

Application Manual

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BAUMÜLLER

b maXX

**PROFINET IRT
device**

**for b maXX 2500/
3300 / 5000**

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1

GENERAL INFORMATION

1.1 Information about the application manual

The application manual PROFINET IRT Device for b maXX® 2500 / 3300 / 5000 provides important information regarding handling the device. A prerequisite for safe working is compliance with all specified safety information and handling instructions.

Furthermore, the local accident prevention regulations and general safety requirements applicable to the area of application of the device must be observed.

Before starting any work on the device, completely read through the Instruction Handbook, in particular the chapter on safety information. The Instruction Handbook is an integral part of the product and must be kept in the immediate vicinity of the device in order to be accessible to personnel at all times.

For commissioning of the device the parameter manual must be used. The parameter manual contains information to the parameters of the device.

The application manual PROFINET IRT Device provides information about the configuration and commissioning in a PROFINET network of b maXX 2500 / 3300 / 5000 devices for controller firmware from version 01.08.

1.2 Explanation of symbols

Warnings

Warnings are identified by symbols in this Parameter Manual. The notices are introduced by signal words which express the magnitude of the danger.

Observe the notices without exception and exercise caution to prevent accidents, personal injury and damage to property.



DANGER!

...warns of an imminently dangerous situation which will result in death or serious injury if not avoided.



WARNING!

...warns of a potentially dangerous situation which may result in death or serious injury if not avoided.



CAUTION!

...warns of a potentially dangerous situation which may result in minor or slight injury if not avoided.



NOTICE!

...warns of a potentially dangerous situation which may result in material damage if not avoided.

Recommendations



NOTE!

...points out useful tips and recommendations, as well as information for efficient, trouble-free operation.

1.3 Limitation of liability

All specifications and information have been compiled taking account of the applicable standards and regulations, the state of the art and also our many years of expertise and experience.

The manufacturer accepts no liability for damage resulting from:

- Non-compliance with the Operating Manual
- Non-intended use
- Use of untrained personnel

The product actually supplied may deviate from the versions and illustrations described here in the case of special versions, the use of additional ordering options or as a result of the latest technical changes.

The user is responsible for carrying out servicing and maintenance in accordance with the safety regulations in the applicable standards and all other relevant national or local regulations concerning conductor dimensioning and protection, grounding, isolation switches, overcurrent protection, etc.

The person who carried out the assembly or installation is liable for damage arising during assembly or upon connection.

1.4 Copyright

Treat the Parameter Manual confidentially. It is intended exclusively for persons involved with the device. It must not be made available to third parties without the written permission of the manufacturer.

**NOTE!**

The details, text, drawings, pictures and other illustrations contained within are copyright protected and are subject to industrial property rights. Any improper exploitation is liable to prosecution.

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is a registered trademark of PROFIBUS International

b maXX[®]

is a registered trademark of Baumüller Nürnberg GmbH,
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**NOTE!**

Please note, that BAUMÜLLER is not responsible to examine whether any (industrial property) rights of third parties are infringed by the application-specific use of the BAUMÜLLER products/components or the execution.

1.5 Other applicable documents

1.5 Other applicable documents

Manual basic unit b maXX 3300 (5.11018) or Manual b maXX 5000 (5.09021) and
Parameter manual b maXX 3300 (5.12001) or Parameter manual b maXX 5000
(5.09022) in the current version at each case.

1.6 Guarantee conditions

The guarantee conditions are located as a separate document in the sales documents.
Operation of the devices described here in accordance with the stated methods/ procedures / requirements is permissible. Anything else, e.g. even the operation of devices in installed positions that are not shown here, is not permissible and must be checked with the factory in each individual case. If the devices are operated differently than described here, any guarantee will be invalidated.

1.7 Customer service

Our customer service department is available for technical information.
Information concerning the responsible contact person can be obtained at any time by telephone, fax, e-mail or over the Internet.

1.8 Terms used

For abbreviations used, see [▶Appendix A - Abbreviations◀](#) from page 39.

FUNDAMENTAL SAFETY INSTRUCTIONS

In this chapter the dangers are prescribed, which can arise during parameterization of the Baumüller b maXX 3300 or b maXX 5000 controller unit and the meaning of the information sign is explained.

2.1 Safety notes and mandatories



WARNING!

Danger from modification of the parameter settings!

The change of parameters affects the behavior of the Baumüller-unit and consequently the behavior of the construction and its components. If you change the adjustments of the parameters, you may cause a dangerous behavior of the construction and/or of its components.

Therefore:

- After each modification of the parameter settings, a commissioning with consideration to all safety instructions and safety regulations must be executed.

2.2 Information sign

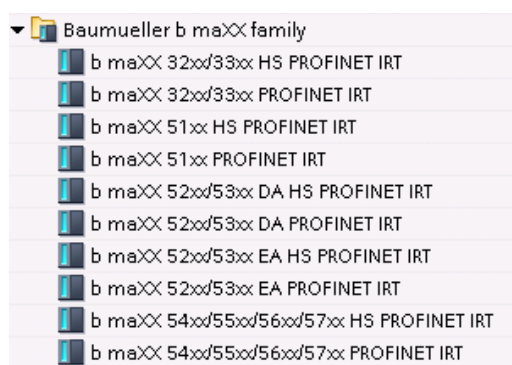


NOTE!

This note is a very important information.

GSDML FILE ACCORDING TO V2.35

The GSDML file „GSDML-V2.35-Baumuller-bmaXX-20....xml“ contains the device description for the complete b maXX device family:



Legend:

- EA Single axis (16 actual values and 16 set values)
- DA Double axis (16 actual values and 16 set values, user-defined configurable to axis 1 or axis 2)
- HS High speed version (8 actual values and 8 set values, user-defined configurable to axis 1 or axis 2, for cycle times of 500 μ s or 250 μ s)

The different device versions are listed in the device catalog under:

More field devices

→ PROFINET IO

→ Drives

→ Baumuller Nuernberg GmbH

→ Baumuller b maXX family



NOTE!

The shown screenshots are made with TiA portal version 14.
Other versions of the TiA portal can be different according the design of the SIEMENS screens.

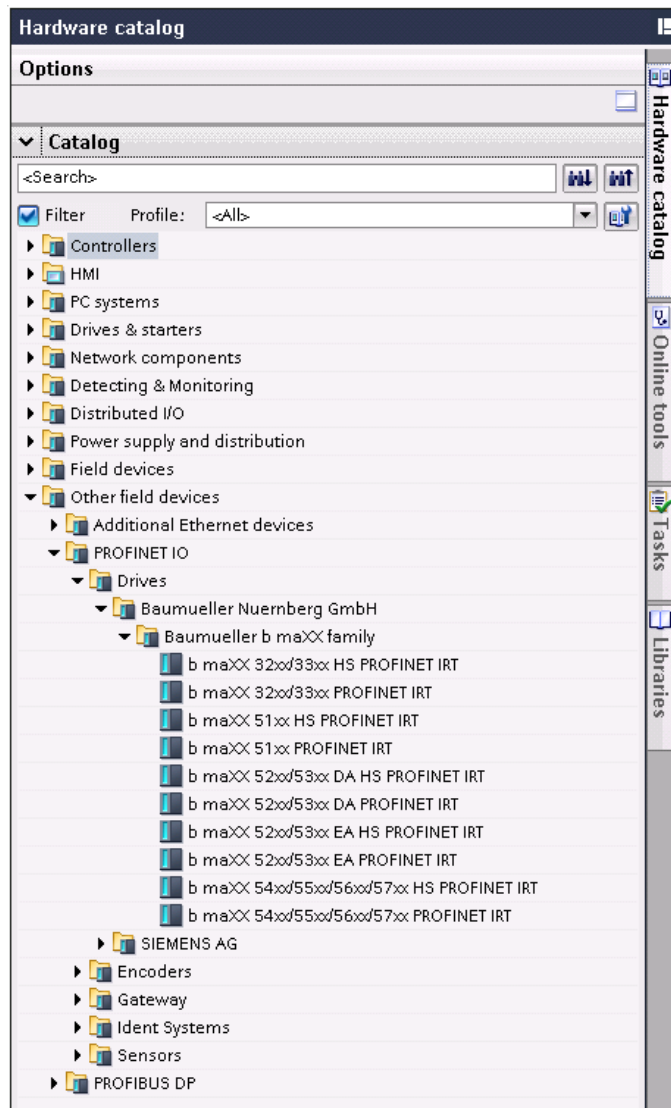


Figure 1: Device catalog Tia portal

Cycle times of 1000 μ s can be selected with the normal device versions (without the HS addition) and 32 parameters (16 actual values and 16 set values) can be configured in total. The HS versions allow 16 parameters (8 actual values and 8 set values distributed over 1 or 2 axes) with a cycle time of 500/250 μ s.

The devices have an internal switch to build up a line topology.

Restrictions relevant for the IRT mode, only:

The system limit must be determined at a line topology in the IRT mode. The maximum number of devices in a line depends on the number of transmitted parameters so that the controller can update the data at the output isochronously to the bus.

IRT PROJECT PLANNING IN TIA PORTAL

The PROFINET device name (P131.24) can be saved in the controller using ProDrive or an IO supervisor (in former versions lower than V1.15.1 also P105.11 was used). The projected cycle time and the Sync offset are set automatically in the controller. The synchronization is not automatically switched on and off, therefore it is necessary to switch the synchronization on in case of IRT is switched on.



NOTE!

The following rules for PROFINET device name must be observed when using PROFINET specification V2.3.

- The device name contains max. 240 characters. It is allowed:
Letters „a“ to „z“,
numbers „0“ to „9“,
hyphen or point
- A name section within the device name, e.g. a character line between two points, can be max. 63 characters.
- The device name must not start or end with a hyphen.
- The device name must not start with the characters „port-xyz“ (x, y, z = 0 to 9).
- The device name n.n.n.n with (n = 0 bis 9) is not allowed.

4.1 Quick start IRT

The devices must be connected in the topology view for an IRT project planning.



NOTE!

The sequence and the port connection must correspond exactly to the installation.

4.1 Quick start IRT

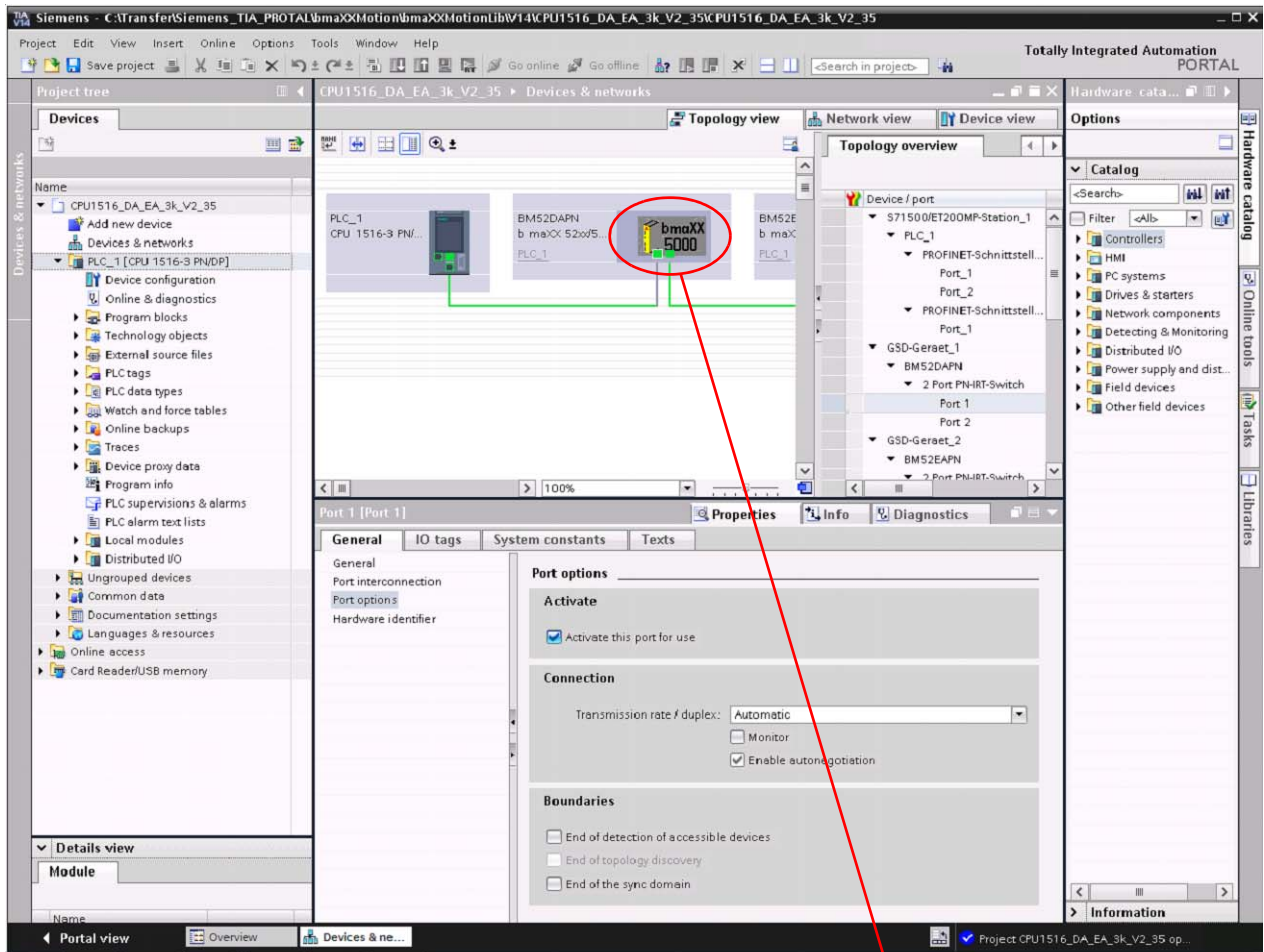


Figure 2: Topology view

The controller is set as Sync master.

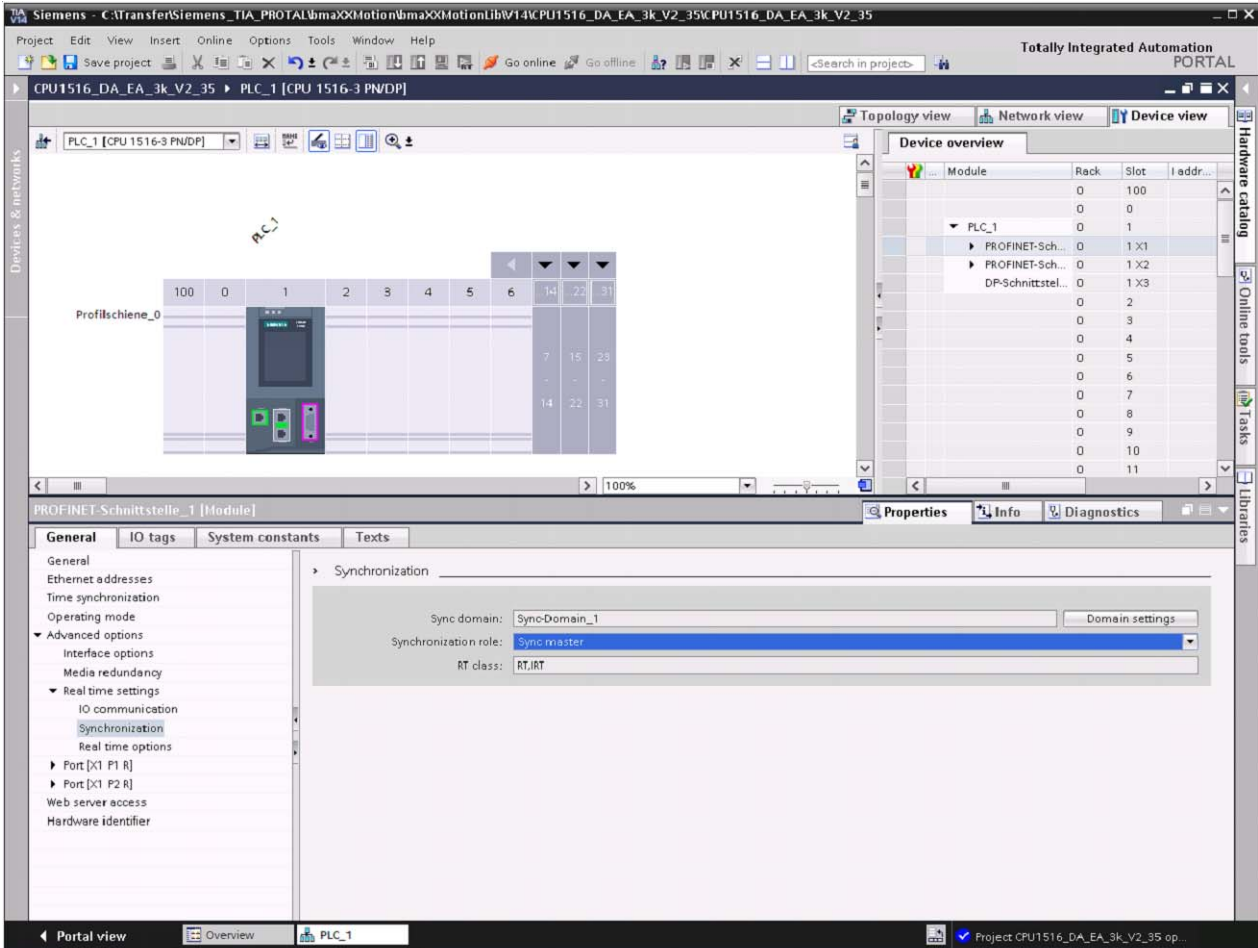


Figure 3: Set IRT mode at the controller

4.1 Quick start IRT

Next the IRT mode must be set at the device and the required parameters must be projected. The preconfigured modules can easily be removed from the slot and replaced by the required parameters.

The available parameters are shown in the device catalog.

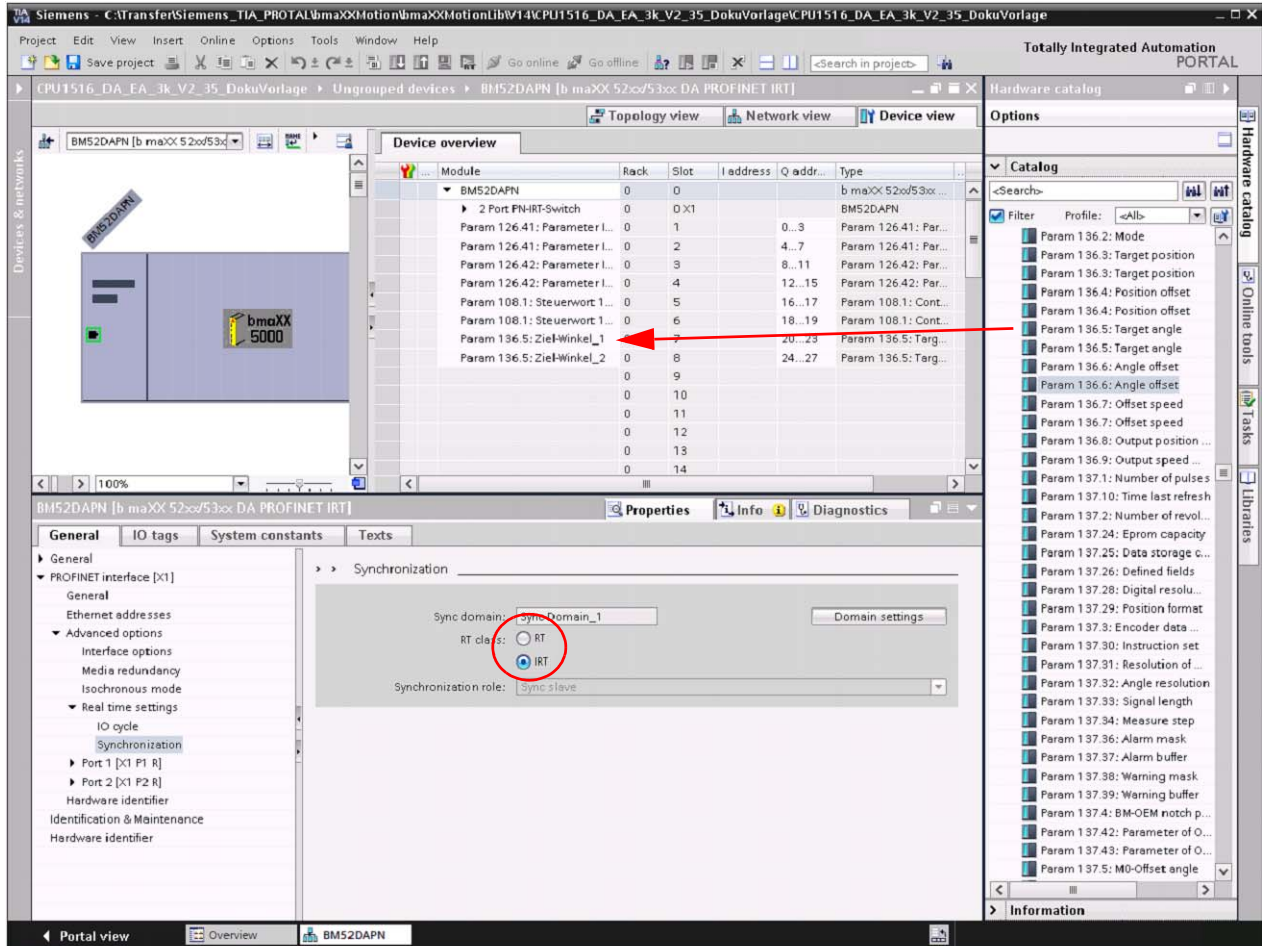


Figure 4: IRT mode device



NOTE!

Set values can be plugged in the slots 1-16 (at HS device in the slots 1-8) only. Actual values can be plugged in the slots 17-32 (at HS device in the slots 17-24) only. The GSDML file prevents that actual values are plugged in set value slots. Thus a faulty configuration can be excluded.

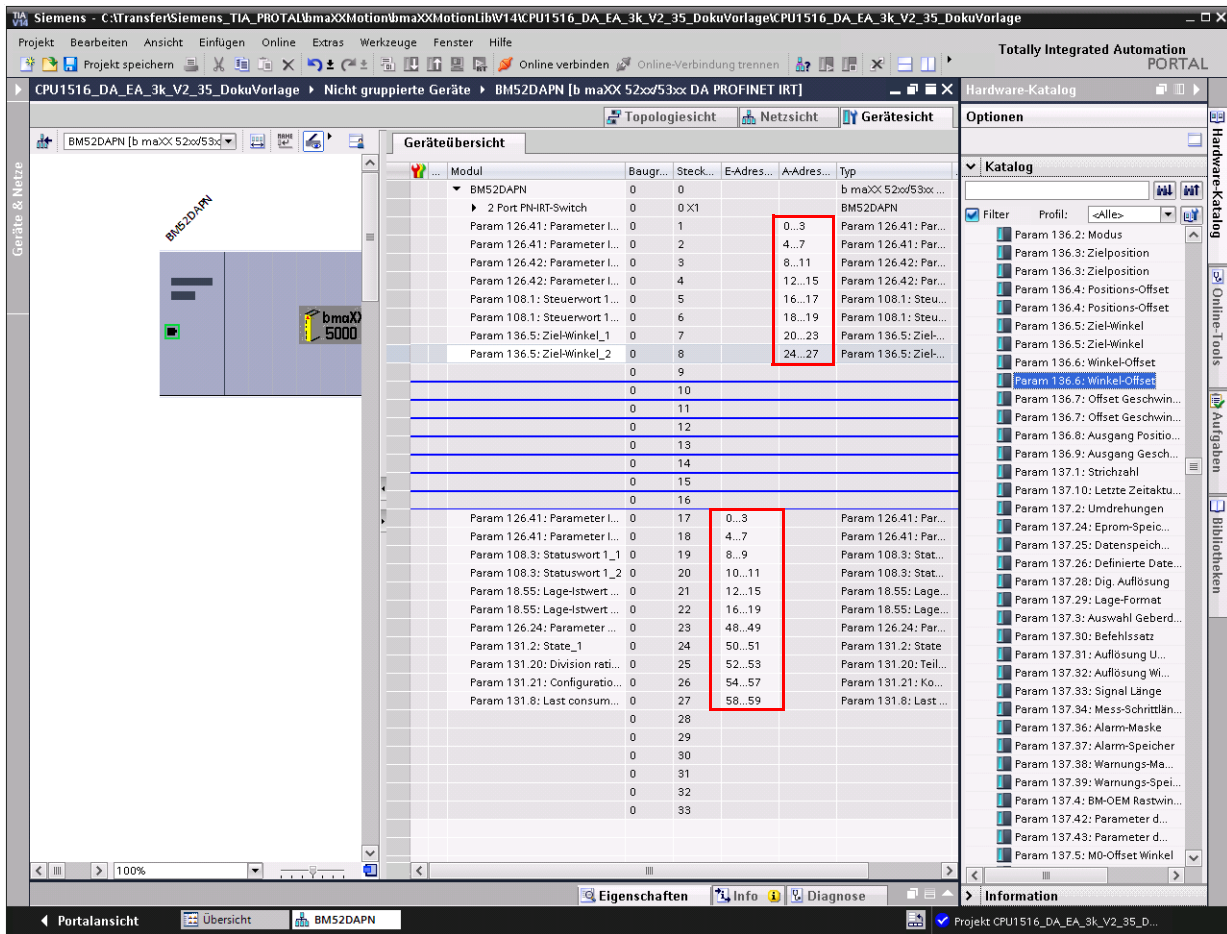


Figure 5: Splitting of set values and actual values

4.1 Quick start IRT

When configuring the parameters there may not be blank spaces between the individual modules (set values or the actual values).

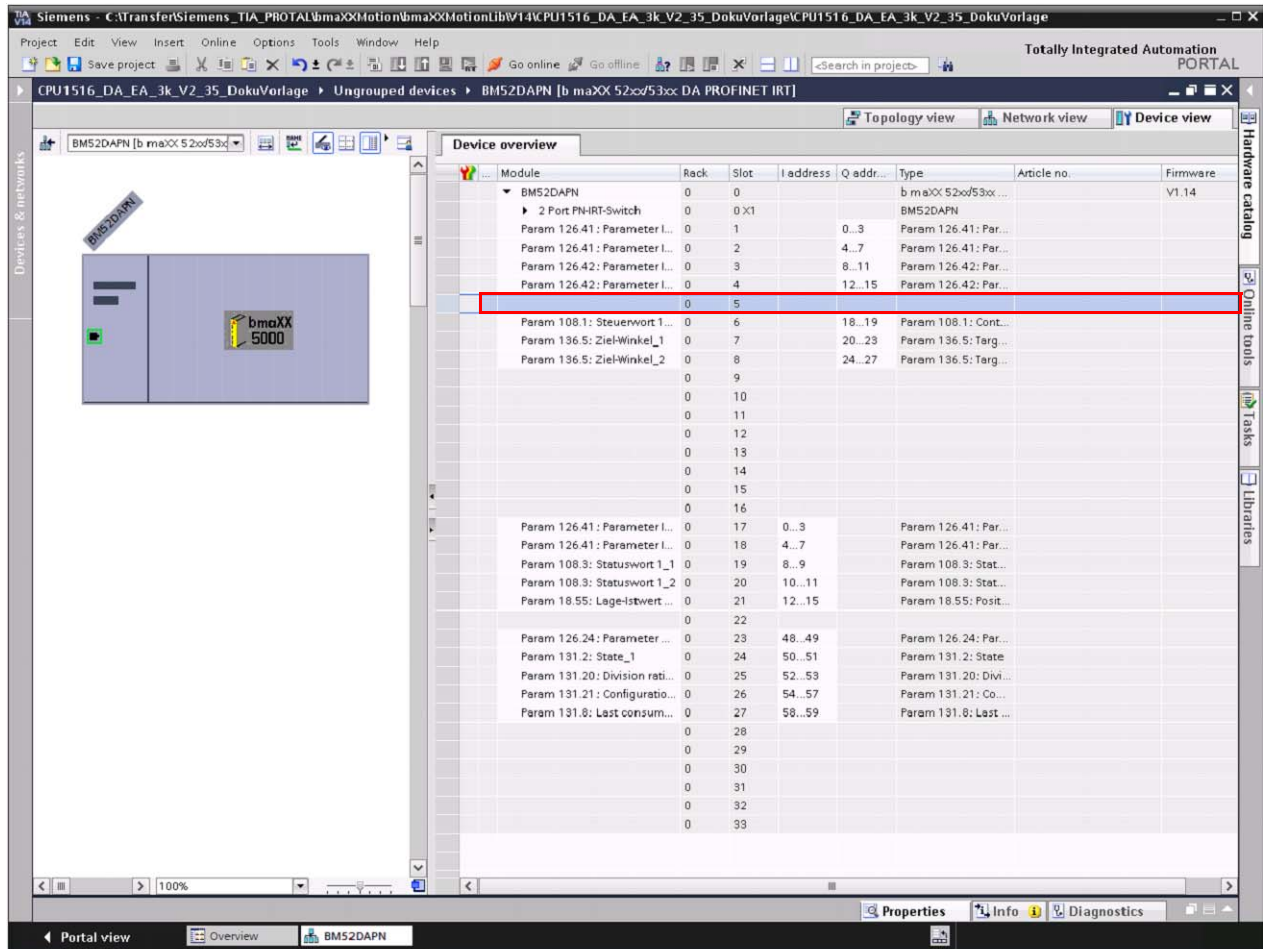


Figure 6: Incorrect configuration

If less modules (parameters) are to be transferred than possible, no preconfigured modules must be plugged. The last slots are simply kept empty.

The preconfigured modules are also indented as space holders in order to generate I/O addresses serially. After finishing the configuration the preconfigured modules can be deleted.

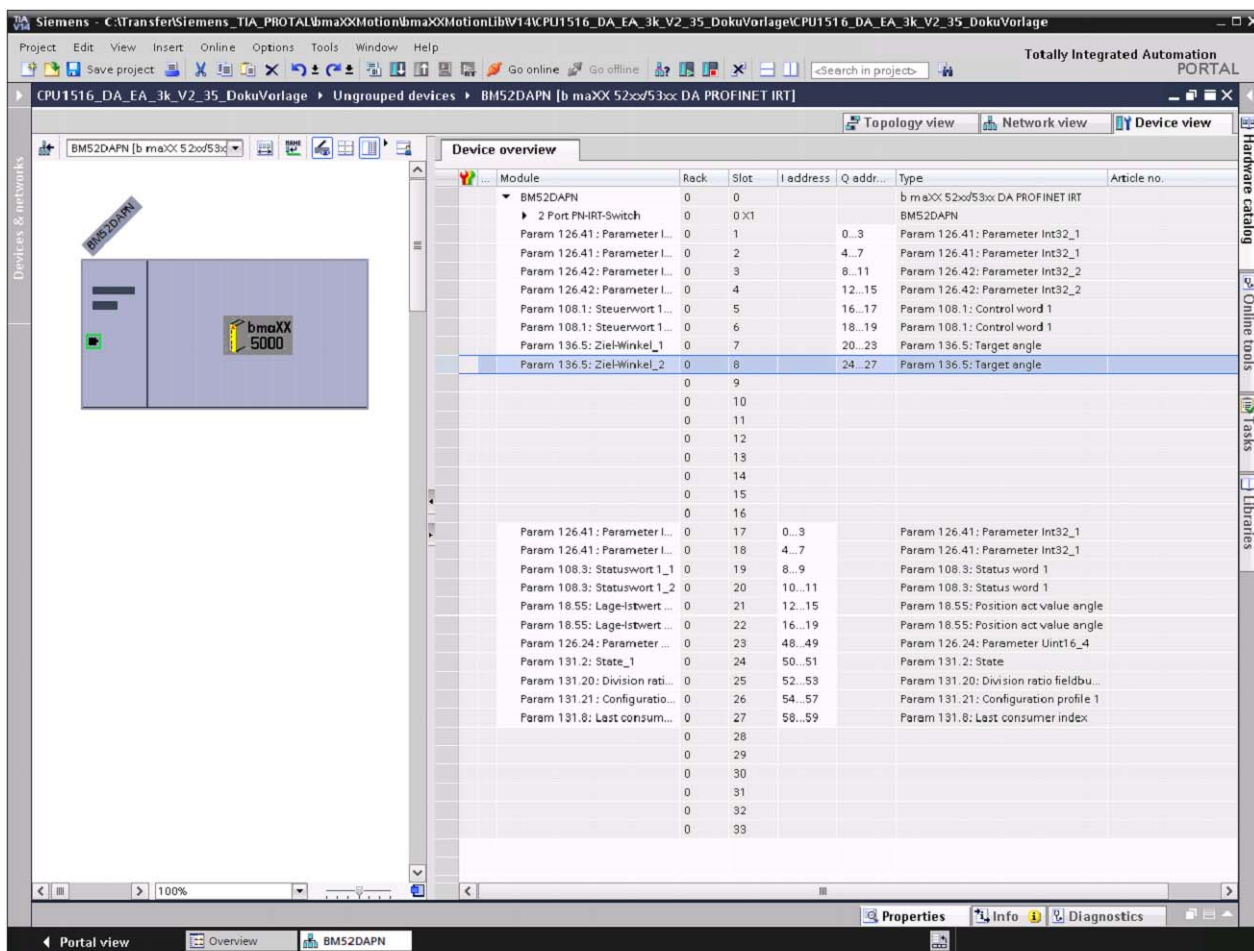


Figure 7: Correct configuration

4.1 Quick start IRT

At double axis controllers, for each parameter the axis number (default is axis 1) must be set. The module parameter opens by a double-click. The function of the FBI can be taken from the Baumüller documentation.

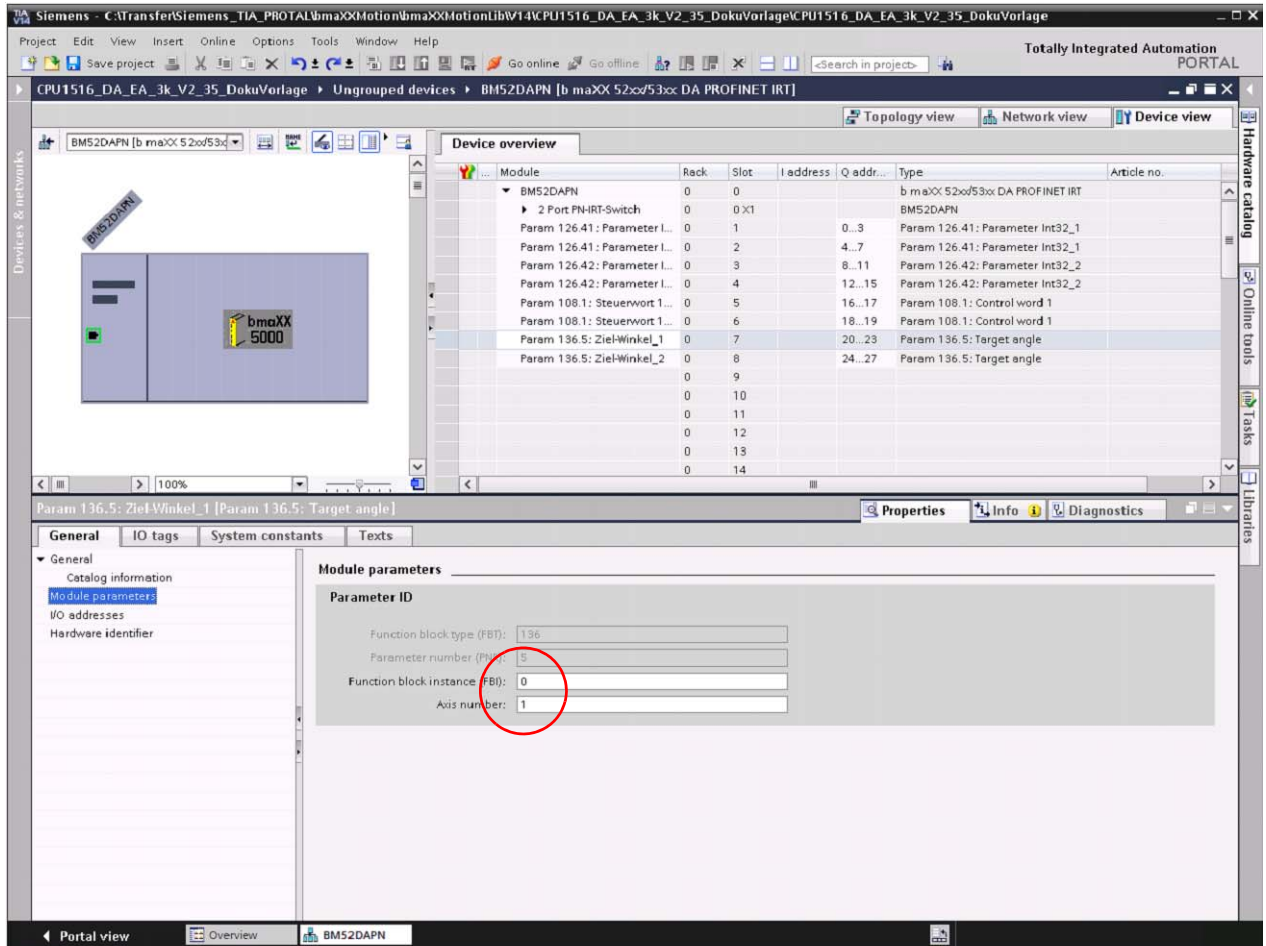


Figure 8: Parameter axis mapping

To implement an isochronous application IRT, the synchronization function block OB61 must be added.

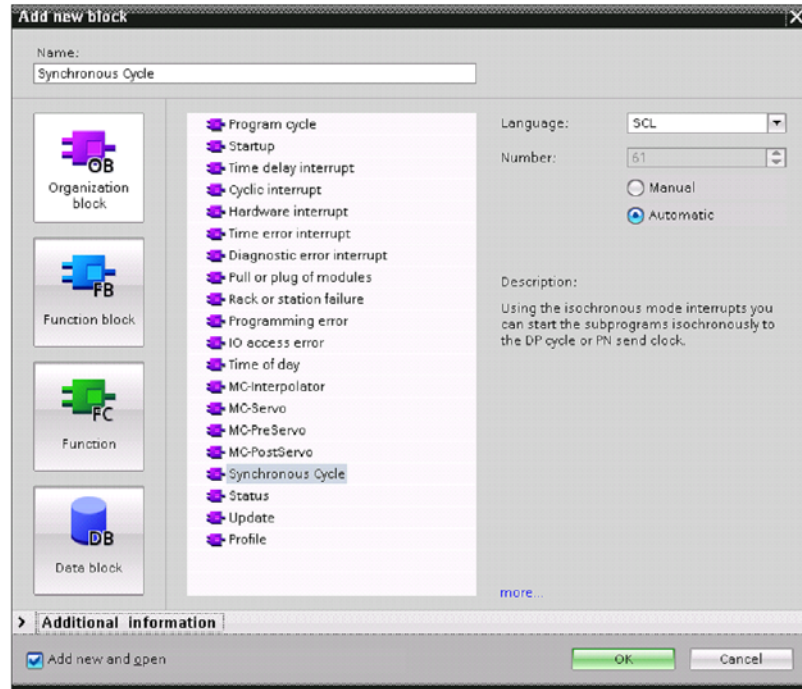


Figure 9: Setting isochronous mode OB61

4.1 Quick start IRT

In the next step a partial process image (TPA) and the decentralized periphery is assigned to the synchronization block OB61.

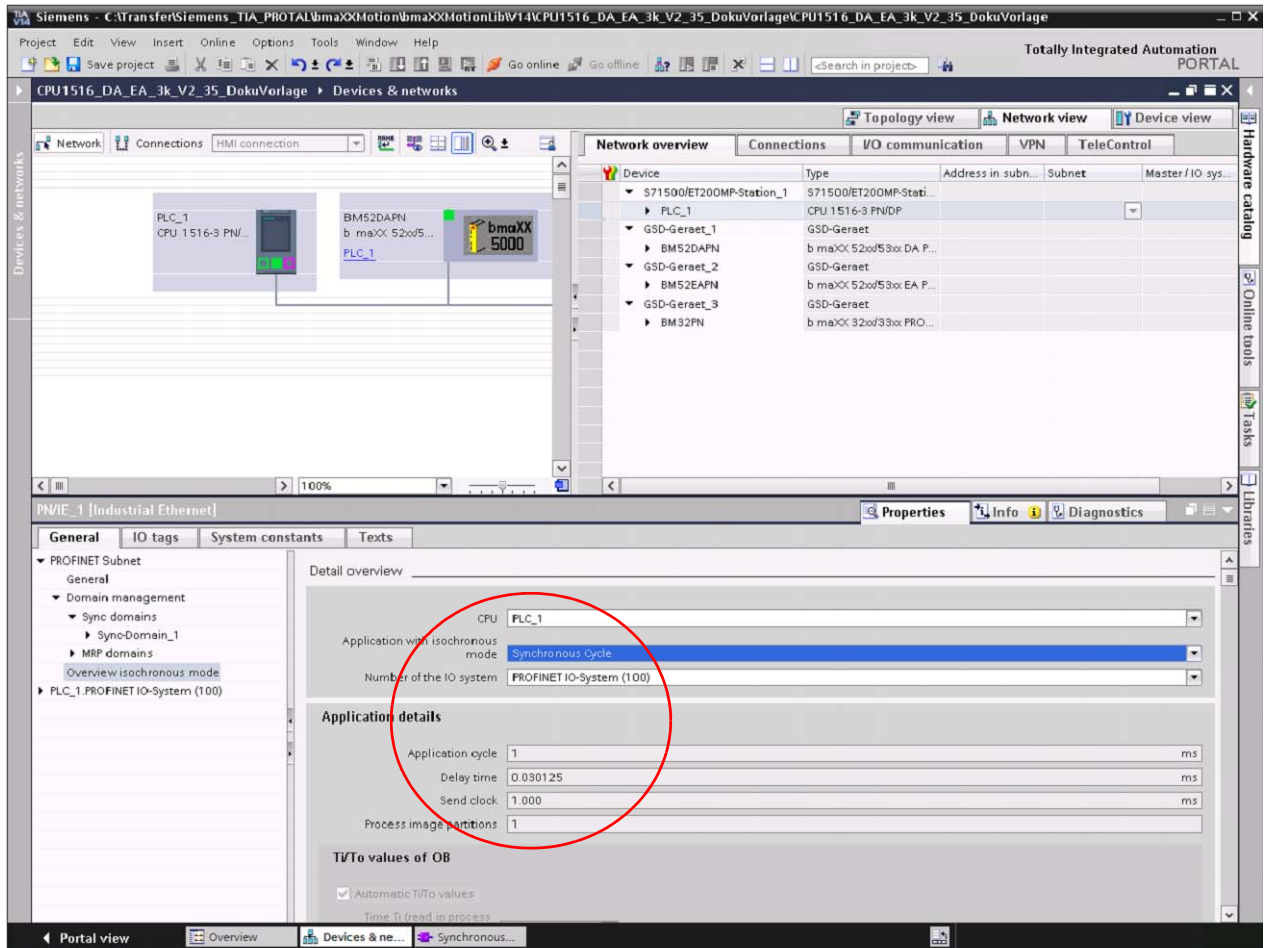


Figure 10: Define partial process image (TPA)

Those parameters, which shall be transferred isochronously, must be assigned to the TPA defined before.

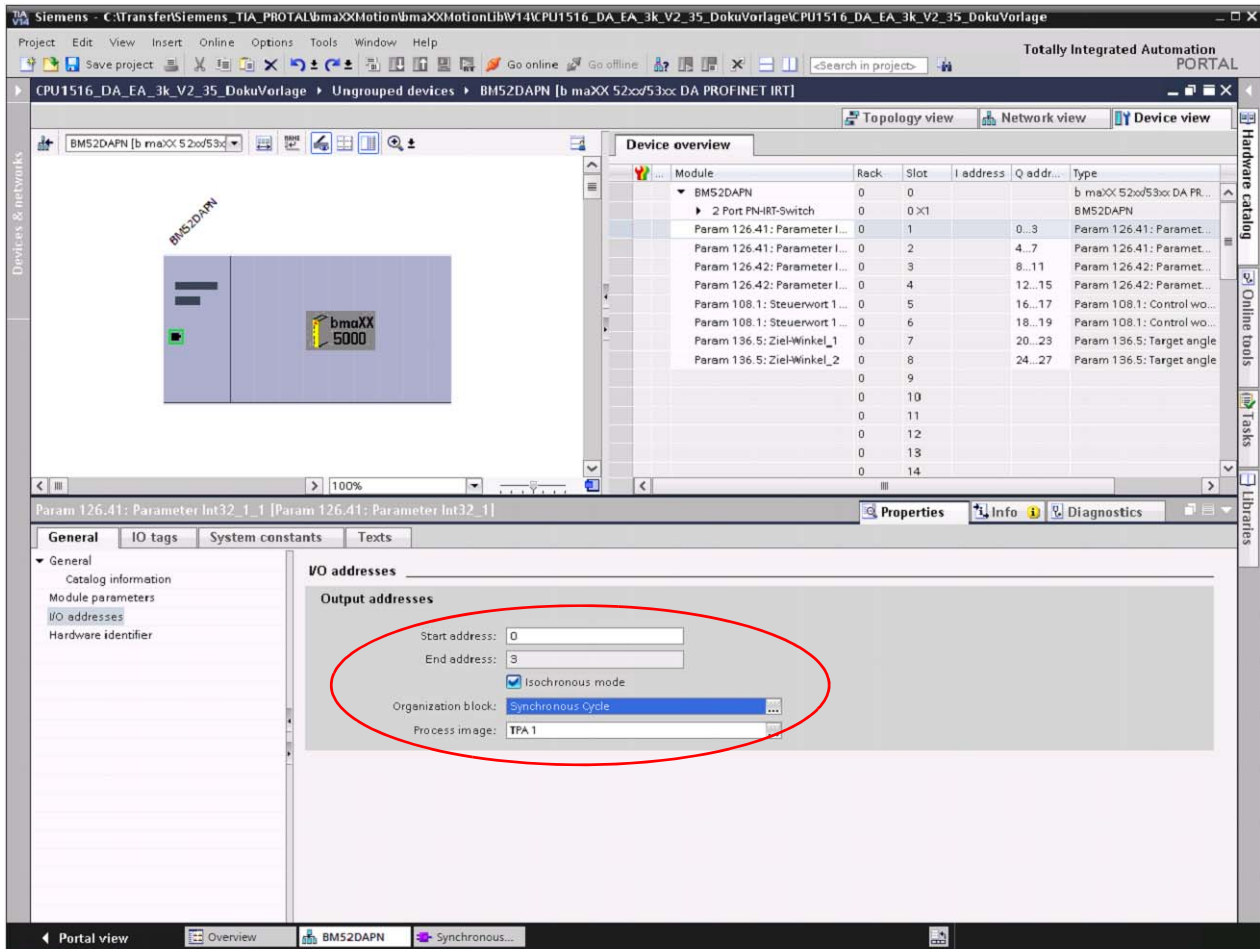


Figure 11: Device process image

4.1 Quick start IRT

At last the isochronous parameters must be marked in the Sync domain as cycle-synchronous modules.

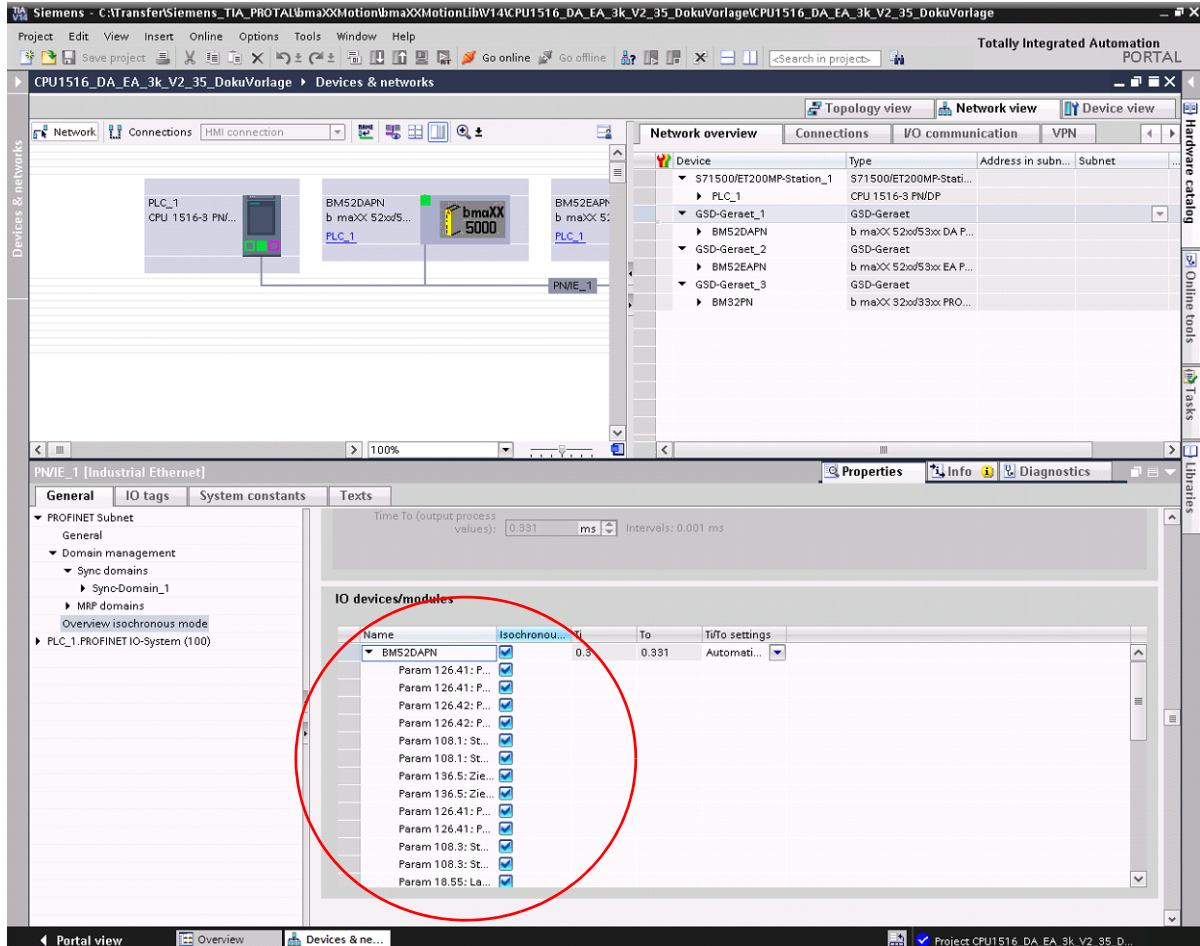


Figure 12: Sync domain configuration

An isochronous application can be implemented now in the synchronization block OB61 using the Sync commands.

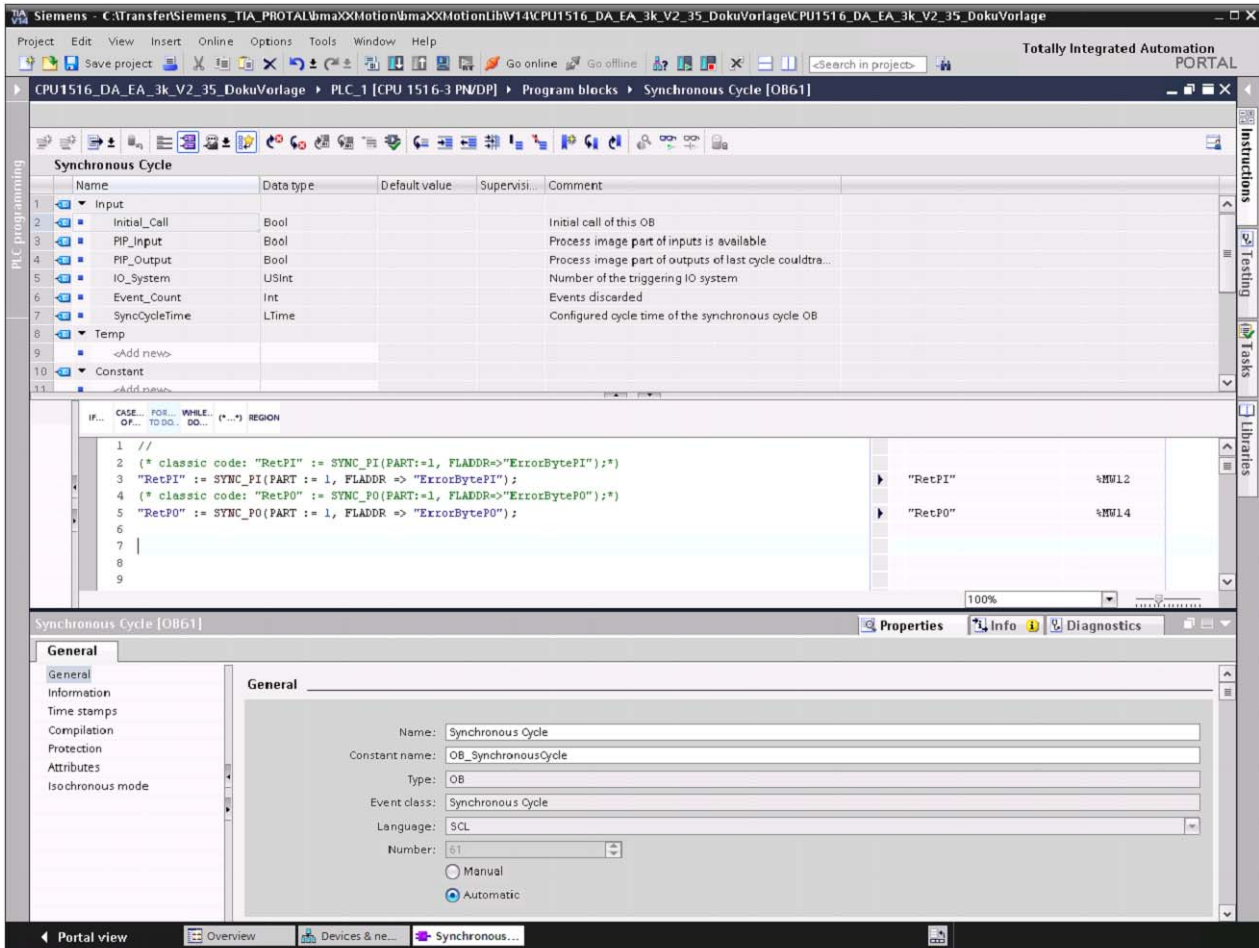


Figure 13: Synchronize process map

ACYCLICAL DATA TRANSFER

5.1 General overview

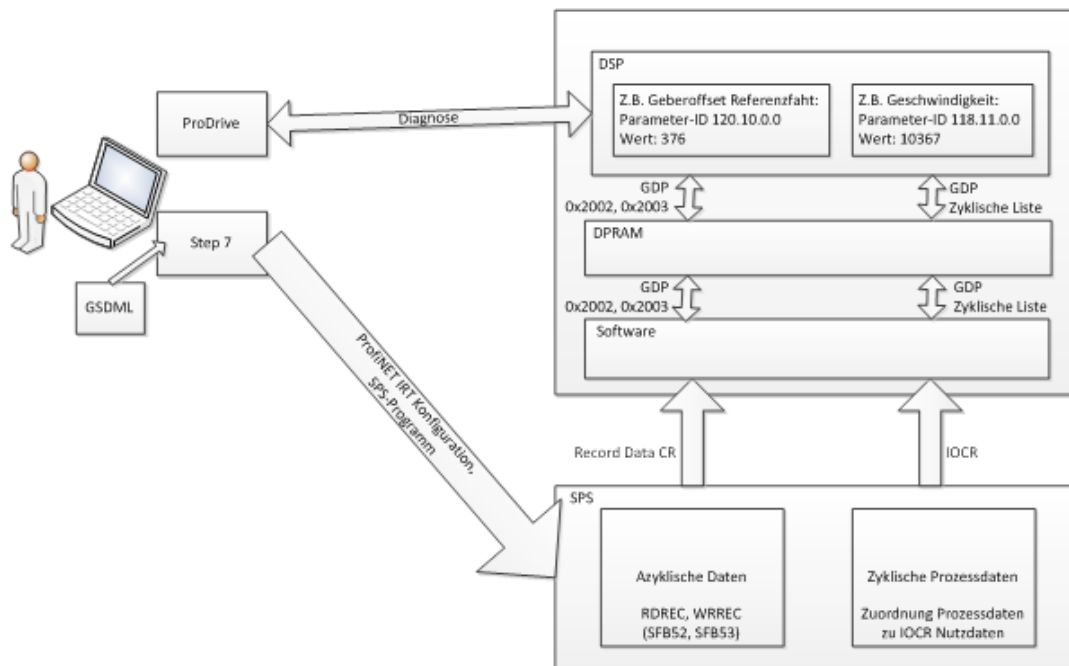


Figure 15: General overview

In general the PLC makes system function blocks available to the transfer of acyclical data. One for reading and one for writing. The Baumüller parameter ID as well as the actual parameter data are transferred as a part of the user data (RECORD).

The acyclical function blocks, especially within the data types of single connections, can be different depending on the type of SIEMENS CPU and version of SIEMENS Tia portal. The data types must be adapted accordingly.

Only 1 parameter is transferred always at a time:

Acyclical function blocks

SFB52 „RDREC“: Read

SFB53 „WRREC“: Write

5.2 Acyclical writing

In order to write acyclical controller parameters, the WRREC command (write data set) must be used.

This command can be found in the extended commands → decentralized periphery

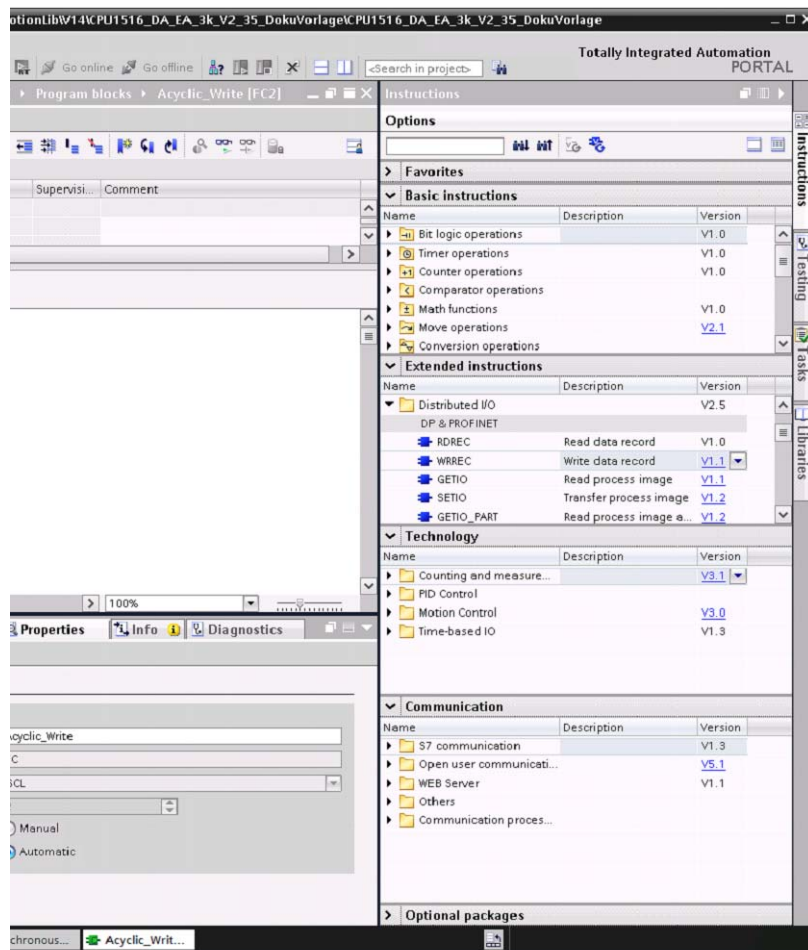


Figure 16: WRREC command

More information referring to this command can be obtained via the information system (F1) of the Tia portal.

The following documentation explains the use of the Baumüller b maXX 5000 command.

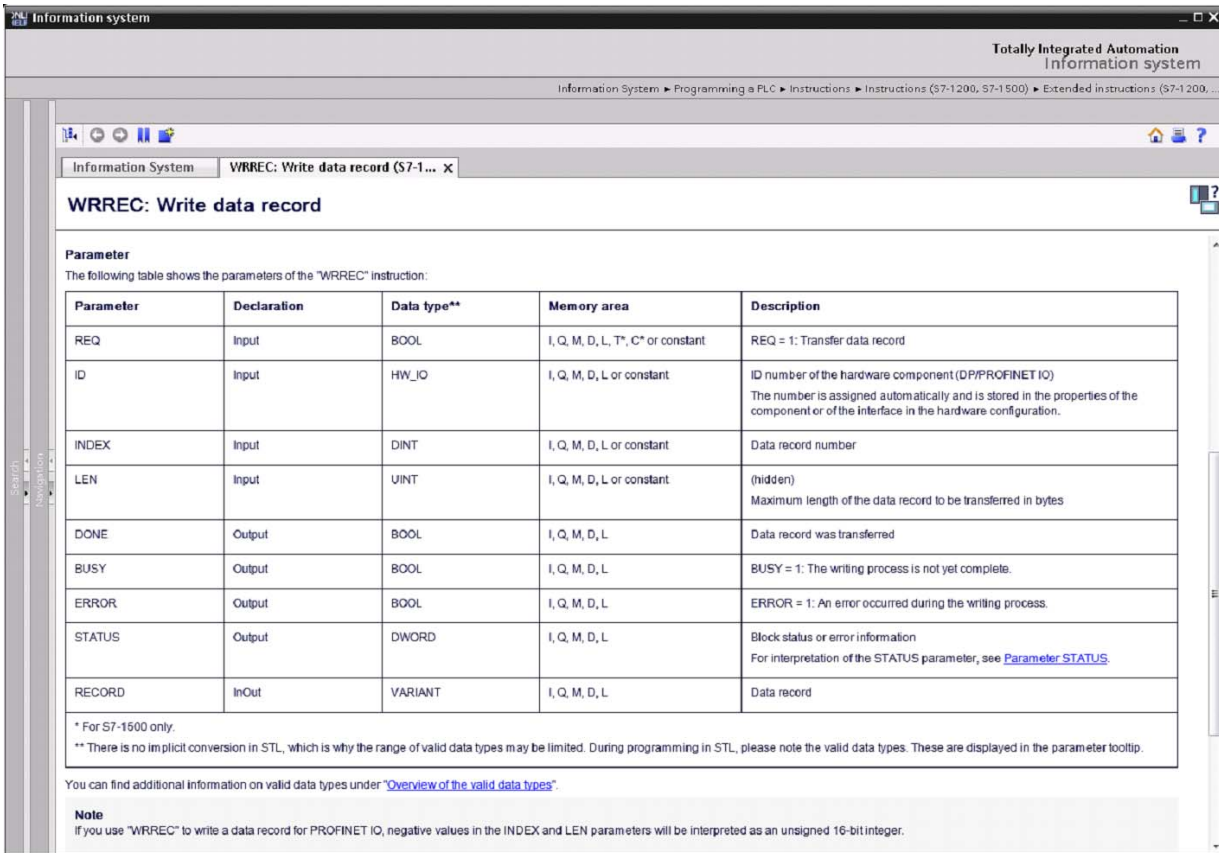


Figure 17: Parameter setting of WRREC

Meaning of the parameters for the b maXX

- EN: Enable function block
- REQ: Start transfer
- ID: Address of the PROFINET device, to which the data set should be transferred.

The data type of the addressing of the devices depends on the type of the SIEMENS CPU and can be different between the versions of the SIEMENS TiA portal.

For example the different addressing of a CPU315 and a CPU1516 with TiA V14 is shown.

5.2 Acyclical writing

CPU 315

For this device the addresses 0-27 are set. The controller can be reached via IDs 0000_8000_{hex} - 0000_801B_{hex} (ID decimal 32768 - 32795).

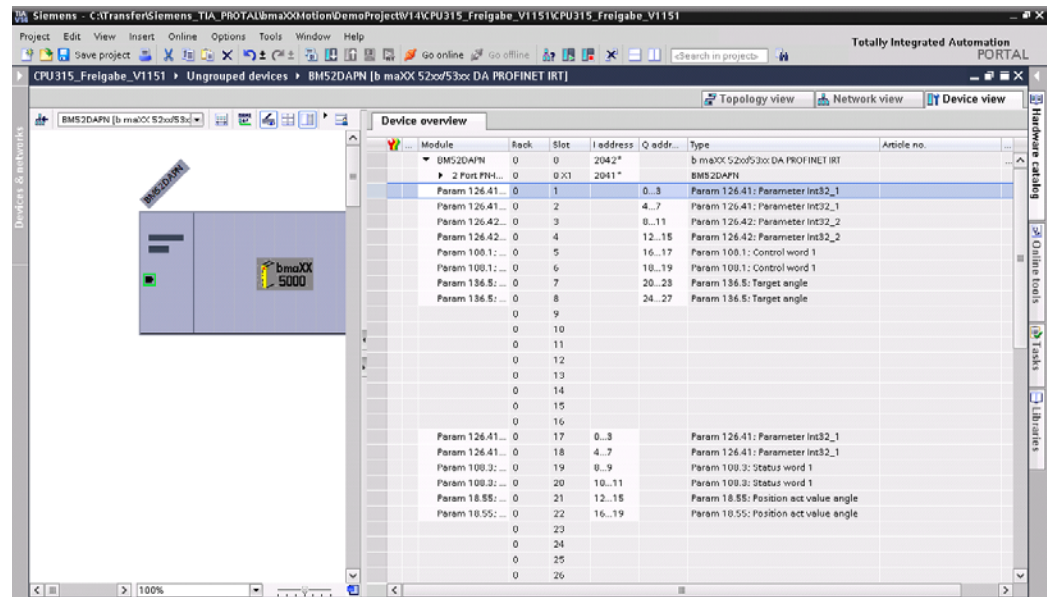


Figure 18: CPU 315, address 0-27

For this device the addresses 28-49 are set. The controller can be reached via IDs 0000_801C_{hex} - 0000_8031_{hex} (ID decimal 32796 - 32817).

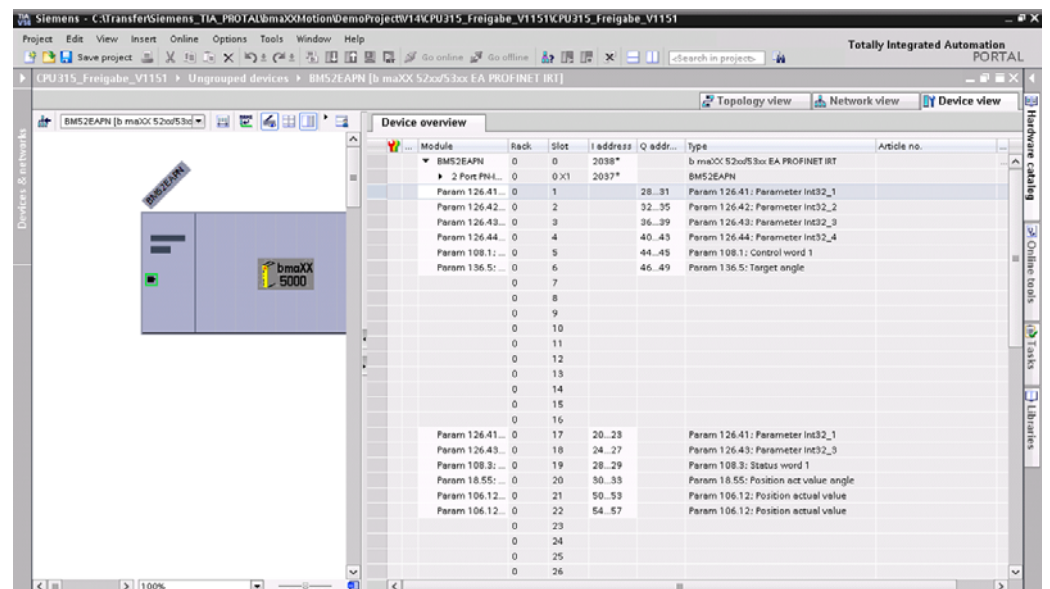


Figure 19: CPU 315, address 28-49

CPU 1516

For this device the addresses 0-27 are set. The controller can be reached via hardware identifier -> 10B_{hex} - 119_{hex} (ID decimal 267 - 281).

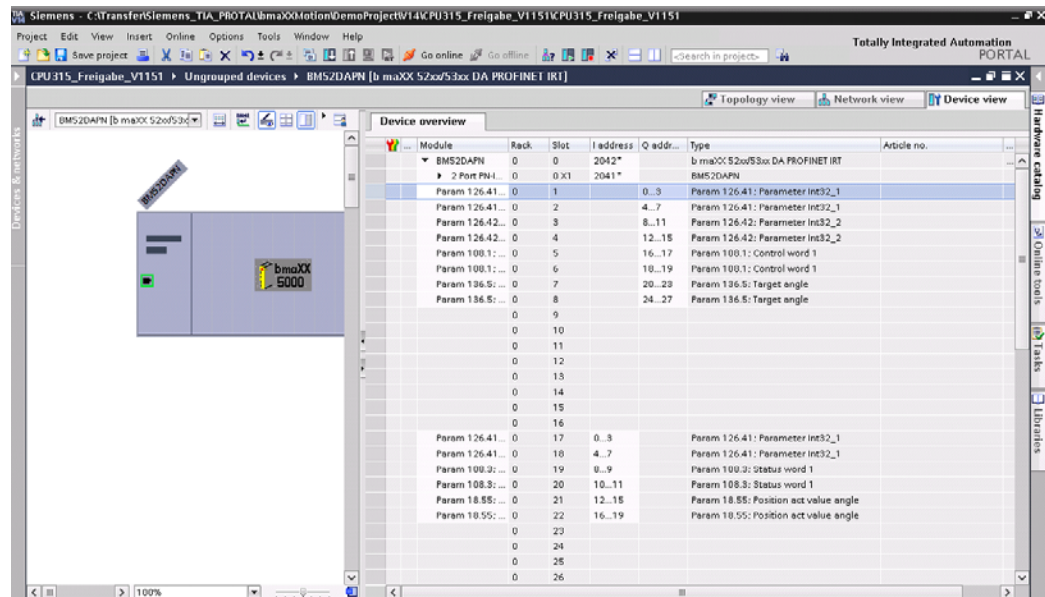


Figure 20: CPU 1516, address 0-27

For this device the addresses 28-49 are set. The controller can be reached via hardware identifier -> 127_{hex} - 120_{hex} (ID decimal 295 - 288).

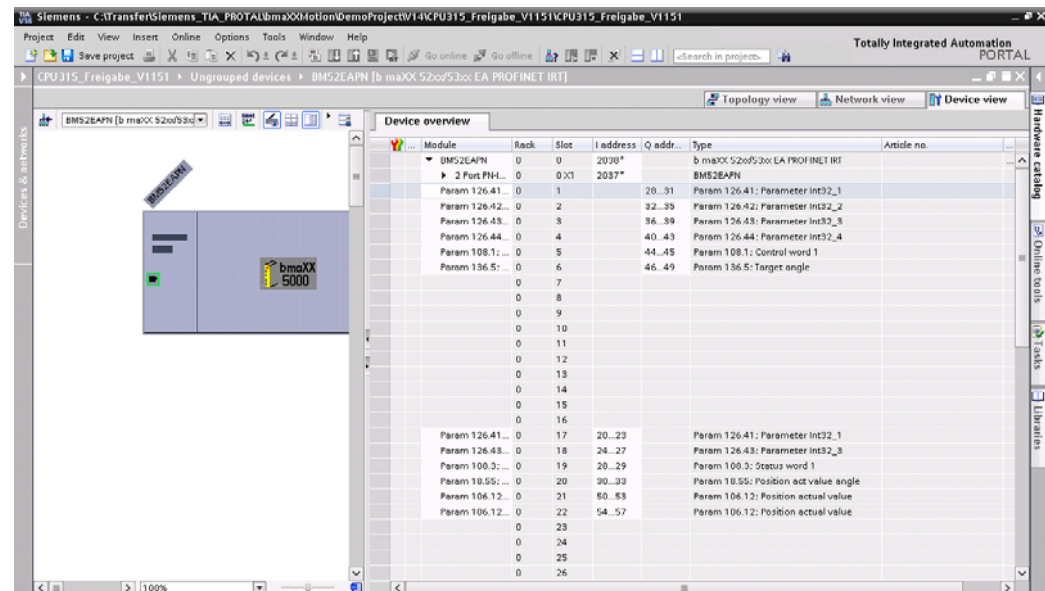


Figure 21: CPU 1516, address 28-49

5.2 Acyclical writing

- Index: For acyclical writing always constant: 252_{dez} or FC_{hex}
- LEN: Number of bytes to be transferred.
The length depends on the data type which is to be transferred;
the header always needs 16 bytes for a write operation
→ Len = 16 + Number of bytes to be transferred
- Record: Pointer to the data set to be transferred

Setup of the RECORD DB at a WriteRequest (WRREC)

DB part	Meaning
Header	Contains the specification of the Baumüller parameter which is to be written ParameterID, index, subdevice, data type
Data	Contains the parameter data to be written

A data block with the following setup must be generated as a data set:

Name	Data type	Offset	Start value	Retain	Visible in ...	Setpoint	Comment
Static							
ParalFormat	Byte	0.0	16#0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
ParalDatensatz	Byte	1.0	16#0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
ParalFunktionBlockT...	Int	2.0	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
ParalInstanzFBI	Byte	4.0	16#0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
ParalParameterNum...	Byte	5.0	16#0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Index0	Int	6.0	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Index1	Int	8.0	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Index2	Int	10.0	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Index3	Int	12.0	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Achse	Byte	14.0	16#0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Datentyp	Byte	15.0	16#0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Date_1	DWord	16.0	16#0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

Figure 22: Data block, record for acyclical writing

The parameters which are defined in the header are Baumüller specific parameters. For further information see the Parameter Manual BM5000 (5.09022) or BM3300 (5.12001).

	RECORD (User data block (DB))		PROFINET Stack / Protocol layer		
Header	Byte[0] <i>u8</i>	Parald.F	0: for scalar parameters 1: for structures or arrays		
	Byte[1] <i>u8</i>	Parald.DS	0: actual data set 1 ... 7: Data set 1 ... 7		
	Byte[2] Byte[3] <i>u16</i>	Parald.FBT	Function block type type of the function block, to which the parameter is mapped. 1 4095: Type code of the function block		
	Byte[4] <i>u8</i>	Parald.FBI	Instance / index of the function block 0 ... 255: Instance of the function block of the type		
	Byte[5] <i>u8</i>	Parald.PNR	Parameter number 0 ... 255: Number of the parameter within the function block		
	Byte[6] Byte[7] <i>u16</i>	ParalIndex.0	Index level 0 for structure parameters or array parameters		
	Byte[8] Byte[9] <i>u16</i>	ParalIndex.1	Index level 1 for structure parameters or array parameters		
	Byte[10] Byte[11] <i>u16</i>	ParalIndex.2	Index level 2 for structure parameters or array parameters		
	Byte[12] Byte[13] <i>u16</i>	ParalIndex.3	Index level 3 for structure parameters or array parameters		
	Byte[14] <i>u8</i>	SubDeviceldx	1: Axis 1 2: Axis 2		
Byte[15] <i>u8</i>	Data type	The following mapping is valid:			
		Value	Data type	Data length [byte]	
		0x0001	BOOL	1	
		0x0002	SINT	1	
		0x0003	INT	2	
		0x0004	DINT	4	
		0x0005	USINT	1	
		0x0006	UINT or WORD	2	
		0x0007	UDINT or DWORD	4	
		0x0008	FLOAT	4	
0x0009	STRING	82			

5.3 Acyclical reading

The following example shows the writing of the value 0x65DD to the application parameter Uint16_1 ▶126.21◀ on axis 1.

bmaXX500_IRT_4Regler ▶ pn-io [CPU 315-2 PN/DP] ▶ Programmbausteine ▶ Datenbaustein_3 [DB5]									
Datenbaustein_3									
	Name	Datentyp	Offset	Startwert	Beobachtungswert	Remanenz	Sichtbar i...	Einstellwert	Kommentar
1	Static								
2	ParaldFormat	Byte	0.0	0	16#00	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
3	ParaldDatensatz	Byte	1.0	0	16#00	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
4	ParaldFunktionBlockT...	Int	2.0	0	126	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
5	ParaldInstanzFBI	Byte	4.0	0	16#00	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
6	ParaldParameterNum...	Byte	5.0	0	16#15	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
7	Index0	Int	6.0	0	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
8	Index1	Int	8.0	0	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
9	Index2	Int	10.0	0	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
10	Index3	Int	12.0	0	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
11	Achse	Byte	14.0	0	16#01	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
12	Datentyp	Byte	15.0	0	16#06	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
13	Data	Word	16.0	16#0	16#65DD	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

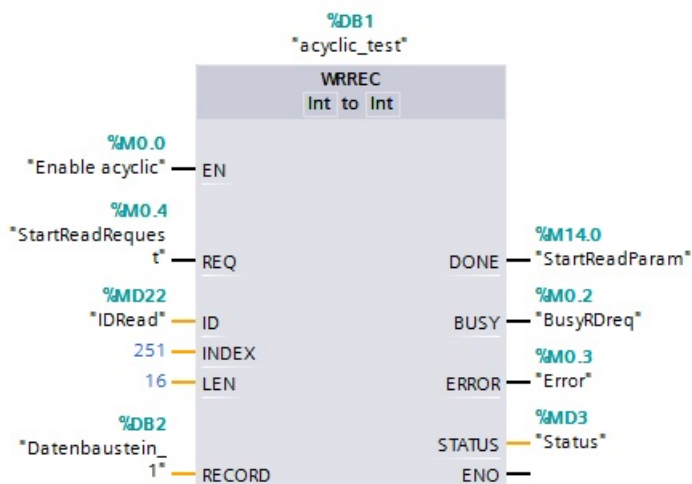


Figure 23: Example: acyclical writing

5.3 Acyclical reading

The parameters of the system function block for acyclical reading (RDREC) are not appropriate to specify the Baumüller parameter to be read. Therefore the acyclical reading of a Baumüller parameter is made in two steps:

- 1 Communicate to the device which Baumüller parameter should be read (WRREC)
- 2 Execute the actual read operation

At first a read order with the data block for acyclical writing (WRREC) must be initiated at the controller. This read order contains which Baumüller parameter should be read in the next step with RDREC.

The first step to provide the reading parameter in the controller is identical with the acyclical writing of the parameter.

Only the differences to the parameterization of acyclical writing are shown here:

- ID: The configuration of ID is described on [page 29](#).
- Index: This parameter is always 251_{dez} or FB_{hex} in order to initiate acyclical reading
- Len WRREC: The data block (Record), which is transferred to the controller when generating a read request, always has the same length: 16 byte
- Len RDREC: The length depends on the data type, which should be read at the reading of the before requested parameter

A WORD is read in the example → MLEN = 22.

The setup of the record is explained subsequently.

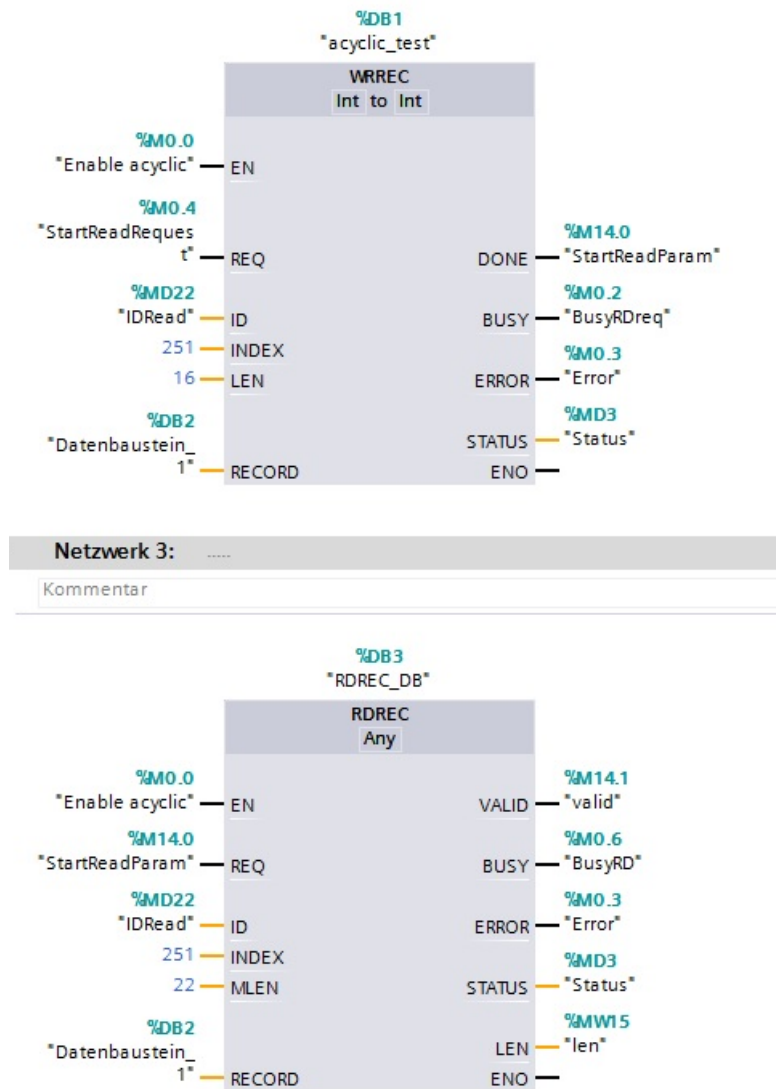


Figure 24: Acyclical reading with WRREC and RDREC

Setup of the RECORD DB at a ReadRequest (RDREC)

DB part		Meaning
Header		Contains the specification of the Baumüller parameter which should be read ParameterID, index, subdevice, data type
Data	RC	Return code
	ParaValue	Contains the read parameter data

A data block with the following setup must be generated as a data set:

Datenbaustein_1								
	Name	Datentyp	Offset	Startwert	Remanenz	Sichtbar i...	Einstellwert	Kommentar
1	Static				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
2	ParaldFormat	Byte	0.0	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
3	ParaldDatensatz	Byte	1.0	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
4	ParaldFunktionBlockT...	Int	2.0	108	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
5	ParaldInstanzFBI	Byte	4.0	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
6	ParaldParameterNum...	Byte	5.0	1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
7	Index0	Int	6.0	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
8	Index1	Int	8.0	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
9	Index2	Int	10.0	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
10	Index3	Int	12.0	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
11	Achse	Byte	14.0	1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
12	Datentyp	Byte	15.0	6	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
13	RC	DWord	16.0	16#0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
14	Data	Word	20.0	16#0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

Figure 25: Data block for acyclical reading

After initiating a read request 16 bytes of the header only are transferred in the first step. When calling the RDREC block 22 bytes are transferred with the same data block. Afterwards the RC code and the read-out value are inserted beginning with byte 16.

The RC return code represents the Baumüller specific error at the data transfer to or from the controller. The RC return code can be found in the Parameter Manual BM5000 or BM3300 (chapter 4).

It is actually necessary to create for WRREC and REREC function blocks an own data function block DB with the according data type for each data type (DWord, Word, Byte, Float/Real). In case of using several devices this can lead to more complexity.

It is possible to create one DB for a DWORD and extract then the desired data type (Word, Byte, Float/Real) from the DWORD. Please ensure, that the correct/valid data is extracted from the DW.

Keyword MSB/LSB and Motorola/Intel format.

6

PRODRIVE

The current controller status can be requested by using ProDrive with a service cable or other settings can be done.

The controller can be accessed using TCP/IP. A connection must be set in ProDrive as follows:

IP address	The address which is set in the project planning tool, must be used here
Port	20547



NOTE!

In an isochronous operation mode is the communication via TCP/IP possible while a real time communication between master control and controller is active. But using CPUs with lower power and many connected devices at the CPU, it is possible, that the communication to ProDrive is shortly interrupted. In this case a continuous communication via ProDrive it is not recommended.

TCP/IP communication is possible without limitation at PROFINET IRT.

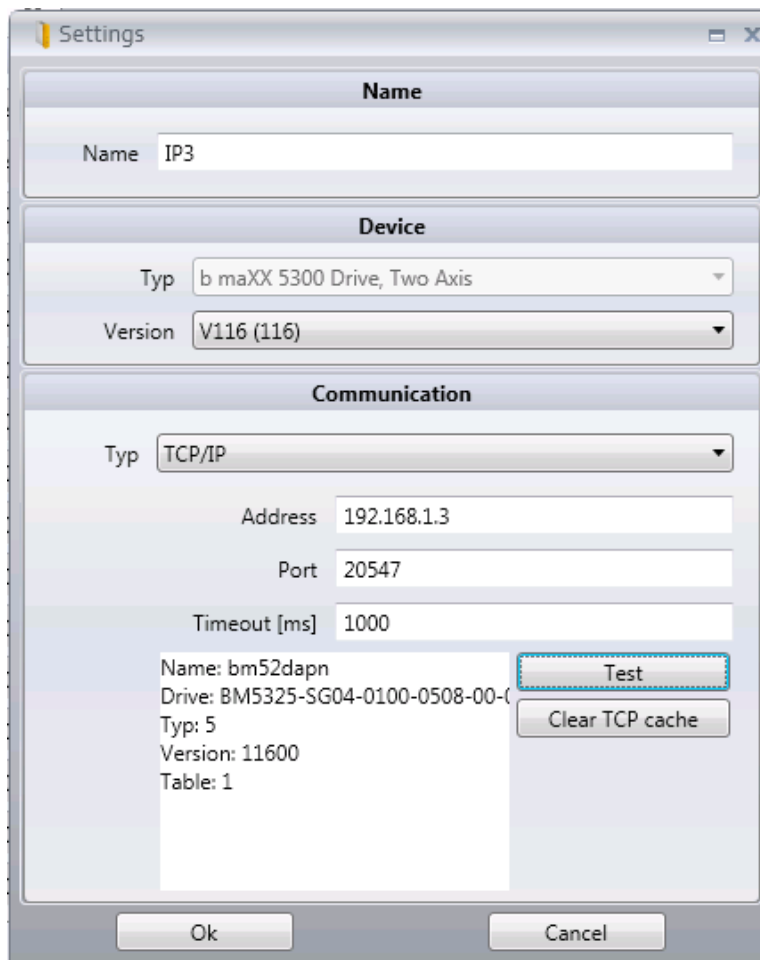


Figure 26: ProDrive TCP/IP

The TCP/IP connection only works if the device is connected with the controller and was assigned the IP address from the controller.

It is possible even without a CPU to establish a connection with ProDrive and the device. Therefore a known IP address must be saved in the data set and the communication can be configured by settings of this window.



APPENDIX A - ABBREVIATIONS

FBI	Function Block Instance
DA	Double axis
DB	Data block
EA	Single axis (Einzelachse)
FW	Firmware
GDP	Gateway Discovery Protocol
GSDML	General Station Description Markup Language
HS	High Speed
IRT	Isochronous Real-Time
PROFINET	Process Field Network
SFB	System Function block
SPS	Programmable logic controller
SYNC	Synchronization
TCP/IP	Transmission Control Protocol / Internet Protocol
TIA Portal	Totally Integrated Automation Portal
TPA	Subprocess image (Teilprozessabbild)



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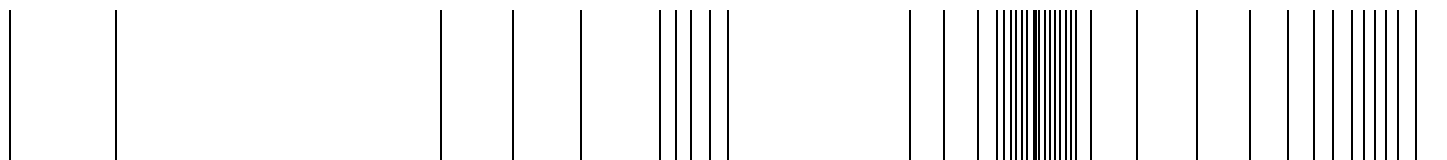




Revision survey

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be in motion



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