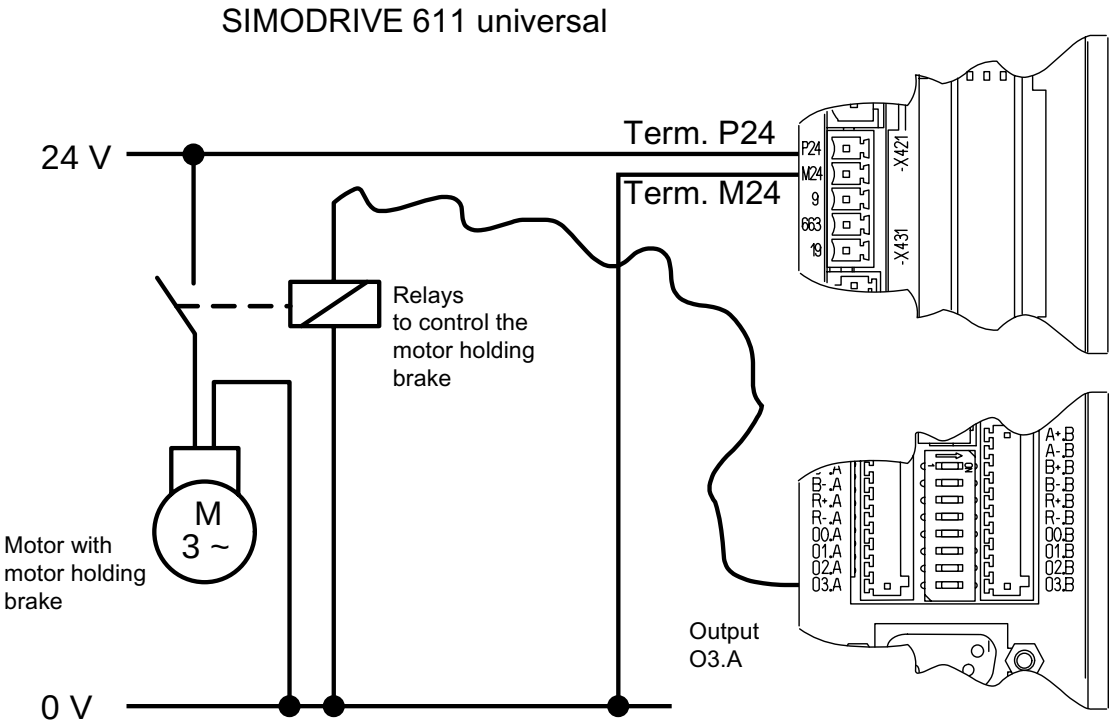
In the expert list of the universal SIMODRIVE 611, each digital output has its own parameter. Enter function value 35 in the parameter to which the digital output used in your application is assigned. You can also invert the digital output via the bit mask in parameter P0699.

P0680	Alarm function - output terminal O0.x
P0681	Alarm function - output terminal O1.x
P0682	Alarm function - output terminal O2.x
P0683	Alarm function - output terminal O3.x
P0684	Alarm function - output terminal O4
P0685	Alarm function - output terminal O5
P0686	Alarm function - output terminal O6
P0687	Alarm function - output terminal O7
P0688	Alarm function - output terminal O8
P0689	Alarm function - output terminal O9
P0690	Alarm function - output terminal O10
P0691	Alarm function - output terminal O11

P0699	Inverting the output terminal signals

Example

Use output O3.A to activate the brake. Enter function value 35 in parameter P683.



5.8.3 Activating braking sequential control in the axis

Introduction

The enable bits ON/OFF1, OFF2, OFF3 and operation enable (pulse enable) of the axis are coordinated via the braking control that is integrated in the drive. This means that, when the axis is switched off normally or in the event of an axis error, you can make sure that the brake is already closed before the pulse enable is cancelled, hence preventing the axis from sagging.

There are two different operating states:

- Switch axis on / off normally using MC_Power
- Switch off the axis in the event of axis errors with error response "RELEASE_DISABLE"

Procedure for configuring switching the axis on / off normally using MC_Power

You configure an axis to switch on / off normally with braking control using the stop modes on the MC_Power block:

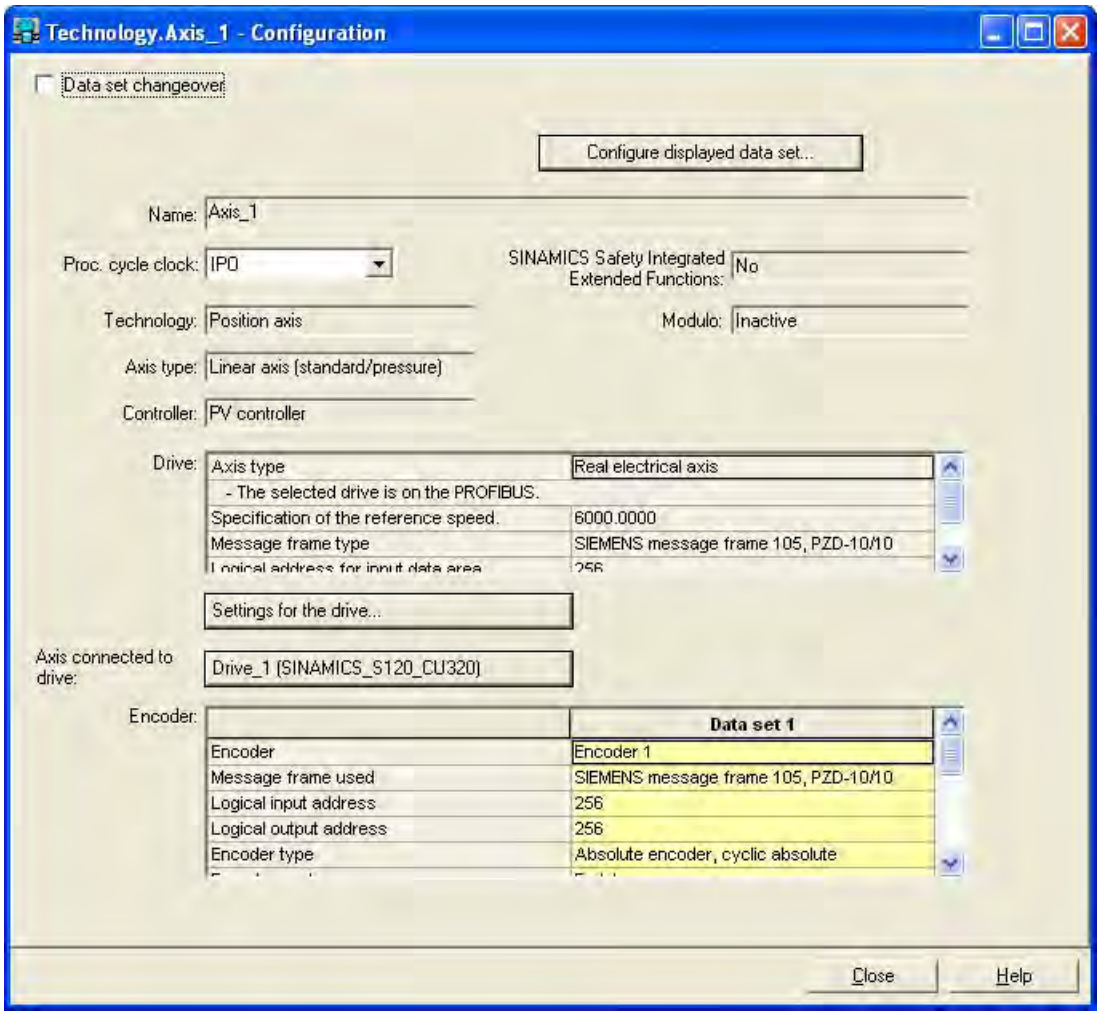
Stop mode	Name	Description
3	Coast stop (OFF2)	The drive coasts to a standstill without power; the brake closes immediately
5	Ramp stop (OFF1)	Stops the axis via the ramp function encoder
6	Fast stop (OFF3)	Stops the axis via a fast stop ramp

You will find further information in the Online Help for the MC_Power block.

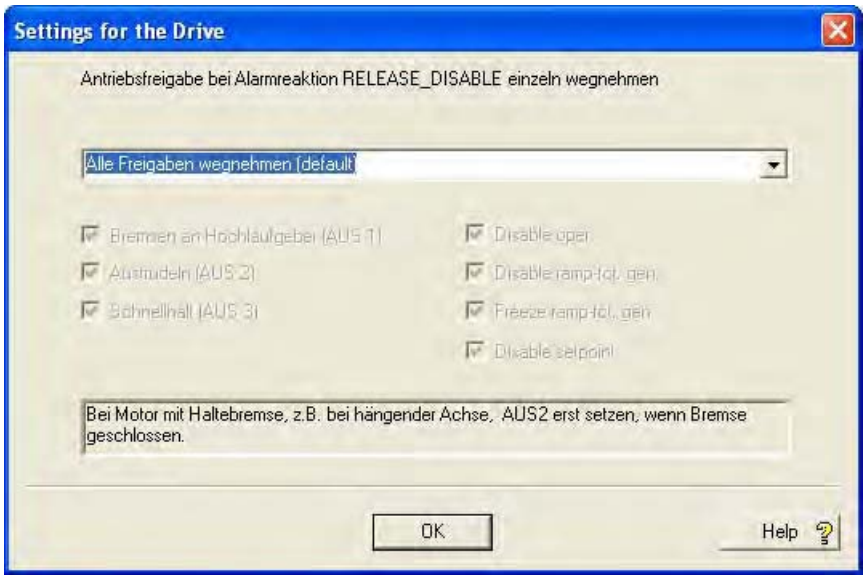
Procedure for configuring the axis response to axis errors with error response "RELEASE_DISABLE"

The response of the axis to axis errors with the "RELEASE_DISABLE" error response is set by changing the configuration in S7T Config.

- Switch to the configuration dialog for the axis, and click the "Drive settings ..." button.

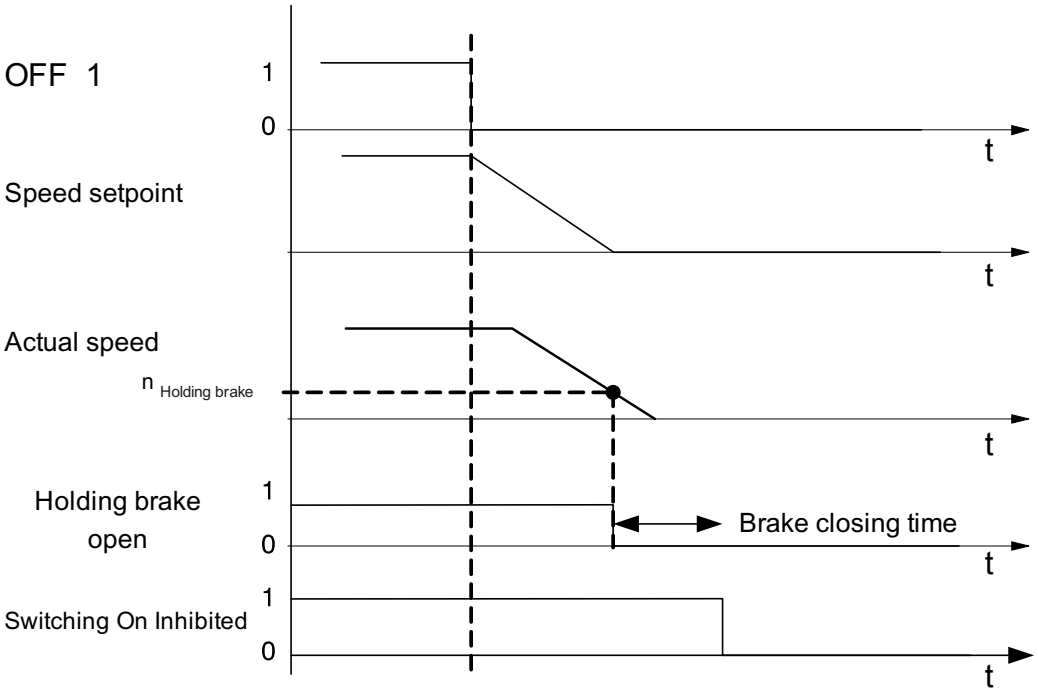


- Select the required response by the axis to axis errors with an error response "RELEASE_DISABLE".



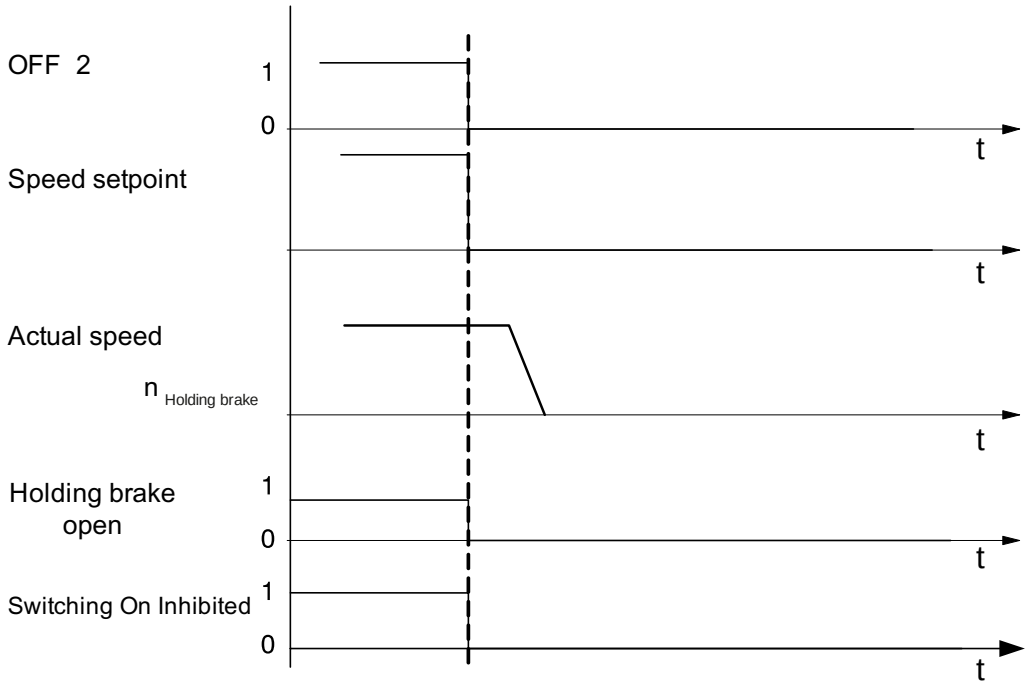
Ramp stop (OFF1):

Braking takes place at the drive's ramp function encoder ramp. When the speed threshold is reached, the holding brake is enabled which disables the pulse enable once the brake closing time has elapsed.



Coast stop (OFF2):

In this case the power enable is cancelled immediately, and the drive costs to a standstill. In parallel, the mechanical braking control is enabled immediately. This engages the brake, which actively brakes the drive. The mechanical stress on the brake depends on the load to which it is subjected.



Fast stop (OFF3):

The drive is braked at the fast stop ramp (emergency stop). When the speed threshold is reached, the holding brake is enabled which disables the pulse enable once the brake closing time has elapsed.