

PROFINET PROFIdrive Interface

Manual



Documentation of the PROFIdrive Interface of the following Drives:

- **C1250-PD-XC-0S/1S**
- **C1450-PD-VS-0S/1S**
- **E1450-PD-QN-0S/1S**

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Note

The information in this documentation reflects the stage of development at the time of press and is therefore without obligation. NTI AG reserves itself the right to make changes at any time and without notice to reflect further technical advance or product improvement.

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1 System overview

PROFINET is the open real-time Ethernet network, in this manual the PROFIdrive profile drives are described. The LinMot drives act as slave in this network and is implemented with the TPS1 chip from Renesas.

For further information on the PROFINET and PROFIdrive fieldbus protocols please visit:

<http://www.profibus.com/>

1.1 References

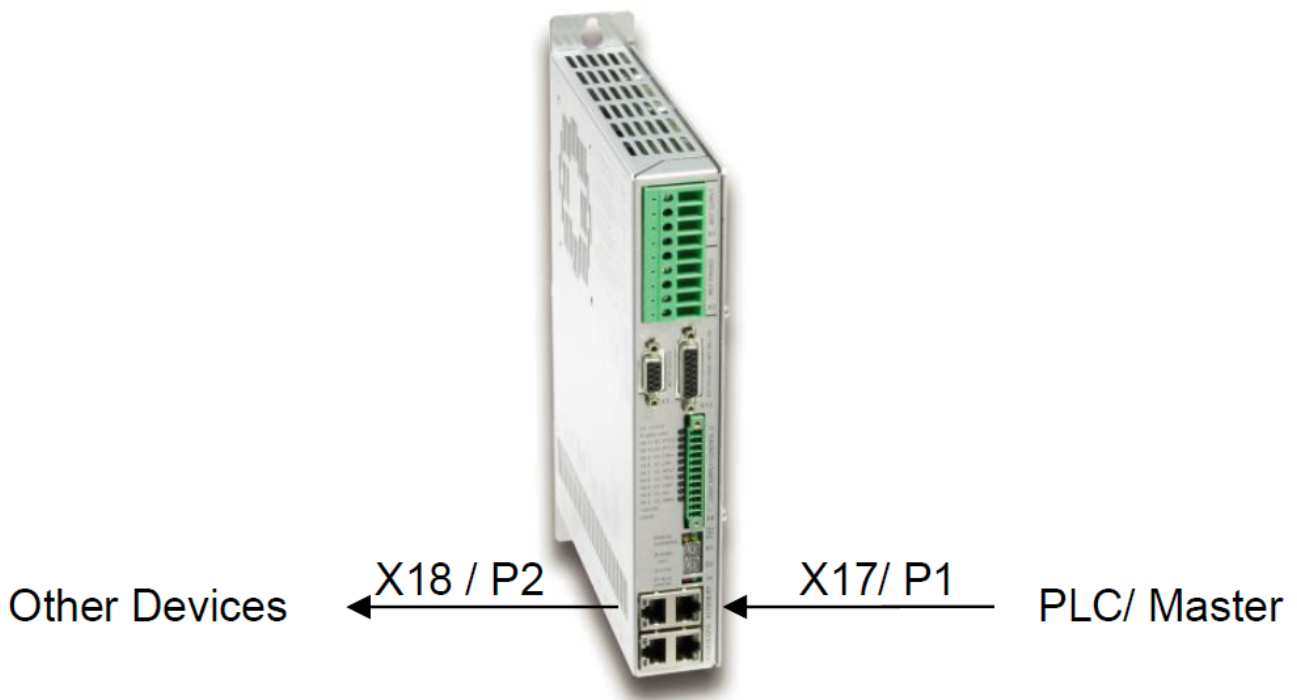
All user manuals are distributed with the LinMot-Talk software the newest versions can be downloaded from the LinMot homepage in the download section.

Ref	Title	Source
1	User Manual Motion Control SW	www.linmot.com
2	LinMot Drive Configuration over Fieldbus Interfaces SG5	www.linmot.com

1.2 Port assignment



Attention: Within the PROFINET network normally the topology is defined, for easy setup and replacement of devices. The real time Ethernet RJ45 connector X17 is the P1 port and the real time RJ45 connector X18 is the P2 port in this context.



2 Setup in Simotion Motion Control System

In the following steps the integration of a LinMot PROFIdrive servo drive with a LinMot linear motor into the SIMOTION motion controller is described. In the example a Siemens SIMOTION D445 and a Linmot C1250-PD-XC-0S drive is used.

2.1 Assumed preconditions

The SIMOTION is in factory reset condition, the programming PC is connected over X127/P1. The Linmot drive is completely wired, the PROFINET is wired from the SIMOTION X150/P1 to the LinMot X17.

It is supposed, that the motor and the drive have PnP functionality, means the motor is basically setup automatically, otherwise the motor has to be setup manually with the LinMot-Talk Motor-Wizard in the drive.

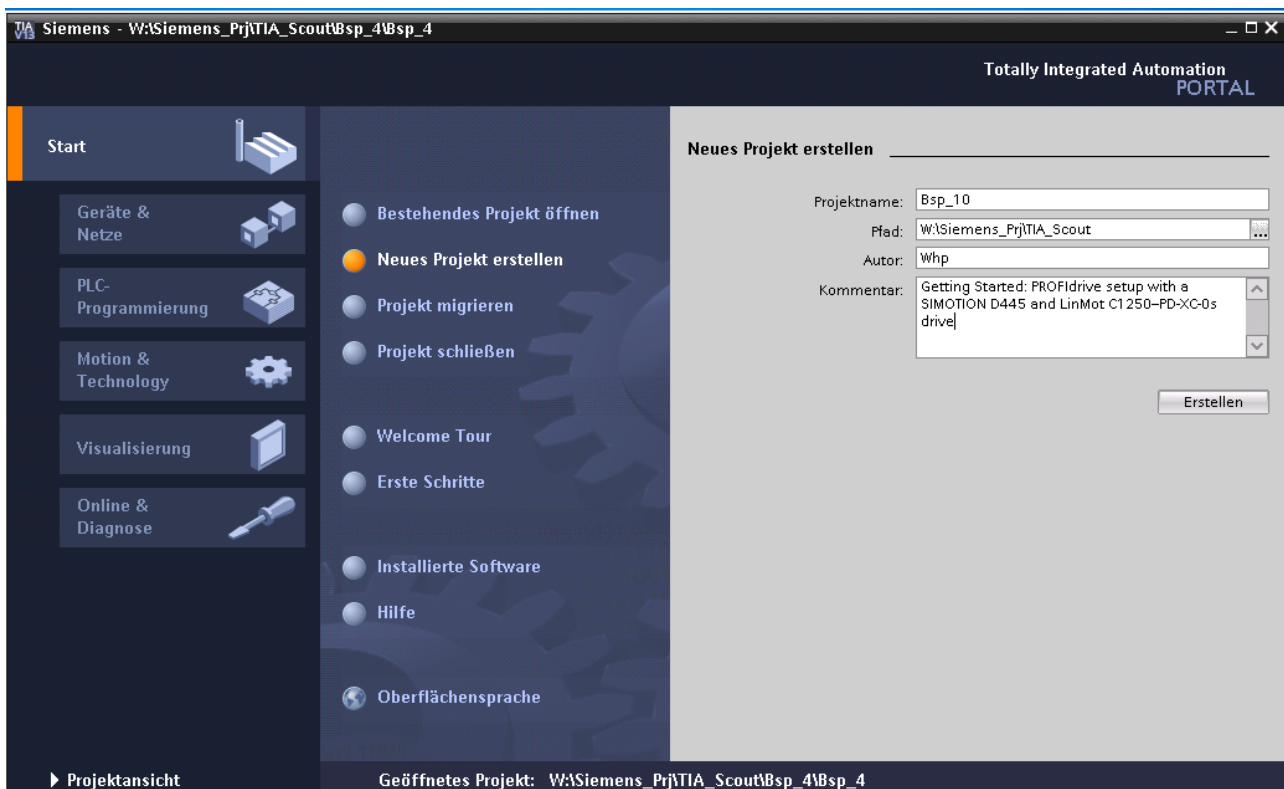


Attention: To achieve a good response of the master setpoint, it is important to tune also the position controller in the LinMot-drive well!

2.2 TIA Configuration

2.2.1 Create a new project

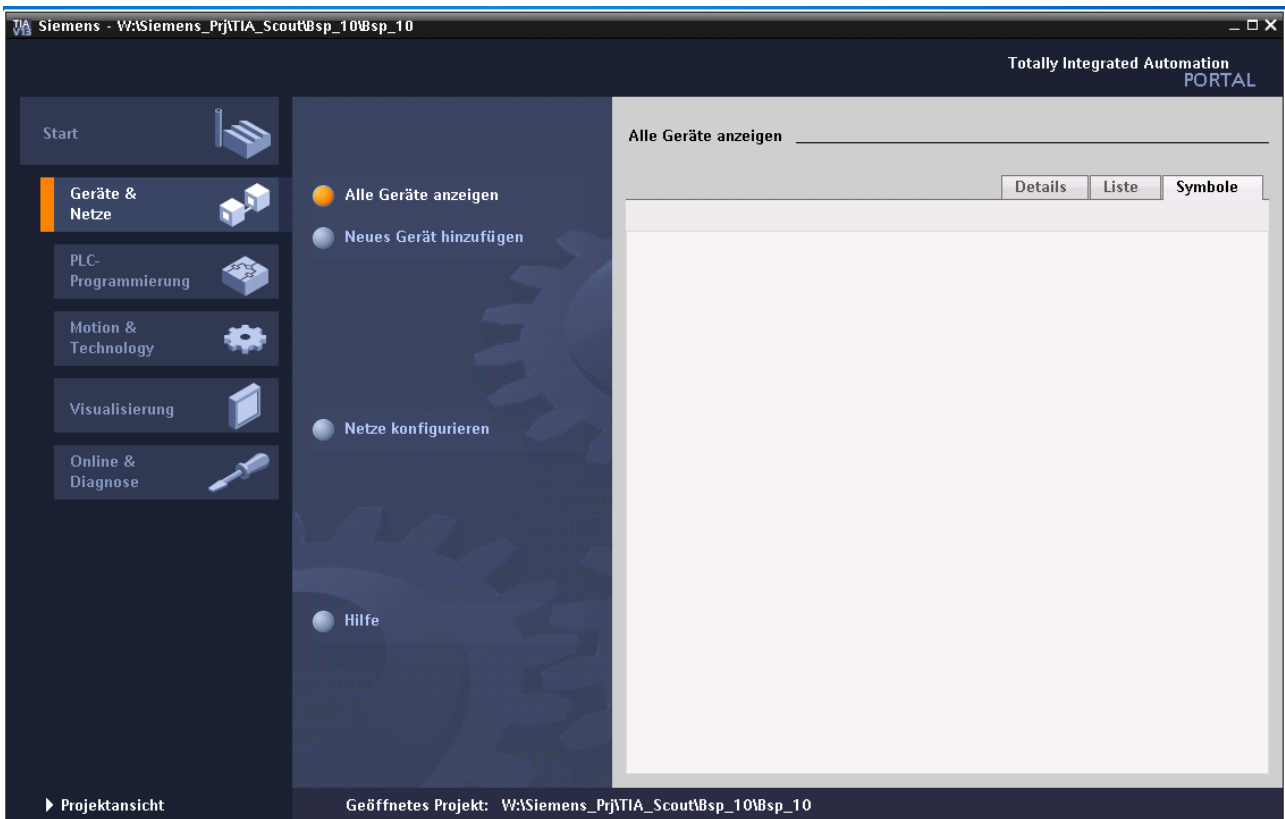
Start the TIA Portal and create a new project BSP_10.



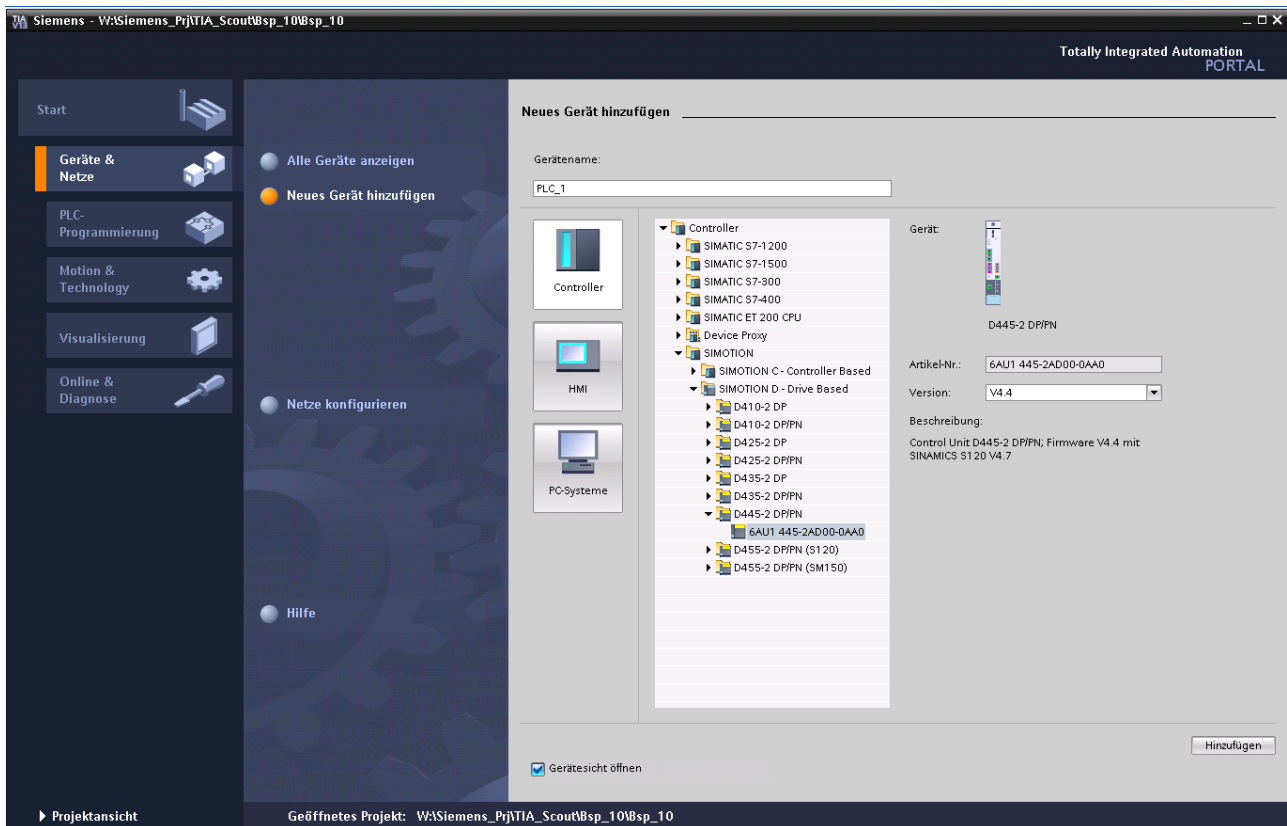
2.2.2 Configure a Device

The screenshot shows the Siemens TIA Portal interface. The title bar reads 'Siemens - W:\Siemens_Prj\TIA_ScoutBsp_10\Bsp_10'. The top right corner says 'Totally Integrated Automation PORTAL'. The left sidebar contains a 'Start' button and a list of project management options: 'Geräte & Netze', 'PLC-Programmierung', 'Motion & Technology', 'Visualisierung', 'Online & Diagnose', 'Bestehendes Projekt öffnen', 'Neues Projekt erstellen', 'Projekt migrieren', 'Projekt schließen', 'Welcome Tour', 'Erste Schritte' (highlighted with an orange dot), 'Installierte Software', 'Hilfe', and 'Oberflächensprache'. The main workspace is titled 'Erste Schritte' and displays a message: 'Projekt: "Bsp_10" wurde erfolgreich geöffnet. Wählen Sie den nächsten Schritt:'. Below this message is a flowchart starting from 'Start' and branching into five options: 'Geräte & Netze' (Ein Gerät konfigurieren), 'PLC-Programmierung' (PLC-Programm schreiben), 'Motion & Technology' (Technologieobjekte konfigurieren), 'Visualisierung' (Ein HMI-Bild projektieren), and 'Projektansicht' (Projektansicht öffnen). The 'Projektansicht' option is currently selected. The bottom status bar shows 'Geöffnetes Projekt: W:\Siemens_Prj\TIA_ScoutBsp_10\Bsp_10'.

2.2.3 Add new Device



2.2.4 Select Device



2.2.5 Configure PROFINET

Add the PROFINET network PN/IE_1 here assigned to X150 and choose the IP-address and subnet netmask.

Bsp_10 -> PLC_1 [D445-2 DP/PN]

Topologiesicht | Netzsicht | **Gerätesicht**

PLC_1

AC_1

SINAMICS_1

SINAMICS Integrated

Geräteübersicht

Baugruppe	Baugr...	Steck...	E-Adres...	A-Adres...	Typ	Art...
PLC_1	0	2	16383*		D445-2 DP/PN	6A...
DP-Schnittstelle_1	0	2 X126	16383*		DP-Schnittstelle	
DP/MPI-Schnittstelle_1	0	2 X136	16382*		DP/MPI-Schnittstelle	
DP Integrated-Schnittste...	0	2 PCI	16381*		DP Integrated-Sch...	
PN/IE-NET-Schnittstelle_1	0	2 X130	16380*		PROFINET PN/IE-NET...	
PROFINET-Schnittstelle_1	0	2 X150	16378*		PROFINET-Interface	
	0	2 X14...				
PN/IE-Schnittstelle_1	0	2 X127	16374*		PROFINET PN/IE-Int...	
DI/DO_1	0	2 X142	66...105	66...105	DI/DO	
SINAMICS_Integrated_1	0	4			S120 SINAMICS Int...	

PROFINET-Schnittstelle_1 [PN-IO]

Eigenschaften | Info | Diagnose

Allgemein | IO-Variablen | Systemkonstanten | Texte

Allgemein

Ethernet-Adressen

Betriebsart

Erweiterte Optionen

Schnittstellen-Optionen

Medienredundanz

Echtzeit-Einstellungen

Port [X150 P1 R]

Port [X150 P2 R]

Port [X150 P3]

Diagnoseadressen

Ethernet-Adressen

Schnittstelle vernetzt mit

Subnetz: PN/IE_1

Neues Subnetz hinzufügen

IP-Protokoll

☒ IP-Adresse im Projekt einstellen

IP-Adresse: 10 . 3 . 8 . 145

Subnetzmaske: 255 . 255 . 255 . 0

☐ Router verwenden

Router-Adresse: 0 . 0 . 0 . 0

☐ Anpassen der IP-Adresse direkt am Gerät erlauben

PROFINET

Define the SIMOTION controller as Sync master in the real time settings.

The screenshot shows the SIMATIC Manager interface with the following components:

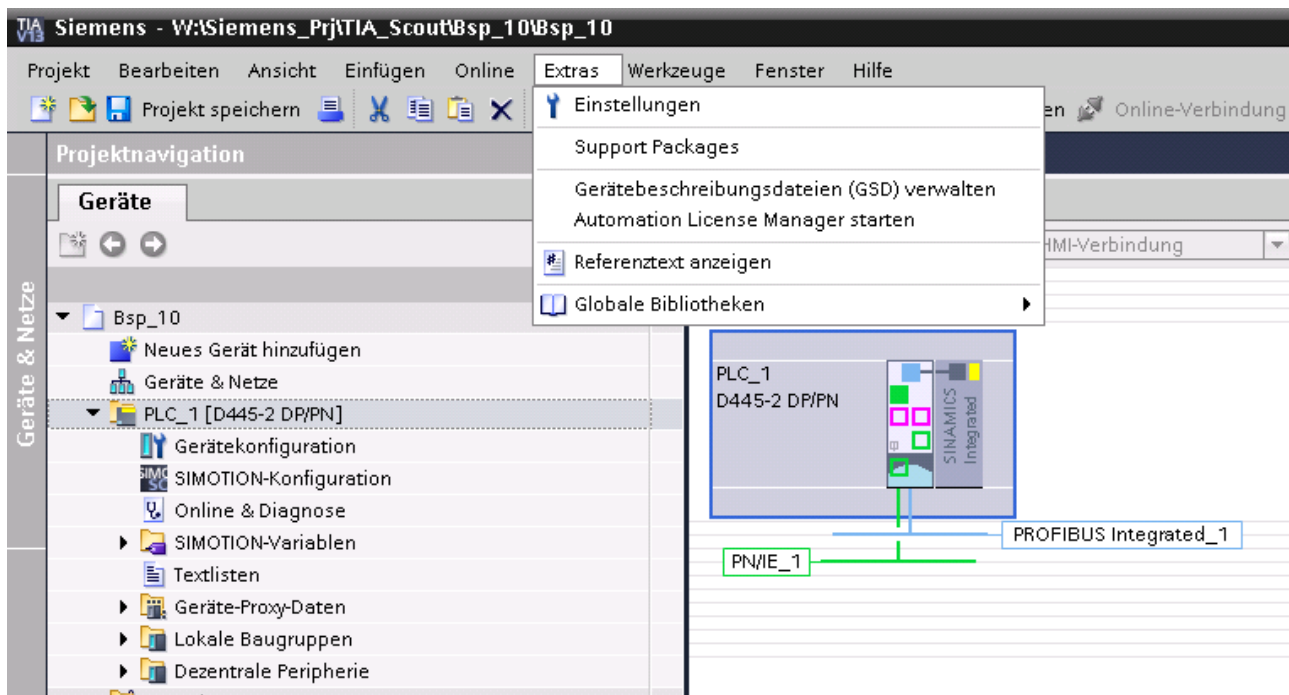
- Top Bar:** Bsp_10 ▶ PLC_1 [D445-2 DP/PN]
- Left Panel:** A graphical representation of the PLC hardware, labeled 'SINAMICS Integrated'.
- Right Panel (Geräteübersicht):** A table listing the hardware components of the PLC_1 rack.

Baugruppe	Baugr...	Steck...	E-Adres...	A-Adres...	Typ	Art...
PLC_1	0	2			D445-2 DP/PN	6A...
DP-Schnittstelle_1	0	2 X126	16383*		DP-Schnittstelle	
DP/MPI-Schnittstelle_1	0	2 X136	16382*		DP/MPI-Schnittstelle	
DP Integrated-Schnittste...	0	2 PCI	16381*		DP Integrated-Sch...	
PN/IE-NET-Schnittstelle_1	0	2 X130	16380*		PROFINET PN/IE-NET...	
PROFINET-Schnittstelle_1	0	2 X150	16378*		PROFINET-Interface	
		0	2 X14...			
PN/IE-Schnittstelle_1	0	2 X127	16374*		PROFINET PN/IE-Int...	
DVDO_1	0	2 X142	66...105	66...105	DVDO	
SINAMICS_Integrated_1	0	4			S120 SINAMICS Int...	
- Bottom Panel (PROFINET-Schnittstelle_1 [PN-IO]):** The 'Eigenschaften' (Properties) window is open, showing the 'Synchronisation' tab.
 - Sync-Domain:** Sync-Domain_1
 - Synchronisationsrolle:** Sync-Master
 - RT-Klasse:** RT,IRT

2.2.6 Install LinMot GSDML device description file

If not already installed, install now the newest device description file of the device you want to use. The device description files are distributed together with the firmware under path

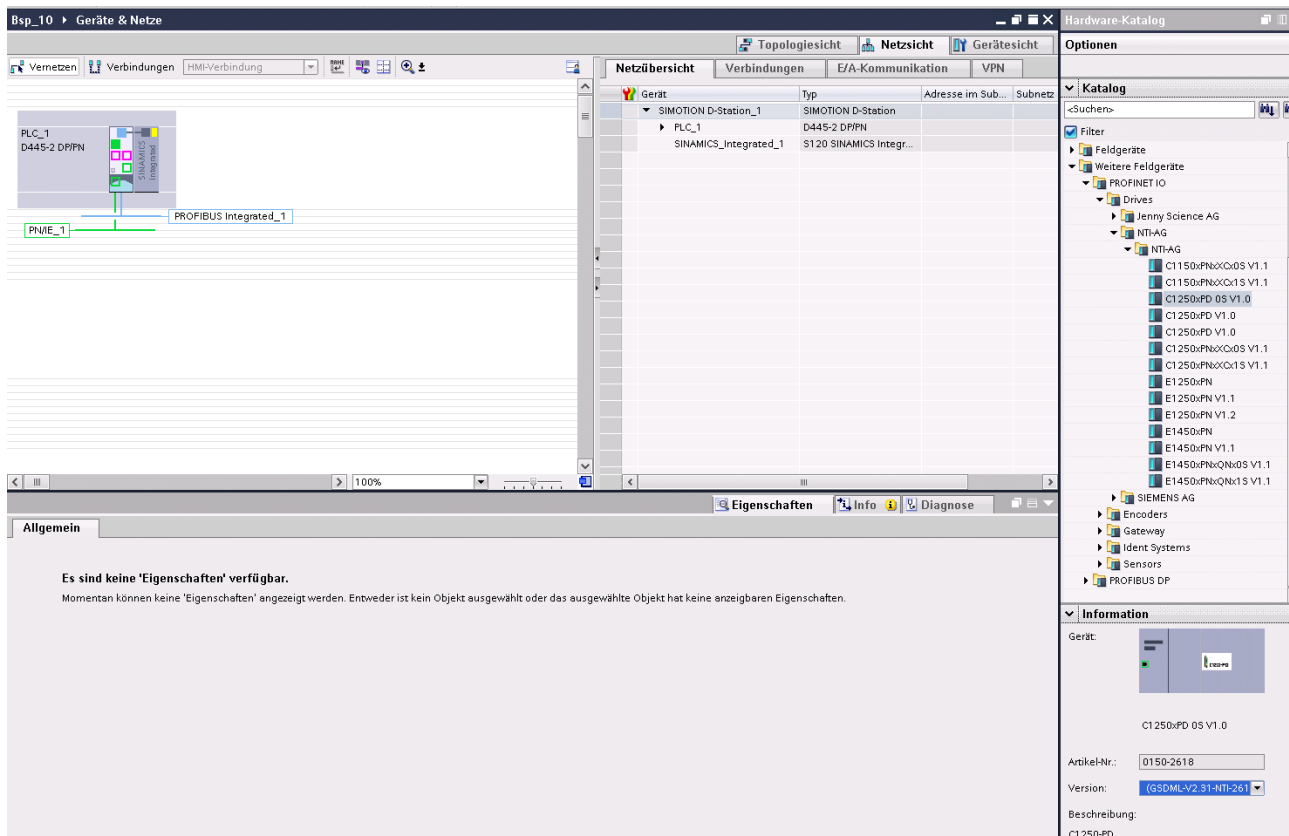
C:\Program Files (x86)\LinMot\LinMot-Talk 6.4 Build 20151112\Firmware\Interfaces\ProfiNet\GSDML_PD



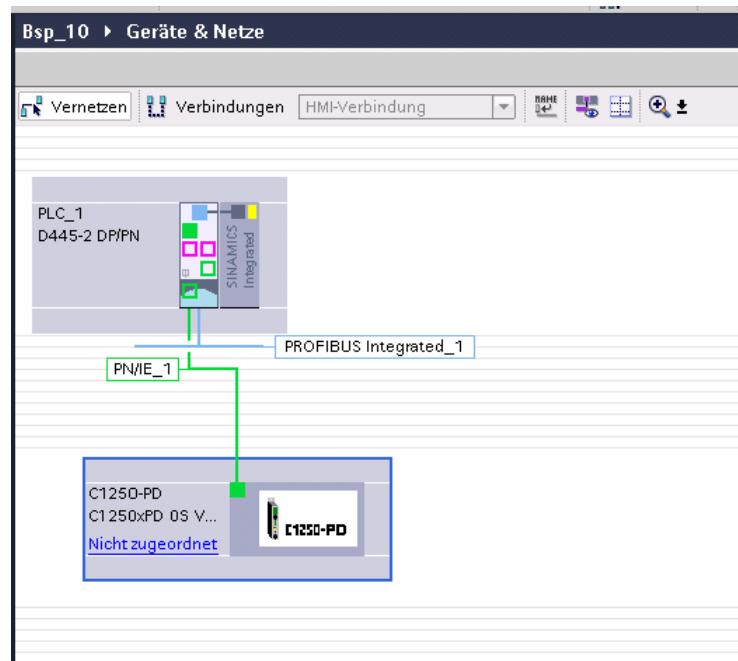
2.2.7 Select correct GSDML device description file

2.2.8 Add NTI drive to PROFINET network

Now change to the network view and add the desired LinMot PROFIdrive device.



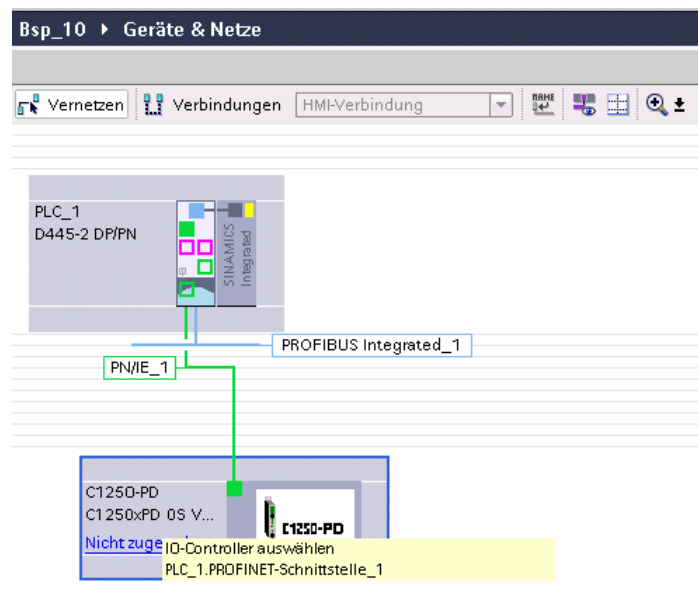
Select the correct NTI drive and drag and drop it to the PN/IE1 network.



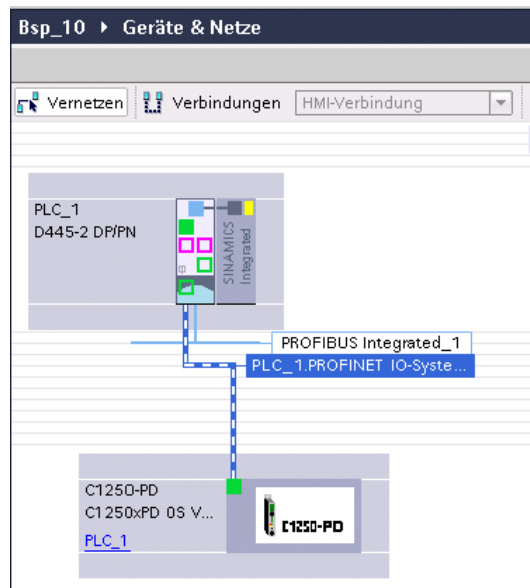
Then Network looks like this.

2.2.8.1 Assign NTI drive to the SIMOTION

Assign the LinMot drive to the SIMOTION master PLC_1.

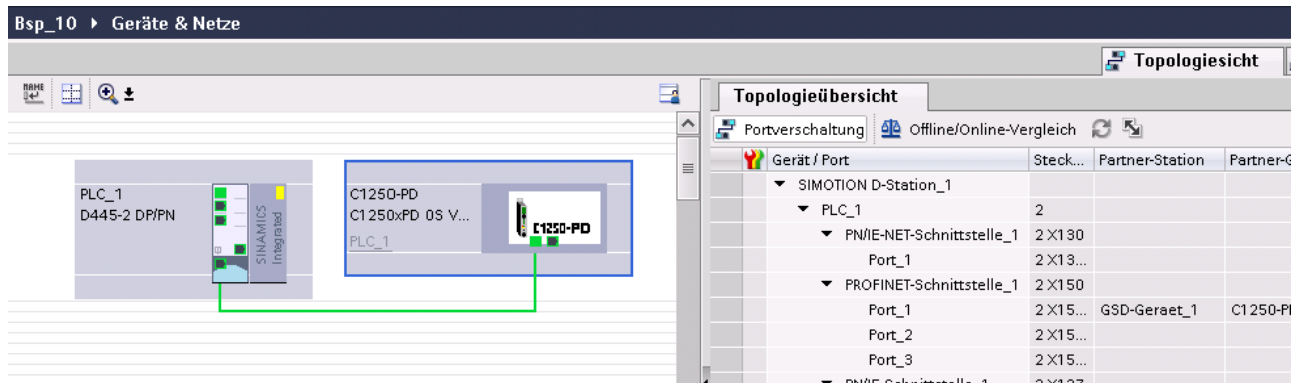


Select PLC_1 as IO Controller.



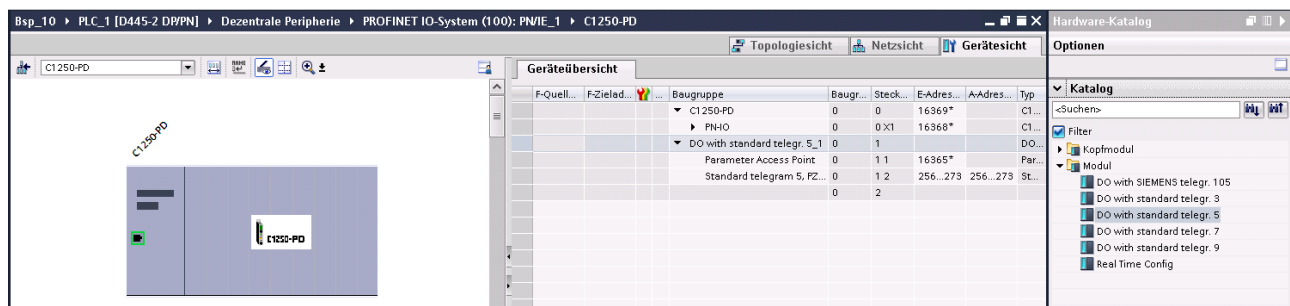
2.2.9 Define the PROFINET Topology

Change to Topology view, and wire the PROFINET connection from PLC-1 X150/P1 port to the C1250-PD/P1 port.



2.2.10 Add communication module to the NTI PROFIdrive drive

Double click in the Topology view the LinMot drive, then automatically the device view of the LinMot drive opens.



Drag and drop from the Catalog the DO with standard teleg. 5 to the device Slot 1. Double click the device and define the isochronous mode.

Bsp_10 ▶ PLC_1 [D445-2 DP/PN] ▶ Dezentrale Peripherie ▶ PROFINET IO-System (100): PN/IE_1 ▶ C1250-PD

Topologiesicht Netzsicht **Gerätesicht**

C1250-PD

Geräteübersicht

F-Quell...	F-Zielad...	Baugruppe	Baugr...	Steck...	E-Adres...	A-Adres...	Typ
		▼ C1250-PD	0	0	16369*		C1...
		▶ PN-IO	0	0 X1	16368*		C1...
		▼ DO with standard telegr. 5_1	0	1	16365*		DO...
		Parameter Access Point	0	1 1	16365*		Par...
		Standard telegram 5, PZ...	0	1 2	256...273	256...273	St...
			0	2			

PN-IO [Module]

Allgemein IO-Variablen Systemkonstanten Texte

Allgemein
Ethernet-Adressen
▼ Erweiterte Optionen
Schnittstellen-Optionen
Medienredundanz
Taktsynchronisation
▶ Echtzeit-Einstellungen
▶ Port 1 - RJ45 [X1 P1 R]
▶ Port 2 - RJ45 [X1 P2 R]
Diagnoseadressen

Taktsynchronisation

☒ Taktsynchroner Betrieb

Sendetakt: 1.000 ms

Applikationszyklus: 1.000 ms

Ti/To-Werte: Automatische Einstellung

Zeit Ti (Prozesswerte einlesen): 0.4 ms

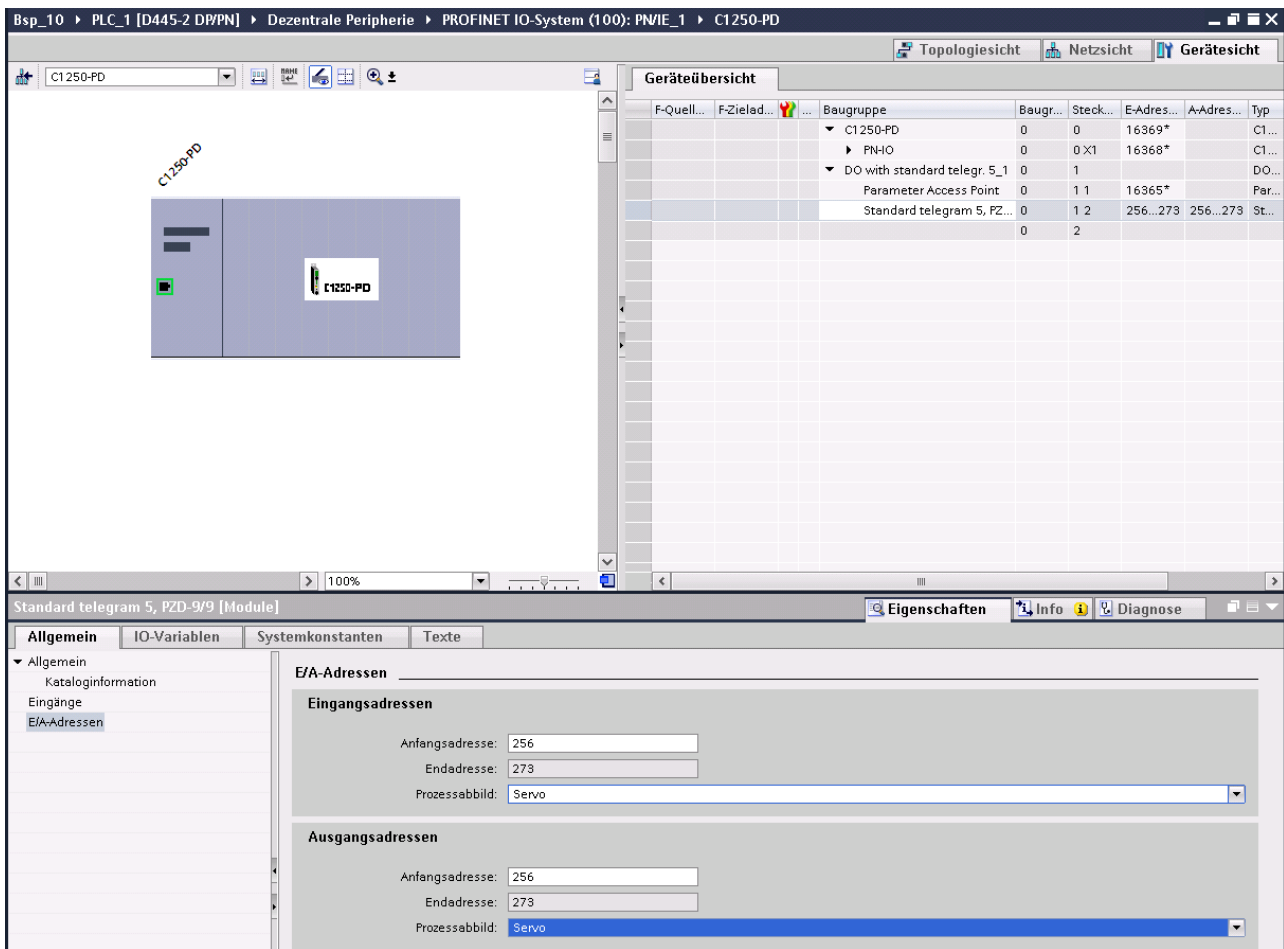
Intervalle: 0.001 ms

Zeit To (Prozesswerte ausgeben): 0.416 ms

Intervalle: 0.001 ms

Detaillübersicht

Name	Steck...	Taktsy..
C1250-PD/TPS 1 for ...	0/1	<input type="checkbox"/>
DO with standard t...	1/1	<input type="checkbox"/>
DO with standard t...	1/2	<input checked="" type="checkbox"/>



Double click the Slot 1.2 and assign the I/O address to the Servo Process image.

2.2.11 Define the PROFIBUS Cycle time

For the SIMOTION D devices the DP cycle time has to be the same as the Isochronous PROFINET IO cycle time, so change it to 1ms.

Bsp_10 ▶ Geräte & Netze

Topologiesicht | **Netzansicht** | Gerätesicht

Vernetzen | Verbindungen | HMI-Verbindung

IO-System: PLC_1.PROFINET IO-System (100)

PLC_1
D445-2 DP/PS

PROFIBUS Integrated_1

C1250-PD
C1250xPD 0S V1.0

PLC_1

Gerät	Typ	Adresse im Sub...	Subnetz
▼ SIMOTION D-Station_1	SIMOTION D-Station		
▶ PLC_1	D445-2 DP/PS		
SINAMICS_Integrated_1	S120 SINAMICS Integr...		
▼ GSD-Geraet_1	GSD-Geraet		
▶ C1250-PD	C1250xPD 0S V1.0		

PROFIBUS Integrated_1 [PROFIBUS Integrated]

Eigenschaften | Info | Diagnose

Allgemein | IO-Variablen | Systemkonstanten | Texte

Äquidistanz

☒ Äquidistanz Buszyklus aktivieren

DP-Zyklus:

☐ DP-Zykluszeit automatisch minimal

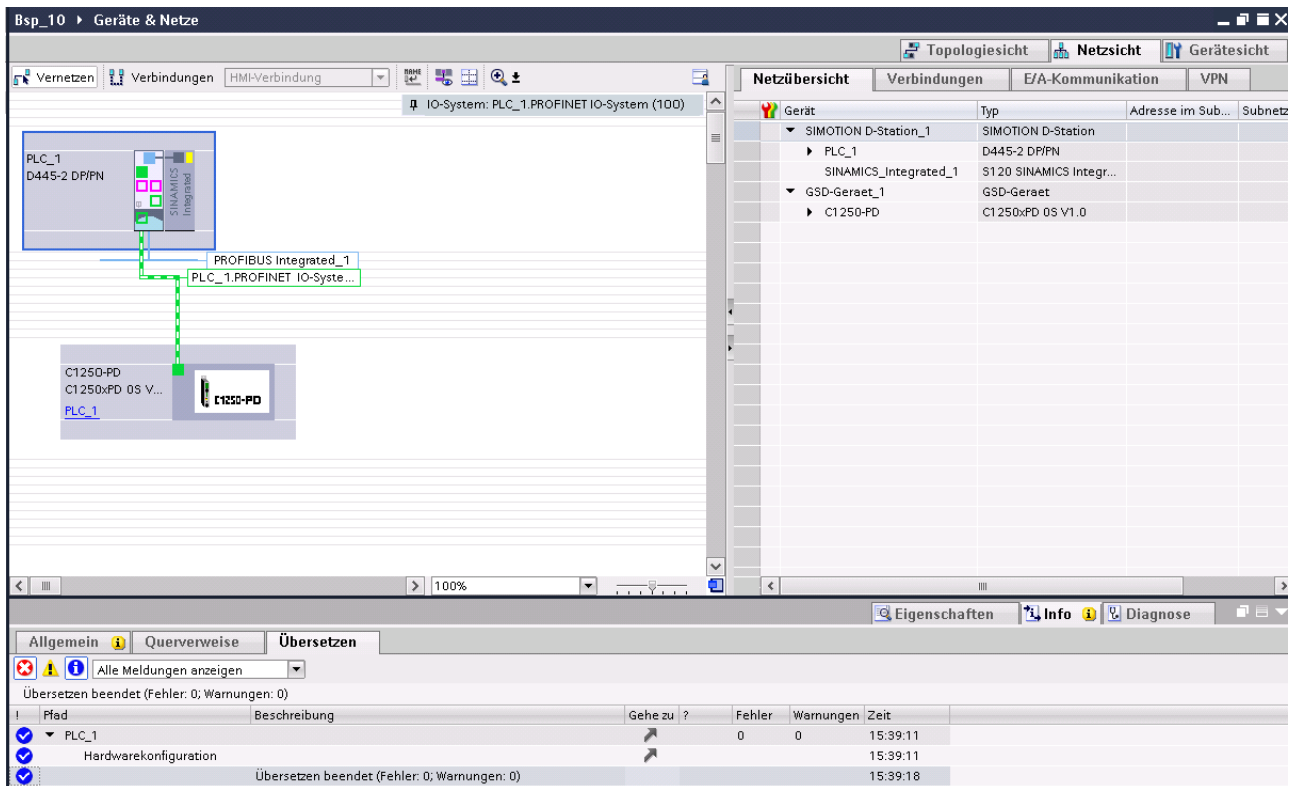
Äquidistanter DP-Zyklus: 1.000 ms Raster: 0.125ms

Zulässige Zeiten: [0.500; 8.000]

Ti/To-Werte des PROFIBUS:

2.2.12 Compile the HW Configuration

Select the SIMOTION device and click  Compile button for compiling the HW configuration.




The screenshot shows the SIMATIC Manager HW Config interface. The main workspace displays a network diagram with a PLC_1 (D445-2 DP/PS) connected to a SIMOTION D-Station_1 (D445-2 DP/PS) via a PROFIBUS Integrated_1. The SIMOTION D-Station_1 is also connected to a C1250-PD (C1250xPD 0S V1.0) via a PLC_1.PROFINET IO-System. The right-hand pane shows the 'Netzübersicht' (Network Overview) table, which lists the devices and their types.

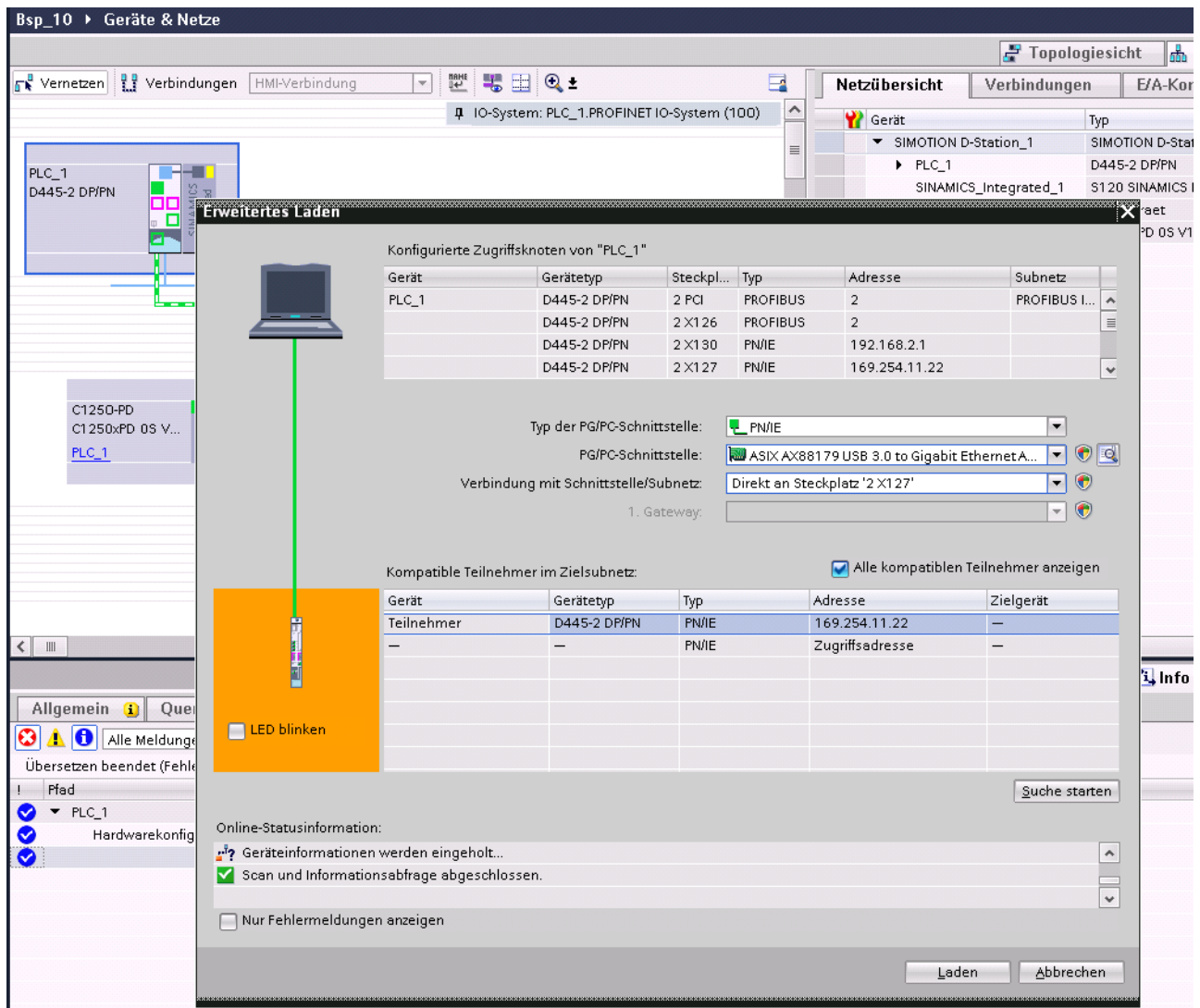
Gerät	Typ	Adresse im Sub...	Subnetz
▼ SIMOTION D-Station_1	SIMOTION D-Station		
▶ PLC_1	D445-2 DP/PS		
SINAMICS_Integrated_1	S120 SINAMICS Integr...		
▼ GSD-Geraet_1	GSD-Geraet		
▶ C1250-PD	C1250xPD 0S V1.0		

The bottom status bar shows the 'Übersetzen' (Compile) tab. It indicates that the compilation was successful: 'Übersetzen beendet (Fehler: 0; Warnungen: 0)'. The table below shows the compilation results:

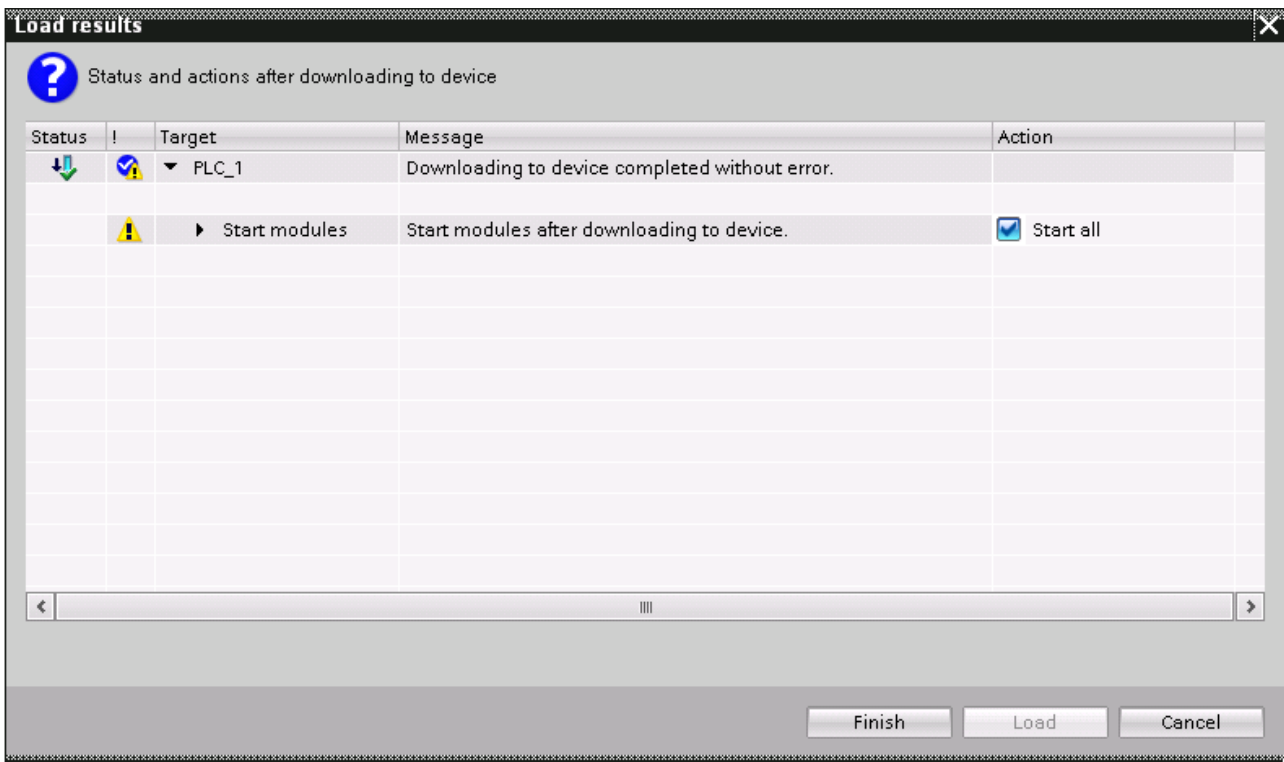
! Pfad	Beschreibung	Gehe zu ?	Fehler	Warnungen	Zeit
▼ PLC_1			0	0	15:39:11
Hardwarekonfiguration					15:39:11
Übersetzen beendet (Fehler: 0; Warnungen: 0)					15:39:18

2.2.13 Download the HW Configuration

By clicking the  button you start the download of the HW configuration. Select your HW devices for accessing the SIMOTION master, click search, then select the SIMOTION device and start the loading by clicking on the "Load" button.

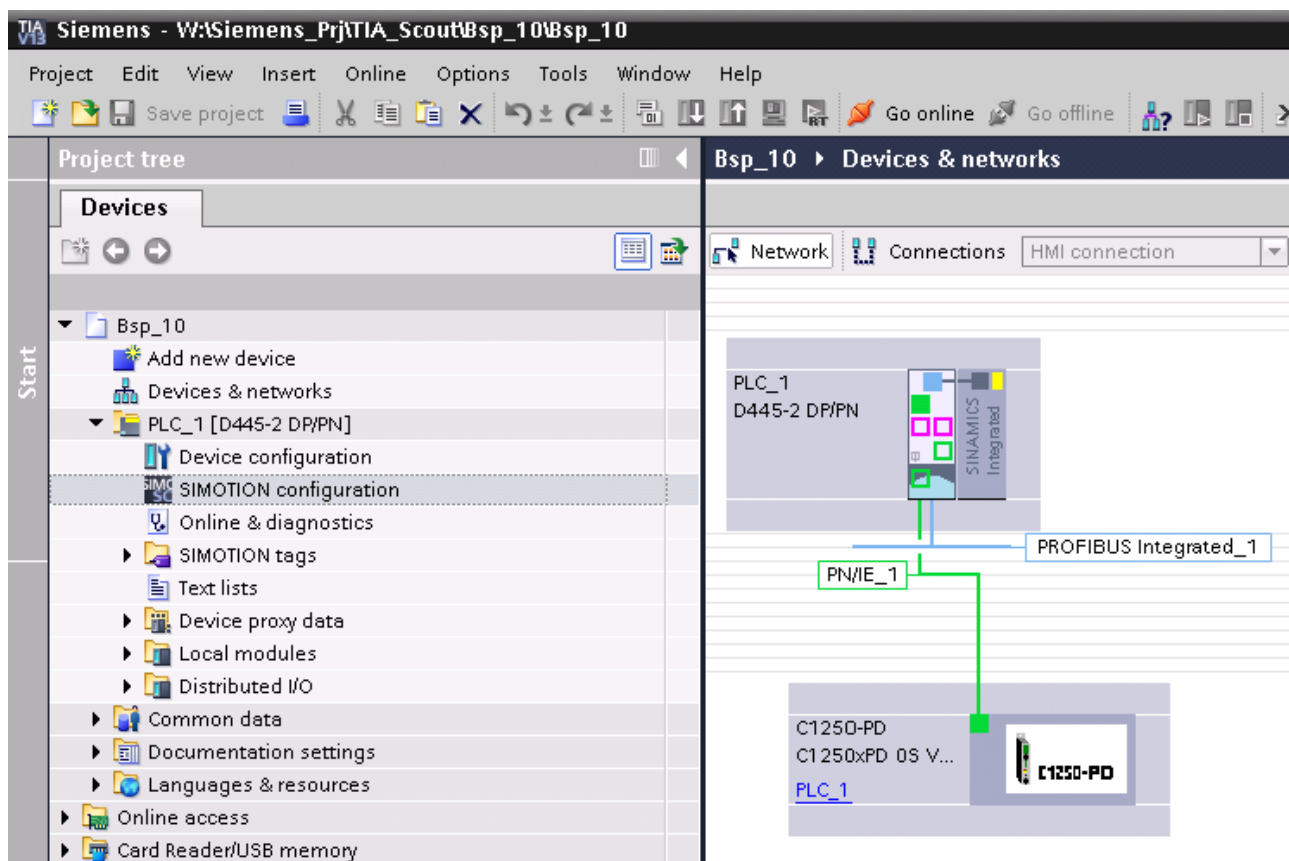


After successful download you get ask for starting the devices select "Start all" check box and click the "Finish" button.

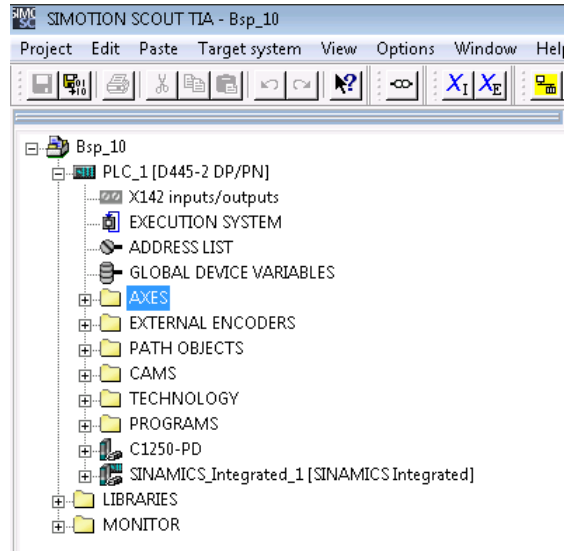


2.3 SIMOTON SCOUT TIA Configuration

Now change to the configuration in the SIMOTION SCOUT configuration tool by double clicking the "SIMOTION configuration" in the Project tree.

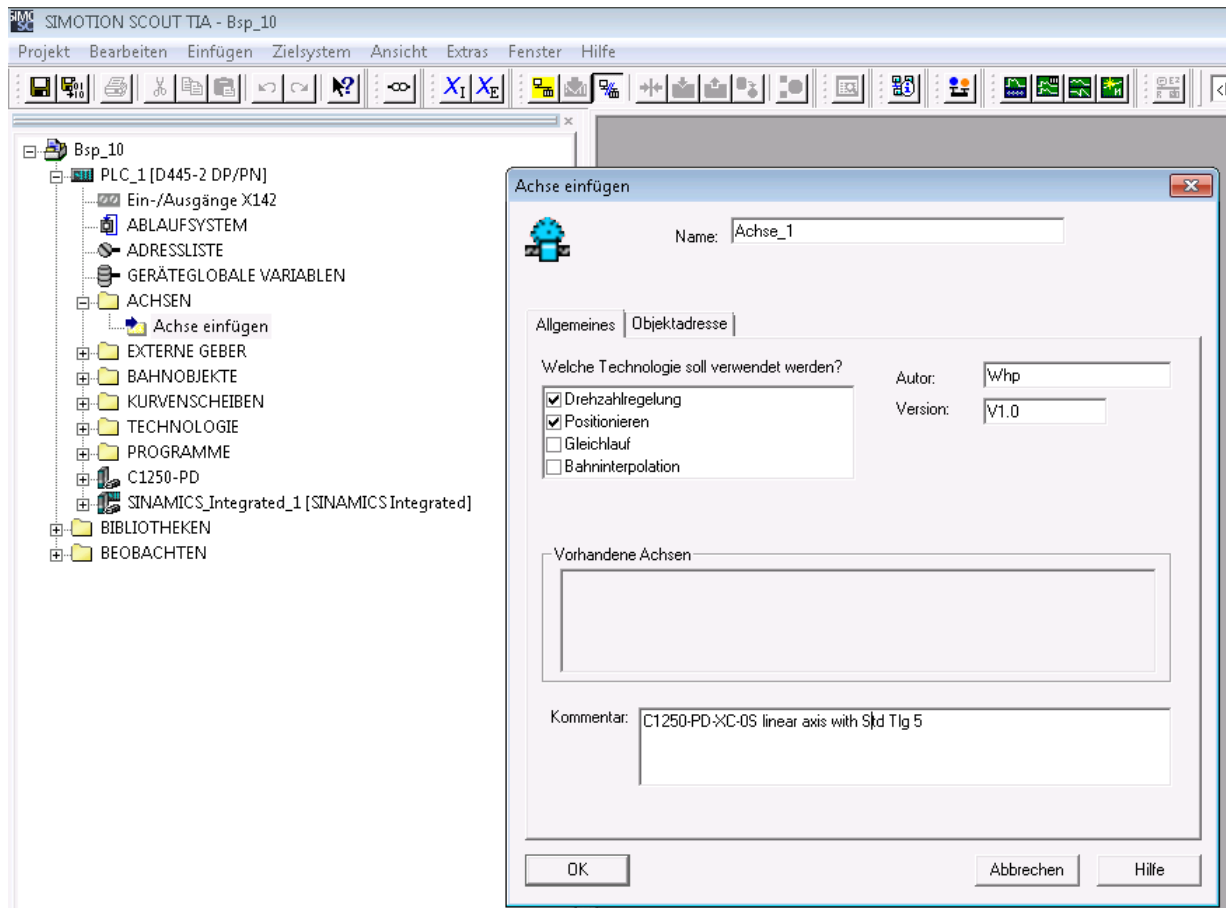


Then the SIMOTION SCOUT TIA tool opens with the configured HW PLC_1 [D445-2DP/PN] and C1250-PD drive.



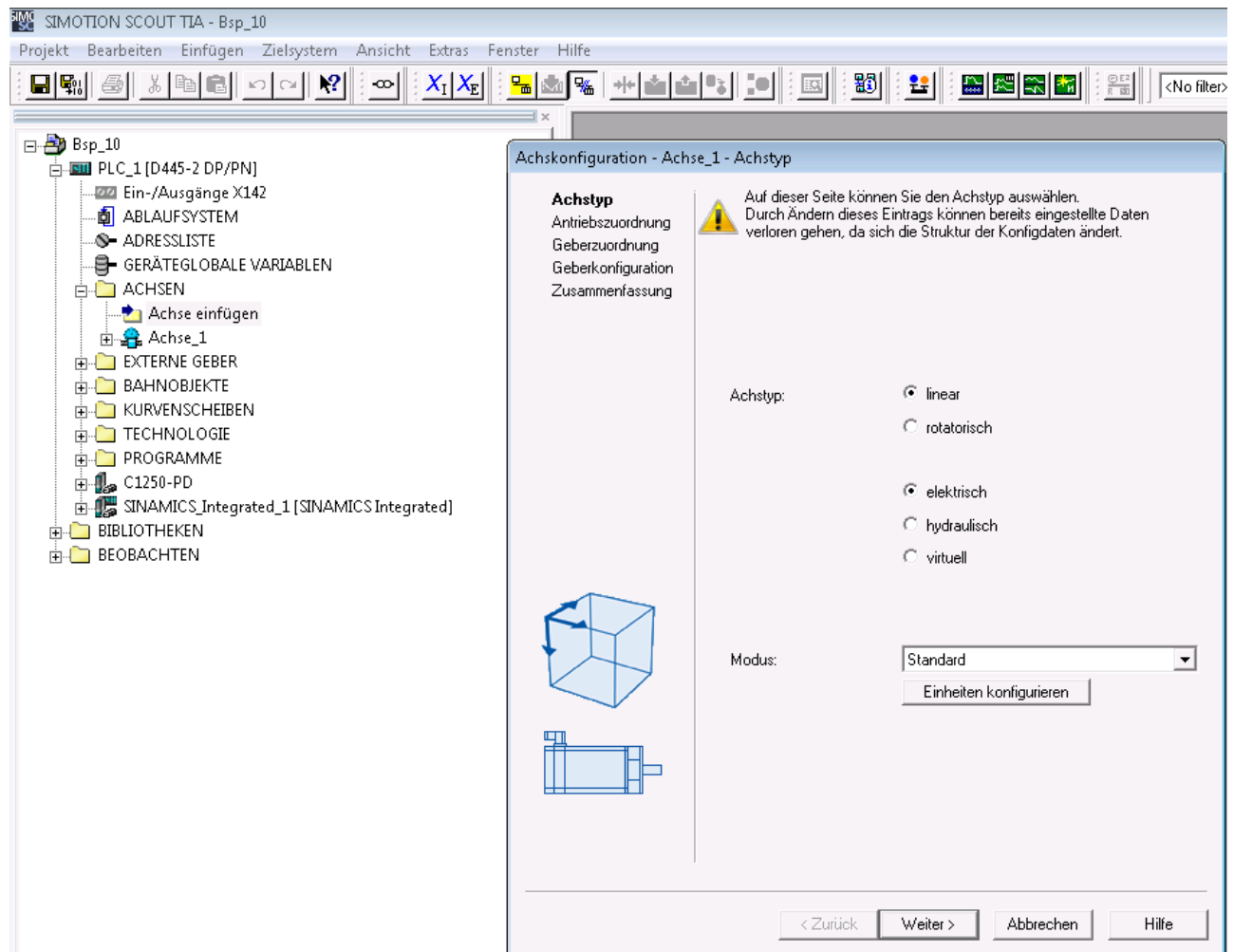
2.3.1 Insert axis

Open the Axes and double click on the “Insert Axis” entry.

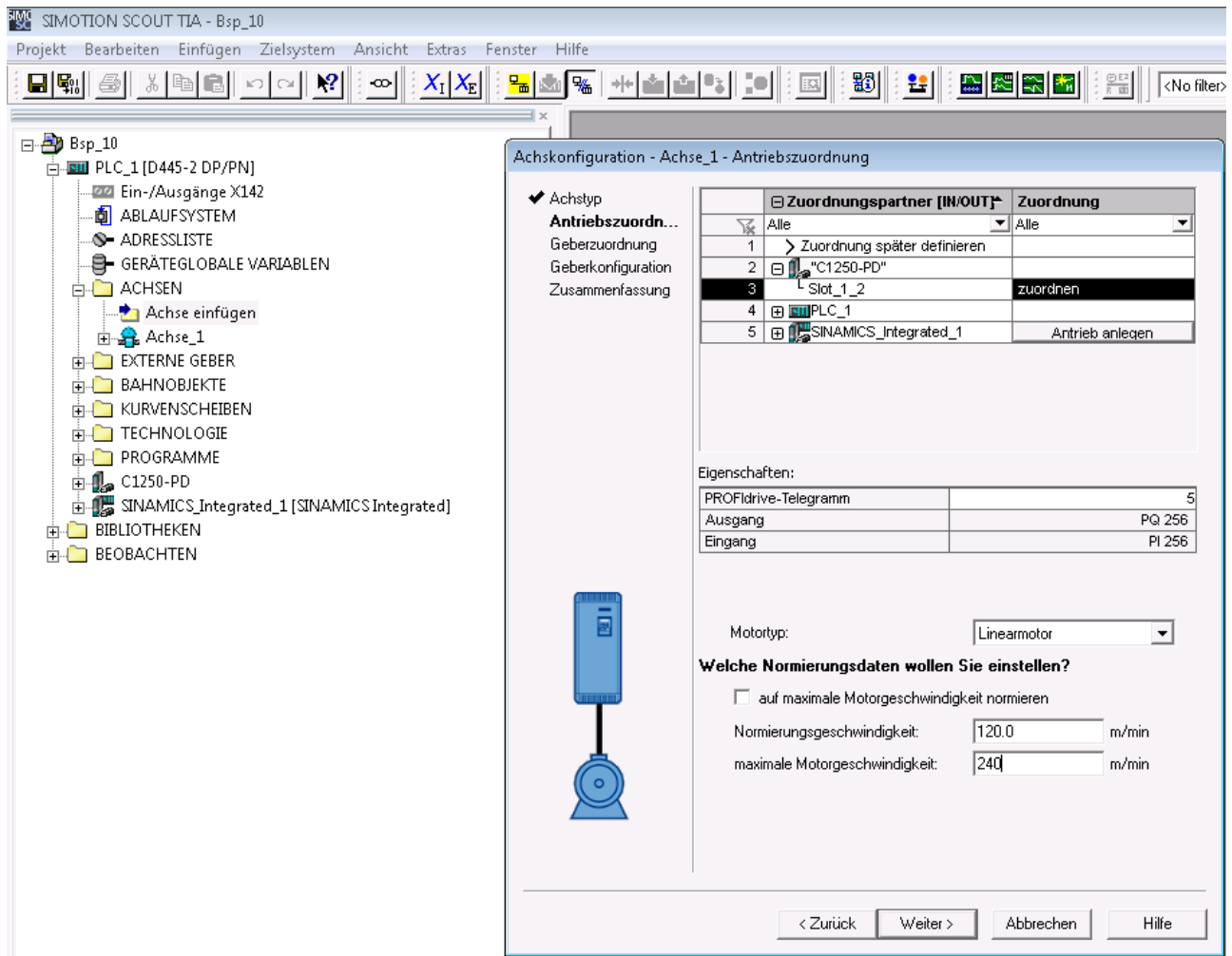


2.3.2 Configure axis

The axis type could be left as suggested, click the next button.



The drive assignment is also correct mapped to the C1250-PD drive, but change the motor type to Linear motor, then click Next>.



In the Encoder assignment change the ??? to linear, then click Next>.

SIMOTION SCOUT TIA - Bsp_10

Projekt Bearbeiten Einfügen Zielsystem Ansicht Extras Fenster Hilfe

Bsp_10

- PLC_1 [D445-2 DP/PN]
 - Ein-/Ausgänge X142
 - ABLAUFSYSTEM
 - ADRESSLISTE
 - GERÄTEGLOBALE VARIABLEN
 - ACHSEN
 - Achse einfügen
 - Achse_1
 - EXTERNE GEBER
 - BAHNOBJEKTE
 - KURVENSCHEIBEN
 - TECHNOLOGIE
 - PROGRAMME
 - C1250-PD
 - SINAMICS_Integrated_1 [SINAMICS Integrated]
 - BIBLIOTHEKEN
 - BEOBACHTEN

Achskonfiguration - Achse_1 - Geberzuordnung

☒ Achstyp
☒ Antriebszuordnung
Geberzuordnung
 Geberkonfiguration
 Zusammenfassung

	Zuordnungspartner [IN/OUT]	Zuordnung
	Alle	Alle
1	> Zuordnung später definieren	
2	> Eingabebaugruppe für Geber...	
3	"C1250-PD"	
4	Slot_1_2	
5	Ch_1	zuordnen
6	PLC_1	
7	SINAMICS_Integrated_1	Geber anlegen

Eigenschaften:

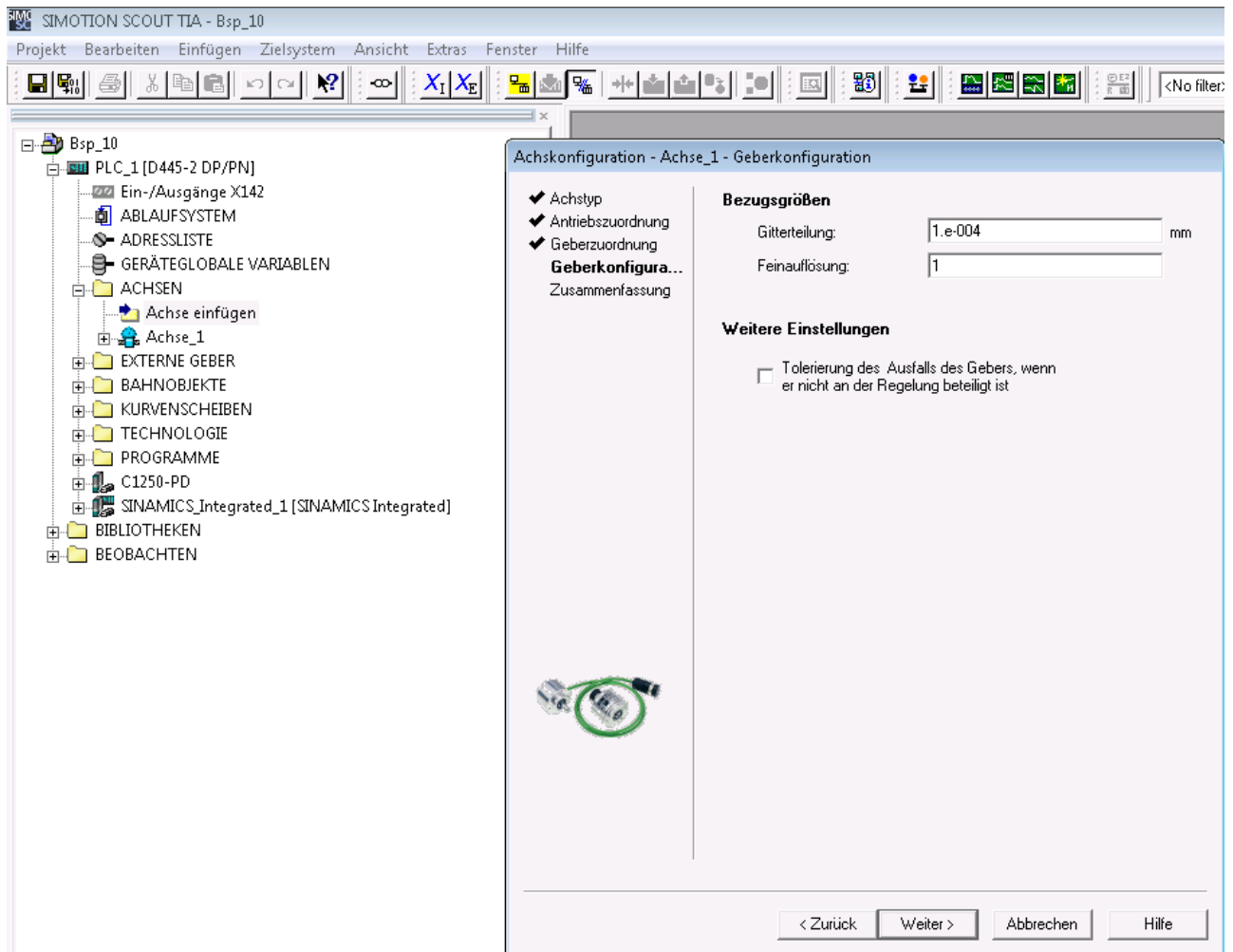
PROFIdrive-Telegramm	5
Ausgang	PQ 256
Eingang	PI 256

Geberverwendung in SIMOTION:

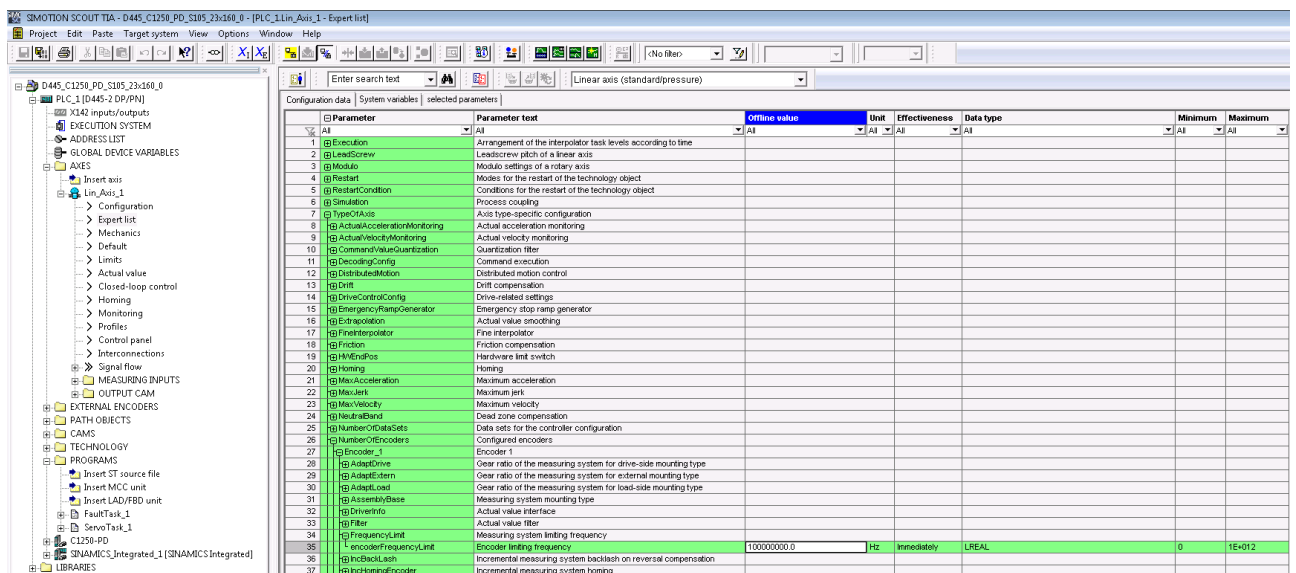
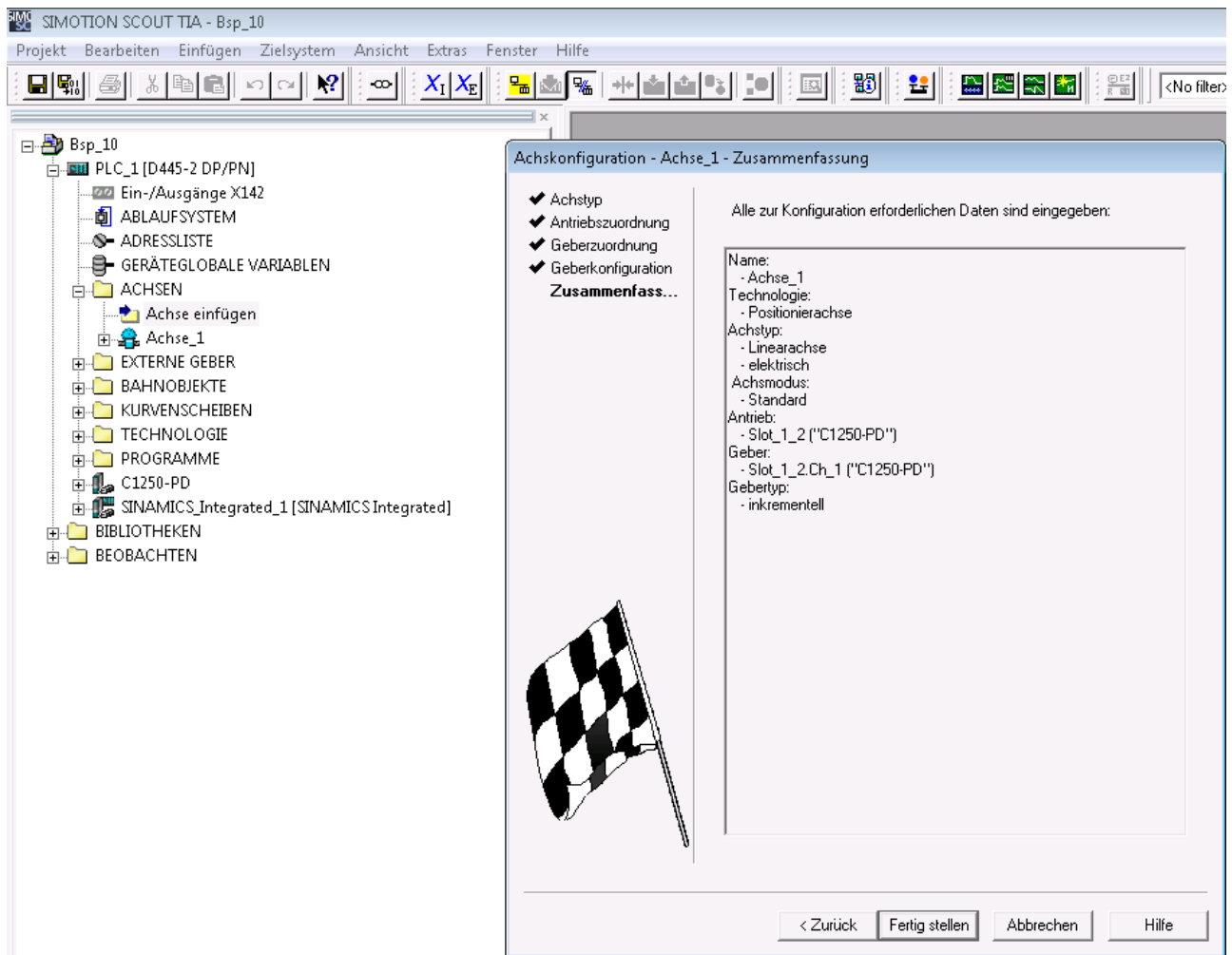
Gebertyp: Inkrementeller Geber
 Gebermodus: Rechteck
 Messsystem: Gebersystem linear (Linearmassstab)

< Zurück Weiter > Abbrechen Hilfe

Change the resolution to 1e-004mm because the NTI drives works with a fix resolution of 100nm. Then Click next>.




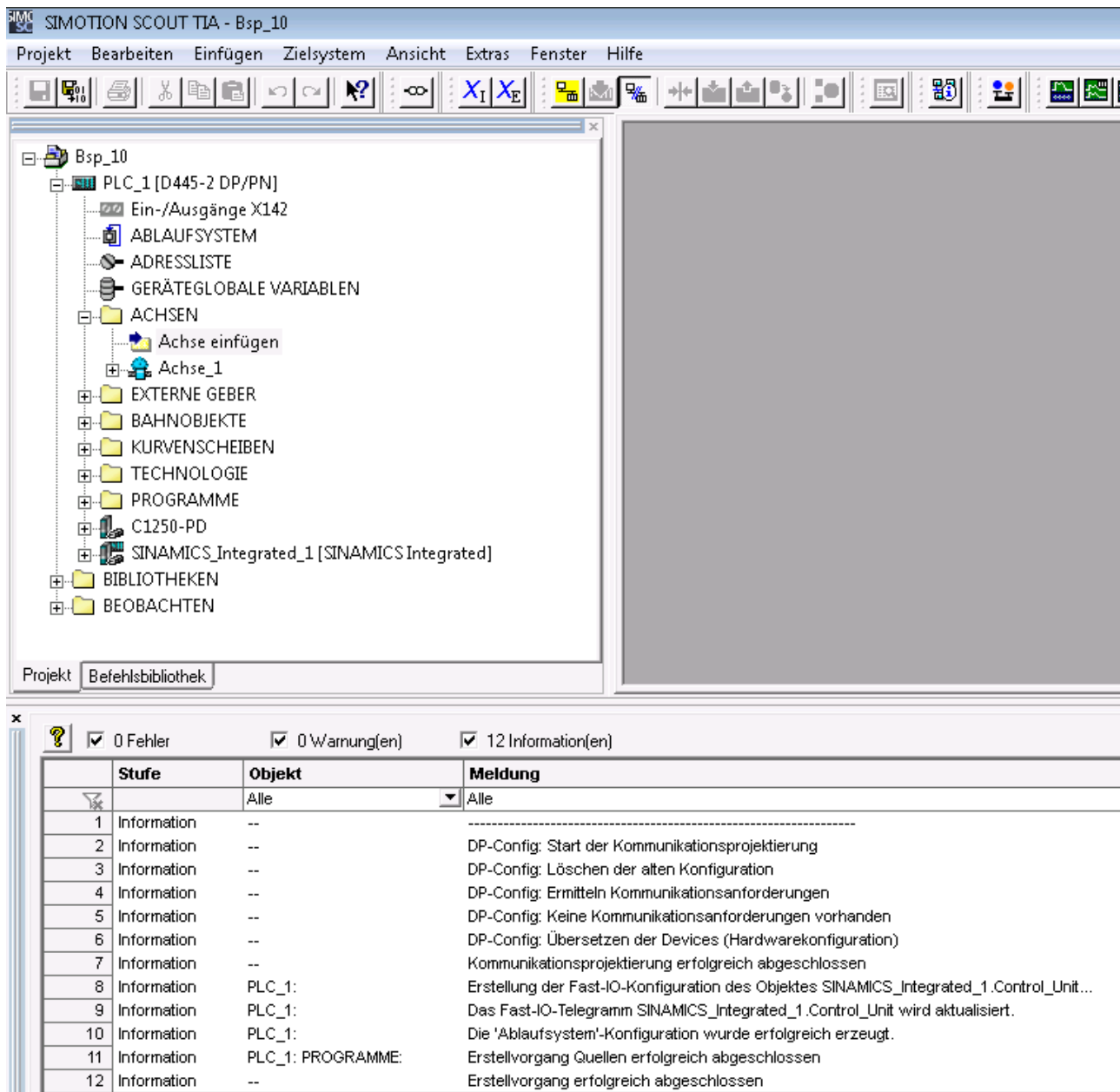
Now a summary of the configured axis appears. Click Finished.



To avoid axis errors due too high encoder frequencies the parameter “encoderFrequencyLimit” has to be increased in the “expert list” Tab “Configuration data” Entry:
 TypeOfAxis/NumberOfEncoders/Encoder_1/FrequencyLimit/encoderFrequencyLimit to 100'000'000. With this value a theoretical maximal velocity of 10m/s is possible, due the encoder resolution of 100nm.


2.3.3 Download SIMOTION SCOUT configuration

Now it is possible to save and compile the project, by clicking the  Toolbox button.

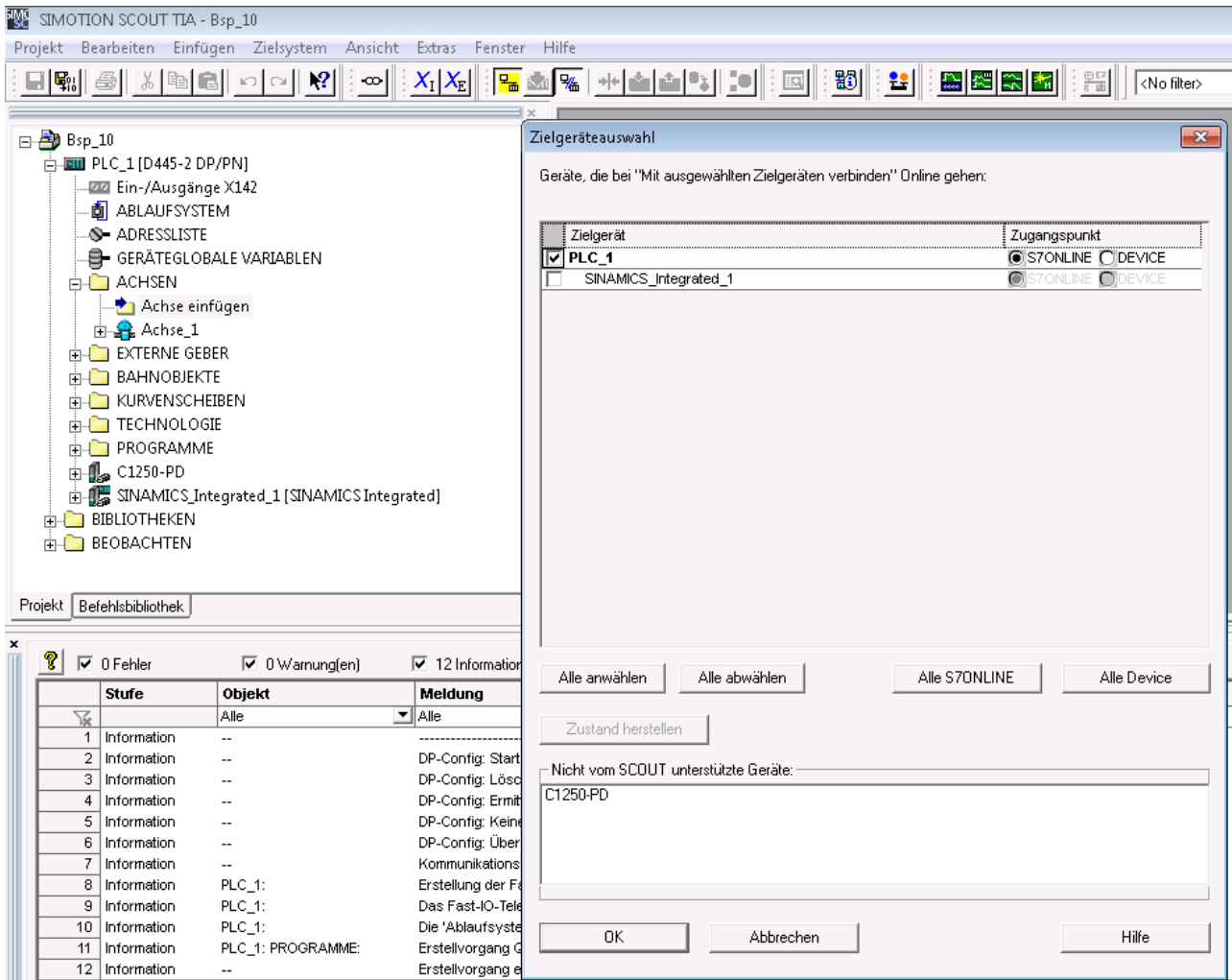



The screenshot shows the SIMOTION SCOUT TIA - Bsp_10 interface. The top menu bar includes Projekt, Bearbeiten, Einfügen, Zielsystem, Ansicht, Extras, Fenster, and Hilfe. The toolbar contains various icons for file operations, editing, and project management. The left pane shows the project tree for Bsp_10, which includes PLC_1 [D445-2 DP/PN] and its sub-components: Ein-/Ausgänge X142, ABLAUFSYSTEM, ADRESSLISTE, GERÄTEGLOBALE VARIABLEN, ACHSEN, Achse_1, EXTERNE GEBER, BAHNOBJEKTE, KURVENSCHEIBEN, TECHNOLOGIE, PROGRAMME, C1250-PD, SINAMICS_Integrated_1 [SINAMICS Integrated], BIBLIOTHEKEN, and BEOBACHTEN. The right pane is empty. The bottom pane shows the message log with 12 information messages.

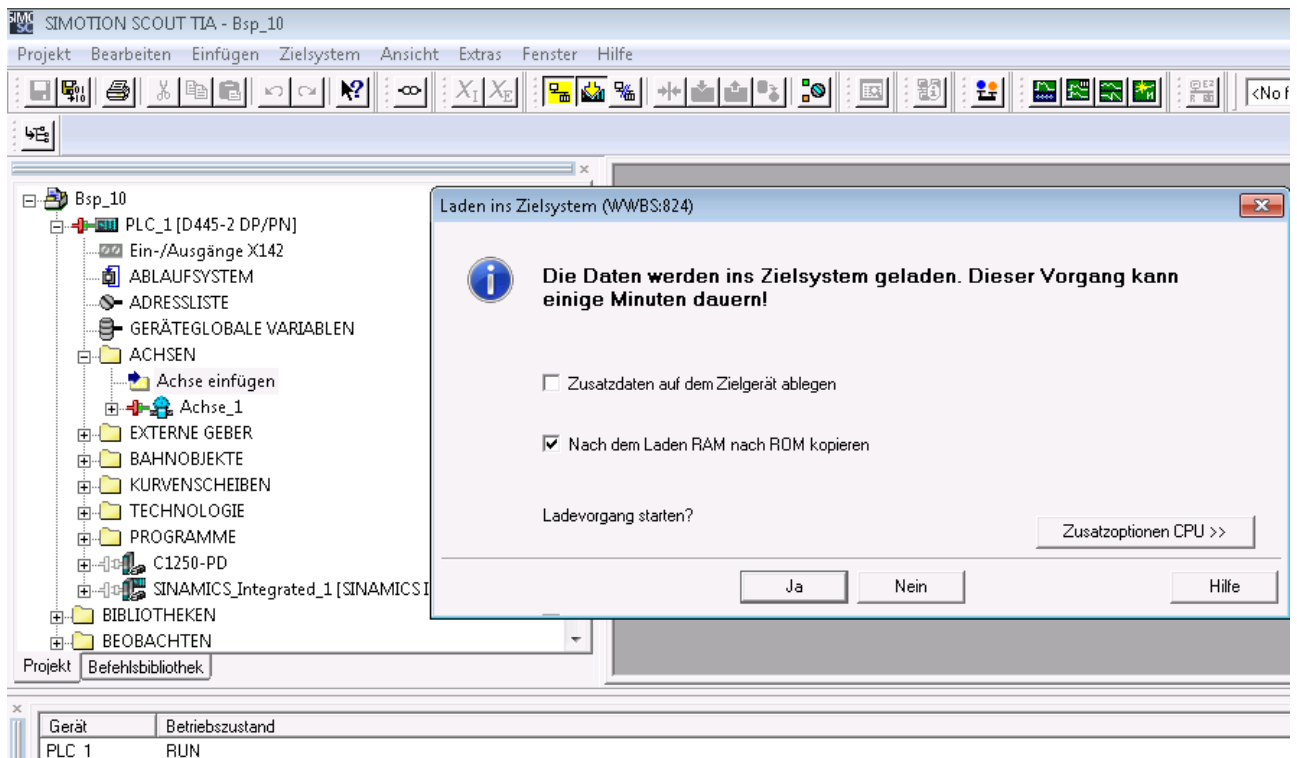
Stufe	Objekt	Meldung
1	Information	--
2	Information	--
3	Information	--
4	Information	--
5	Information	--
6	Information	--
7	Information	--
8	Information	--
9	Information	--
10	Information	--
11	Information	--
12	Information	--

For Downloading the project first connect to the target system, by clicking the button .

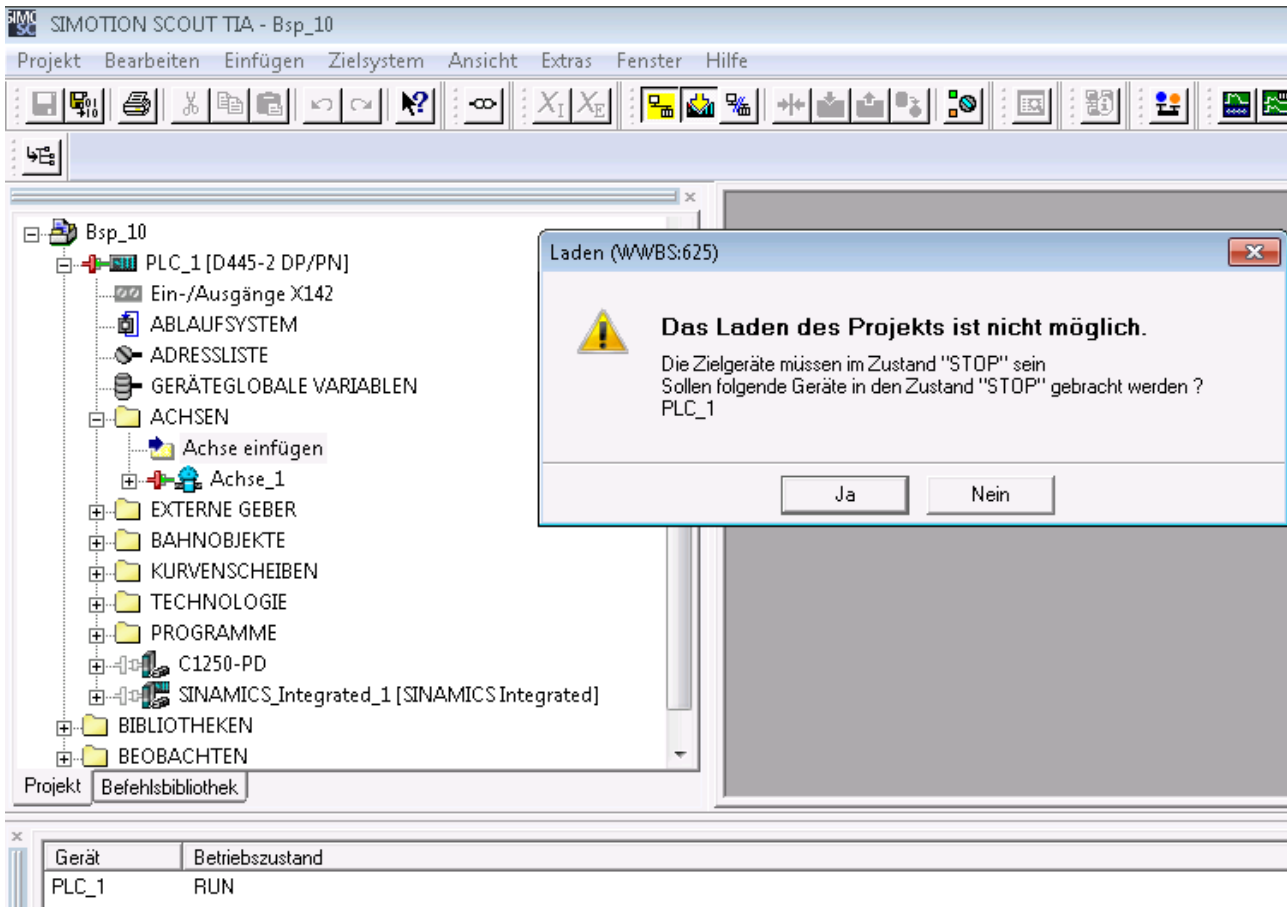
Select the target system, the click OK



For downloading the project, click the  button, and check the „After loading, copy RAM to ROM Checkbox entry, the click the Yes button.



Now the SIMOTION tool ask for stopping the target system, click Yes.



After the successful download, the tool ask for set the RUN mode again click the Yes button.



2.3.4 Move the Axis with the Control panel

Now the system is ready for motion commands over the control panel, to do this double click the "Control panel" entry in the AXES tree.

The screenshot displays the SIMOTION SCOUT TIA - Bsp_10 software interface. The left pane shows the project tree with 'Achse_1' selected under 'ACHSEN'. The right pane is empty. The bottom pane shows the 'PLC_1 - Achse_1' control panel with various status indicators and a data table.

Control Panel Status:

- Steuerungshoheit holen!
- Details...
- Achse beschleunigt
- Achsalarm
- In Betrieb
- Referenziert
- Antriebsfehler
- Freigaben vorhanden
- Leistungsfreigabe

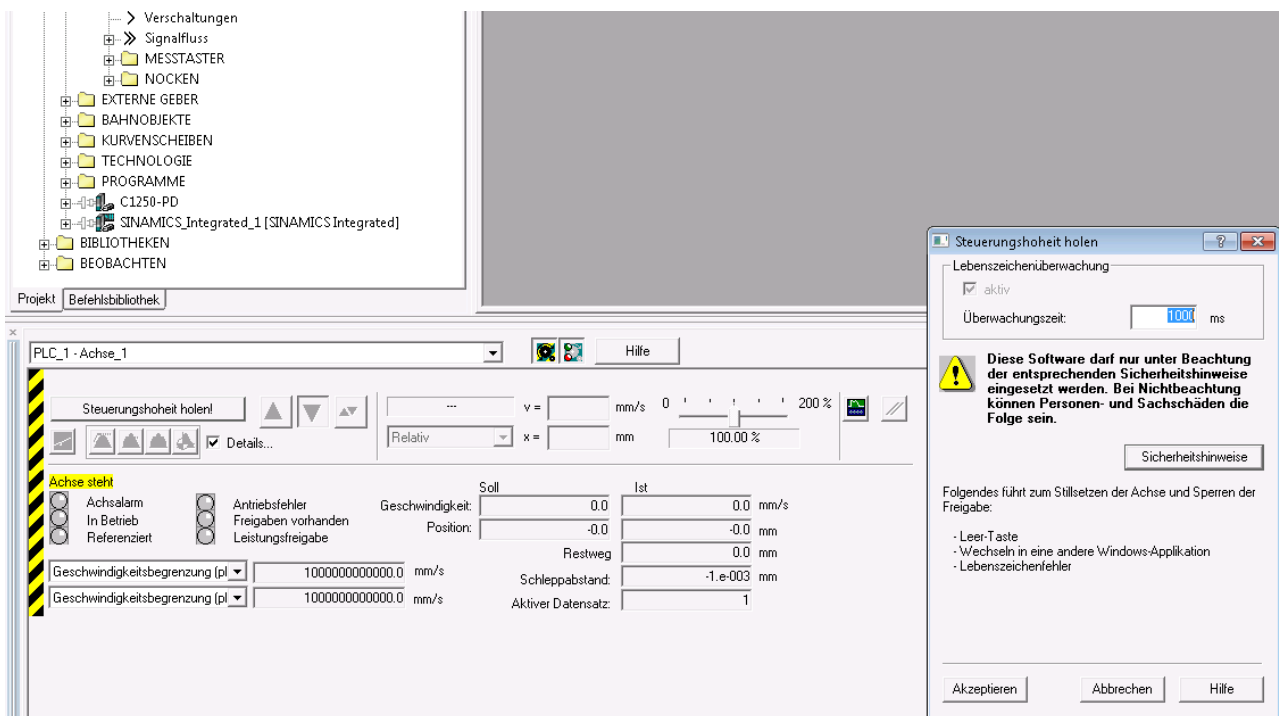
Data Table:

	Soll	Ist	
Geschwindigkeit:	2.1	2.1	mm/s
Position:	4.e-003	-0.0	mm
Restweg		0.0	mm
Schleppabstand:		0.0	mm
Aktiver Datensatz:		1	

In the next step we have to get the control priority click the

Assume control priority!

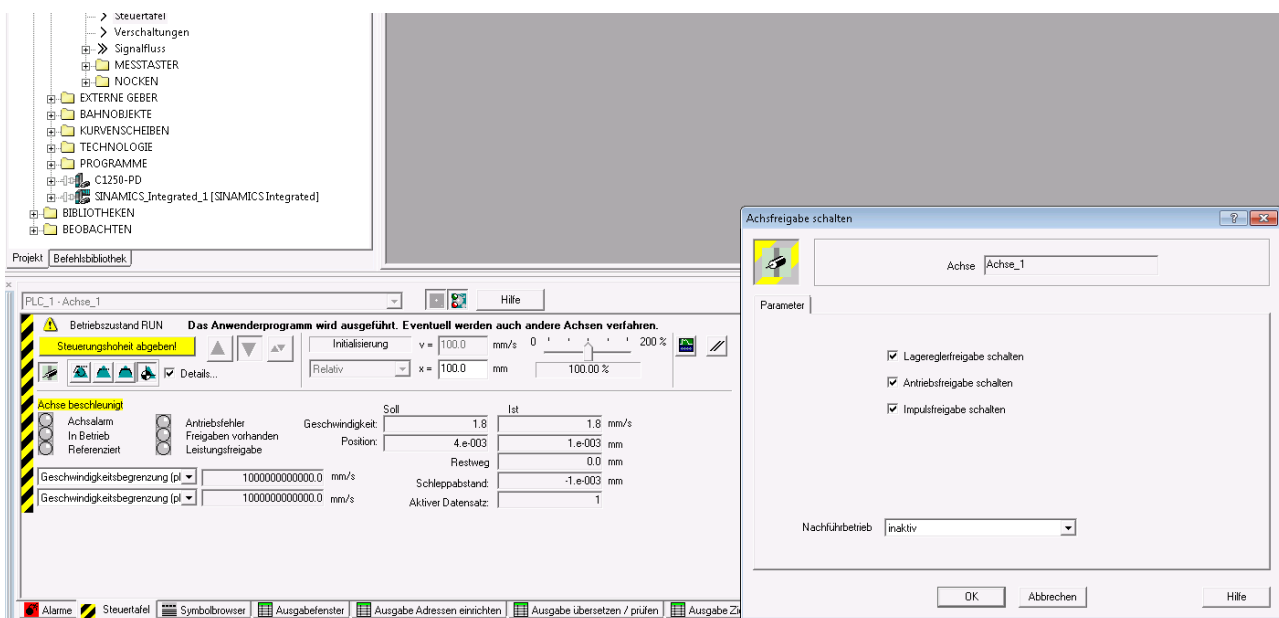
button, then accept the safety note if you could do so.





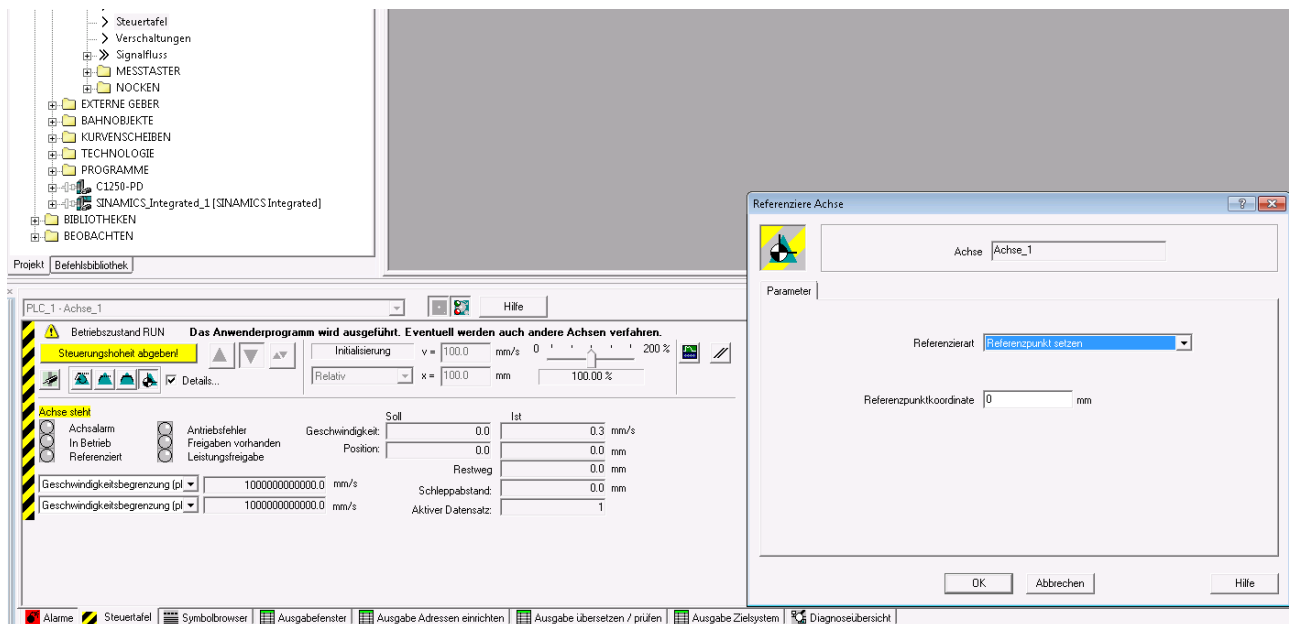
In the next step you have to set the enables, click the



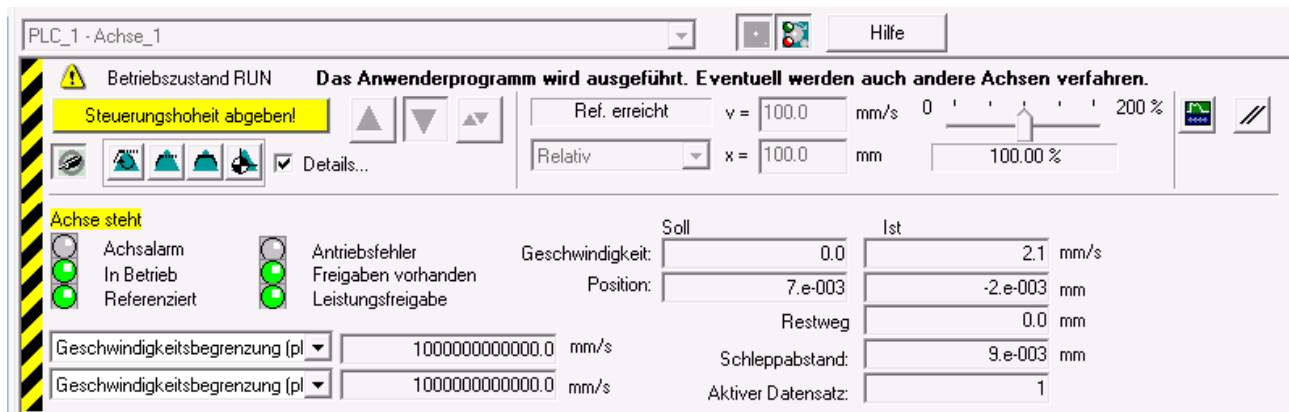
button and then Ok in the appeared popup window. Now the motor is position controlled.




Now Home the axis by clicking the  button, select „set home position,, as Homing type and press Ok, for the action homing you have to press the  Button.



After the homing the green LED left from Homed glows.



Now the axis is ready for absolute position motions. For this click on the  button and select the absolute motion if possible the position could be left at 100mm if your motor have more limited position range reduce this value. Then click OK.

The screenshot displays the LinMot software interface. On the left, a project tree shows a hierarchy of components including 'Steuertafel', 'Verschaltungen', 'Signalfluss', 'MESSTASTER', 'NOCKEN', 'EXTERNE GEBER', 'BAHNOBJEKTE', 'KURVENSCHEIBEN', 'TECHNOLOGIE', 'PROGRAMME', 'C1250-PD', 'SINAMICS_Integrated_1 [SINAMICS Integrated]', 'BIBLIOTHEKEN', and 'BEOBACHTEN'. The main window shows the 'PLC_1 - Achse_1' configuration. A status bar at the top indicates 'Betriebszustand RUN' and 'Das Anwenderprogramm wird ausgeführt. Eventuell werden auch andere Achsen verfahren'. Below this, a 'Steuerungshohheit abgeben!' button is visible. The 'Achse steht' section shows various status indicators: 'Achsalam', 'In Betrieb', 'Referenziert', 'Antriebsfehler', 'Freigaben vorhanden', and 'Leistungsfreigabe'. A table displays speed and position data for 'Soll' (desired) and 'Ist' (actual) values. The 'Positioniere Achse' dialog box is open, showing parameters for 'Achse_1', including 'Position' (100 mm), 'Typ' (Absolut), and 'Geschwindigkeit' (100 mm/s). The dialog has 'OK', 'Abbrechen', and 'Hilfe' buttons.

Positioniere Achse

Achse:

Parameter | Dynamik

Position: mm

Typ:

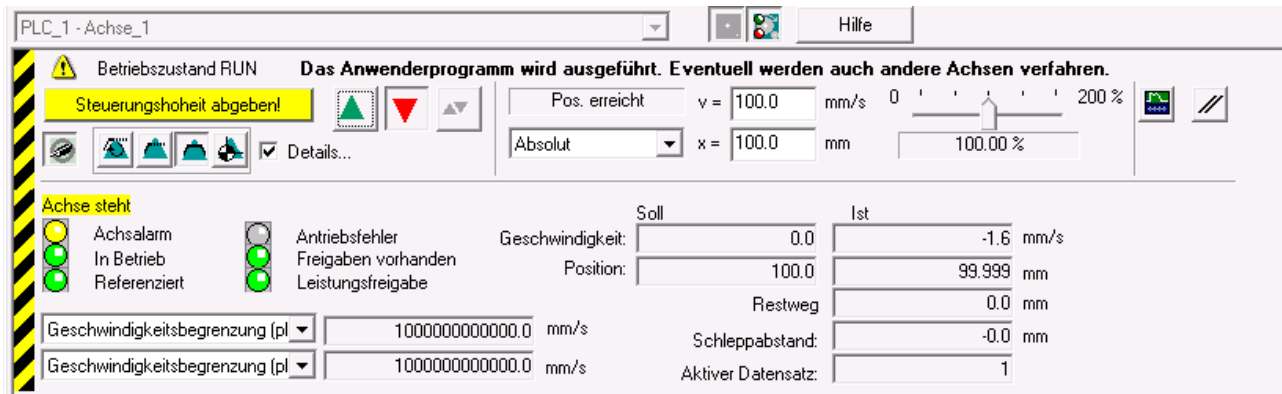
Geschwindigkeit: mm/s


OK Abbrechen Hilfe

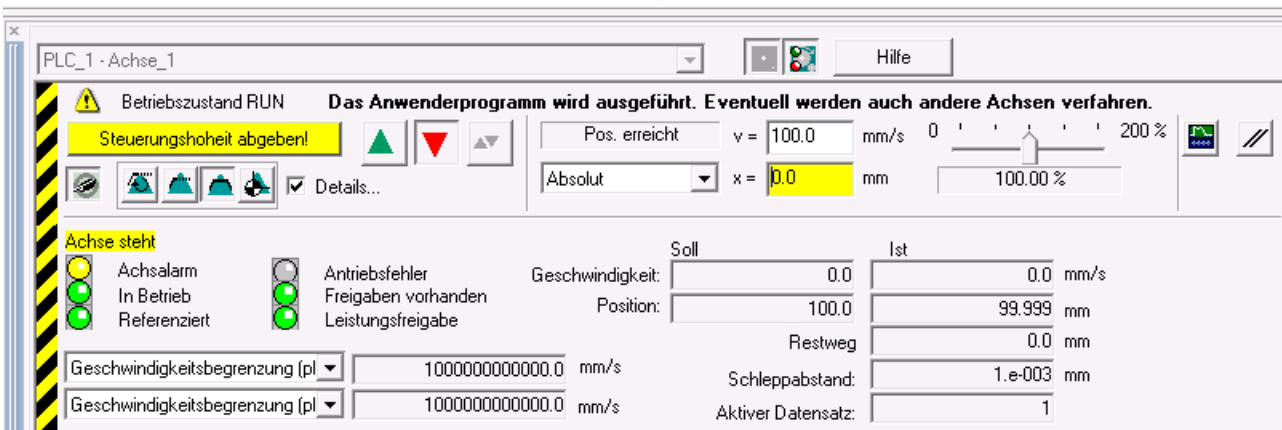
Achse steht	
Achsalam	Antriebsfehler
In Betrieb	Freigaben vorhanden
Referenziert	Leistungsfreigabe
Geschwindigkeitsbegrenzung [pl]	1000000000000.0 mm/s
Geschwindigkeitsbegrenzung [pl]	1000000000000.0 mm/s

Geschwindigkeit	
Soll	Ist
0.0	0.3 mm/s
Position	7.e-003
	4.6e-002 mm
Restweg	0.0 mm
Schleppabstand	-3.8e-002 mm
Aktiver Datensatz	1

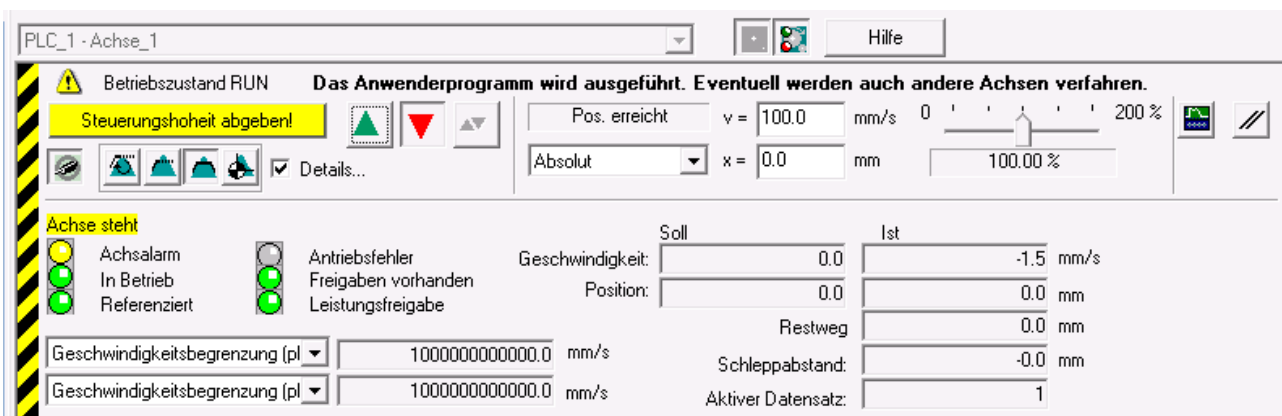
To start the motion, click again the  button.



To move back to 0mm you could directly change the x= value to 0mm, then start the motion with clicking again the  button.



The motor moves back to 0mm and the position changes also back to 0mm.



Before leaving the control panel click the  button.

PLC_1 - Achse_1

Steuerungshoheit holen!

☒ Details...

...

v = 100.0 mm/s

0 100 200 %

Absolut

x = 0.0 mm

100.00 %

Achse beschleunigt

Achsalarm

In Betrieb

Referenziert

Antriebsfehler

Freigeben vorhanden

Leistungsfreigabe

	Soll	Ist
Geschwindigkeit:	2.1	2.1 mm/s
Position:	7.e-003	3.e-003 mm
Restweg		0.0 mm
Schleppabstand:		-2.e-003 mm
Aktiver Datensatz:		1

Geschwindigkeitsbegrenzung (pl)

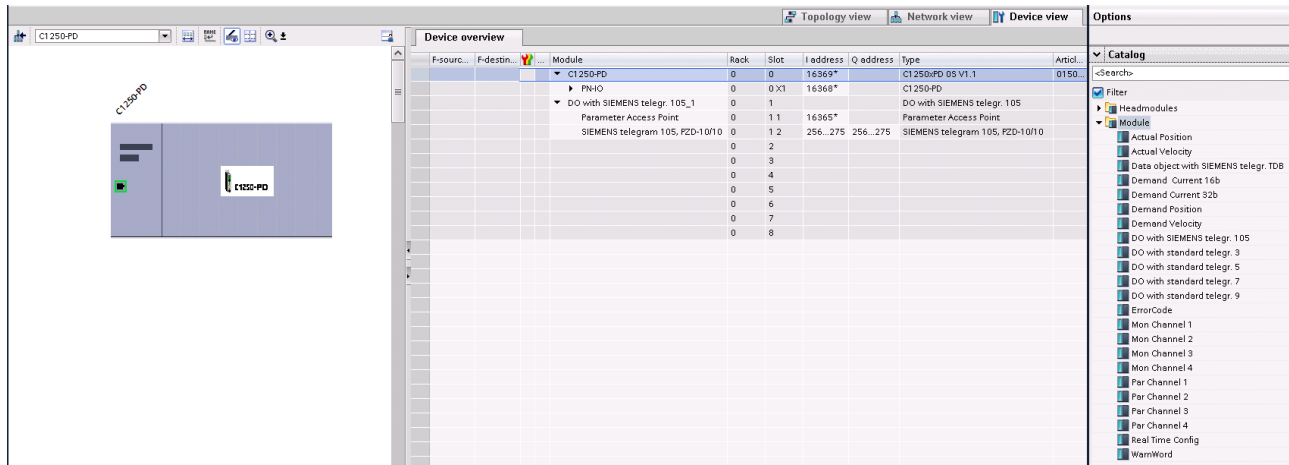
1000000000000.0 mm/s

Geschwindigkeitsbegrenzung (pl)

1000000000000.0 mm/s

3 Process Data Object (PDO) Configuration

The cyclic process data is configured in the master and transmitted to the slave during startup. The data Object modules could be configured by drag and drop to the device slots 1..8.



Overview of the supported Data Objects Modules.

3.1 Bidirectional PDO Modules

Geben Sie hier den Text ein.

3.1.1 Standard telegram 3

The telegram content has speed-setpoint interface, 32 bit, with one sensor

Output Data

Index	Size [Byte]	Byte Offset	Name	Data Type
Tlg 3	10	-	Variables	RECORD
1	2	0	STW1	UInt16
2, 3	4	2	NSOLL_B	Int32
4	2	6	STW2	UInt16
5	2	8	G1_STW	UInt16

Input Data

Index	Size [Byte]	Byte Offset	Name	Data Type
Tlg 3	18	-	Variables	RECORD
1	2	0	ZSW1	UInt16
2, 3	4	2	NIST_B	Int32
4	2	6	ZSW2	UInt16
5	2	8	G1_ZSW	UInt16
6, 7	4	10	G1_XIST_1	Int32
8, 9	4	14	G1_XIST_2	Int32

3.1.2 Standard telegram 5

The standard telegram 5 is derived from standard telegram 3 for additional use of the Dynamic Servo Control (DSC). The telegram contain speed-setpoint interface, 32 bit with one sensor, additionally position difference and position controller gain in the setpoint direction for DSC.

Output Data

Index	Size [Byte]	Byte Offset	Name	Data Type
Tlg 5	18	-	Variables	RECORD
1	2	0	STW1	UInt16
2, 3	4	2	NSOLL_B	Int32
4	2	6	STW2	UInt16
5	2	8	G1_STW	UInt16
6, 7	4	10	XERR	Int32
8, 9	4	14	KPC	Int32

Input data

Index	Size [Byte]	Byte Offset	Name	Data Type
Tlg 5	18	-	Variables	RECORD
1	2	0	ZSW1	UInt16
2, 3	4	2	NIST_B	Int32
4	2	6	ZSW2	UInt16
5	2	8	G1_ZSW	UInt16
6, 7	4	10	G1_XIST_1	Int32
8, 9	4	14	G1_XIST_2	Int32

3.1.3 Standard telegram 7

The standard telegram 7 is defined for positioning mode.
Content: Positioning interface (Program submode)

Output Data

Index	Size [Byte]	Byte Offset	Name	Data Type
Tlg 7	4	-	Variables	RECORD
1	2	0	STW1	UInt16
2	2	2	SATZANW	UInt16

Input Data

Index	Size [Byte]	Byte Offset	Name	Data Type
Tlg 7	4	-	Variables	RECORD
1	2	0	ZSW1	UInt16
2	2	2	AKTSATZ	UInt16

3.1.4 Standard telegram 9

The standard telegram 9 is also defined for positioning mode.

Content: Positioning interface (Program sub-mode plus Manual Data Input sub-mode)

3.1.4.1 Output Data

Index	Size [Byte]	Byte Offset	Name	Data Type
Tlg 9	20	-	Variables	RECORD
1	2	0	STW1	Uint16
2	4	2	SATZANW	Uint16
3	2	4	STW2	Uint16
4, 5	2	6	MDI_TARPOS	Int32
6, 7	4	10	MDI_VELOCITY	Int32
8	2	14	MDI_ACC	Uint16
9	2	16	MDI_DEC	Uint16
10	2	18	MDI_MOD	Uint16

Details Of STW1

Bit	Name	Significance
0	ON/OFF	Switched On (1) / Power-Down (0)
1	No STO active / STO active	No STO (1) / STO active (0)
2	No Quick Stop / Quick Stop	No Quick Stop (1) / Quick Stop (0)
3	Enable Operation / Disable Operation	Enable Operation (1) / Inhibit Operation (0)
4	Abort - forced by parameter	No Abort (1) / Abort (0)
5	Freeze - forced by parameter	No Freeze (1) / Freeze (0)
6	Go To Position	Activate traversing task or a new MDI setpoint (0 -> 1)
7	Error Acknowledge	The group signal is acknowledged with a positive edge (0 -> 1)
8	Jog Move +	Jog 1 signal source
9	Jog Move -	Jog 2 signal source
10	Control via PLC	Control by PLC (1) / No Control by PLC (0)
11	Home	Start Homing (1) / No Homing (0)

Details of SATZANW

Bit	Name	Significance
0 -9	The Command Table Entry ID is entered here	The Command Table Entry ID can be from 0 to 255. This is used in Command Table Entry mode
10 -14	Reserved	
15	MDI selection	Activation of MDI submode (1) / Deactivation of MDI submode (0)

STW2 - This is not used

MDI_TARPOS is MDI target position

MDI_VELOCITY is MDI target velocity

MDI_ACC is MDI acceleration

MDI_DEC is MDI deceleration

If MDI_MOD = 0, VAI Increment (Relative) Demand Position Command is used (011xh).

If MDI_MOD = 1, VAI Go to absolute positioning mode command (010xh) is used.

Telegram 9 supports the Command Table entry when the Traversing task is activated (STW1.bit6) along with No Abort and No Freeze and when no MDI is activated (SATZANW.bit 15). In this scenario "Set Command Table Command" 200xh is selected. The Command Table Entry ID which is taken as the parameter of the Command Table Command has to be programmed in SATZANW.bit 0-9.

3.1.4.2 Input Data

Index	Size [Byte]	Byte Offset	Name	Data Type
Tlg 9	10	-	Variables	RECORD
1	2	0	ZSW1	Uint16
2	2	2	AKTSATZ	Uint16
3	2	4	ZSW2	Uint16
4, 5	4	6	XIST_A	Int32

Details of ZSW1

Bit	Name	Significance
0	Ready To Switch On	Ready for switching ON (1) / Not Ready for Switch ON (0)
1	Ready To Operate	Ready to Operate (1) / Not Ready to Operate (0)
2	Operation Enabled	Operation Enabled (1) / Operation Disabled (0)
3	Fault Present	Fault Present (1) / No fault (0)
4	Coast Stop Not activated	No Abort (1) / Abort (0)
5	QuickStop Not activated	No Freeze (1) / Freeze (0)
6	Switch ON Inhibited	Switch On Inhibited (1) / Switch On Not Inhibited (0)
7	Warning Present	Warning Present (1) / No Warning Present (0)
8	Within Tolerance Range	Following Error within tolerance range (1) / Following Error out of tolerance range (0)
9	Control Request	Target Position Reached (1) / Not at Target Position (0)
10	Target Reached	Control by PLC (1) / No control by PLC (0)
11	Homing Position Set	Home Position Set (1) / Home Position Not set (0)
12	Traversing Task Acknowledgment	Using positive edge 0->1, it is acknowledged that a new traversing task or MDI set-point was accepted
13	Drive Stopped	Drive Stopped (1) / Drive Moving (0)

Details of AKTSATZ

Bit	Name	Significance
0 -9	The evaluated Command Table Entry ID	This is active when telegram 9 is used for Command Table Command

Bit	Name	Significance
10 -14	Reserved	
15	Status of sub-mode switch and currently active submode	1 if MDI sub-mode active, The input values for the motion command will be taken from MDI_TARPOS, MDI_VELOCITY, MDI_ACC and MDI_DEC.

XIST_A is position actual value.

3.1.5 Siemens telegram 105

Siemens telegram 105 can only support IRT mode.

Output Data

Index	Size [Byte]	Byte Offset	Name	Data Type
Tlg 105	20	-	Variables	RECORD
1	2	0	STW1	UInt16
2, 3	4	2	NSOLL_B	Int32
4	2	6	STW2	UInt16
5	2	8	TORQUERED	UInt16
6	2	10	G1_STW	UInt16
7, 8	4	12	XERR	Int32
9, 10	4	16	KPC	Int32

The telegram part TORQRED is mapped to the MC SW parameter with UPID 0x1399 "Motor relative Max Current Limit".

Input Data

Index	Size [Byte]	Byte Offset	Name	Data Type
Tlg 105	20	-	Variables	RECORD
1	2	0	ZSW1	UInt16
2, 3	4	2	NIST	Int32
4	2	6	ZSW2	UInt16
5	2	8	MELDW	UInt16
6	2	10	G1_ZSW	UInt16
7, 8	4	12	G1_XIST_1	Int32
9, 10	4	16	G1_XIST_2	Int32

Details of MELDW

Bit	Name	Significance
1	MELDW.1	1 = Torque utilization [%] < torque threshold value 2
6	MELDW.6	1 = No motor overtemperature alarm
7	MELDW.7	1 = No alarm, thermal overload, power unit
11	MELDW.11	1 = Controleur enable

3.1.6 Siemens telegram TDB 200

The Siemens telegram 200 is used on Simotion PLC.

Output Data

Index	Size [Byte]	Byte Offset	Name	Data Type
Tlg TDB	6	-	Variables	RECORD
1	2	0	M_Add	Int16
2	2	2	(B+) pos torque Limit	Uint16
3	2	4	(B-) neg torque Limit	Uint16

The additional torque (M_Add) is calculated with UPID 0x119E (maximal Motor Current) and written to UPID 0x139C or 0x13B0 depending on which control parameter set is active.

The additional torque is standardised by 4000h. The unit of M_Add is N (or Nm if rotary).

Value at UPID 0x139C/ 0x13B0 = M_Add * maximal Motor Current / 4000h

The torque limits B+ and B- are also calculated with UPID 0x119E (maximal Motor Current) and written to UPID 0x13FC/0x13FD or 0x13FE/0x13FF depending on which control parameter set is active.

The unit of (B+) pos torque Limit and (B-) neg torque Limit are N (or Nm if rotary).

Value at UPID 0x13FC/0x13FE = (B+) pos torque Limit * maximal Motor Current / 4000h

Value at UPID 0x13FD/0x13FF = -(B-) neg torque Limit * maximal Motor Current / 4000h

Input Data

Index	Size [Byte]	Byte Offset	Name	Data Type
Tlg TDB	20	-	Variables	RECORD
1	2	0	M_act	Int16

M_act is the standardised actual torque/ force.

For linear motor, $M_{act} = \text{Motor Actual Force (UPID 0x1BFF)} / \text{Motor Maximim Force (UPID 0x1BB0)} * 0x4000$. The unit is N.

For rotary motor, $M_{act} = \text{Motor Actual Torque (UPID 0x1BBF)} / \text{Motor Maximim Torque (UPID 0x1BBE)} * 0x4000$. The unit is Nm.

3.1.7 Real Time Config telegram 404

Output Data

Index	Size [Byte]	Byte Offset	Name	Data Type
Tlg 404	8	-	Variables	RECORD
1	2	0	Config Control Word	Uint16
2	2	2	Config Index/..	Uint16
4, 5	4	4	Config Value	Word32

Input Data

Index	Size [Byte]	Byte Offset	Name	Data Type
Tlg 404	8	-	Variables	RECORD
1	2	0	Config Status Word	Uint16
2	2	2	Config Index/..	Uint16

Index	Size [Byte]	Byte Offset	Name	Data Type
4, 5	4	4	Config Value	Word32

Please refer to the document 0185-1074-E_1V7_MA_Drive-Configuration-Over-Fieldbus-SG5-SG7.pdf [2] from LinMot for more details.

3.2 Output PDO Modules

3.2.1 Par Channel 1 telegram 417

Index	Size [Byte]	Byte Offset	Name	Data Type
Tlg 417	4	-	Variables	RECORD
1, 2	4	0	Parameter Channel 1	Word32

3.2.2 Par Channel 2 telegram 418

Index	Size [Byte]	Byte Offset	Name	Data Type
Tlg 418	4	-	Variables	RECORD
1, 2	4	0	Parameter Channel 2	Word32

3.2.3 Par Channel 3 telegram 419

Index	Size [Byte]	Byte Offset	Name	Data Type
Tlg 419	4	-	Variables	RECORD
1, 2	4	0	Parameter Channel 3	Word32

3.2.4 Par Channel 4 telegram 420

Index	Size [Byte]	Byte Offset	Name	Data Type
Tlg 420	4	-	Variables	RECORD
1, 2	4	0	Parameter Channel 4	Word32

3.3 Input PDO Modules

3.3.1 Actual Position telegram 405

Index	Size [Byte]	Byte Offset	Name	Data Type
Tlg 405	4	-	Variables	RECORD
1, 2	4	0	Actual Position	Int32

3.3.2 Demand Position telegram 406

Index	Size [Byte]	Byte Offset	Name	Data Type
Tlg 406	4	-	Variables	RECORD
1, 2	4	0	Demand Position	Int32

3.3.3 WarnWord telegram 407

Index	Size [Byte]	Byte Offset	Name	Data Type
Tlg 407	2	-	Variables	RECORD
1	2	0	WarnWord	UInt16

3.3.4 ErrorCode telegram 408

Index	Size [Byte]	Byte Offset	Name	Data Type
Tlg 408	2	-	Variables	RECORD
1	2	0	ErrorCode	UInt16

3.3.5 Demand Current 32b telegram 409

Index	Size [Byte]	Byte Offset	Name	Data Type
Tlg 409	4	-	Variables	RECORD
1, 2	4	0	Demand Current 32b	Int32

3.3.6 Mon Channel 1 telegram 410

Index	Size [Byte]	Byte Offset	Name	Data Type
Tlg 410	4	-	Variables	RECORD
1, 2	4	0	Mon Channel 1	Word32

3.3.7 Mon Channel 2 telegram 411

Index	Size [Byte]	Byte Offset	Name	Data Type
Tlg 411	4	-	Variables	RECORD
1, 2	4	0	Mon Channel 2	Word32

3.3.8 Mon Channel 3 telegram 412

Index	Size [Byte]	Byte Offset	Name	Data Type
Tlg 412	4	-	Variables	RECORD
1, 2	4	0	Mon Channel 3	Word32

3.3.9 Mon Channel 4 telegram 413

Index	Size [Byte]	Byte Offset	Name	Data Type
Tlg 413	4	-	Variables	RECORD
1, 2	4	0	Mon Channel 4	Word32

3.3.10 Demand Current 16b telegram 414

Index	Size [Byte]	Byte Offset	Name	Data Type
Tlg 414	2	-	Variables	RECORD
1	2	0	Demand Current 16b	Int16

3.3.11 Actual Velocity telegram 415

Index	Size [Byte]	Byte Offset	Name	Data Type
Tlg 415	4	-	Variables	RECORD
1, 2	4	0	Actual Velocity	Int32

3.3.12 Demand Velocity telegram 416

Index	Size [Byte]	Byte Offset	Name	Data Type
Tlg 416	4	-	Variables	RECORD
1, 2	4	0	Actual Velocity	Int32

4 Asynchronous Configuration Protocol

For configuration purpose (Parameter Handling) the standard PROFINET Protocol is used.

With a SIMOTION master the `_writerecord()` and `_readrecord()` system function could be used to access the parameters.

4.1 PROFIdrive Profile Area

PNU	Name	Access
922	Telegram selection	r
924	Status word bit Pulses Enabled	r
925	Number of Controller Sign-Of-Life failures which may be tolerated	r
928	Control priority DO IO Data	r
930	Operating mode	r
944	Fault message counter	r
947	Fault number	r
950	Scaling of the fault buffer	r
951	Fault number list with text	r
952	Fault situation counter	r

PNU	Name	Access
953	Warning parameters	r
964	Drive Unit identification	r
965	Profile identification number	r
974	Base Mode Parameter Access service identification	r
975	DO identification	r
980	Number list of defined parameter	r
60000	Velocity reference value(not yet implemented)	r

LinMot PROFIdrive Object Dictionary

4.2 Manufacturer specific Profile Area

The RAM/ROM value of the drive parameters could be accessed by its parameter number (UPID) added with an offset of 0x2000 (UPID+0x2000).

4.3 Suported Services

The table below shows the services (request IDs) which are supported for parameter acces.

Request ID	Description
0x01	Request Parameter, reads the RAM value of the parameter
0x02	Change parameter, changes the RAM value of the parameter
0x41	Read ROM value of parameter, only valid with value attribute
0x42	Write ROM value of parameter, only valid with the value attribute

5 PROFIdrive Parameters

5.1 Parameters



Attention: The PROFIdrive Interface has an additional parameter tree branch (Parameters → Profinet), which can be configured with the distributed LinMot-Talk software.

With these parameters, the PROFIdrive interface can be enabled or disabled.
The LinMot-Talk software can be downloaded from <http://www.linmot.com> under the section download, software & manuals.

5.1.1 PROFdrive/Dis-/Enable

With the Dis-/Enable parameter the LinMot Servo Drive can be run without the Ethernet PROFIdrive Interface going online. So in a first step the system can be configured and run without any bus connection.

PROFdrive/Dis-/Enable

Disable	Servo Drive runs without PROFINET.
Enable	Servo Drive runs with PROFINET connection.

IMPORTANT: If the PROFIdrive Interface is disabled, the integrated TPS1-ASIC rests in reset state! No messages will be sent to other devices connected to the PROFINET-Network via the servo drive.

5.1.2 PROFdrive/Byte Order

With the Byte Order parameter the used Byte order of the transmitted data could be defined.

PROFdrive/Byte Order

reversed	Byte order is reversed. For S7 PLC_s select reversed.
not reversed	Byte order is not reversed.

5.1.3 PROFdrive/Word Order

With the Word Order parameter the used Word order of the transmitted data could be defined.

PROFdrive/Word Order

Reversed	Word order is reversed.
not reversed	Word order is not reversed.

5.1.4 PROFdrive/Monitoring Channels

With these parameters the parameters are defined which are copied to the corresponding monitoring channel.

PROFdrive/Monitoring Channels

Channel 1 UPID	Course UPID for moniring channel 1
Channel 2 UPID	Course UPID for moniring channel 2
Channel 3 UPID	Course UPID for moniring channel 3
Channel 4 UPID	Course UPID for moniring channel 4

5.1.5 PROFdrive/Axis Configuration/ Axis Type

With this parameter the Axis type is defined.



Attention: It has to be the same as configured on the master side!

PROFdrive/Byte Order

Linear	The axis is linear.
Rotative	The axis is rotative.

5.1.6 PROFdrive/Axis Configuration/ Linear/Rotative Reference Velocity

With PROFdrive telegrams the setpoint values are transmitted normalised, for this reason they have to be set into relation to a reference value. The Parameter “Linear Reference Velocity” is the reference value for the NSOLL_B and NIST_B values used the the telegrams 3, 5 and 105 if the axis is of type linear, if the axis is of type rotative the Reference value is defined with the parameter “Rotative Reference Velocity”.

5.1.7 PROFdrive/Axis Configuration/ MDI Configuration

With PROFdrive telegrams the setpoint values are transmitted normalised, in the MDI mode the position and velocity is mapped directly without the use of a reference value for scaling.

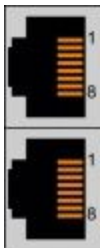
The transmitted position has the resolution [0.1µm]. The transmitted velocity has the resolution [1µm/s].

Only for the acceleration and deceleration the reference parameter “MDI Acceleration Scale” is used for scaling the acceleration and deceleration of the MC-SW motion command. With the default value of 1'000 the transmitted acceleration values have the resolution [0.01m/s³]. With a value of 100'000 they will have the resolution [1m/s³].

6 Connecting to the PROFINET Network

6.1 Pin Assignment of the Connectors X17-X18

The PROFINET connector is a standard RJ45 female connector with a pin assignment as defined by EIA/TIA T568B:

X17 - X18		RealTime Ethernet Connector		
		Pin	Wire color code	Assignment 100 BASE-TX
		1	WHT/ORG	Rx+
		2	ORG	Rx-
		3	WHT/GRN	Tx+
		4	BLU	-
		5	WHT/BLU	-
		6	GRN	Tx-
		7	WHT/BRN	-
		8	BRN	-
		case	-	-
RJ-45		Use standard patch cables (twisted pair, S/UTP, AWG26) for wiring. This type of cable is usually referred to as a "Cat5e-Cable".		

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