Getting started

cynapse<sup>®</sup> SIEMENS PLC – SIEMENS IO-Link Master



alpha



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# Table of contents

1	Ab	bout this manual	2
	1.1	Information symbols and cross references	2
2	На	ardware structure	3
3	Co	ommissioning in the SIEMENS TIA Portal V15.1	4
	3.1	Hardware configuration Siemens components	4
	3.2	Hardware configuration cynapse <sup>®</sup> with S7-PCT	11
	3.2	2.1 Loading IODD	11
	3.2	2.2 Import cynapse <sup>®</sup> online	14
4	Pre	ocess data	18
	4.1	Definition	18
	4.2	Providing PLC program process data	18
	4.3	Read process data using the "cynapse process data" FB	25
5	Ра	arameter	31
	5.1	Definition	31
	5.2	Integrating Siemens block for parameter reading/writing into program	31
	5.3	Reading Parameters	38
	5.4	Writing parameters	41
6	Ev	vents	44
	6.1	Definition	44
	6.2	Reading events	44
7	Blo	ob data	49
	7.1	Definition	49
	7.2	Reading blob data using the "Blob_Transfer" FB	49
8	Fir	rmware update	56
	8.1	Updating cynapse <sup>®</sup> firmware using PCT	56



# 1 About this manual

This guide contains procedures for the exemplary use of the WITTENSTEIN sensor cynapse<sup>®</sup>. This guide uses example code. If you require any code examples, please contact: cybertronic-support@wittenstein.de

The original was prepared in German, all other language versions are translations of the original instructions.

#### 1.1 Information symbols and cross references

The following information symbols are used:

Indicates an action to be performed

- Indicates the results of an action
- Provides additional handling information

A cross reference refers to the chapter number and the header of the target section

(e.g. chapter 5 "Parameter").

A cross reference to a table refers to the table number (e.g. table "Tbl - 1").



# 2 Hardware structure

The hardware structure of the sample project consists of the following components:

- Control system: SIEMENS S7-1500 (6ES7511-1AK02-0AB0)
- Bus adapter: BA 2xRJ45 (6ES7193-6AR00-0AA0)
- PROFINET interface module: SIMATIC ET 200SP IM 155-6PN (6ES7155-6AU01-0BN0)
- <u>IO-Link master</u>: CM 4xIO link (6ES7137-6BD00-0BA0)
- IO link device: WITTENSTEIN cynapse®





The Siemens IO system (with IO-Link Master) is connected to the control unit via the bus adapter via PROFINET (green). cynapse<sup>®</sup> is connected to one of the IO-Link ports of the master (black). Knowledge of the correct wiring of all components is assumed and is not covered in this example description.



# 3 Commissioning in the SIEMENS TIA Portal V15.1

#### Requirement

To carry out the commissioning of cynapse® you need an open project in the TIA portal.

- ➔ The hardware has been set up.
- An IP address and the subnet mask have already been assigned for the existing CPU.

# 3.1 Hardware configuration Siemens components

#### Introduction

In the following, you create the CPU, the decentralized peripheral system ET 200SP and the IO-Link Master in the hardware configuration and network them together.

#### Procedure

- 1. Open the "Devices & networks" portal.
- 2. Insert a new device.
- 3. Open the folder "SIMATIC S7-1500".
- **4.** Select the CPU you are using.
- 5. If necessary, adjust the version of your hardware.



- 6. Create the CPU by double-clicking on the name.
- **7.** Double-click on the CPU in the automatically opened project view and jump into the CPU settings.



8. Under "Ethernet addresses", enter the assigned IP address and the subnet mask.

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- 9. Open the "Hardware catalog".
- 10. Switch to the "Network view".
- **11.** Open the "Distributed I/O" folder and the "ET 200SP" folder.
- **12.** Open the "Interface modules", "PROFINET" folders and the "IM 155-6 PN ST" folder.
- **13.** Drag the interface module you are using and drop it into the white background of the network view.

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- In the "ET 200SP" folder, open the "Communications modules", "IO-Link Master" folders and select the master you are using.
   Drag the master you are using and drop it into the interface module.

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- **16.** In the "ET 200SP" folder, open the "Server modules" folder.
- **17.** Drag the server module as well and drop it into the interface module.

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**18.** Drag & drop a connection from the interface of the CPU to the interface of the interface module in order to link these via PROFINET.

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- **19.** For successful communication, the device name of the reachable subscriber must match that of the hardware configuration. Check it as follows:
- Right click on the IO device.

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• Select "Assign device name".

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• Click on "Update list".

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PLC tags					Information	

• If the device name is different: Select the line of the participant and click "Assign name".

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External source files			Close	Drive interfaces		
PLC tags				V > Information		

#### Result

Successful communication between TIA Portal, CPU and IO-Link Master is possible.

# 3.2 Hardware configuration cynapse<sup>®</sup> with S7-PCT

#### Requirement

When configuring the IO-Link Master in STEP 7, you have unchecked the option box "Configuration without S7-PCT".

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	Security settings		10% ×		0	4	🕨 🕨 🛅 DI		0
	Common data					<u> </u>	► DQ		li
	Documentation settings	CM 4xIO-Link_1 [CM 4xIO-Lin	ik]	Q Properties	🔼 Info 🚺 🔛 Diag	nostics	🖌 🕨 🛅 Al		et
	Languages & resources	General IO tags Sy	stem constants Texts				▶ 🛅 AQ		00
	Online access	▼ General	Π				<ul> <li>Communications modules</li> </ul>		S
	Card Reader/USB memory	Project information	Project information Parameters						
		Catalog information	Diagnostics				PROFINET/Ethernet		2
		Identification & Maintenance	Diagnostics				PROFIBUS		as
		Potential group		No supply voltage L+			<ul> <li>AS interface</li> </ul>		ks
		Module parameters					Point-to-point		
		▼ CM 4xlO-Link		- Port I			🕶 🛅 IO-Link Master		
		General		Port 2			▼ Im CM 4xIO-Link		F
		Parameters		Port 3			6ES7 137-6BD00-0BA0		rar
	< III >	Ports		Port 4			Image: Station extension		es
	➤ Details view	I/O addresses	•				Technology modules		
	A data		Configuration				Motor starter		
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			Input/output type - Input/output	32/32			Server modules		
	Name						• 📑 ET 200AL		
	Device configuration			Configuration without S7-PCT					
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	Rogram blocks								
	🙀 Technology objects								
	External source files								
	PLC tags						> Information		
	PIC data tanar						<ul> <li>Information</li> </ul>		

#### 3.2.1 Loading IODD

#### Requirement

You have obtained the current IODD cynapse<sup>®</sup> from the following sources: IODD Finder (<u>https://ioddfinder.io-link.com</u>)

#### Introduction

In the following, download the cynapse<sup>®</sup> IO device description to add the sensor to the selection catalog of the PCT.

#### Procedure

- **1.** In the TIA Portal, open the device configuration.
- 2. Switch to the device view of the IO device.



alpha

ENSTEIN

- **3.** Move your mouse pointer over the CM 4xIO-Link module.
- 4. Right-click to open the dialog box.
- 5. Click on "Start Device Tool".
- 6. Download the wizard to import the IO device description via Options > import IODD.

K SIMATIC S7-PCT - PLC_1							_ 🗆 X
File Edit View Device Optio	ons Help						IO-Link
🕒 🕒 🖬 🖉 🔜 🗙 🗐 📒	Import IODD						Port Configuration Tool
▼ PLC_1*	IODD Vendor List	us I&M Commands			,	Catalog	ά×
PROFINET IO: PROFIN	Export Catalog	Info				Search	
[192.168.0.1] IO-dev	Import Catalog	200SP- CM 4xIO-Link V2 2	]			Text search	~
	Restore Derault Catalog	7 137.68D00.0840					Tênî Lênî
	Supported Modules					Profile: V1.0 and V1.1	~
	User Role					In the ky10	
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	Communication Settings				_		
		·					
	Column Hilter						
	Port Autosense M	Node Name	IO-Link Version	Inspection Level	Backup Level		
		eactivated V		No check C	Off v		
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	4 0 0	eactivated ~		No check	Off 🗸		
	Detaile						
	Details						
	Vendor Name:						
	Vendor URL:						
		-					
	Device Name:						
	Description:		~				
			Y				
Communication Percelta	Article Number:						



**7.** Select the IODD .xml via "Browse..." in your location. If you have not saved them yet, you can do so by clicking on "Download IODDs from Internet with IODDfinder".

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File Edit View Device Options Help	10-1	ink
. 3 3 4 4 4 4 × 11 5 6 6 9 10 9	Por	t Configuration Tool
PLC_1*     Ports Addresses Status I&M Commands	Catalog	ά×
A PROFINET IO: PROFINET IO: System     General Macter Info	Search	9
	Text search	~
E Ditto: I Low skrigters I Product Name EI 2005P: CM skrigters V2.2		tini Lini
Article Number: [6ES7 137-6BD00-0BA0		
Import IODD Files	×	
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Strumping for the second		
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IODD Files		2
Selected IODD File Name Vendor Name Device ID Device Family Device Name Vension Device Details Stat	tus	
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Ready STEP 7 (Integrated) Commissioning		
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8. Click on "Import".

#### Result

• cynapse<sup>®</sup> is included in the PCT catalog and can be detected online or configured manually.

W	H SIMATIC S7-PCT - PLC_1								_ = ×
Pr	File Edit View Device Options H	lelp						1	IO-Link
_	19 19 19 19 18 19 19 19 19 19 19 19 19 19 19 19 19 19	u 🖸 🖻 💋 💷	0						Port Configuration Tool
	- PLC_1*	Ports Addresses	Status I&M Commands					∧ Catalog	άx
	PROFINET IO: PROFINET IO-System	General Ma	ster Info					Search	
5	[Slot 1] CM dxIQ-link 1	Product Name	ET 2005P-CM AvIO Link V2.2					Text search	~
at l		, riddeer Hane		 					tini tini
letv		Article Number:	6E57 137-68D00-08A0					Profile: V1.0 and V1.1	~
ā		Comment:							
Ces								ID Link V1.0	
le i								• In the electronic amph	
		Port Info		 				SIEMENS AG	
		Column Filter						STANDARD	
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			Deactivated V	TO DIR Version	No check	Off		Smart Feature	
		2	Deactivated ×		No check	Off	~	Ocynapse 2x integra	sted
		3	Deactivated ~		No check	Off	~		
		4	Deactivated ~		No check	∨ Off	~		
		Details							
		Vendor Name:							
		Vendor URL:							
		Device Name:							
		Description:		<u>^</u>					
		Article Number	:					<b>~</b>	
	Communication Results								Ψ×
	2/4/2022 11:28:31 AM [Slot 1] CM 4xIO-Link     2/4/2022 11:29:47 AM [1] cynapse 2x ir	k_1: Upload successful ntegrated: Upload succe	essful						\$
	Ready			STEP 7 (II	ntegrated)	Commissi	oning		



### 3.2.2 Import cynapse<sup>®</sup> online

#### Requirement

- ➔ You have read the current IODD of cynapse<sup>®</sup> as described in Chapter 3.2.1 "Loading IODD".
- The hardware configuration is error free.
- Communication with the hardware is possible and the S7-PCT is open.
- ① Information about possible errors / online reading of the device is not possible:
- In order for the S7-PCT to establish a connection, full access must be granted in the CPU security settings. In addition, no password may be assigned.

K Siemens - C:\Implementierung_cynapse\Siem	ens\10_Siemens_Siemens\DEV\Sie	mens_Siemens_FW2.x_2022-04-04\Siemens_Siemer	is_FW2.x_2022-04-04		_ # X				
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2 <b>1</b>					rd Catalog				
▼ Siemens Siemens FW2.x 2022-04-04				= Y Device					
Add new device				<ul> <li>S71500/E1200MP station_1</li> <li>BLC 1</li> </ul>					
Devices & networks	PLC_1 IC	O-device_1		▼ FT200SP station 1	Filter Profile: <all></all>				
PLC_1 [CPU 1511-1 PN]				IO-device 1	Controllers				
Ungrouped devices				-	► HMI				
Security settings					PC systems				
Common data	P	N/IE_1			Network components				
Contraction settings					Detecting & Monitoring				
Online access					Distributed I/O				
Card Reader/USB memory					Power supply and distribution				
-				×	Field devices				
	<	> 100%	· · · · · · · · · · · · · · · · · · ·		Other field devices				
	PLC_1 [CPU 1511-1 PN]	LC_1 [CPU 1511-1 PN] 🖳 Properties 🚺 Info 🕦 🔂 Diagnostics 📄 🖃 🤝							
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• Details view	Time of day	Select the access level for the PLC.							
Module	Protection & Security								
	Connection mechanisms	* Access level	Access	Access permi					
Name	Certificate manager		HMI Read	Write Password					
Device configuration	Security event	- Full access (no protection)	× ×	✓					
Online & diagnostics	· → OPC UA	Read access	× ×						
Reason blocks	General	No access     No access (complete protection)	•						
Technology objects	▼ Server	( no access (complete protection)							
External source files	General								
PLC tags	Options 🗸			•	2				
V mediateria		< II		>	> Information				

- PROFINET device names of the online and offline configuration must match, otherwise a communication is not possible (help for this in chapter 3.1 "Hardware configuration Siemens components").

#### Introduction

In the following, you will read the connected hardware on the IO-Link Master using the S7-PCT.



# Procedure

**1.** Click the "Load to PG with Devices" button to find devices online.

SIMATIC S7-PCT - PLC_1			- C
ile Edit View Device Options H	Help		IO-Link Port Configuration Too
PRC.1*     # PRCFINET IO. PROFINET IO. System     [732 158 01 1] O.device_1     [732 158 01 1] O.device_1     [744054rk_1	Pots Addresses SaturLMA Commands Load to Powth Devices General Master III00 Product Name _ET 2005P.CM 4u0-Link V2.2 Article Number _ GE57 137-68:D00-08A0 Comment		Catalog         0           Search         Test search           Profile:         V1.0 and V1.1           Image: Profile:         V1.0 unk V1.0           Image: Profile:         V1.0 unk V1.1
	Port Info Column Filter		
	Pot         Adorenne         Mode         Name           1          Deadtraded            2          Deadtraded            3          Deadtraded            4          Deadtraded	No-Line Version Injection Leve Backup Level No check Off  No check Off  No check Off  No check Off  No check Off	
	Details		
	Vendor VRL:		
	Device Name:		
	Description:		
	Article Number:		

**2.** Confirm the warning with "Yes".

ile Edit View Device Options H	° 11 E 🌶 🖃 0	IO-Link Port Configuration Te
PIC_1     PRCTI     PRCTI     PRCTIC     PRCTIC	Port Addresses Statu MAI Commando   General Master Tufo Statu Statu Statu   Product Name: E2571376600008A0 Profix   Port Info Statu Profix   Comme Filter Statu Statu   Port Info Statu   Column Filter Statu   Port Addresse Statu   2 Deactivated >   3 Deactivated >   4 Deactivated >   Vendor Vane: Yes   Vendor Vane: Statu   Device Name: Statu   Description: Commertiant	Port Configuration To dh search (V10 and V1.1 O Lek V1.0 0 Lek V1.1
	· · · · · · · · · · · · · · · · · · ·	

3. After successfully adding devices, cynapse<sup>®</sup> will appear at the corresponding port.

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SIMATIC S7-PCT - PLC 1	an weak affection and		_ <b>_</b> ×
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	Details		
	Vendor Name: WITTENSTEIN cyber motor GmbH Vendor URL: <u>http://www.wittenstein.de</u>		
	Device Name: Onappe 2x integrated Description: Onappe 2x integrated, Device Family Smart Feature, Release Date 2021		
Communication Results	Article Number: cynapse		
Ready		STEP 7 (Integrated) Commissioning	

4. Click on the "Addresses" tab to view the cynapse<sup>®</sup> process data.

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						v	
Communication Results							
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5. Close the S7-PCT and confirm the save to save the configuration read online.



# Result

- cynapse<sup>®</sup> was searched, found and saved online. The hardware is present when the S7-PCT is reopened.
- In addition, the S7-PCT can display further information such as warning thresholds, pending error codes, hardware version or firmware version. These cannot be changed in this view. For more information, see Chapter 5 "Parameter".

H	RT SIMATIC S7-PCT - PLC_1						_ <b>-</b> ×
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2		Parameter	Value	Icon	Unit	Status ^	
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e		Ecynapse					Profile: V1.0 and V1.1 V
-20		□ Temperature					
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e i		Product defined over temperature threshold	80.0		°C	loaded	In U Link VI.1
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		Application defined under temperature threshold	-12.3		°C	loaded	STANDARD
		Application defined over temperature threshold	111.1		°C	loaded	WITTENSTEIN cyber motor GmbH
		Settings - Application defined over and under temperature threshold	inactive			loaded	cynapse
		⊡ Shock					- Im Smart Feature
		Application defined shock threshold	10.0		m/s <sup>2</sup>	loaded	Cynapse 2x integrated
		Settings - Application defined shock threshold	active			loaded	
		⊡Vibrations					
		Application defined vibration threshold	10.0		m/s <sup>2</sup>	loaded	
		Settings - Application defined vibration threshold	active		-	loaded	
		Operation time		-	-		
		Temperature threshold to distinguish between operating and idle mode	-50.0	-	°C	loaded	
		Absolute vibration threshold to distinguish between operating and idle mode	0.0		m/s <sup>2</sup>	loaded	
		E Operating modes		-			
		Settings - Process data profile	Temperature, Peak to Peak, BMS	-	_	loaded	
		Settings - Send events	inactive	-		loaded	
		Standard parameters					
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	Reauy		STEP / (I	megrated	a) Icom	missioning	



# 4 Process data

#### 4.1 Definition

Process data is understood to mean cyclically communicated data between the IO-Link Master and control. In each cycle, these data are transferred. The process data sent by cynapse<sup>®</sup> depends on the version status of the hardware and software. For more information, see the cynapse<sup>®</sup> operating manual.

### 4.2 Providing PLC program process data

#### Introduction

In the following, you generate a PLC data type source file, read this into the control and create a variable of this type in the variable table.

#### Procedure

- 1. Open S7-PCT.
- 2. Click on "Create PLC data type source file".

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								IO Link V1.0	
evie		Show PLC addresses		Pack (Byte)	Pack (Bit)		•	IO Link V1.1	
		Port Info							
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		3							
		4							
				•					
		Structure of Proc	ess Da	ta					
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			1	Temperature, Peak to Peak, RMS	IntegerT	0.80-97			
			1	Temperature, Peak to Peak, RMS	IntegerT	(1) 10.0 - 11.7			
			1	Temperature, Peak to Peak, RMS	IntegerT	(1) 12.0 - 13.7			
			1	Temperature, Peak to Peak, RMS	IntegerT	(1) 14.0 - 15.7			
							~		
	Communication Results								# ×
	Ready					STEP 7 (Integrated	I) Commissioning		



3. Give a name and save the .udt-file by clicking on "Save".

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Port Info		
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	1 Temperature, Peak to Peak, RMS IntegerT (I) 6.0 - 7.7	
	1 Temperature, Peak to Peak, RMS IntegerT (I) 8.0 - 9.7	
	1 Temperature, Peak to Peak, RMS IntegerT (I) 10.0 - 11.7	
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Communication Results		
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- 4. Close S7-PCT.
- 5. In the project tree, select "External source files".



6. Double click on "Add new external file".

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PLC supervisions & alarms	inpublique sinpublique : 32/32		
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▼ CM 4xiO-Link	Input addresses		AQ
General	Christian Marrie D		Communications modules
Parameters	Start address: 0		
Name   Ports	End address: 31		
General	Organization block: (Automatic update)		
Port 1	Process image: Automatic update		
Port 2			
Port 3	Output addresses		
Port 4			
I/O addresses	Start address: 0		
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- Select the previously saved .udt file.
   This is now under the tab "External source files".

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Parameters	Startautess.					
Name   Ports	End address: 31					
General	Organization block: (Automatic upda	te)				
Port 1	Process image: Automatic update					
Port 2						
Port 3	Output addresses					
Port 4						
I/O addresses	Start address: 0					
	End address: 31			~	> Information	

9. Right-click on the .udt file.



10. Click on "Generate blocks from source file".

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#### 11. The data type exists under "PLC data types".

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12. Under "PLC tags", open "Show all tags".

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- **14.** Confirm your input with Enter.**15.** Adjust any linked addresses to the hardware.



### Result

 cynapse<sup>®</sup> is linked as hardware and the output variables can be linked to blocks in the PLC program.

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	- 0		Com	niling finished (errors	0: warnings: 0	0						1.27	75 PM	Defense her



# 4.3 Read process data using the "cynapse process data" FB

#### Requirement

You have obtained a sample project for reading out the process data from the following source:

cybertronic-support@wittenstein.de

#### Introduction

In the following, you will read process data from a sample project using a function module. The latter takes over the scaling of the measured values.

cynapse<sup>®</sup> offers different process data formats to offer different data for further processing while maintaining the same process data length. These process data can be selected by the parameter Settings. For more information, see the operating manual cynapse<sup>®</sup> and Chapter 5.4 "Writing parameters".

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	"cynapse_P	rozessdaten"	
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0	Input4	Out4	0.0
0	Input6	Out5	-0.0
0	Input8	Out6	0.0
0	Input10	Out7	0.0
0	Input12	Out8	0.0
0	Input14	Out9	-0.0

Input/output	Data type	Function
Input 0	BYTE	Byte 0 reserved
Input 1	BYTE	Byte 1 process data profile
Input 2-14	INT	Process data profile dependent input variables – more information on this in the operating manual
Out 1	INT	-
Out 2	REAL	Current active process data profile
Out 3-9	REAL	Scaled values of inputs 2-14

Tbl - 1

#### Procedure

- 1. Open the resulting sample project.
- 2. In parallel, open the project in which you want to read process data.
- 3. Select the "cynapse\_Process Data" FB in the sample project.



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alpha

4. Drag and drop it into your project under "Program blocks".





5. Drag and drop the FB into the main block.



6. Create the DB by clicking on "OK".

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7. The block is contained in a network of the main block.

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Device proxy data	0 Input4	Out4 - 0.0		
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PLC supervisions & alarms	0 Input8	Out6 - 0.0		
PLC alarm text lists	0 Input10	Out7 - 0.0		
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8. Double-click on the inputs to display the inputs created in variable tables (see chapter 4.2 "Providing PLC program process data section "Result").

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9. Click on the "cynapse" data type.



**10.** Link the inputs according to the information in the cynapse<sup>®</sup> operating manual.





#### Result

The scaled process data are present at the outputs of the module according to the selected process data image and can be used further in the program.

After compiling 🖥 and downloading 🖳 the data can be 🧖 Go online observed online. 🕾



# 5 Parameter

### 5.1 Definition

Parameters are understood to be acyclically communicated data. In this way, device parameters such as device information, threshold values or diagnostic data of an IO-Link device (e.g cynapse<sup>®</sup>) can be read or written. The data on the device is uniquely addressed with index and subindex.

For more information about the index and subindex as well as the structure of the data set, see the cynapse<sup>®</sup> operating manual.

### 5.2 Integrating Siemens block for parameter reading/writing into program

#### Requirement

- ➔ You have obtained the LIOLink library from the Siemens website and know the location.
- Your TIA project is open and the Libraries task card is open.



In Note: A duplicate request to a device via the IO\_LINK\_DEVICE module is not possible. Since parameters are read, parameters are written, events are read out and blob data are accessed on this block, these are to be locked against one another.



#### Introduction

In the following, you integrate the functional module "FBIoLinkDevice" published by Siemens into your project and determine project-specific input variables of the module.

With the help of this function module, you can read program parameters, measured values and diagnostic data from an IO-Link device or write device parameters to an IO-Link device or send system commands.

#### Procedure

- **1.** Click the "Open global library" button.
- 2. Select the library in the known location.

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- 3. Click "Open".
- **4.** The library appears under "Global libraries" and can be opened.





5. Drag and drop the IO\_LINK\_DEVICE block into program blocks.



- 6. Open the main block with a double click.
- 7. Drag and drop the IO\_LINK\_DEVICE block into the network.
- 8. Have the corresponding DB created by the TIA Portal statement.

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- 9. Create the data block DB for inputs and outputs of the function block:
- Under "Program blocks"; click on "Add new block".
- Select and name DB.



- Click "OK".
- Open DB by double-clicking on it.
- Create variables in the required data types according to the block description of Siemens in the DB.

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10. Link the inputs and outputs of the function block in the main block to the created variables in the data block.

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- **11.** Open the created DB by double-clicking.**12.** Set project-specific input parameters:

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• ID: IO-Link communication module hardware ID: This information can be found in the system constants in the hardware view = 266

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- CAP: Client Access Point: This information can be found in the Siemens documentation = 227
- PORT: Port number on which the IO-Link device is operated: This information can be found in the Port Configuration Tool = 1

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# Result

- The functional module is integrated into the main module.
- All inputs and outputs are linked to the created data block.
- Project-specific input quantities were determined and set as starting values in the DB.





### 5.3 Reading Parameters

#### Requirement

- The project is open and the function module IO\_Link Device has been integrated into the program as described in chapter 5.2 "Integrating Siemens block for parameter reading/writing into program".
- The project was successfully loaded into the hardware and online access is possible.
- The index and subindex information of the desired parameter were determined. The general indices are given in the IO-Link specification. The cynapse<sup>®</sup>-specific indices can be found in the operating manual.
- ① Note: A duplicate request to a device via the IO\_LINK\_DEVICE module is not possible. Since parameters are read, parameters are written, events are read out and blob data are accessed on this block, these are to be locked against one another.

#### Introduction

In the following, you will use the integrated function module "FBIoLinkDevice" to read the currently issued process data format from cynapse® using the parameter Settings.

Here is some information about the module:

- The data transmission takes place in the form of raw data (ARRAY of byte)
- If "RD\_WR" = FALSE, data is read out and output to "RECORD\_IOL\_DATA".
- As long as no valid response data have been received, this is signaled via the output "BUSY" = TRUE.
- The value TRUE of the output "DONE\_VALID" indicates that the transfer was successful. In the case of a read job, the data are now consistently present at the input/output "REDORD IOL DATA" and the output "RD LEN" indicates the length of the received data.
- The value TRUE of the output "ERROR" indicates that an error has occurred. As long as the input REQ = TRUE, the output parameters retain their value. If the input REQ = FALSE before the processing of the FB is completed, the values of the output parameters are held for only one cycle after the processing of the order.

#### Procedure

- 1. Open the data block with input/output variables of the block by double-clicking.
- 2. Press the "Go online" button. So online
- 3. Start online monitoring. 🕾
- **4.** Double-click on "Monitor value" of the input you want to change.
- **5.** Enter the index.



6. Confirm with "OK".

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7. Enter the subindex according to the same scheme.

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8. Set input REQ from FALSE to TRUE by double-clicking on "Monitor value".

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- 9. DONE\_VALID TRUE indicates successful readout.
- **10.** RD\_LEN displays the length of the parameter read.
- **11.** Expand RECORD\_IOL\_DATA.

#### Result

■ In the RECORD\_IOL\_DATA array, the parameters read are displayed in coded form.

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Watch and force tables		19	80		RECORD_IOL_DAT	Byte	16#0	16#0	16#00						<ul> <li>S7-1500 Professional</li> </ul>
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Device proxy data		23	•		RECORD_IOL_DAT	Byte	16#0	16#0	16#00		<ul> <li>Image: A start of the start of</li></ul>				Master copies
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PLC supervisions & alarm		25			RECORD IOL DAT	Byte	16#0	16#0	16#00						Languages & resources
PLC alarm text lists		26			RECORD IOL DAT	Byte	16#0	16#0	16#00						
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This example specifies the currently output process data format.

# 5.4 Writing parameters

#### Requirement

- The project is open and the function module IO\_Link Device has been integrated into the program as described in chapter 5.2 "Integrating Siemens block for parameter reading/writing into program".
- The project was successfully loaded into the hardware and online access is possible.
- The information about the index, subindex and length of the desired parameter was determined. The general indices are given in the IO-Link specification. The cynapse<sup>®</sup>-specific indices can be found in the operating manual.
- ① Note: A duplicate request to a device via the IO\_LINK\_DEVICE module is not possible. Since parameters are read, parameters are written, events are read out and blob data are accessed on this block, these are to be locked against one another.
- (1) **Note:** If the length of the parameter to be written is greater than 1 byte, it must be converted into a byte array. For example, parameters of the float type must be converted into a 4-byte array using the "REAL\_TO\_DWORD" command.

#### Introduction

In the following, you change the currently output process data format using the parameter Settings of cynapse<sup>®</sup> for example by using the integrated function module "FBIoLinkDevice". A parameter is written for this.

Here is some information about the module:

- The data transmission takes place in the form of raw data (ARRAY of byte)
- If "RD WR" = TRUE, the data from "RECORD IOL DATA" is written in cynapse<sup>®</sup>.
- For a write job, the length of the parameter to send must be specified under LEN.
- As long as no valid response data have been received, this is signaled via the output "BUSY"
   = TRUE.
- The value TRUE of the output "DONE\_VALID" indicates that the transfer was successful.
- The value TRUE of the output "ERROR" indicates that an error has occurred. As long as the input REQ = TRUE, the output parameters retain their value. If the input REQ = FALSE before the processing of the FB is completed, the values of the output parameters are held for only one cycle after the processing of the order.



#### Procedure

- **1.** Open the data block with input/output variables of the block by double-clicking.
- 2. Press the "Go online" button. So online
- 3. Start online monitoring. 🕾
- **4.** Set the value for the input variable RD\_WR by double-clicking on the variable in the orange "Monitor value" column to TRUE.
- 5. Enter the length of the parameter to write in LEN.

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6. In Array RECORD\_IOL\_DATA, enter the desired process data format = 1 in the first byte.

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7. Set the REQ input from FALSE to TRUE by double-clicking on "Monitor value".



# Result

➔ DONE\_VALID TRUE indicates successful writing of the parameter.

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The change can be checked by reading the parameter as described in chapter 5.3 "Reading Parameters".

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# 6 Events

# 6.1 Definition

Events is the notification of an incorrect operating state of the IO-Link device. Examples of this are too high an operating temperature, vibrations or a detected defect on the device. In this case, warnings or errors in the form of events only occur when threshold values are exceeded or undershot and are automatically reset. cynapse<sup>®</sup> distinguishes between limit values defined by WITTENSTEIN and user-defined limit values. The latter can be changed via Write parameters.

For details on parameters for custom thresholds and error-specific codes, see the cynapse<sup>®</sup> operating manual.

# 6.2 Reading events

### Requirement

- You have obtained a sample project for reading out events from the following source: cybertronic-support@wittenstein.de
- The hardware build-up with up to two cynapse<sup>®</sup> is present without errors, with the order of the ports and the devices coinciding (one cynapse<sup>®</sup> on port 1, second cynapse<sup>®</sup> on port 2 of the master)
- Note: The function module described below is programmed for reading out events of up to two cynapse<sup>®</sup>. If you are running more than these two IO\_Link devices, please contact: cybertronic-support@wittenstein.de

In order to read out events, a general event release must take place in cynapse<sup>®</sup>. This release is given in the parameter Index = 96, Subindex = 1. In addition, events are enabled for reporting via the subindexes 2, 3, 5 and 7. For more information, see the cynapse<sup>®</sup> operating manual.

① Note: A duplicate request to a device via the IO\_LINK\_DEVICE module is not possible. Since parameters are read, parameters are written, events are read out and blob data are accessed on this block, these are to be locked against one another.

#### Introduction

In the following, you will read upcoming events using a function module from a sample project. By shaking, several events are provoked.



Input/output	Data type	Function
NumberOfPorts	Integer	Number of attached devices
xid	HW_IO	IO-Link Communication Module Hardware ID Executed input of the IO_LINK_DEVICE module
хСар	DInteger	Client Access Point
		Executed input of the IO_LINK_DEVICE module
EventCode1, EventCode2	Array of bytes	Event code of the respective port read out
xDoneValid	Bool	Executed output of the IO_LINK_DEVICE module
xBusy	Bool	Executed output of the IO_LINK_DEVICE module
xError	Bool	Executed output of the IO_LINK_DEVICE module
xStatus	DWord	Executed output of the IO_LINK_DEVICE module
xIOL_Status	DWord	Executed output of the IO_LINK_DEVICE module
xRD_LEN	Integer	Executed output of the IO_LINK_DEVICE module

Tbl - 2



#### Procedure

- **1.** Open the resulting sample project.
- 2. In parallel, open the project in which you want to monitor events.
- **3.** Highlight the EventBlock function block.
- 4. Drag and drop this into your project under "Program blocks".



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5. Drag and drop the FB into the main block.

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	LGF_CRC3			Conversion ope
	Blob_Tran	Network 4:		Program control
	cynapse	Vetwork 5:		Word logic oper
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- 6. Create the DB by clicking on "OK".
- 7. The block is contained in the network of the main block.
- 8. Open the data block with input/output variables of the block by double-clicking.



9. Set project-specific input parameters:

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- NumberOfPorts: Number of attached devices
- ID: IO-Link communication module hardware ID: This information can be found in the system constants in the hardware view = 266

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- CAP: Client Access Point: This information can be found in the Siemens documentation = 227
- 10. Compile the program.
- 11. Run the program on the hardware.
- 12. Press the "Go online" button. So online
- 13. Start online monitoring. 🕾



#### Result

The upcoming event codes can be found in the EventCode arrays. If several events are pending, they are displayed successively in packets of 3 bytes as a list in the RECORD\_EVENT array.

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A table from the IO-Link specification explains this.

# Table B.14 – DetailedDeviceStatus (Index 0x0025)

Sub- index	Object name	Data Type	Comment
1	Error_Warning_1	3 octets	All octets 0x00: no Error/
2	Error_Warning_2	3 octets	Octet 1: EventQualifier
3	Error_Warning_3	3 octets	Octet 2,3: EventCode
4	Error_Warning_4	3 octets	
n	Error_Warning_n	3 octets	

Byte 1 always has the value 16#E4 and initiates the event code.

The event code in byte 2 and byte 3 can now be decoded with the cynapse<sup>®</sup> operating manual and used further.

In this example, the following event is pending:

Byte 1	Byte 2	Byte 3	Translation using the operating manual
EventQualifier	EventCode	EventCode	
16#E4	16#18	16#5A	The user's upper temperature threshold has been exceeded

# 7 Blob data

### 7.1 Definition

IO-Link defines the transfer of large amounts of data (**b**inary large **ob**ject) by the BLOB transfer profile. In this case, the type of the data block to be transmitted is identified via the BLOB\_ID between 1 and 32767. The sign of the ID indicates the direction of the transfer; a positive sign indicates the data flow direction from master to device, a negative sign indicates data flow from device to master.

cynapse<sup>®</sup> offers various data packets transported by BLOB transfer. For more information about the BLOB\_ID and the decoding of the data packets read out, see the cynapse<sup>®</sup> operating manual.

# 7.2 Reading blob data using the "Blob\_Transfer" FB

#### Requirement

- You have obtained a sample project for blob transfer from the following source: cybertronic-support@wittenstein.de
- In Note: A duplicate request to a device via the IO\_LINK\_DEVICE module is not possible. Since parameters are read, parameters are written, events are read out and blob data are accessed on this block, these are to be locked against one another.

#### Introduction

Below, you will read blob data from a sample project using a function block. The latter takes over the specification-compliant sequence of the blob transfer. For more information, see the IO-Link specification.





Input/output	Data type	Function
BlobID	Integer	ID of the data block to be transmitted
ID	HW_IO	IO-Link Communication Module Hardware ID
САР	Integer	Client Access Point
port	Integer	Port number where the IO-Link device is operated
StartBlob	Bool	Positive edge: Start blob transfer
BlobData	Array of bytes	Read data
Error	Bool	Error status (0: no error)
Ready	Bool	Ready status (1: successfully completed blob transfer)
IOL_Status	DWord	IO-Link error status of IO_LINK_DEVICE block
		Thi - 4

#### Procedure

- 1. Create the DB by clicking on "OK".
- 2. The block is contained in the network of the main block.
- **3.** Open the resulting sample project.
- **4.** In parallel, open the project in which you want to read blob data
- 5. Select the Blob-Transfer function block and the LGF\_CRC32 function in the sample project.
- Note: Important: LGF\_CRC32 from example project is slightly modified. If this is not used, the length of the array must be included in the original module.
- 6. Drag and drop this into your project under "Program blocks".





7. Drag and drop the FB into the main block.

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- 8. Create the DB by clicking on "OK".
- 9. The block is contained in the network of the main block.
- **10.** In order to be able to operate this, a range of values for the read-out BLOB data must be reserved in a global data module
- Double click on "Add new block".
- Create global data block.

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• Create an array in the size of 0-600000 bytes.

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# 11. Link the block.

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• ID: IO-Link communication module hardware ID: This information can be found in the system constants in the hardware view = 266

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- CAP: Client Access Point: This information can be found in the Siemens documentation = 227
- PORT: Port number on which the IO-Link device is operated: This information can be found in the Port Configuration Tool = 1

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- **13.** Download the project to load the hardware and go online.
- **14.** Specify the BlobID.
- **15.** Start the blob transfer with the start trigger.

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# Result

By the output Ready = 1, the block indicates a successfully executed blob transfer. The data being read out is in the array associated with the BlobData output and can be used further.





# 8 Firmware update

# 8.1 Updating cynapse<sup>®</sup> firmware using PCT

#### Requirement

- You have obtained the latest update of cynapse<sup>®</sup> from the following source: cybertronic-support@wittenstein.de
- You have the latest update available.
- The hardware configuration is error free.
- A communication with the hardware is possible.

#### Introduction

The following is a firmware update for cynapse<sup>®</sup>.

#### Procedure

- 1. Open the "Device configuration" in the TIA portal.
- 2. Switch to the "Device view" of the IO device.

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	C III Description:	4-channel serial interface module for connection of IO link devices. parameter assignment performed with port configuration tool.	Port A	Information	

- **3.** Move your mouse pointer over the CM 4xIO-Link module.
- 4. Right-click the dialog box and click "Start device tool".
- 5. Select the device.
- 6. Open the "Firmware Update" tab.



7. Select the existing update from the Browse button.

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8. Click Start.

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# Result

Status reports an update has been successfully performed.

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# **Revision history**

Revision	Date	Comment	Chapter
01	12/02/2019	New version	All
02	07/15/2022	cynapse <sup>®</sup> Trademark, Revision	All
03	06/20/2023	Translation EN	All



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