SIEMENS

TX-I/O™
TX-I/O PROFINET BIM V1.0
User manual

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Building Technologies

Contents

1 About this Document

1.1 Revision History

Version	Date	Changes	Section	Pages
1.0	31.03.2010	New document	–	–

1.2 Reference Documents

Ref.	Document title	Type of document	Document no.
[1]	TX-I/O functions and operation	User Manual	CM110561
[2]	TX-I/O engineering and installation manual	User Manual	CM110562
[3]	Engineering workflows with XWP V4	Workflow documentation	CM111001
[4]	Digital input modules	Product data sheet	CM2N8172
[5]	Universal modules	Product data sheet	CM2N8173
[6]	Super universal modules	Product data sheet	CM2N8174
[7]	Relay modules	Product data sheet	CM2N8175
[8]	Resistance measurement module	Product data sheet	CM2N8176
[9]	Bistable relay module	Product data sheet	CM2N8177

1.3 Before you Start

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1.4 Terminology

The key terms in TX-I/O terminology are listed below.

Term	Definition, *description*
Addressing	Unit from a module number (range 1…120) and an I/O point number (ranage 1…16) from the view of the building automation system.
Address key	Accessory part that has to be inserted in the TX-I/O module. *The mechanical coding of the key assigns the module its address.*
Bus connection module	"Passive" module that relays the bus signal and the module supply from one I/O row to the next and/or feeds an additional field supply for peripheral devices (AC/DC 12...24 V)
Bus Interface Module (BIM)	Interface between a controller and the bus of the TX-I/O modules.
Bus master	Device with general functions for a group of I/O modules.
TX-I/O module bus (island bus)	• Communication bus between the bus master (bus interface module, BIM) and the connected TX-I/O modules. • Also serves as carrier of the module supply and field supply. • *The bus is constructed by plugging the TX-I/O modules together.*
Electronic unit	Removable part of the TX-I/O module with the module electronics.
Functional test	Control of an output (separate island bus) – i.e., program commands are not effective. *When disconnecting the connection of the BIM tool (or in the case of power failure), the outputs assume their original values again.*
I/O function	Function in an I/O point that defines the point's operation mode (e.g., signal input, voltage output 0...10 V). *Specific functions can occupy a number of I/O points (e.g., multistage switching output).*
I/O island	All TX-I/O devices (bus users) that are physically connected to the same island bus segment and connected by a common bus master.
I/O module	Device in which the physical signals of the field devices are converted to software process values and vice versa. *An I/O module has a number of I/O points specified by the module type. The modules are divided into a terminal socket and a pluggable electronic unit.*
I/O point	Smallest addressable unit in an I/O module. *One or more I/O points (e.g., a three-stage switching output) correspond to one data point/channel on the automation station.*
I/O row	An I/O island comprising different rows of modules. *Each row starts either with a bus master, a supply module or a bus connection module.*
Terminal	Connection unit for the cables of the peripheral devices (field devices).
Terminal socket	Part of the TX-I/O module that is mounted on the standardized mounting rail and on which the wiring is implemented. *The terminals implement the function of switching cabinet series terminals.*
Configuring	Specification of the functionality of an I/O point by defining an I/O function and its parameters. *An I/O function that already exists in a module before the downloading and its I/O points are first disabled (for details, refer to the TX-I/O engineering documentation [3]).*
Local override control	Operation of an output using keys on the module.
Deletion key	Used to reset the module function to the factory settings. *Inserted in place of the address key for later removal.*
Process value	Software image of the physical value in the peripheral device. *Communicated on the bus.*
Parameterize	Change the properties of an I/O function during the configuration or operation (*for details, please refer to the TX-I/O engineering documentation [3]).*
Supply module	"Active" power supply that converts AC 24 V to DC 24 V. *Provides module power supply for operation of the module electronics and supply for field devices with DC 24 V and AC 24 V.*
Tool override control	Control of an output using a tool.

2 General

2.1 Overview

Profinet BIM is an interface module which enables to access from the Simatic infrastructure to

- process data
- configuration data and
- parameters

of TX-I/O modules.

2.2 Application

Function

The purpose of Profinet BIM is to connect the two communication media, TX-I/O and PROFINET-DP, and in this way to allow access to the DESIGO I/O modules from a SIMATIC S7.

Handling

Within SIMATIC

- Profinet BIM is handled as a Profinet I/O device and
- TX-I/O modules are represented as Profinet I/O modules.

Behavior

- In the Profinet infrastructure, Profinet BIM behaves as a PNIO device and supports the datagram data exchange in the direction of the Profinet IO controller (SIMATIC S7).

- On the island bus (communication bus of the TX-I/O modules) the Profinet BIM operates as the island bus master. Consequently, it is responsible for the data flow to and from the TX-I/O modules.

  All data forwarded via the Profinet BIM is converted to the datagram format used by SIMATIC S7.

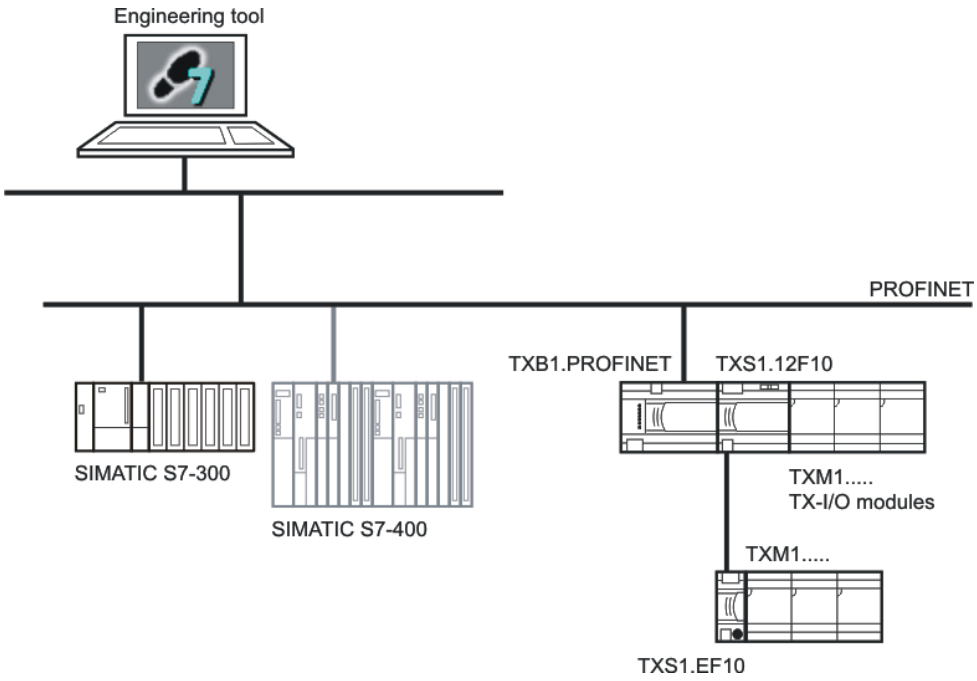
Engineering

Engineering of the Profinet BIM is carried out using standard Profinet I/O engineering methods. The properties of the TX-I/O modules are saved in the product-specific GSDML file. The GSDML file provides the basis for engineering with the Profinet project engineering tool (e.g., Simatic Manager).

The Profinet BIM does not require engineering. It receives its parameters from the Profinet I/O controller assigned to it (e.g., from the SIMATIC S7).

2.3 Configuration

The following figure shows how the TX-I/O modules are connected to SIMATIC S7 (S7-200, 300 and 400) and to the higher-level management PC.



2.4 Features

Communication

On the Profinet side, Profinet BIM supports 100-MHz full duplex Ethernet communication.

Performance

The performance (number of TX-I/O modules per Profinet BIM that can be used) depends on the following specific conditions:

Support

64 TX-I/O modules (max.)

Conditions

- Programmable TX-I/O module addressing range 1–120
  It is recommended to start from 1 and increase in steps.
- Maximum of 256 input bytes made up of the following data:
  - Total of all process data bytes of all input modules
  - Number of input modules
  - Number of output modules.
- Maximum of 256 output bytes made up of the following data:
  - Total of (all) process data bytes of all output modules
- The cyclical input and output data of a configured Profinet BIM can be calculated using the following table. The number of input and output data bytes are added together for each connected TXM module and each channel function.

Device / module / function	Cyclic input data length	Cyclic output data length
Profinet BIM device	4	0
TXM1.8D	1	0
TXM1.16D	2	0
TXM1.8U	1	0
TXM1.8U-ML	1	0
TXM1.8X	1	0
TXM1.8X-ML	1	0
TXM1.6R	1	1
TXM1.6R-M	1	1
TXM1.6RL	0	1
TXM1.8P	1	0
AI_XXX	2	0
BI_XXX	0	0
CI	4	1
AO_XXX	0	2
AO_Y250T_2Cha	0	2
BO_XXX	0	0
MO_XXX_XXX	0	0

Example

A Profinet BIM with
- a TXM1.8D module with
  - BI pulse configuration in channel 1
  - CI configuration in channel 2

occupies:

Quantity	Device (input or output)	Input	Output
1 x	Profinet BIM device	4	0
1 x	TXM1.8D	1	0
1 x	BI	0	0
1 x	CI	4	1
Total		**9 bytes**	**1 byte**

- 9 bytes cyclic input data length and
- 1 byte cyclic output data length

In the cyclic telegram between Profinet BIM and Profinet I/O controller:
the input and output data lengths vary according to the TX-I/O module used and its configured functionality.

Other data

Module process data Chapter 4

2.5 Cycle Times of Profinet BIM

Profinet versus island bus

The cyclic process data exchange between Profinet and the island bus runs with different cycle times.

Profinet

Possible cyclic process data exchange intervals are: 8, 16, 32, 64, 128, 256 ms.
The required interval is set by the user during the SIMATIC S7 hardware configuration.

Island bus

The process data exchange interval is fixed. The process data of every TX-I/O module is accessed once every 500 ms.

2.6 Product Overview & Functionality

The Profinet BIM can be configured for the following TX-I/O modules:

- 8 DP DI modules — TXM1.8D
- 16 DP DI modules — TXM1.16D
- 6 DP DI modules with relay — TXM1.6R
- 6 DP DO modules with relay / local override — TXM1.6R-M
- 6 DP DO modules with bistable relay — TXM1.6RL
- 6 DP PT100 modules — TXM1.8P
- 8 DP Universal modules — TXM1.8U
- 8 DP Universal modules with local override / identification device (LOID) — TXM1.8U-ML
- 8 DP Super Universal modules — TXM1.8X
- 8 DP Super Universal modules with LOID — TXM1.8X-ML

DP	Data point
DI	Digital Input
DO	Digital Output
LOID	Local Override, Identification

The following pages provide an overview with signal types, S7 types, brief descriptions and the maximum number of functions for each module.

Signal type	S7 type	Description		Max. number of functions per module									
			I/O points per function	TXM1.8D	TXM1.16D	TXM1.8U	TXM1.8U-ML	TXM1.8X	TXM1.8X-ML	TXM1.8P	TXM1.6R	TXM1.6R-M	TXM1.6RL
Digital inputs													
D20 / D20R	BI_STATIC	Indication; floating permanent contact, NO, NC contact	**1**	**8**	**16**	**8**	**8**	**8**	**8**				
D20S	BI_PULSE	Indication; floating pulse contact, NO contact	**1**	**8**	**16**	**8**	**8**	**8**	**8**				
C		Metering; floating pulse contact, mechanical or electronic, NO contact											
	CI_Limited	max. 10 Hz, with debouncing	**1**	**8**	**8**								
	CI	max. max. 25 Hz, with debouncing	**1**			**8**	**8**	**8**	**8**				
	CI	max. 100 Hz, electronic	**1**			**8**	**8**	**8**	**8**				
Analog inputs													
NTC10K	AI_NTC10K	Temperature sensor; NTC 10 K	**1**			**8**	**8**	**8**	**8**				
NTC100K	AI_NTC100K	Temperature sensor; NTC 100 K	**1**			**8**	**8**	**8**	**8**				
P100 (4-Draht)	AI_PT100_4 Climatic	Resistor; 250 Ω / temperature Pt 100	**1**							**8**			
P100 (4-Draht)	AI_PT100_4 Standard	Resistor; 250 Ω / temperature Pt 100	**1**							**8**			
NI1K	AI_NI1K	Temperature sensor; LG-Ni	**1**			**8**	**8**	**8**	**8**	**8**			

Signal type	S7 type	Description		Max. number of functions per module									
			I/O points per function	TXM1.8D	TXM1.16D	TXM1.8U	TXM1.8U-ML	TXM1.8X	TXM1.8X-ML	TXM1.8P	TXM1.6R	TXM1.6R-M	TXM1.6RL
		1000 Ω											
R250 (2 wire)	AI_R250	Resistor; 250 Ω	**1**							**8**			
R2K5	AI_R2K5	Resistor; 2500 Ω	**1**			**8**	**8**	**8**	**8**	**8**			
Pt1K375	AI_PT1K375 Climatic	Temperature sensor; Pt 1000, climatic	**1**			**8**	**8**	**8**	**8**	**8**			
Pt1K385	AI_PT1K385 Standard	Temperature sensor; Pt 1000, standard	**1**			**8**	**8**	**8**	**8**	**8**			
T1	AI_T1	Temperature sensor; PTC	**1**			**8**	**8**	**8**	**8**				
U10	AI_U10N	Voltage; DC 0 .. 10 V	**1**			**8**	**8**	**8**	**8**				
I25	AI_I020	Current; 0...20 mA	**1**					**4**	**4**				
I420	AI_I420	Current; 4...20 mA	**1**					**4**	**4**				
Digital outputs													
Q250	BO_Q250	Permanent contact, switch	**1**								**6**	**6**	
Q250A-P / Q250-P	BO_Q250P_2Cha	Pulse on/off	**2**								**3**	**3**	
	BO_Q250P_1Cha	Pulse on/off with current surge relay (ElTako)	**1**								**6**	**6**	
Q-M2…4	MOx_Static_xCha	Pulse contact, 2-4-stage	**2-4**								**1-3**	**1-3**	
Q250-P2..4	MOx_Pluse_x+1Cha	Pulse, 3-stage	**3-5**								**1-2**	**1-2**	
Q250L	BO_Bistabil	NO-contact, bistable	**1**										**6**
Y250T	AO_Y250T	Pulse, actuating signal, 3-point output, internal hub model	**2**								**3**	**3**	
Analog outputs													
Y10S	AO_U10N	Constant actuating signal DC 0…10 V	**1**			**8**	**8**	**8**	**8**				
Y420	AO_I420N	Constant actuating signal DC 4…20 mA	**1**					**4**	**4**				
Indication and local override control													
		Local override control					**x**		**x**			**x**	
		LCD indication					**x**		**x**				
		Green I/O status LEDs			**x**	**x**	**x**	**x**	**x**	**x**	**x**		**x**
		3-color I/O status LEDs (varies acc. to signal type)		**x**								**x**	

Note

- On TXM1.16D the counters are implemented on the inputs 1 to 8
- On TXM1.8X.. the 4...20 mA outputs are implemented on the I/O points **5 to 8**
- Digital inputs are not isolated galvanically from the system electronics
- Mechanical contacts must be free of potential
- Electronic switches must support SELV / PELV
- Meter inputs that count faster than 1 Hz and are longer than 10 m and in the same cable duct with analog inputs must be shielded.

Example of reading

The Y250T function (actuating signal, three-point output) occupies two I/O points. There is room for 3 actuating drives on a TXM1.6R relay.

3 Engineering

GSDML file

Engineering is based on the GSDML file. It is standardized in accordance with the GSDML Specification for Profinet IO V2.2.

SIMATIC Manager

The engineering tool (Simatic Manager) is part of the engineering process. It needs to be informed by an import about which GSDML file to use for the Profinet BIM.

As a result of the import, the Profinet BIM will then appear as a field device in the hardware catalog of the program (path: ...\Profinet IO\I/O\TX-I/O).

Workflow

Engineering can be carried out in the following two different ways:

1 a) First, the application is created and loaded into the CPU and
b) then the periphery is configured, ***or***

2 a) First, the modules are configured and tested, and
b) then the application is loaded.

⚠ In this case, specific organization blocks (OBs) must be available. If one of these organization blocks is missing, then in the event of

- **configuration errors** and
- if a **module fails during running operation**

the **CPU** will be stopped.

The following organization modules should be available:

OB no	OB name	Meaning
OB82	I/O Point Fault 1	Diagnostics alarm
OB83	I/O Point Fault 2	Removal/insertion (of modules)
OB85	OB Not Loaded Fault	Program operation error
OB86	Loss of Rack Fault	Module rack failure
OB122	Module Access Error	Program operation error

Help regarding the organization blocks (OBs)

can be found in the online help function of the SIMATIC Manager
If no organization blocks are yet available, you can find information as follows:

- **SIMATIC Manager** > **Help** > **Find** tab > **Organization blocks**
  or
- **SIMATIC Manager** > **Wizard for new project** > **Next** > **Select CPU type** > **Next** > mark the required OB > **Help for OB** button

Note
In this sequence do **not** click the **Finish** button.

Procedure

We assume in this manual that are beginning a project from the very start. The following procedure is useful:

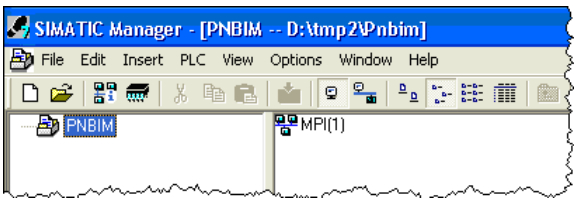
1. SIMATIC Manager **Create a** Step7 **project**
   See Section 3.1 – Create a Step7 *project*
2. Import Profinet BIM GSDML file
   Current GSDML file: GSDML-V2.2-Siemens-ProfinetBim-<yyyymmdd>.xml
   Refer to Section 3.2 – Instal GSDML file: **Import GSDML and BMP files**
3. Under HW Config on the programming PC: engineer S7-CPU 2xx/3xx/4xx-2PN/DP

The corresponding step-by-step method is given below.

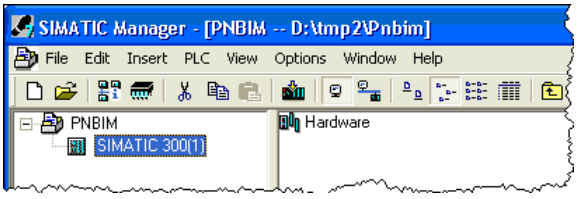
3.1 Creating a Step7 Project

Select a CPU

1. Open the **SIMATIC Manager**
2. **File** > **New**
   Opens a dialog field
3. Dialog field: Enter the **path** and **name** of the project
   The suggested path should not be changed (convention).
4. Close with **OK**
   Generates the project (example: PNBIM)



5. Right-click **PNBIM** > context menu: **Insert New Object**
   Opens a dialog field
6. Select the **CPU family** (select the type of PCL used)
   The selected CPU family is added to the project (e.g., SIMATIC 300).

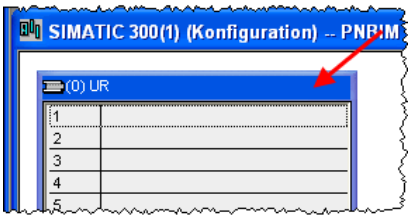


Click the new entry.
***Hardware** then appears in the right part of the window.*

Select a rack

1. Open the Hardware Design window: click **Hardware** > context menu: **Open Object**
   *Opens the hardware configuration dialog window **HW Config***
2. Hardware catalog: **Select profile bar** for CPU (e.g., Rack 300):

   a. Open the appropriate **folder**
   b. **Doubleclick the profile bar** or use drag&drop
   to insert the profile bar in the right window section.



Add power supply

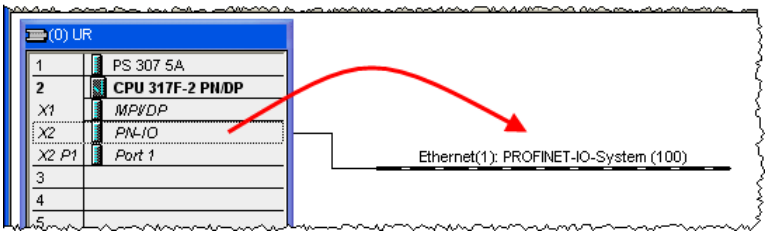
1. Rightclick Rack: **Field 1** > context menu: **Insert Object**
2. From the list box, **select a power supply**
   The power supply is added to the rack.

Add a CPU

1. **Add a PLC CPU** (e.g., CPU 317-2 PN/DP):
2. Hardware catalog: Open up the tree to the corresponding **folder**
3. Add the required version of the **CPU** to the rack by drag&drop.
   *During this action the corresponding field of the rack changes to **green.***
   *After dropping the CPU, the dialog field **Ethernet interface properties** opens.*

Add Profinet I/O system

1. **Ethernet interface properties** dialog field, **Parameters** tab:
   a. **Optional:** Change the IP address and subnet mask
   ! We recommend that the suggested address be left unchanged.
   b. **Subnetz** group field: select the required **subnet** from the list box
   i If no subnet is displayed, continue with 2.
   c. **OK** button.
2. **Subnet** group field: **NEW** button
   Open the Properties dialog field – new subnet Industrial Ethernet
3. **Properties** dialog field – new subnet Industrial Ethernet, text field **Name:**
   a. Enter the required subnet name
   b. **OK** button.
   The subnet name then appears in the selection of the Properties dialog field – new subnet Industrial Ethernet.
4. **Ethernet interface properties** dialog field, **Parameters** tab:
   a. **Select subnet**
   b. **OK** button.



Note i In the event of multiple selection options, an Ethernet interface must always be selected.

Add Profinet interface later

The Profinet (Ethernet) interface can also be added at a later time. Proceed in this case as follows:

1. Rightclick **PNIO subslot**
2. List field: **Add Profinet I/O system**

   i If the I/O system was already created, it is now automatically attached to the subsystem.

! **Note**
If the I/O system is not already available, please proceed as described above (*Add Profinet I/O system).*

3.2 Install GSDML File

Important

After installing a SIMATIC Manager
- the GSDML file (data, xml file) and
- the corresponding image file (icon, bmp file)

are not available. They must be *imported.*

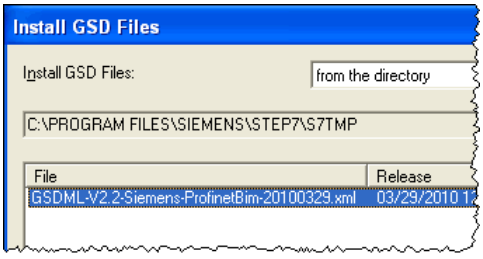
Before the installation, you must copy the files to a folder outside C:\...\Siemens\Step7\GSD\... – otherwise they will not be installed. During the installation, the files are written to the above-mentioned folder.

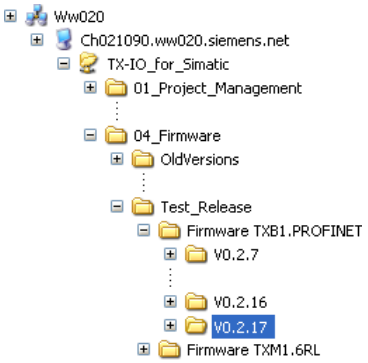
Import GSDML and BMP files

1. Locate the GSDML file and bmp files (this is only an example): \\Ch021090.ww020.siemens.net\TX-IO_for_Simatic\04_Firmware\Test_Release\Firmware TXB1.PROFINET\...
   This is not the full path name. You would usually want to download the latest version. This version can be found under the specified path as shown in the adjacent figure – e.g., V0.2.17.
2. Copy files to the following path in the local PC:
   C:\Program Files\Siemens\Step7\S7tmp
   *This path **must** be used. The files are not permitted to be copied to the actual target folder. This is done automatically by the installation program during the installation.*

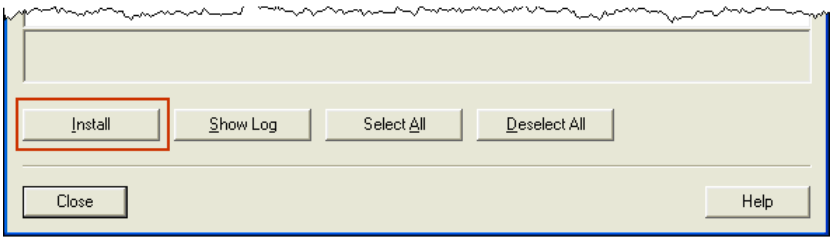
Install GSDML and BMP files

1. Open the hardware configuration window.
2. **Tools** > **Install GSD Files**
   Opens Install GSD Files



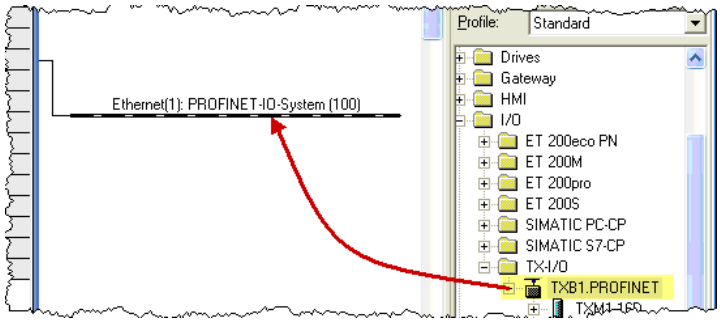


3. Select the required **GSDML file**
   The possible files are listed in the text field.
4. **Install** button.

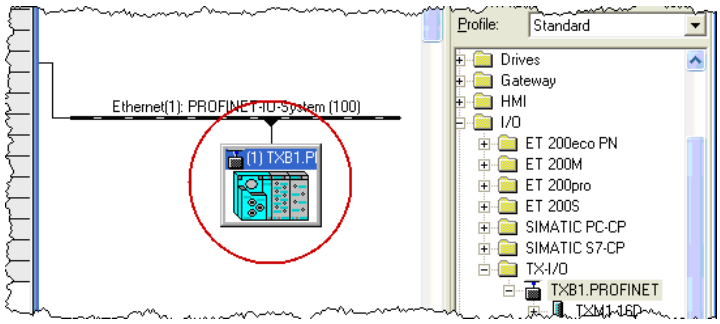


5. **Close** button.
   The file is imported into the engineering tool. After this procedure the Profinet BIM appears in the hardware catalog (...\Profinet IO\I/O\TX-I/O).

6. **Import Profinet BIM** to the Profinet network by drag&drop of the TXB1.Profinet BIM.

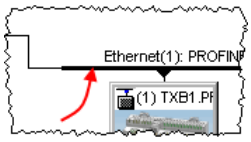


After releasing the mouse button, the Profinet BIM is inserted and is displayed in the Profinet network.



Note
When clicking the Profinet BIM, the slot allocation and I/O addresses are displayed in detail in the station window.

7. Rightclick **I/O bar** > context menu: Object Properties
   Opens the PROFINET I/O system properties dialog field.
8. **Update time** tab: mark the device > **Edit** button
   Opens the Edit update time/mode dialog field.



9. Set the **update time** to **256 ms** using the dropdown list box.
   This is a recommendation. A higher clock rate makes no sense since the island bus is clocked at 512 ms.
10. Close with **OK.**

3.3 Engineering the Profinet BIM with the SIMATIC Manager

The Profinet BIM is a modular device. It supports specific TX-I/O modules and their corresponding channel functions.

Supported TX-I/O modules

TXM1.8D	TXM1.8U	TXM1.8X	TXM1.6R	TXM1.6RL
TXM1.16D	TXM1.8U-ML	TXM1.8X-ML	TXM1.6R-M	TXM1.8P

The following sections explain the engineering procedure in terms of
- module configuration
- submodule configuration and
- parameterization.

Supported slots

- Profinet BIM supports 120 slots. TX-I/O modules can be inserted in any slot within this range (1...120).

- Up to 64 TX-I/O modules can be connected with a Profinet BIM at the same time.

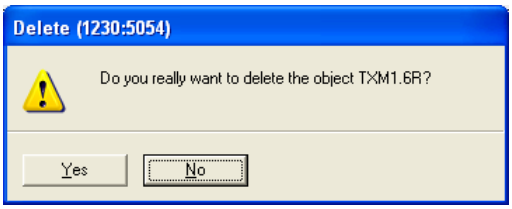
3.3.1 Module Configuration

The TX-I/O modules supported by the Profinet BIM are found in the hardware catalog under the **TXB1.Profinet** submodule.

Before you start

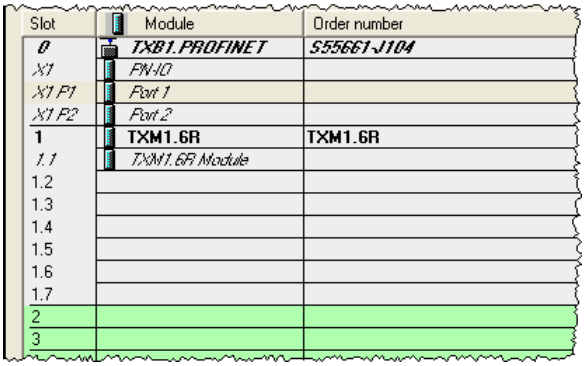
Please observe the following points when working on the module configuration:

- **Recommendation:** Keep the addresses identical with the parameterized SIMATIC input and output addresses.
- ---> TX-I/O module addresses must agree with the number of the slot in which they are located and
  ---> TX-I/O modules must be inserted in the slot whose number matches the corresponding TX-I/O module address.
- Slots suitable for accepting TX-I/O modules are marked in **green**.
- A TX-I/O module can be deleted at any time with the **Del** button. In doing so, you must reply to a security prompt (example for a TXM1.6R module):



Procedure

1. Upper window section: click the required **submodule**
   Opens the TX-I/O module in the lower window section.
2. Hardware catalog: insert the required **TX-I/O module** by drag&drop.
   *When dragging the object, the free slots are displayed in **green**. After dropping the module, a window similar to the one shown below appears (extract, with TXM1.6R as an example).*

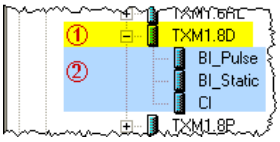


3. **Save**
   We recommend saving at meaningful intervals, but always for each inserted TX-I/O module.

3.3.2 Channel Configuration

Mapping

The functionality of the channels of the TX-I/O modules is mapped to the input/output submodules. The supported submodules (2) are listed in the hardware catalog under each TX-I/O module (1).



Free subslots

Submodules can be inserted in any free subslot (free subslots are marked in **green**).

Slot	Module	Order number	I Address	Q address	Diagnostic address
0	*TXB1.PROFINET*	*S55661-J104*			*8187**
X1	*PN-IO*				*8186**
X1 P1	*Port 1*				*8185**
X1 P2	*Port 2*				*8184**
1	TXM1.6R	TXM1.6R			0*
1.1	*TXM1.6R Module*		*0*	*3*	
1.2	BO_Q250_P_2Cha_Off				8175*
1.3					
1.4					
1.5					
1.6					
1.7					

Subslot 1

Subslot 1 of the modules is defined at the factory with an object that is typical for the corresponding module. The subslot contains

- the binary I/O process data of the configured binary I/O channels and
- the override information of configured output channels.

Numbering of the module channels

Module channels begin with subslot number 2 for the first I/O channel and end with the subslot number of the *maximum number of module channels + 1.*

Multistate output channels

Multistate output channels (MO) must be carefully connected.

- The channels must be integrated in precisely the order in which they appear in the catalog.

1	TXM1.6R-M	TXM1.6R-M			17*
1.1	*TXM1.6R-M Modul*		*17*	*20*	
1.2					
1.3					
1.2	MO3_Pulse_4Cha_Off				8183*
1.3	MO3_Pulse_4Cha_St1				8182*
1.4	MO3_Pulse_4Cha_St2				8181*
1.5	MO3_Pulse_4Cha_St3				8180*
2					

MO2_Pulse_3Cha_Off
MO2_Pulse_3Cha_St1
MO2_Pulse_3Cha_St2
MO2_Static_2Cha_St1
MO2_Static_2Cha_St2
MO3_Pulse_4Cha_Off
MO3_Pulse_4Cha_St1
MO3_Pulse_4Cha_St2
MO3_Pulse_4Cha_St3
MO3_Static_3Cha_St1

Procedure

1. Hardware catalog: open the **module** with the affected objects
2. Enter the required **objects in the TX-I/O module** in the rack in the correct order by drag&drop.
   This only works with individual objects – multiselection is not possible.
3. **Save**

3.3.3 Parameterizing Submodules

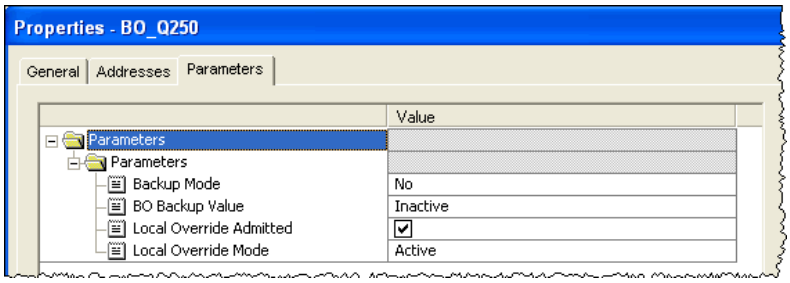
Properties dialog box

The functions with subslots of connected TX-I/O modules can be parameterized in the corresponding properties dialog box. The dialog box is opened by doubleclicking on the submodule.

Parameterized values are transferred to the controller during loading of the project. The controller sends the parameter values to the Profinet BIM only during the Profinet communication start. After communication has started, the channel

parameters can only be changed by reloading the Step7 project. In doing so, the Profinet communication is aborted and must be restarted by the controller.

Configurable parameters of a binary output channel



Important

The configurable parameters differ according to the object. A description of all possible parameters would exceed the scope of this documentation – for information, please go to 4 – Parameters, page 24 pp. for a summary.

Procedure

1. Rightclick the row with the required object
2. Context menu: **Object Properties** > **Parameters** tab
3. Edit the required parameter or parameters
   The parameters are edited
   - *in a* dropdown list box *by selecting a value*
   - *in a* text box *by manual input*
   - *by selecting/unselecting* a checkbox
4. **OK** button.

3.3.4 Symbol Table

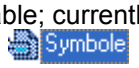
Definition, *addition*

Symbol = user designation of an input or output address.
Symbols are defined and remarked upon in the symbol table (address, address type). The symbols can then be entered in the variable table which then appear in the allocated symbol table in the variable table.

Syntax

Operand	Description	Format	Example
E	Input bit	BOOL	E 8.6
A	Output bit	BOOL	A 30.1
EB	Input byte	BIN	EB 10
AB	Output byte	HEX	AB 11
EW	Input word	DEC	EW 100
AW	Output word	DEC	AW 120
PEW	Process input word	DEC	PEW 1000
PAW	Process output word	DEC	PAW 1020
ED	Input	FLOATING POINT	ED 20
AD	Output	FLOATING POINT	AD 30
PED	Process input	DEC	PED 1500
PAD	Process output	DEC	PAD 1600

Step-by-step procedure

1. SIMATIC Manager, left screen section: **S7 Program(x)** > menu: **Insert** > Symbol table
   Opens a symbol table; currently the corresponding symbol is visible on the right of the screen: 

2. **Optional:** Rename the symbol (**Edit** > **Rename** > Text box: **Enter new name**)
3. **Open the symbol table** (**rightclick** on symbol > context menu: **Open object**)
   Opens the symbol editor

4. Symbol text box: **Enter the symbol name**
   Recommendation: *select short, concise, meaningful names (useful for input into the variable table)*
5. Address text box: enter the **address** in the appropriate syntax
   See the Syntax table further below
   The entry of the address (column: example) is not critical in terms of the writing style – for example, E8.6 can be entered, but so can also E<space>8.6
6. Address text box: **exit the box** (click with the mouse cursor anywhere else)
   The box on the right ("Data type" column) is automatically filled in, but can be adjusted manually.
7. **Save** (**menu Table** > **Save**)
8. a. **Table** > **Close** (after entering the desired data points)
   If the table was not saved beforehand, a security prompt is issued here.
   b. Reply to the security prompt as appropriate.

Error indications

After exiting a box, different error indications are possible – for example, in the **Status** column. The indications disappear when the corresponding errors are corrected. Example of the **Status** column:

Symbol	Cause	Correction
=	Two identical symbol names available	Change one of the symbol names
X	Symbol name or address missing	Enter the corresponding parameter

3.3.5 Variable Table

3.3.5.1 Creating a Variable Table

Definition, *addition*

Block for displaying or editing the attributes of the current module.
System attributes and user-defined attributes control and coordinate functions between individual application for reading/writing controller input, output and local data. All I/O address data entered in this table can be monitored and/or edited.

Requirements

- In order that the variable table can be created and used, specific requirements must be fulfilled:Defined device name in TX-I/O BIM
- If you want to work with symbols, they must previously have been created in the symbol table

Syntax

Operand	Description	Format	Example
E	Input bit	BOOL	E 8.6
A	Output bit	BOOL	A 30.1
EB	Input byte	BIN	EB 10
AB	Output byte	HEX	AB 11
EW	Input word	DEC	EW 100
AW	Output word	DEC	AW 120
PEW	Process input word	DEC	PEW 1000
PAW	Process output word	DEC	PAW 1020
ED	Input	FLOATING POINT	ED 20
AD	Output	FLOATING POINT	AD 30
PED	Process input	DEC	PED 1500
PAD	Process output	DEC	PAD 1600

Note
The values must be entered without blanks (etc.) between the operand and value (unlike the symbol table).

Step-by-step procedure

1. SIMATIC Manager, left screen section: **Blocks** > menu: **Insert** > S7 block **Insert new object** > subcontext menu: **Variable table.**

Opens the Variable table properties dialog box

General tab – part 1

2. Variable table properties dialog box, General tab – part 1, Symbolic name text box: **Enter name**
   This name is displayed in the Simatic Manager
3. **Optional:** Symbol comments text box: **Enter comment**

General tab – part 2

4. General tab – part 2: fill in the text boxes as required
   Convention: The boxes Name (Header), Family *and* Author *are allowed to have up to eight (8) alphanumeric characters, and* Version *five (5).*
5. Attributes tab: enter **attributes** as required
6. **OK** button.
   Closes the dialog box.
7. Optional: **Table** > **Close** (close variable table)

3.3.5.2 Working with the Variable Table

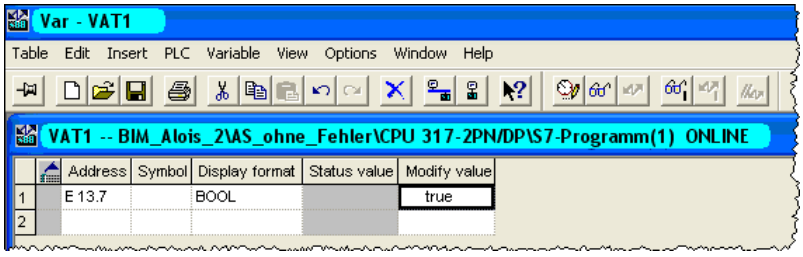
Channel values can be changed with the variable table. This is particularly useful when testing, during commissioning and/or for diagnostics.

Requirements

- The corresponding module and/or channel is released for local override
- The SIMATIC Manager can work in **online mode** (S300 is available and operable)

Symbol bar

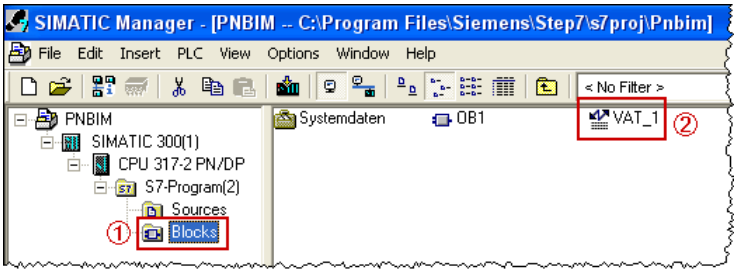
The symbol bar contains the elements for controlling variables using the variable table. When moving the mouse over a symbol ("mouseover"), the explanations/tips given in the table below appear.



Symbol	Meaning	Symbol	Meaning
	Always in the Foreground		Row not effective
	New		Set up Connection to Configured CPU
	Open		Set up Connection to Directly Connected CPU
	Save		Help
	Print		Variable Trigger
	Cut		Monitor Variable
	Copy		Modify Variable
	Paste		Update Monitor Values
	Undo		Activate modify values
	Redo		Modify/Force Value as Comment (on/off)

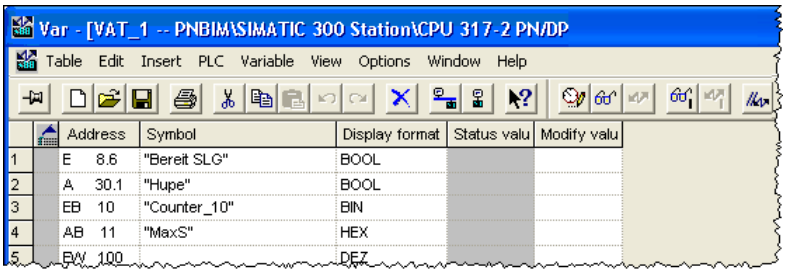
Step-by-step procedure

1. SIMATIC Manager: open tree to **Blocks** > ① **Mark blocks** > ② **rightclick variable table** > context menu: **Open object**



Opens the dialog box Var [<name of the variable table>]

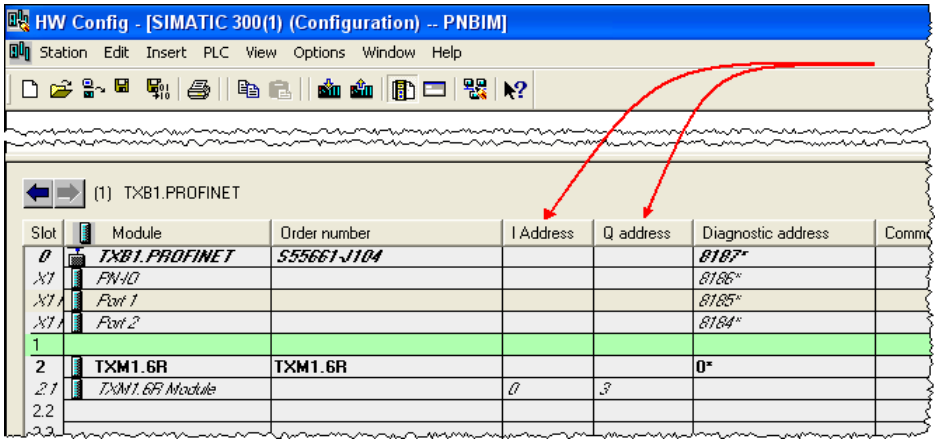
2. **Target system** > **Create link to** > **Engineered CPU**
   (or Directly connected CPU or Accessible CPU)
   The corresponding link can also be established using the symbols (without Accessible CPU).
3. **Control value column:** enter the required **value** as appropriate



4. Activate the value with the **Control value** button
5. Query the status value with the **Update status value** button
6. Save and/or close the table as required
   When closing the table a security prompt must be answered accordingly (if changes were made).

Note

1. The submodule process data can be accessed by means of the **E and A addresses using controllers and VATs (variable tables) of the SIMATIC Manager.** These addresses must be defined beforehand.



2. Only variables from the process image can be viewed.
3. The size of the process image is configured with the properties of the CPU under the "Cycle/clock marker" tab (separately for inputs and outputs).

4 Parameters

Note This is a summary. Its purpose is to quickly locate the relevant parameters.

4.1 Binary Input (Static)

Representation

BI_STATIC (SIMATIC Manager hardware catalog)

Definition, *addition*

Static binary input = input for detecting/processing static status changes in applied signals.
A floating contact is connected with the static binary input. The object carries out a cyclical check at the input. Every change from one stable status to the other is detected.

4.1.1 Contact

Definition, *addition*

Parameters for defining the contact type.

Parameters

Possible values	Description
NO Contact	"Not Open" contact
NC Contact	"Not Closed" contact

Functional overview

Status	NO contact		NC contact	
Contact position	LED indication	Process value	LED indication	Process value
Closed	LED on	1	LED off	0
Open	LED off	0	LED on	1

4.1.2 Debounce Time

Definition, *addition*

Parameter to define the minimum time that the input signal must remain stable in order to be valid.
Changing the parameter resets an active debounce timer.

Parameter

Value range	Unit
0..255	0.1 s

4.1.3 Display

Definition, *addition*

Parameters for color definition of the meaning of an indication.
As a result, a specific LED color is assigned to each meaning.
Parameter type: [DisplayEnum]

Mapping for multicolored LEDs
Only modules TXM1.8D and TXM1.6R-M

Possible values	Description
Normal	LED is lit green
Alarm	LED is lit red
Service	LED is lit yellow

Note

- This parameter is used to assign a LED color to a signal type. After the configuration, the color remains permanently assigned.

It is expressly *not* intended for use in combination with the status of the process value.

4.1.4 Process Data

For process data mapping of binary input functions to channel process data, refer to the corresponding sections in Chapter 4, "Process Data Channel Mapping" of the TX-I/O modules.

4.1.5 Channel Diagnosis

Alarm type	Cause / solution
Invalid	Check the module configuration and parameterization

4.2 Binary Input (Pulse)

Representation

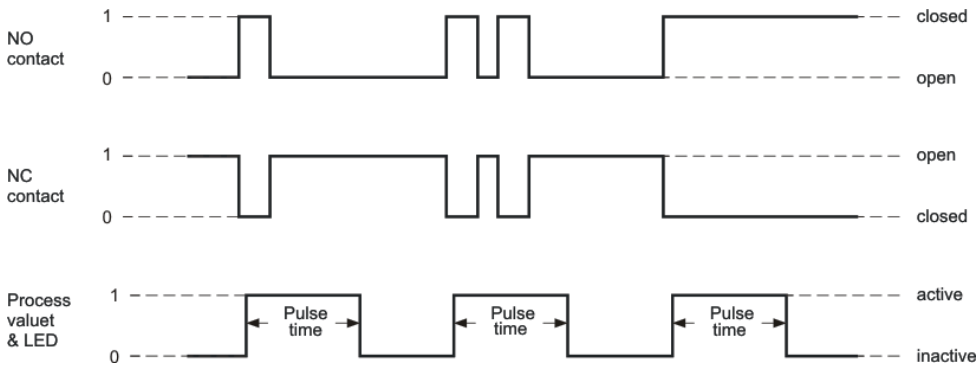
BI_PULSE (SIMATIC Manager hardware catalog)

Definition, *addition*

Pulse binary input = input for detecting/processing continuous status changes in applied signals.
A floating contact or electronic switch is connected with the binary pulse input. The object carries out a cyclical check at the input. Every change from one stable status to the other is detected.

Note

If the Profinet communication is missing, a short pulse is indicated with the relevant LED for each pulse at the input.



4.2.1 Pulse Length

Definition, *addition*

Parameter for defining the pulse length.

Parameter

Value range	Unit
0..255	0.1 s

4.2.2 Contact

Definition, *addition*

Parameters for defining the contact type.

Parameters

Possible values	Description
NO Contact	"Not Open" contact
NC Contact	"Not Closed" contact

Functional overview

Status	NO contact		NC contact	
Contact position	LED indication	Process value	LED indication	Process value
Contact closed > open	Pulse 0 > 1 > 0	Pulse 0 > 1 > 0	0	0
Contact open > closed	0	0	Pulse 0 > 1 > 0	Pulse 0 > 1 > 0

4.2.3 Debounce Time

Definition, *addition*

Parameter to define the minimum time that the input signal must remain stable in order to be valid.
Changing the parameter resets an active debounce timer.

Parameter

Value range	Unit
0..255	0.1 s

4.2.4 Display

Definition, *addition*

Parameters for color definition of the meaning of an indication.
As a result, a specific LED color is assigned to each meaning.
Parameter type: [DisplayEnum]

Mapping for multicolored LEDs
Only modules TXM1.8D and TXM1.6R-M

Possible values	Description
Normal	LED is lit green
Alarm	LED is lit **red**
Service	LED is lit yellow

Note
This parameter is used to assign a LED color to a signal type. After the configuration, the color remains permanently assigned.
It is expressly *not* intended for use in combination with the status of the process value.

4.2.5 Process Data

For process data mapping of binary input functions to channel process data, refer to the corresponding sections in Chapter 4, "Process Data Channel Mapping" of the TX-I/O modules.

4.2.6 Channel Diagnosis

Alarm type	Cause / solution
Invalid	Check the module configuration and parameterization

4.3 Counter Input

Representation **CI_PULSE** (SIMATIC Manager hardware catalog)

Definition, *addition* Parameters for counting floating pulses.
The counter value is provided as a process value.

4.3.1 Contact

Definition, *addition* Defines the contact type.

Parameters

Possible values	Description
Mechanical Contact	Mechanical contact
Electrical Contact	Electrical contact

- The counter rises in increments when the contact closes ($R = \infty \rightarrow R = 0$).
- The debounce time for the signal type [Contact_Mech] is long, but short for [Contact_El].
  Note the following: a short debounce time allows higher signal frequencies that can be counted, but at the same time demands greater signal quality of the contact.

Reference values for sampling rates of 1 (50 %).

Contact type	f_{max} [Hz]
Contact_Mech	25
Contact_El	100

4.3.2 New CI Value

Definition, *addition* New counter value that is set by the controller during the connection setup phase of the Profinet communication.
The existing counter value is replaced by the new counter value if the function output byte value changes from 0 to 1.

Parameter

Value range
$0...2^{32}-1$ (=4294967295)

4.3.3 Power-up Mode

Definition, *addition* Parameters for defining the behavior of [PowerUpMode].
The operation of the counter after powering up the I/O module can be configured in two possible modes with the [PowerUpMode] parameter:
- Normal mode (RESET)
- Safe mode (LASTVALUE)

Normal mode (RESET) After powering up the I/O module, the counter is reset to "0" (default value) – the counter value does not have to be permanently saved in the I/O module.

The controller is responsible for the following:
- for tracing the current counter **and**
- for persistent saving in the event of power failure.

If the communication between the I/O module and controller is interrupted, and the I/O module detects this as a power supply fault, the pulses accumulated during the downtime are not considered.

Safe mode (LASTVALUE)

After powering up the I/O module, the counter is reset to the last persistently saved value before the power supply fault occurred. The controller traces the current counter value for as long as the communication works between the I/O module and controller. If the communication is interrupted, the I/O module must continue to trace the value and prevent loss of the counter value in the I/O module that threatens to happen in the case of a power supply fault. Once the communication has returned to normal operation, the current counter value is relayed to the controller.

Note

- The prevention of loss of the counter value is a local task for the I/O module. Security can be obtained in the following ways:
  - by saving the counter value upon detection of a power supply fault, *and/or*
  - by periodic saving of the counter value, *and/or*
  - by any other mechanism.
- Because of the limited number of write cycles of the volatile memory and for economic reasons, the counter value may not be absolutely accurate.

4.3.4 Process Data

For process data mapping of counter input-configured channels, refer to the corresponding sections in Chapter 5, "Process Data Channel Mapping" of the TX-I/O modules.

4.3.5 Defining Start Counter Value

The start counter value is defined in the SIMATIC Manager module parameter window. It is transferred to the Profinet BIM during the connection setup phase. The transmitted counter value is activated when the corresponding channel bit changes from '0' to '1'.

For counter value mapping of counter input (CI)-configured channels, refer to the corresponding sections in Chapter 5, "Counter Value Definition Channel Mapping" of the CI-configured TX-I/O modules.

4.3.6 Channel Diagnosis

Alarm type	Cause / solution
Invalid	Check the module configuration and parameterization

4.4 Binary Output – OnOff

Representation

BO_Q250 (SIMATIC Manager hardware catalog)

Definition, *addition*

Unit for converting a binary process value to the module-specific switching value.

4.4.1 Backup Mode

Definition, *addition*

Function for control of the behavior of the function when changing to the "MasterDown" status.

Possible values	Description
NO	Process value = INACTIVE, 0 (Off)
VALUE	Specific value of the parameter [BOBackupValue]
KEEP	Save the last active process value

4.4.2 BO Backup Value

Definition, *addition*

Parameter – type [BinaryValueEnum] – that represents the backup value and becomes valid in the following cases:

- a change in status to "MasterDown" *and*
- the parameter [BackupMode] = VALUE

Possible values	Description
ACTIVE	Binary output is active.
INACTIVE	Binary output is inactive.

4.4.3 Display

Definition, *addition*

Parameters for color definition of the meaning of an indication.
As a result, a specific LED color is assigned to each meaning.
Parameter type: [DisplayEnum]

Mapping for multicolored LEDs
Only modules TXM1.8D and TXM1.6R-M

Possible values	Description
Normal	LED is lit green
Alarm	LED is lit red
Service	LED is lit yellow

Note

- This parameter is used to assign a LED color to a signal type. After the configuration, the color remains permanently assigned.
  It is expressly *not* intended for use in combination with the status of the process value.

4.4.4 Enabling Local Override

Definition, *addition*

Parameter for enabling/disabling the module key Up/Down for the "Local override" function.

Switching behavior

The general switching behavior (for enabled local overriding) is defined as follows:

- Switch from automatic to local override (manual):
  The current process value is valid until a new manual command is issued.
- Switch from local override to automatic:
  The automatic process value becomes valid once the Profinet I/O controller writes a new value.

Possible values	Description
Selected	Enabled
Not selected	Disabled

4.4.5 Local Override Mode

Definition, *addition*

Parameter for defining the type of 'local override' signal.
A logical '1' is usually interpreted as 'active'. However, it is possible for migrations to interpret a logical '0' as 'active'.

The following assignments apply here:

Value	Input	Local override
Active	1	Active
Inactive	0	Active
Active	0	Inactive
Inactive	1	Inactive

4.4.6 Process Data

BO value	LED	NO contact	NC contact
Active	On	Closed	Open
Inactive	Off	Open	Closed

The allocation of process data of binary output-configured channels is described in 'Process Data Channel Mapping' for the corresponding TX-I/O module.

Masterdown

If the TX-I/O BIM is in the status 'Masterdown', a backup value becomes valid according to [BackupMode].

4.4.7 Channel Diagnosis

Alarm type	Cause / solution
Invalid	Check the module configuration and parameterization
No_Output	Operating voltage too low -> check the power

4.5 Binary Output (Bistable)

Representation **BO_BISTABIL** (SIMATIC Manager Hardware catalog)

Definition, *addition* Parameter for converting a binary process value to the module-specific switching value.
Unlike the OnOff binary output function, the following points apply to this output:
- *The behavior can be defined if PowerDown (AC) is detected. In this regard, bistable relays are used that retain their status during PowerDown.*
- *The activation of the backup value can be delayed if a MasterDown status is detected.*

4.5.1 Backup Mode

Definition, *addition* Function for control of the behavior of the function when changing to the "MasterDown" status.

Possible values	Description
NO	Process value = INACTIVE, 0 (Off)
VALUE	Specific value of the parameter [BOBackupValue]
KEEP	Save the last active process value

4.5.2 BO Backup Value

Definition, *addition* Parameter – type [BinaryValueEnum] – that represents the backup value and becomes valid in the following cases:
- a change in status to "MasterDown" *and*
- the parameter [BackupMode] = VALUE

Possible values	Description
ACTIVE	Binary output is active.
INACTIVE	Binary output is inactive.

4.5.3 BackupDelay

Definition, *addition* Parameter for defining a delay upon activation of a backup value (according to the [BackupMode]) after detection of a MasterDown.

Value range	Unit
0...65535	0.1 s

4.5.4 PowerDownModeAC24V

Definition, *addition* Parameter for defining the behavior following the detection of a MasterDown.

Possible values	Description
NO	Process value = INACTIVE, 0 (Off)
VALUE	Specific value of the parameter [BOBackupValue]
KEEP	Save the last active process value

4.5.5 BOPowerDownValue

Definition, *addition*

Parameter for representation of the backup value that becomes valid when
- the device takes on the status PowerDown **and**
- the parameter [PowerDownModeAC24] = VALUE.

Possible values	
INACTIVE	
ACTIVE	

4.5.6 Display

Definition, *addition*

Defines the meaning of the display color.
As a result, a specific LED color is assigned to each meaning.
Parameter type: [DisplayEnum]

Mapping for multicolor LEDs
Only module TXM1.8D

Possible values	Description
Normal	LED is lit green
Alarm	LED is lit red
Service	LED is lit yellow

Note
- This parameter is used to assign a LED color to a signal type. After the configuration, the color remains permanently assigned.
  It is expressly *not* intended for use in combination with the status of the process value.

4.5.7 Enabling Local Override

Definition, *addition*

Enable/disable the module key Up/Down for the "Local override" function.

Switching behavior

The general switching behavior (for enabled local overriding) is defined as follows:
- Switch from automatic to local override (manual):
  The current process value is valid until a new manual command is issued.
- Switch from local override to automatic:
  The automatic process value becomes valid once the Profinet I/O controller writes a new value.

Possible values	Description
Selected	Enabled
Not selected	Disabled

Restriction

The module **TXM1.6RL** ('light module') does not support **local overriding.**

4.5.8 Local Override Mode

Definition, *addition*

Parameter for defining the type of 'local override' signal.
A logical '1' is usually interpreted as 'active'. However, it is possible for migrations to interpret a logical '0' as 'active'.

The following assignments apply here:

Value	Input	Local override
Active	1	Active
Inactive	0	Active
Active	0	Inactive
Inactive	1	Inactive

4.5.9 Process Data

BO value	LED	NO contact	NC contact
Active	On	Closed	Open
Inactive	Off	Open	Closed

The allocation of process data of binary output-configured channels is described in 'Process Data Channel Mapping' for the corresponding TX-I/O module.

Masterdown

If the TX-I/O BIM is in the status 'Masterdown', a backup value becomes valid according to [BackupMode] after the [BOBackupDelay] delay.

Powerdown (AC24)

If the device detects a [PowerDown], a backup value becomes valid according to [PowerDownModeAC24].

4.5.10 Channel Diagnosis

Alarm type	Cause / solution
Invalid	Check the module configuration and parameterization
No_Output	Operating voltage too low -> check the power
Unreliable ACDC24V	ACDC 24 V power not available > check the ACDC 24 V power supply

4.6 Binary Output – OnOff Pulse (1-channel)

Representation

BO_Q250_P (SIMATIC Manager hardware catalog)

Definition, *addition*

Parameters for control (1-channel) of a binary output with specified pulse length.
When the process value [BOValue] is written, the output is activated for the specified pulse length and then deactivated again.
If the next process value is written before the pulse expires, the pulse will be terminated. After a delay of [BreakTime] the next pulse is generated.
The minimum duration between two process value write operations is specified by the cycle time of the PNIO controller.

Function of

S7 software
The S7 software outputs a pulse output signal if the status of a field device is to change from 0 to 1 or from 1 to 0.

Panel wiring
The field device is controlled by an external surge current relay.

Manual operation
The TXM1.6R-M module allows local override by means of pressure on the rocker switch of **one** of the two channels. The following applies: pressure on…

- ... **Middle** (hand): local override ON / OFF; no change at the output. The yellow LED of the channel lights while the override function is switched on
- ... + (up) or – (down): independently of the selected key, each application of pressure changes the status of the field device – for example, on – off – on – off, etc.

4.6.1 Break Time

Definition, *addition*

Parameter for defining the minimum time between an 'open' and 'close' signal.
This time is needed to prevent (electrical) damage to an actuator.

Value range	Unit
0…255	0.1 s

4.6.2 Pulse Time

Definition, *addition*

Parameter for defining the pulse length.

Value range	Unit
1…255	0.1 s

4.6.3 Enabling Local Override

Definition, *addition*

Parameter for enabling/disabling the module key Up/Down for the 'Local override' function.

Switching behavior

The general switching behavior (for enabled local overriding) is defined as follows:

- Switch from automatic to local override (manual):
  The current process value is valid until a new manual command is issued.
- Switch from local override to automatic:
  The automatic process value becomes valid once the Profinet I/O controller writes a new value.

Possible values	Description
Selected	Enabled
Not selected	Disabled

4.6.4 Local Override Mode

Definition, *addition*

Parameter for defining the type of 'local override' signal.
A logical '1' is usually interpreted as 'active'. However, it is possible for migrations to interpret a logical '0' as 'active'.

The following assignments apply here:

Value	Input	Local override
Active	1	Active
Inactive	0	Active
Active	0	Inactive
Inactive	1	Inactive

4.6.5 Process Data

The allocation of process data of binary output-configured channels is described in 'Process Data Channel Mapping' for the corresponding TX-I/O module.

Masterdown

If the TX-I/O BIM has the status 'Masterdown', the relay (after a delay for an active pulse) will return to its original status (i.e., no new output pulse is generated).

Local override

If local override is active after starting the TX-I/O, no output pulse is generated either.

4.6.6 Channel Diagnosis

Alarm type	Cause / solution
Invalid	Check the module configuration and parameterization
No_Output	Operating voltage too low -> check the power

4.7 Binary Output – OnOff Pulse (2-channel)

Representation

BO_Q250_P_2CHA (SIMATIC Manager hardware catalog)

Definition, *addition*

Parameters for control of a binary output (2-channel) with specified pulse length.

Function

- *When the process value [BOValue] changes from **inactive** to **active**, the output (n+1) is activated for the specified pulse length and then deactivated again.*
- *When the process value [BOValue] changes from **active** to **inactive**, the output (n) is activated for the specified pulse length and then deactivated again.*
- *If the process value [BOValue] changes while a pulse is being generated, the pulse will be*
  - *cancelled **and***
  - *the other output is activated after a delay [BreakTime] in accordance with the new process value.*

S7 software

- The S7 software provides a continuous output signal for the first channel, which displays the status of the field device.
- The S7 software does not send any pulse signals since the pulses are generated by the TX-I/O module.
- Each signal sent to the second channel is ignored.

Panel wiring

Locking in the module makes it impossible to run a command on both channels at the same time. However, we recommend the installation of an additional lock in the switching cabinet. The switching contacts can be used for this purpose, for example.

Manual operation

The TXM1.6R-M module enables local override. Press the rocker switch of **either** of the two channels. The following applies: pressure on…

- ... **middle** (hand): local override ON / OFF; no change at the output. The yellow LED of the channel lights while the override function is switched on
- ... + (up): connected device on
- ... – (down): connected device off

Possible values	Description
selected	Enabled
not selected	Disabled

4.7.1 Break Time

Definition, *addition*

Parameter for defining the **minimum time** between an '**open**' and **'close'** signal. *This time is needed to prevent (electrical) damage to an actuator.*

Value range	Unit
0...255	0.1 s

4.7.2 Pulse Time

Definition, *addition*

Parameter for defining the pulse length.

Value range	Unit
1...255	0.1 s

4.7.3 Enabling Local Override

Definition, *addition*

Parameter for enabling/disabling the module key Up/Down for the 'Local override' function.

Switching behavior

General switching behavior (for enabled local overriding):

- Switch from automatic to local override (manual):
  The current process value is valid until a new manual command is issued.
- Switch from local override to automatic:
  The automatic process value becomes valid once the Profinet I/O controller writes a new value.

Possible values	Description
Selected	Enabled
Not selected	Disabled

4.7.4 Local Override Mode

Definition, *addition*

Parameter for defining the type of 'local override' signal.
A logical '1' is usually output for 'active'. However, it is possible for migrations to output a logical '1' for 'active'.

The following assignments apply here:

Value	Input	Local override
Active	1	Active
Inactive	0	Active
Active	0	Inactive
Inactive	1	Inactive

4.7.5 Process Data

The allocation of process data of binary output-configured channels is described in 'Process Data Channel Mapping' for the corresponding TX-I/O module.

Masterdown

If the TX-I/O BIM has the status 'Masterdown', the relays (after a delay for an active pulse) will return to their original status (i.e., no new output pulse is generated).

Local override

If local override is active after starting the TX-I/O, an output pulse defined by [BOValue] will be generated.

4.7.6 Channel Diagnosis

Alarm type	Cause / solution
Invalid	Check the module configuration and parameterization
No_Output	Operating voltage too low -> check the power

4.8 Multistate Output Mapping (Static)

Representation

MO(X)_STATIC_(X)CHA_(X) (SIMATIC Manager hardware catalog)

Definition, *addition*

Parameter for mapping the multistate process value to a specific number of output channels.

Function and representation of the channels

We distinguish between three different [MO(n)_Static] function types. The following table shows the channels in regard to function and representation in the SIMATIC Manager hardware catalog:

Channels	Relevant submodules, representation in the Simatic Manager hardware catalog
2-channel	MO2_Static_2Cha_St1 MO2_Static_2Cha_St2
3-channel	MO3_Static_3Cha_St1 MO3_Static_3Cha_St2 MO3_Static_3Cha_St3
4-channel	MO4_Static_4Cha_St1 MO4_Static_4Cha_St2 MO4_Static_4Cha_St3 MO4_Static_4Cha_St4

⚠ Important

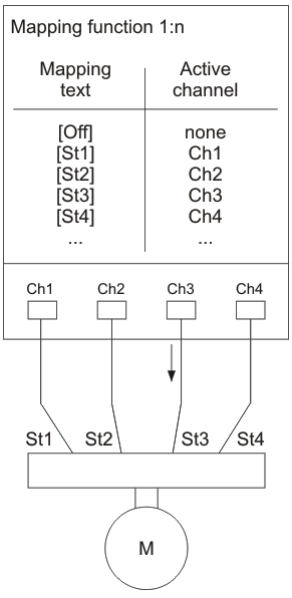
These function groups must be inserted in the subslots

- without any changes to the order *and*
- in direct succession to each other.

4.8.1 Mapping Function 1:n

Definition, *addition*

Parameter for mapping the multistate process value to a single active output channel in accordance with the parameter [MappingTable].



ℹ Only a single output can ever be active.
In the case of an invalid [MOValue] (i.e., no corresponding value was found in [MappingTable],

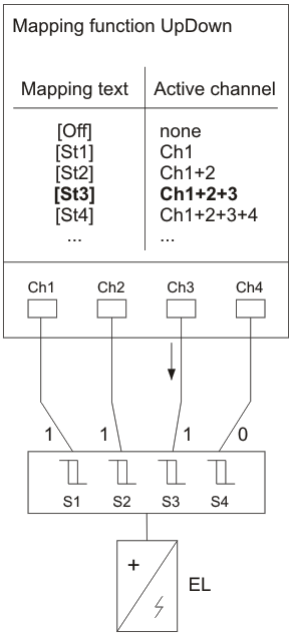
- a quality error message (Reliability) is generated [Quality = MULTISTATE_FAULT]
- a backup value becomes valid according to the value in [BackupMode].

ℹ Duplicate assignments in the [MappingTable] are not detected by the I/O function. Only the value that is found first determines the output channel.

4.8.2 The Mapping Function UpDown

Definition, *addition*

Parameter for assigning a [MOValue] to multistate outputs.
The parameter enables multiple outputs at the same time. Their combination is fixed (and remains so).

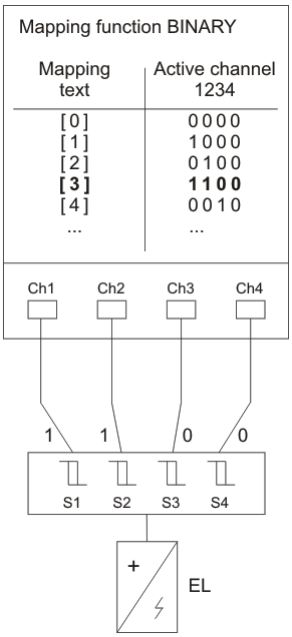


4.8.3 The Mapping Function BINARY

Definition, *addition*

Parameter for assigning a [MOValue] to multistate switching outputs.

The parameter enables multiple outputs at the same time. Their combination is fixed (and remains so).



4.8.4 Backup Mode

Definition, *addition*

Function for control of the behavior of the function when changing to the "MasterDown" status.

Possible values	Description
NO	Process value = INACTIVE, 0 (Off)
VALUE	Specific value of the parameter [BOBackupValue]
KEEP	Save the last active process value

4.8.5 MO Backup Value

Definition, *addition*

Parameter – type [BinaryValueEnum] – that represents the backup value and becomes valid in the following cases:

- a change in status to "MasterDown" *and*
- the parameter [BackupMode] = VALUE

Possible values	Description
ACTIVE	Binary output is active.
INACTIVE	Binary output is inactive.

Backup values are the same values as the process data values for the channels. For information, refer to 'Process Data Channel Mapping' of each TX-I/O module with MO function.

4.8.6 Mapping Type

Definition, *addition*

Parameter for defining the mapping type.

Possible values	Description
Mapping_1_n	1:n mapping
MappingUpDown	UpDown mapping
MappingBinary	Binary mapping

4.8.7 Enabling Local Override

Definition, *addition*

Parameter for enabling/disabling the module key Up/Down for the 'Local override' function.

Switching behavior

General switching behavior (for enabled local overriding):

- Switch from automatic to local override (manual):
  The current process value is valid until a new manual command is issued.
- Switch from local override to automatic:
  The automatic process value becomes valid once the Profinet I/O controller writes a new value.

Possible values	Description
Selected	Enabled
Not selected	Disabled

4.8.8 Local Override Mode

Definition, *addition*

Parameter for defining the type of 'local override' signal.
A logical '1' is usually interpreted as 'active'. However, it is possible for migrations to interpret a logical '0' as 'active'.

The following assignments apply here:

Value	Input	Local override
Active	1	Active
Inactive	0	Active
Active	0	Inactive
Inactive	1	Inactive

4.8.9 Process Data

The allocation of process data and the channel status information of multistate output-configured channels for local override are described in 'Process Data Channel Mapping' for the corresponding TX-I/O module.

MOValue value range

Mapping type	S7 representation	MOValue value range
1:n mapping	MO2_Static_2Cha	0,1,2
	MO3_Static_3Cha	0, 1, 2, 4
	MO4_Static_4Cha	0, 1, 2, 4, 8
UpDown mapping	MO2_Static_2Cha	0, 1, 3
	MO3_Static_3Cha	0, 1, 3, 7
	MO4_Static_4Cha	0, 1, 3, 7, 15
Binary mapping	MO2_Static_2Cha	0 .. 3
	MO3_Static_3Cha	0 .. 7
	MO4_Static_4Cha	0 .. 15

If [MOValue] is invalid – i.e., the value exceeds the permitted range for the assigned number of outputs, then

- a quality error message (Reliability) is generated [Quality = MULTISTATE_FAULT]
- a backup value becomes valid according to the value in [BackupMode].

Masterdown

If the TX-I/O BIM is in the status 'Masterdown', a backup value becomes valid according to [BackupMode].

4.8.10 Channel Diagnosis

Alarm type	Cause / solution
Invalid	Check the module configuration and parameterization
No_Output	Operating voltage too low -> check the power
Multistate_Fault	Mapping error in a multistate function

4.9 Multistate Output Mapping (Pulse)

Representation

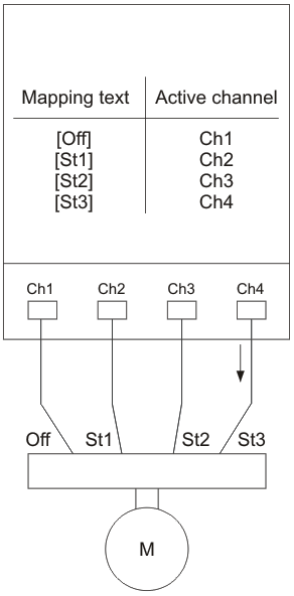
MO(X)_PULSE_(X)CHA_(X) (SIMATIC Manager hardware catalog)

Definition, *addition*

Parameter for mapping the multistate process value to a specific number of output channels.

Function

The multistate output (pulse) is similar to the function of the Q250-P (BO_OnOff_Pulse).
The function has **n** combined outputs. **n** is independent of the TX-I/O module that is used.
The function ensures that only one output can be active at any one time.
If a new process value is set, the following steps are performed in succession:
The OFF relay [Out_X(n)] is activated
The OFF relay [Out_X(n)] enables the circuit
The OFF relay [Out_X(n)] is disabled
One of the contact relays [Out:X(n+1)]… [Out:X(n+s)] is activated
After the pulse has expired, the corresponding contact relay is disabled.



Note

- The first channel of the [MO_PULSE] function is always the OFF channel.
- If a pulse with the pulse length [MinOffTime] was generated in the OFF channel ***before*** a change in the value [MOValue], it cannot be interrupted by changing the value.

Function types

We distinguish between three different [MO(n)_PULSE] function types. The following table shows the channels in regard to function and representation in the SIMATIC Manager hardware catalog:

Representation of the channels

Channels	Relevant submodules, representation in the Simatic Manager hardware catalog
2-stage, 3-channel	MO2_Pulse_2Cha_Off MO2_Pulse_2Cha_St1 MO2_Pulse_3Cha_St2
3-stage, 4-channel	MO3_Pulse_3Cha_Off MO3_Pulse_3Cha_St1 MO3_Pulse_3Cha_St2 MO3_Pulse_3Cha_St3
4-stage, 5-channel	MO4_Pulse_4Cha_Off MO4_Pulse_4Cha_St1 MO4_Pulse_4Cha_St2 MO4_Pulse_4Cha_St3 MO4_Pulse_4Cha_St4

Important

These function groups must be inserted in the subslots

- without any changes to the order *and*
- in direct succession to each other.

4.9.1 Backup Mode

Definition, *addition*

Function for control of the behavior of the function when changing to the 'MasterDown' status.

Possible values	Description
NO	Process value = INACTIVE, 0 (Off)
VALUE	Specific value of the parameter [BOBackupValue]
KEEP	Save the last active process value

4.9.2 MO Backup Value

Definition, *addition*

Parameter – type [BinaryValueEnum] – that represents the backup value and becomes valid in the following cases:

- a change in status to 'MasterDown' *and*
- the parameter [BackupMode] = VALUE

Possible values	Description
ACTIVE	Binary output is active.
INACTIVE	Binary output is inactive.

Backup values are the same values as the process data values for the channels. For information, refer to 'Process Data Channel Mapping' of each TX-I/O module with MO function.

4.9.3 Minimum OFF Time

Definition, *addition*

Parameter for defining the **minimum pulse length** for the OFF channel (first channel).

Value range	Unit
1...255	0.1 s

4.9.4 Pulse Time

Definition, *addition*

Parameter for defining the pulse length for contact channels (2…n).

Value range	Unit
1...255	0.1 s

4.9.5 Enabling Local Override

Definition, *addition*

Parameter for enabling/disabling the module key Up/Down for the 'Local override' function.

Switching behavior

General switching behavior (for enabled local overriding):

- Switch from automatic to local override (manual):
  The current process value is valid until a new manual command is issued.

- Switch from local override to automatic:
  The automatic process value becomes valid once the Profinet I/O controller writes a new value.

Possible values	Description
Selected	Enabled
Not selected	Disabled

4.9.6 Local Override Mode

Definition, *addition*

Parameter for defining the type of 'local override' signal.
A logical '1' is usually interpreted as 'active'. However, it is possible for migrations to interpret a logical '0' as 'active'.

The following assignments apply here:

Value	Input	Local override
Active	1	Active
Inactive	0	Active
Active	0	Inactive
Inactive	1	Inactive

4.9.7 Process Data

The allocation of process data and the channel status information of multistate output-configured channels for local override are described in 'Process Data Channel Mapping' for the corresponding TX-I/O module.

Read MOValue

[MOValue] represents the current status. During the 'off' pulse, [MOValue] changes to '0'. During the delay period [MinOffTime] the current [MOValue] differs from the commanded value.

Invalid MO Value

If [MOValue] is invalid (i.e., no corresponding channel is available), then
- a quality error message (Reliability) is generated:
  [Quality = MULTISTATE_FAULT]
- a backup value becomes valid according to the value in [BackupMode].

4.9.8 Channel Diagnosis

Alarm type	Cause / solution
Invalid	Check the module configuration and parameterization
No_Output	Operating voltage too low -> check the power
Multistate_Fault	Mapping error -> check the multistate functions

Masterdown

If the TX-I/O BIM has the status 'Masterdown' ***after a start***, no new output pulses are generated, regardless of the value [BackupMode].

Local override

If local override is active after starting the TX-I/O, an output pulse defined by [MOValue] will be generated.

4.10 Analog Input (Measure)

Representation

AI_XXX (SIMATIC Manager hardware catalog)

Definition, *addition*

Parameter for converting analog measurement values to standard SIMATIC values. *Analog values and corresponding SIMATIC values are described further below under 'Process Data'.*

S7 software

TX analog inputs can be handled like S7 analog inputs:

- Temperature sensors use the same values as the SIMATIC modules; we distinguish between the following:
  - 'Climatic' (resolution: 0.01 °C; range: –50…+150 °C) and
  - 'Standard' (resolution: 0.1 °C; range: –50…+400 °C)

- Voltage and current measurements use the range 0 to 27648. Consequently, the rated sensor ranges 0…20 mA, 0…10 V and 4…20 mA are covered.

- (Measurement) errors detected by the module are indicated as an overflow value (32767) or underflow value (–32768).

- Resistance measurements have different ranges and conversions compared with SIMATIC analog inputs. For further information, refer to the corresponding table under 'Resistance Measurement' further below in this section.

4.10.1 Representation in the SIMATIC Manager Hardware Catalog

The following inputs are represented in the SIMATIC Manager hardware catalog:

AI_U10N	AI_PT1K375	AI_NTC10K
AI_I020	AI_PT1K385	AI_NTC100K
AI_I420N	AI_R2K5	AI_PT100_4_Climatic
AI_NI1K	AI_T1	AI_PT100_4_Standard

4.10.2 Functions

Voltage measurement

Voltage measurement				
SIMATIC HW catalog	Description	Rated measurement range	Maximum measurement range	Resolution
AI_U10N	DC voltage measurement (0…10 V)	0…10 V	– 1.5 V…+ 11.5 V	1/1000 V

Current measurement

Current measurement				
SIMATIC HW catalog	Description	Rated measurement range	Maximum measurement range	Resolution
AI_I020	DC measurement (0…20 mA)	0…20 mA	– 3.0…+ 23 mA	1/1000 mA

Resistance measurement

Resistance measurement				
SIMATIC HW catalog	Description	Rated measurement range	Maximum measurement range	Resolution
AI_NI1K	Temperature LG-Ni1000	– 50…+ 150°C	– 52.5…+ 185°C	1/100 K
AI_PT1K385	Temperature Pt 1000 Standard	– 50…+ 400°C	– 52.5…+ 610°C	1/10 K
AI_R2K5	Resistance 0..250Ω 2 wire	0..2500 Ω	0..2650 Ω	1/10 Ω
AI_T1	Temperature (PTC)	– 50…+ 130°C	– 52.5…+ 155°C	1/100K
AI_NTC10K	Temperature NTC 10k	– 40…+ 115°C	– 52.5…+ 155°C	1/100 K
AI_NTC100K	Temperature NTC 100k	– 40…+ 125°C	– 52.5…+ 155°C	1/100 K
AI_PT100_4_Climatic	Temperature PT100 Climatic	– 50…+ 180°C	– 52.5…+ 185 °C	1/100 K
AI_PT100_4_Standard	Temperature PT100 Standard	– 50…+ 400°C	– 52.5…+ 610 °C	1/10 K

4.10.3 Compensation

Definition, *addition*

Parameter for setting a compensation value for the conductor resistance.
The compensation value is subtracted from the result of the resistance measurement. It is used for all signal types with two-wire resistance sensors.
Exceptions: NTC 10K and NTC 100K.

Value range	Unit
0...65535	0.01 ohm

4.10.4 Representation of Analog Values

Voltage measurement (0…10 V)

SIMATIC value		Analog value	Description
Decimal	Hex		
32767	7FFF	11.8515 V	Overflow; measurement faulty
31458	7AE2	11.3780 V	
31457	7AE1	11.3777 V	Overshoot range; measurement is correct, measurement accuracy is no longer assured
27649	6C01	10.0004 V	
27648	6C00	10.000 V	Rated range
20736	5100	7.5000 V	
1	1	0.0004 V	
0	0	0 V	
– 32768	8000	< 0 V	Underflow; conductor interruption

Current measurement (0 mA...20 mA)

SIMATIC value		Analog value	Description
Decimal	Hex		
32767	7FFF	23.703 mA	Overflow; measurement faulty
32512	7F00	23.5181 mA	
32511	7EFF	23.5178 mA	Overshoot range; measurement is correct, measurement accuracy is no longer assured
27649	6C01	20.0007 mA	
27648	6C00	20.0000 mA	Measurement range
20736	5100	15.0000 mA	
1	1	0.7234 µA	

SIMATIC value		Analog value	Description
Decimal	Hex		
0	0	0.0000 mA	
– 4146	EFDB	– 3.0000 mA	Underflow range
– 4147	EFDA	– 3.0007 mA	Underflow
– 32768	8000	< – 3 mA	

Current measurement (4 mA...20 mA)

SIMATIC value		Analog value	Description
Decimal	Hex		
32767	7FFF	> 23.52 mA	Overflow; measurement faulty
31795	7F00	23.5207 mA	
31794	7C32	23.52 mA	Overshoot range; measurement is correct, measurement accuracy is no longer assured
27649	6C01	20.0007 mA	
27648	6C00	20 mA	Measurement range
20736	5100	12 mA	
1	1	4.0006 mA	
0	0	4 mA	

Temperature sensor 'Climatic' range

Table for the 'Climatic' temperature measurement sensor.

AI_NI1K AI_T1 AI_NTC100K
AI_PT1K375 AI_NTC10K AI_PT100_4_Climatic

SIMATIC value		Analog value	Description
Decimal	Hex		
32767	7FFF	> 155 … > 185 °C	Overflow, line interruption
32512	7F00		
15500…18500		155.00 …185.00 °C	Upper limit range
11501…18001			Overshoot range
11500…18000		115.00 … 180.00 °C	Measurement range
10000		100.00 °C	Rated range
1		0.01 °C	Varies according to sensor type
0		0 °C	
– 1		– 0.01 °C	
– 3999…– 4999			
– 4000…– 5000		– 40.00…– 50.00 °C	
4001…– 5001			Underflow range
– 5250		– 52.50 °C	Lower limit range
– 32513	80FF		Underflow, short-circuit
– 32768	8000	< – 52.50 °C	

Refer also to the rated ranges / limit ranges in the following tables.

Temperature sensor 'Standard' range

Table for the extended temperature range of the platinum sensors.

AI_PT1K385
AI_PT100_4_Standard

SIMATIC value		Analog value	Description
Decimal	Hex		
32767	7FFF	> 610 °C	Overflow
32512	7F00		
6100		610°C	Upper limit range
4001			Overshoot range
4000		400.0 °C	Measurement range
1000		100.0 °C	Rated range
1		0.1 °C	Varies according to sensor type

0		0 °C	
– 1		– 0.1 °C	
– 1000		– 100.0 °C	
– 5000		– 50.00 °C	
– 5001			Underflow range
– 5250		– 52.50 °C	Lower limit range
– 32513	80FF		Underflow
– 32768	8000	< – 52.50 °C	

Resistance measurement

SIMATIC value		Analog value	Description
Decimal	Hex		
32767	7FFF	>256 Ω / 2.56 kΩ	Overflow
26500	7F00		
26499		256 Ω / 2.56 kΩ	Upper limit range
25001			Overshoot range
25000		250 Ω / 2.5 kΩ	Rated range
10000		100 Ω / 1 kΩ	
1		0.01 Ω / 0.1 Ω	
0		0 Ω	

4.10.5 Channel Diagnosis

Alarm type	Cause / solution
Invalid	**Check the module configuration and parameterization**
No_Output	Operating voltage too low -> **check the power**
Over_Range	Sensor shows a higher value than the rated range **> check the sensor output**
Under_Range	Sensor shows a lower value than the rated range **> check the sensor output**
Short_Loop	The connection between the sensor and module shows a value that indicates a **short-circuit > check the sensor and cable connection between the sensor and module**
Open_Loop	The connection between the sensor and module shows a value that indicates an **interruption > check the sensor and cable connection between the sensor and module**
No_Sensor	The 4...20 mA current measurement signal indicates the value **No_Sensor** if no current was measured. **> check the sensor and cable connection between the sensor and module**
Unreliable	The operating voltage ACDC 24 V is below a specific value (AC or DC) > check the operating voltage value (power supply)

Error messages (overview)

Function	Short loop	Under range	Over range	Open loop	No sensor	Unreliable other V_{ACDC} or V_{DC}
AI_U10N		X	X	X		X
AI_I020		X	X		X	X
AI_I420N		X	X		X	X
AI_NI1K	X	X	X	X		
AI_PT1K375	X	X	X	X		
AI_PT1K385	X	X	X	X		
AI_R2K5			X	X		
AI_T1	X	X	X	X		
AI_NTC10K	X	X	X			

AI_NTC100K	X	X	X			
AI_PT100_4_Climatic	X	X	X	X		
AI_PT100_4_Standard	X	X	X	X		

4.11 Analog Output (Positioning)

Representation **AO_U10N, AO_I420N** (SIMATIC Manager hardware catalog)

Definition, *addition* Parameter for changing/mapping the process value [AOValue] as a SIMATIC standard analog value.

4.11.1 Functions

AO_U10N DC voltage output.

Voltage measurement				
SIMATIC HW catalog	Description	Rated output range	Maximum output range	Resolution
AI_U10N	DC voltage output	0…10 V	– 0.054 V… + 10.66 V	

AO_I420N DC current output.

Voltage measurement				
SIMATIC HW catalog	Description	Rated measurement range	Maximum measurement range	Resolution
AI_U10N	DC output	4…20 mA		16/10000 mA

4.11.2 Backup Mode

Definition, *addition* Function for control of the behavior of the function when changing to the 'MasterDown' status.

Possible values	Description
NO	Process value = INACTIVE, 0 (Off)
VALUE	Specific value of the parameter [BOBackupValue]
KEEP	Save the last active process value

4.11.3 AO Backup Value

Definition, *addition* Parameter – type [AnalogValueEnum] – that represents the backup value and becomes valid in the following cases:

- a change in status to 'MasterDown' *and*
- the parameter [BackupMode] = VALUE

Value range
-32768 .. +32767

4.11.4 Enabling Local Override

Definition, *addition*

Parameter for enabling/disabling the module key Up/Down for the 'Local override' function.

Switching behavior

General switching behavior (for enabled local overriding):

- Switch from automatic to local override (manual):
  The current process value is valid until a new manual command is issued.
- Switch from local override to automatic:
  The automatic process value becomes valid once the Profinet I/O controller writes a new value.

Possible values	Description
Selected	Enabled
Not selected	Disabled

4.11.5 Local Override Mode

Definition, *addition*

Parameter for defining the type of 'local override' signal.
A logical '1' is usually interpreted as 'active'. However, it is possible for migrations to interpret a logical '0' as 'active'.

The following assignments apply here:

Value	Input	Local override
Active	1	Active
Inactive	0	Active
Active	0	Inactive
Inactive	1	Inactive

4.11.6 Process Data

The allocation of process data and the channel status information of analog output-configured channels for local override are described in 'Process Data Channel Mapping' for the corresponding TX-I/O module.

Masterdown

If the TX-I/O BIM is in the status 'Masterdown', the backup functions become active. The backup function then works in the mode defined by the value in the parameter [BackupMode].

Local override

If the channel is set to local override, [AOValue] is limited to the rated value range.

4.11.7 Representation of Analog Values

Voltage output (0…10 V

SIMATIC value		Analog value	Description
Decimal	Hex		
32767	7FFF	11.14 V	Overflow, operating voltage off
29310			
29309		10.66 V	Overshoot range
27649	6C01		
27648	6C00	10 V	Measurement range

SIMATIC value		Analog value	Description
Decimal	Hex		
20736	5100	7.5 V	
1	1	361.7 µV	
0	0	0 V	
-1	FFFF	361.7 µV	Underflow, not supported Output value limited to 0 V
-141		-54 mV	
		0.00V	Underflow, not supported Output value limited to 0 V Channel diagnosis: Under_Range
-32767…-142			
-32768			

Current output (4 mA...20 mA)

SIMATIC value		Analog value	Description
Decimal	Hex		
32767	7FFF	0.00 mA	Overflow, operating voltage off
32512	7F00		
32511	7EFF	22.81 mA	Overshoot range
27649	6C01		
27648	6C00	20 mA	Measurement range
20736	5100	15 mA	
1	1	4mA + 578.7 nA	
0	0	4 mA	
-1	FFFF	0 mA	Underflow range
-20736	E500		
-27648	E4FF		Not supported, output value limited to 0 mA
-32512	8100		
-32513	80FF		Underflow, no voltage/no current

4.11.8 Channel Diagnosis

Alarm type	Cause / solution
Invalid	**Check the module configuration and parameterization**
No_Output	Operating voltage too low -> **check the power**
Over_Range	Sensor shows a higher value than the rated range **> check the output process value**
Under_Range	Sensor shows a lower value than the rated range **> check the output process value**
Short_Loop	The connection between the sensor and module shows a value that indicates a **short-circuit > check the sensor and cable connection between the sensor and module**
Open_Loop	The connection between the sensor and module shows a value that indicates an **interruption (open loop) > check the sensor and cable connection between the module and field device**
Unreliable	The operating voltage ACDC 24 V is below a specific value (AC or DC) > check the operating voltage value (power supply)

4.12 Continuous 3-Point Analog Output

Representation

AO_Y250T_2Cha_1_Open (SIMATIC Manager hardware catalog)
AO_Y250T_2Cha_2_Close (SIMATIC Manager hardware catalog)

Definition, *addition*

Continous 3-point analog output with two channels for positioning drives.
This function is used for the open/close control of three-position drives without feedback (without a position potentiometer) – for example, for

- valve drives
- Damper actuators
- Third-party drives

4.12.1 Function

The function uses two channels. These must

- be in the same module and
- follow in direct succession.

An internal stroke model (path algorithm) [StrkPos] calculates the required length of the open or close pulses from the drive cycle time and the position defined by the process value. No feedback is required by the drive.

The function supports **asymmetric drives** with different opening and closing cycle times under the condition that this is also supported by the automation station.

AO_Cont3Point_Simple	
SIMATIC HW catalog	Description
AO_Y250T_2Cha_1_Open	'Open' channel for the AO_Cont3Point_Simple function
AO_Y250T_2Cha_2_Close	'Close' channel for the AO_Cont3Point_Simple function

Positioning model

The function converts the process value [AOValue] to a 3-position signal. A stroke model [StrkPos](path algorithm) continuously simulates the position of the drive based on the incoming control commands, and calculates the required length of the open and close pulses from the drive cycle time and the position defined by the process value. It therefore represents the drive position at all times. As a result, the drive does not require corresponding feedback signals.

Full functionality

For full integration of all of the functionality – including the resulting stroke position [StrkPos] and the function status [FncSta] – the 'Cluster Object Model' must be applied (as described in PD622-F-0012 – Architectural Concepts).

4.12.2 Backup Mode

Definition, *addition*

Function for control of the behavior of the function when changing to the 'MasterDown' status.

Possible values	Description
NO	Process value = INACTIVE, 0 (Off)
VALUE	Specific value of the parameter [BOBackupValue]
KEEP	Save the last active process value

4.12.3 AO Backup Value

Definition, *addition*

Parameter – type [AnalogValueEnum] – that represents the backup value and becomes valid in the following cases:

- a change in status to 'MasterDown' *and*
- the parameter [BackupMode] = VALUE

Value range	Unit
0...10000	0.01 %

4.12.4 StartSynchronization

Definition, *addition*

Parameter – type [SynchEnum] – for synchronization after a reset.
The synchronization cannot be interrupted. After a reset the current position of the stroke model is set to 0 % before the synchronization is started.

Possible values	Description
NONE	No synchronization
SINGLEOPEN	Immediate opening synchronization for 1.5 ∗ [rise time]
SINGLECLOSE	Immediate closing synchronization for 1.5 ∗ [fall time]

4.12.5 LimitSynchronization

Definition, *addition*

Parameter for stopping a drive at specified end positions. In doing so, [StrkPos] is set to [AOValue] at the same time.
While [LmStp]=TRUE,

- *all synchronization types remain irrelevant*
- *any ongoing synchronization operation is cancelled*

If the local override function is active, [LmStp] is set to FALSE.

Note
The function becomes even more useful if an end position detection function is available with an additional input and a correspondingly assigned end switch.

Possible values	Description
Selected	No synchronization
Not selected	Stop

4.12.6 StartSynchronization

Definition, *addition*

Parameter for starting the synchronization.

- *StartSynchronisation is automatically triggered after a reset if this has been specified accordingly.*
- *The synchronization is not interrupted by any other event.*

Possible values	Description
NONE	No synchronization
SINGLEOPEN	Immediate 'Open' synchronization for 1.5 ∗ [rise time]
SINGLECLOSE	Immediate 'Close' synchronization for 1.5 ∗ [fall time]

Note
Before you activate the synchronization after a reset, set the position in the positioning model to 0 %.

Recommendation: NONE – no synchronization
Every other configuration can cause unpredictable drive actions (valve, damper drives).

4.12.7 LimitSynchronization

Definition, *addition*

Parameter for defining the behavior of the synchronization if
- [AOValue] reaches a final position (0% or 100%) *and*
- the positioning model is within ([neutral zone]/2 + hysteresis) – i.e., the positioning model considers the drive as fully open or fully closed.

The synchronization is interrupted if [AOValue] changes to a value
> 0% + [NeutralZone]/2 + hysteresis *or*
< 100% – ([NeutralZone]/2 + hysteresis).

Possible values	Description
NONE	No synchronization
CONTINUOUS	Continuous synchronization (0% and 100%)
SINGLE	Synchronization for 1.5 ∗ [rise time] (100%) *or* 1.5 ∗ [fall time] (0%)
EVERY10MIN	Synchronization for 1.5 ∗ [rise time] (100%) *or* 1.5 ∗ [fall time] (0%) every 10 minutes
EVERY20MIN	Synchronization for 1.5 ∗ [rise time] (100%) *or* 1.5 ∗ [fall time] (0%) every 20 minutes
CONTINOPEN	Continuous synchronization (100%)
SINGLEOPEN	Synchronization für 1.5 ∗ [rise time] (100%)
EVERY10MINOPEN	Synchronization für 1.5 ∗ [rise time] (100%) every 10 minutes
EVERY20MINOPEN	Synchronization für 1.5 ∗ [rise time] (100%) every 20 minutes
CONTINCLOSE	Continuous synchronization (0%)
SINGLECLOSE	Synchronization für 1.5 ∗ [fall time] (100%)
EVERY10MINCLOSE	Synchronization für 1.5 ∗ [fall time] (100%) every 10 minutes
EVERY20MINCLOSE	Synchronization für 1.5 ∗ [fall time] (100%) every 20 minutes

Recommendation: SINGLE
Every other configuration can cause unpredictable drive actions (valve, damper drives).

4.12.8 RiseTime

Definition, *addition*

Parameter for defining the open time of a valve, flap, etc.

Value range	Unit	Recommended range
63...65535	0.1 s	6.5...600 s

The open time (0 % to 100 %) can be defined within the range specified above.

4.12.9 FallTime

Definition, *addition*

Parameter for defining the close time of a valve, flap, etc.

Value range	Unit	Recommended range
63...65535	0.1 s	6.5...600 s

The fall time (100% to 0 %) can be defined within the range specified above.

4.12.10 BreakTime

Definition, *addition*

Parameter for defining the break time (pause) when a drive changes direction (open/close).

Value range	Unit
0...255	0.1 s

4.12.11 NeutralZone

Definition, *addition*

Parameter for setting the percentage share of the extent of a neutral zone (in relationship to the required time).

Value range	Unit
0...20	0.1 s

Function

Is the difference between the process value and path algorithm greater than half of the neutral zone plus hysterisis, a pulse of appropriate length and direction is generated until the difference value is again within the neutral zone.

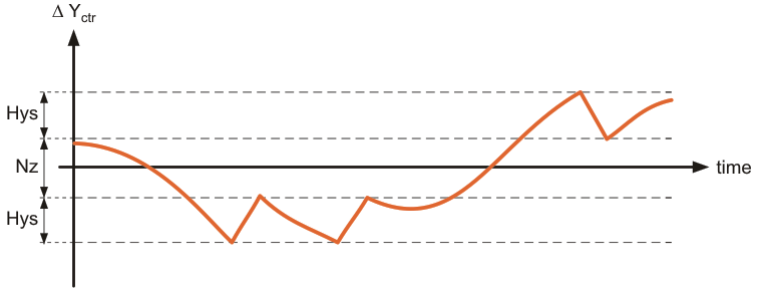
4.12.12 Hysteresis (Switching Limit)

Definition, *addition*

Parameter for defining the component of deviation between [StrokeModel] and the process value [AOVal].
The process value must be reached until the [StrokeModel] has been adjusted and, as a result, an OnCmd or OffCmd pulse has been generated..

The entire deviation ΔY_{ctr} in the figure below must comply with the following condition:

$$\Delta Y_{ctr} > \left(\frac{NeutralZone}{2} + Hysteresis \right)$$



Hysteresis

The minimum pulse times are defined by, among other factors, the hysteresis [Hys] properties. Where:

Minimum pulse length for OnCmd = [Hys] ∗ [RiseTime]
Minimum pulse length for OffCmd = [Hys] ∗ [FallTime]

Value range	Unit
0...20	%2

4.12.13 Enabling Local Override

The local override function for the channel is enabled by pressing the rocker switch of a channel. The following assignments apply in this case.
Pressure on…

- ... **middle** (hand): local override ON / OFF; no change at the output. The yellow LED of the channel lights while the override function is switched on
- ... + (up): connected device on; I/O point (n)
- ... – (down): connected device off; I/O point (n+1)

The *stroke algorithm* is updated when the local override function is activated.

The local override function can be disabled in the configuration.

Manual operation

The TXM1.6R-M module enables local override. Press the rocker switch of **either** of the two channels. The following applies: pressure on…

4.12.14 Local Override Mode

Definition, *addition*

Parameter for defining the type of 'local override' signal.
A logical '1' is usually interpreted as 'active'. However, it is possible for migrations to interpret a logical '0' as 'active'.

The following assignments apply here:

Value	Input	Local override
Active	1	Active
Inactive	0	Active
Active	0	Inactive
Inactive	1	Inactive

4.12.15 Process Data

The allocation of process data and the channel status information of analog output-configured channels for local override are described in 'Process Data Channel Mapping' for the corresponding TX-I/O module.

Local override

If local override is active after starting the TX-I/O, [StrokeModel] is set to the value of the last override value. As a result, the relay remains inactive and the drive is immobile.

Masterdown

If the TX-I/O BIM is in the status 'Masterdown', the backup function becomes active. The backup function works in the mode defined by [BackupMode].

SIMATIC representation of analog values

SIMATIC value		Analog value	Description
Decimal	Hex		
32767	7FFF		Value limited to 100 % (no faults)
27649	6C01		
27648	6C00	100 %	Measurement range
20736	5100	75 %	
1	1		
0	0	0 %	
-1	FFFF		Value limited to 0 % (no faults)
-32768	—		

4.12.16 Channel Diagnosis

Alarm type	Cause / solution
Invalid	Check the module configuration and parameterization
No_Output	Operating voltage too low -> check the power
No_Output	AC/DC 24 V voltage lower than minimum value > check the power supply

5 Diagnostics

5.1 Diagnostics with the SIMATIC Manager

Identification-related diagnostics are used to diagnose the Profinet BIM.

The function block `DIAG-DESIGO-IO` is provided in the Emx to evaluate the diagnostics data with the SICLIMAT X environment.

5.1.1 Basic Diagnostics

The following diagnostics information is displayed in the module information window:

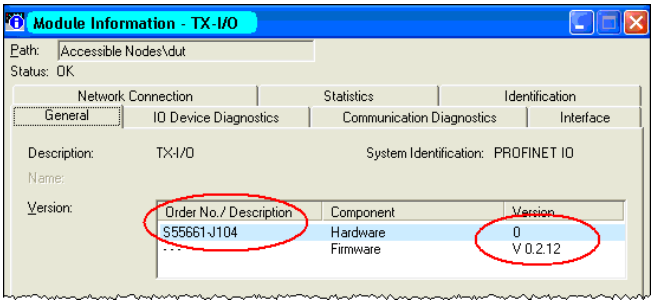
- the firmware version
- the hardware version
- MLFB number (machine-readable production number = order number)
- Ethernet port statistics

Step-by-step procedure

1. SIMATIC Manager, left screen section: **Mark CPU** > menu: **Target system** > **Show accessible nodes**
   Opens the Accessible Nodes dialog box

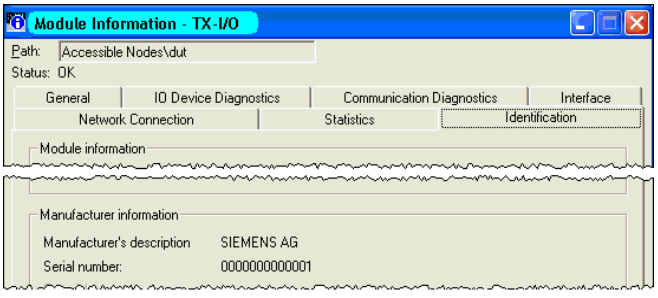
Version and MLFB (order number)

2. General tab, group field: Version > **Version**



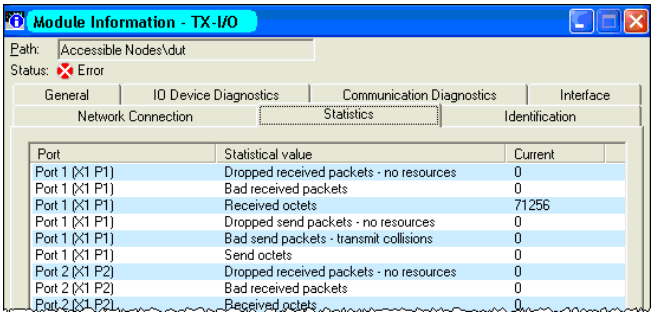
Serial number

3. Identification tab, group field: Manufacturer information > **Serial number**



Ethernet port statistics

4. Statistics tab



5. **Close** button.
   Closes the dialog box.

5.1.2 Advanced Diagnostics

The following diagnostics information is displayed in the module information window:

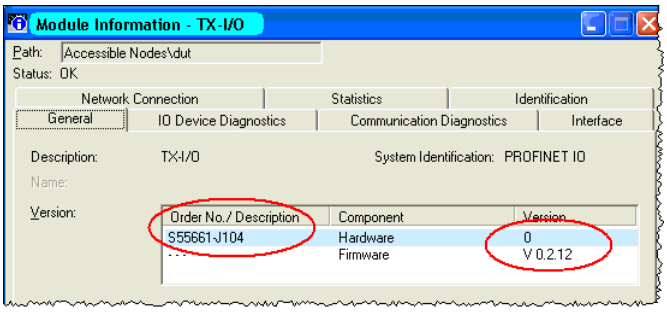
- Diagnostics alarm list per device/function object/channel

Procedure

1. SIMATIC Manager, left screen section: **Mark CPU** > menu: **Target system** > **Show accessible nodes**
   Opens the Accessible Nodes dialog box

Version and MLFB (order number)

2. IO Device Diagnostics tab, group field: **Standard diagnstics** and **Channel-specific diagnostics**



5.1.3 Diagnostics Alarms

German	English	Alarm #
Kurzschluss	Short Circuit	1
Unterspannung	Under Voltage	2
Überspannung	Over Voltage	3
Überlast	Over Load	4
Übertemperatur	Over Temperature	5
	Line Break	6
Obere Grenze überschritten	Upper Limit Exceeded	7
Untere Grenze überschritten	Lower Limmit Exceeded	8
Fehler	Error	9
Ungültig	Invalid	16
Gerätefehler	Device Fault	17
Kein Fühler	No Sensor	21
Ausgang gesperrt	Output Disabled	24
Multistate-Fehler	Multistate Fault	27
	Break Fault	29

5.2 Diagnostics on Profinet BIM

LED indication						Description
Run	**FLT**	**Link1**	**Comm 1**	**Link2**	**Comm 2**	**Cause**
on	off					Firmware runs without faults
on	flashing					Alarm present
on	on					Firmware is running, no Profinet communication
flashing	flashing					Hardware problem
flashing	off					Firmware update is running, firmware is running
flashing	on					Firmware update is running, firmware is not running
off	on					Firmware is not running
		on				Connection to Ethernet port 1 available
				on		Connection to Ethernet port 2 available
			flickering			Ethernet communication on port 1
					flickering	Ethernet communication on port 2

5.3 Diagnostics in Telnet

5.3.1 Telnet Commands

The following commands are used on the DOS command level for working with Telnet:

help firmware	
Command	Description
fwupdate	Starts firmware update
cimiupdate	Starts CIMI firmware update
cfgget	Get device configuration
cfgupdate	Update device configuration
calibrate	Starts CIMI calibration
devicestop	Stops Profinet IO Device
devicestart	Starts Profinet IO Device
setPvMode	Sets ComMode of a device to Master/Slave or Frontend/Backend

help info	
Command	Description
devicelist	Shows the device and module list
alarmlist	Shows the active alarms
diagbasic	Display the diagnostic and process alarms
diagextended	Display the extended diagnosis
ethstats	Display the ethernet statistics
showlog	Display trace log
version	Display the firmware version

5.3.2 Authentication

Definition, *addition*

Defined user names and assignment of corresponding rights.
The user names and passwords are used for the login procedure.

User name	Password	Rights
guest	guest01	Read rights (monitoring)
user	user01	Firmware configuration updates and monitoring
root	root	All rights

Step-by-step procedure

You access the login dialog automatically when opening telnet.
Start > Run

Enter **cmd > OK** in the text box
Opens the DOS commander

1 Optional (recommended): navigate to the directory C:\temp with
cd c:\temp > **return key**

2 At the DOS prompt (C:\temp>) enter: **telnet** > **return key**
Starts Telnet and shows the welcome text

3 At the DOS prompt (Microsoft Telnet>) enter the IP address of the TX-I/O BIM:
open xxx.xxx.xxx.xxx > **return key**
Refreshes the screen and displays the login prompt

4 At the DOS prompt (login:) enter: **telnet** > **return key**

5 At the DOS prompt (password:) enter (hidden text input): **user01** > **return key**
*Displays 'Welcome user' and prompts with **PNBIM>***

6 Continue with the following options:

- **Version**
- **Configuration**
- **Basic Diagnostics**
- **Advanced Diagnostics**
- **Alarm List**
- **Device List**

- **Optional:** Exit by entering at the DOS prompt: **quit** > **return key**

5.3.3 Version

Definition, *addition*

Command for displaying the loaded firmware versions.

Procedure

1 At the DOS prompt (PNBIM>) enter: version > return key
Shows the version parameters of the firmware (see the example below)

2 Continue by entering at the DOS prompt or exit with **quit** > **return key**

```
PNBIM> version
Firmware version : V 0.2.12.0
Production Date  : 18.2.2010
CIMI Firmware version : V2.0
CIMI Protocol version : V1
PNBIM>
```

5.3.4 Configuration

Definition, *addition*

Command for displaying the configuration data.

Procedure

At the DOS prompt (PNBIM>) enter: **cfgget** > **return key**

Shows the configuration parameters of the TX-I/O BIM; (see the example below)

1 Continue by entering at the DOS prompt or exit with **quit** > **return key**

```
Device configuration
IPADDRESS:192.168.1.8
SUBNET:255.255.255.0
GATEWAY:192.168.1.8
NAME:dut
MACIF:08 00 06 A2 B0 01
MACPORT1:08 00 06 A2 B0 11
MACPORT2:08 00 06 A2 B0 21
HWVERSION:0
SERIAL:0000000000001
PRODDATE:21.2.2010
MLFB:S55661-J104
COMMUNICATIONMODE:MSPNBIM> PNBIM>
```

5.3.5 Basic Diagnostics

Definition, *addition*

Command for running and displaying the basic diagnostics.

Procedure

1 At the DOS prompt (PNBIM>) enter: diagbasic > return key

Shows the basic diagnostics parameters of the TX-I/O BIM; the following parameters are listed (see the example below)

- Firmware version
- Hardware version
- CIMI firmware version
- MLFB number
- Serial number
- Ethernet port statistics

```
PNBIM> diagbasic
Port 1 statistics:
--------------------
RxTotalByte:0, RxTotalFrame:0, RxGoodFrame:0
RxUnicast:0, RxMulticast:0, RxBroadcast:0, RxUnknown:0
TxTotalByte:0, TxTotalFrame:0, TxCollision:0, TxDropped:0
TxUnicast:0, TxMulticast:0, TxBroadcast:0
```

2 **Optional:** Exit by entering at the DOS prompt: **quit > return key**

5.3.6 Advanced Diagnostics

Definition, *addition*

Command for running and displaying the basic diagnostics and for writing the advanced diagnostics to a file (diagext.file).

The file created with this command can be downloaded via FTP.

Procedure

1 At the DOS prompt (PNBIM>) enter: diagextended > return key

Shows the parameters of the extended diagnostics of the TX-I/O BIM; the following parameters are listed:

- *Diagnostics alarm list per device/function object/channel*
- *Exception history (see the following example)*
- *Log history*

```
PNBIM> diagextended
diagext.txt is created successfully
Fatal Restart Count:0, DevHndl:0, ErrLevel:0, PackId:0, ModId:0, LineNum:0
Exception Restart Count:0, reg[0]:0, reg[1]:0, reg[2]:0, reg[3]:0, reg[4]:0,
reg[5]:0, reg[6]:0, reg
```

2 **Optional:** Exit by entering at the DOS prompt: **quit > return key**

5.3.7 Alarm List

Definition, *addition*

Command for displaying the alarm list.

This command can only be run during ongoing Profinet communication.

Procedure

1 At the DOS prompt (PNBIM>) enter: alarmlist > return key
Shows the alarm list; for example:

```
PNBIM> alarmlist
Alarm list
------------
Address:0, Channel:1 Ident:0x0, Alarm Type:11
Address:8, removed
PNBIM>
```

2 Optional: Exit by entering at the DOS prompt: quit > return key

5.3.8 Device List

Definition, *addition*

Command for displaying a TX-I/O module list for modules that are connected with the Profinet BIM.

This command can only be run during ongoing Profinet communication.

Procedure

1 At the DOS prompt (PNBIM) enter: devicelist > return key
Shows the device list; for example:

```
PNBIM> devicelist
Scanning addresses 1-120
Found device  TXM-1.8X-ML with address 1
FW Id 0x1001 Date Fri Apr 25 07:20:42 1997
.....................................
Found 1 devices on the IslandBus
```

2 Optional: Exit by entering at the DOS prompt: quit > return key

6 Updates

6.1 Firmware Update

6.1.1 FW Upload to TX-I/O BIM

Preparation

1 Download the zip file pnbim firmware Vxxx.zip and the GSDML file (.xml) from Swanweb
The following link is an example and is neither binding nor complete (you need to navigate further, but this is self-explanatory)
https://intranet.sbt.siemens.com/swanlink/default.php?tabcard=4b73a4b5&src=txio/asn/TXB1.Profinet

2 Extract the file pnbim_fw_V0_2_xx.bin and copy it together with the GSDML file to a local folder – e.g., C:\temp.

Passwords

Passwords are required below during the login procedure.

User name	Password	Rights
guest	guest01	Read rights (monitoring)
user	user01	Firmware configuration updates and monitoring
root	root	All rights

Step-by-step procedure

1 Start > Run

2 Enter cmd in the text box and then return key
Opens the DOS commander

3 Optional (recommended): navigate to the folder named above (e.g., C:\temp) with cd c:\temp > return key

4 At the DOS prompt (C:\temp>) enter: ftp > return key
Prompts ftp>

5 At the DOS prompt (ftp>) enter the IP address of the TX-I/O BIM:
open xxx.xxx.xxx.xxx > **return key**
Displays 'Connected to <IP address> and 220 Service ready'

6 At the DOS prompt User (<IP address>: (none)) enter: user > return key
Display '331 User name ok, need password'

7 At the DOS prompt (password:) enter (hidden text input): user01 > return key
Displays '230 User logged in'

8 At the DOS prompt (ftp>) enter:
put pnbim_fw_Vx_x_xx.bin > return key
Displays '200 Command OK, 150 Connecting for STOR, 226 Transfer OK, Closing connection' and 'ftp: xxxxxx bytes sent in xxx.xx Seconds xx.xxKbytes/s.'

9 At the DOS prompt (ftp>) enter: quit > return key
Exits ftp

```
C:\temp>ftp
ftp> open 192.168.0.114
Connected to 192.168.0.114.
220 Service ready
User (192.168.0.114:(none)): root
331 User name ok, need password
Password:
230 User logged in
ftp> put pnbim_fw_V0_2_18.bin
200 Command OK
150 Connecting for STOR
226 Transfer OK, Closing connection
ftp: 3244916 bytes sent in 210.31Seconds 15.43Kbytes/sec.
ftp> quit
```

6.1.2 Firmware Update of PROFINET BIM

Preparation

1 **Start** > **Run**

2 Enter **cmd** in the text box > **return key**
Opens the DOS commander

3 Optional (recommended): navigate to the directory C:\temp with
cd c:\temp > **return key**

4 At the DOS prompt enter: **telnet** > **return key**
Starts Telnet and shows the welcome text

5 At the DOS prompt (Microsoft Telnet) enter the IP address of the TX-I/O BIM:
open xxx.xxx.xxx.xxx > **return key**
Refreshes the screen and displays the login prompt

6 At the DOS prompt (login:) enter: **telnet** > **return key**

7 At the DOS prompt (password:) enter (hidden text input): **user01** > **return key**
*Displays 'Welcome user' and prompts with **PNBIM>***

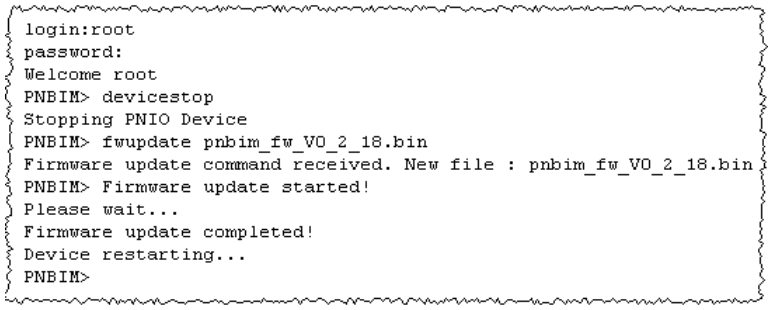
Step-by-step procedure

1 At the DOS prompt (PNBIM>) enter: devicestop > return key
Displays 'Stopping PNIO Device'

2 At the DOS prompt (PNBIM>) enter: fwupdate pnbim_fw_Vx_x_x.bin > return key
Displays 'Firmware update command received. New file : pnbim_fw_V0_2_18.bin' (see screenshot example below)
Numbers are represented by an 'x' in these instructions. The 'x' can have 1 or more digits.

3 After the actual FW update has (automatically) run, the utility restarts the TX-I/O BIM.

4 At the DOS prompt (PNBIM>) enter: quit
This exits the utility.



6.2 Configurations Update

General

GSDML files contain the engineering data of a Profinet device. The files are compiled by a Profinet device engineering tool – e.g., by the SIMATIC Manager hardware configuration software.
The hardware configuration software itself has no upgrade function to upgrade, for example, existing configurations into a new GSDML file.

6.2.1 Preparation

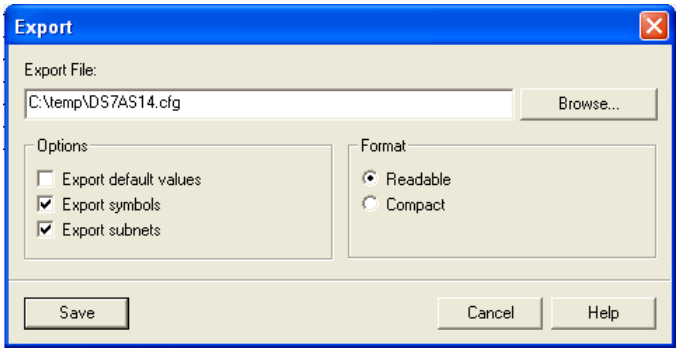
Important ⚠ Proceed as follows in order to prevent complete reengineering:

1 Back up the engineering data:
SIMATIC Manager: **File** > context menu: **Archive** > **OK**

2 Read the release notes on the GSDML file to determine in what (sub)modules data was changed.

3 Delete all (sub)modules with changes from the HW configuration:
Rightclick the module row > context menu: **Delete** > security prompt: **Yes** button
Hold down the CTRL key for multiselection.

4 Export the hardware configuration engineering data to a Config file:
HW configurator: **Station** > **Export** > text box: enter **path/filename** > **Save** button



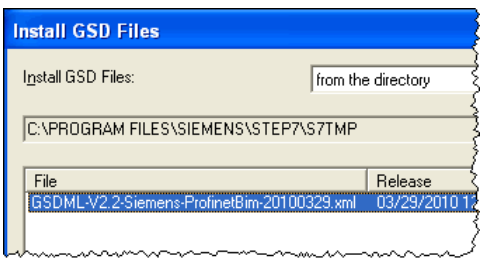
6.2.2 Updating the SIMATIC Manager

Install new GSDML file

! **Requirement**: the corresponding file has already been imported. For details, refer to page 17 – **Import GSDML and BMP** files

1 S7 Manager: **Run** the hardware configuration

2 Tools > Install GSD Files
Opens Install GSD Files



3 Select the required **GSDML file**
The possible files are listed in the text field.

4 Select the required **File** > click **Install** > answer security queries (click **Yes**)

5 Acknowledge the installation success message (click **OK**) and close the dialog box (click **Close**).

Change the output status

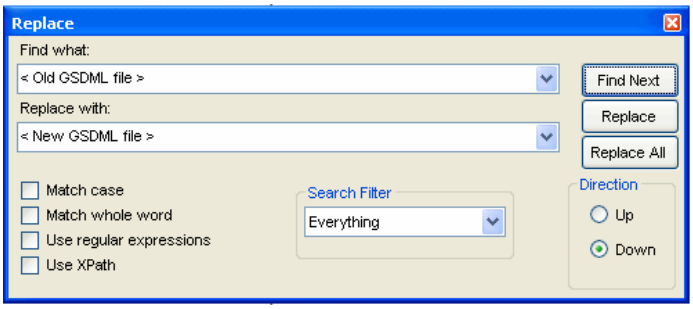
1. Mark the Profinet BIM > **Edit** > **Object Properties**
Opens the Properties dialog box for the corresponding Profinet BIM
2. Properties dialog box: click **Change output status**
Opens the listbox GSD file – Change output status
3. From the listbox, select the required (latest) file
4. **Optional:** make your selection in the *Use marked output status for* group field (default: the current I/O device)
5. ⚠ Note the names of the old **and** new GSDML files.
These file names will be needed later!
6. Click the **OK** button.
Closes the listbox.
7. Properties dialog box: click **OK**.

Save the update

1. S7 hardware configurator: mark **Profinet BIM** > **Station** > **Save**
2. **Optional:** If other BIMs are available for updating, repeat steps 3 to 10 above.

6.2.3 Updating Export Data

1. Open the exported configuration file in a text editor (Notepad, XML editor, etc.)
2. Replace the old file names by the new GSDML file names.
This is most easily done by Search & Replace.



3. Save the configuration file
4. Update the S7 hardware configuration
Refer to the next section for details.

6.2.4 Updating the S7 Hardware Configuration

Requirements

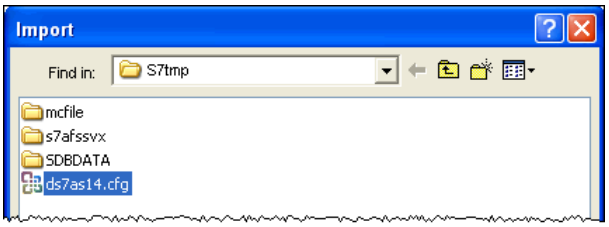
It is assumed that the reader knows of the procedure implemented above. The following steps are therefore repeated in concise form.

Step-by-step procedure

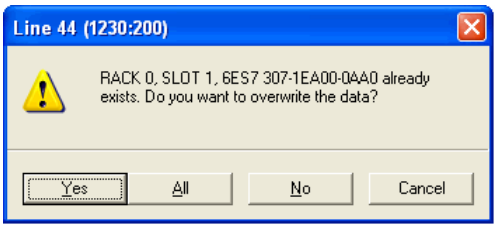
1 Start the S7 hardware configurator (if this is not already the case)

2 Station > Import
Opens the Import dialog box.

3 Import dialog box: mark the modified GSDML file > click Open



4 Answer various security queries accordingly.
Example:

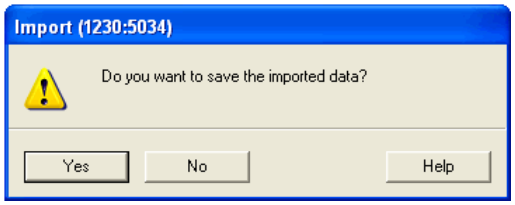


Two options of acknowledgement are possible:

Yes *Acknowledgement for one object (i.e., a security prompt will be displayed for the next object).*

All *Acknowledgement for each category of objects; in this way, for example, all racks, all subsystems etc. can be handled with one security query in each case.*

5 Reply to the security query by clicking Yes.



The data is then saved and the dialog box closes.

6 Reengineer all previously removed modules and submodules.
These are modules and submodules that were previously removed from the HW configuration because they had been changed.

7 Station > Save and compile
This action saves and compiles the module and submodule data.

8 Target system > load to module
Opens the 'Select target module' dialog box

9 Select target module > click OK
Follow the dialog; the action ends after a short time.

7 Module Data

This section explains how the input/output channels of the TX-I/O modules are mapped to the SIMATIC S7 input/output addresses.

7.1 General

Every newly added ('plugged') module must be addressed. This procedure is not similar for all modules. We distinguish between

- binary input/output modules and
- analog and multistate modules.

Binary modules

The addressing takes place on the module (subslot 1) according to the binary channel of the module.

The SIMATIC S7 address of a binary input/output is obtained from the parameterized address of the module plus the offset specified in the table.

Example

Module input address	50	
Channel 4	0.3	(byte 0, bit 3)
SIMATIC S7 address	E 50.3	

Analog and multistate modules

The addressing takes place on the submodule (subslots 2…1) according to the analog or multistate function.

The SIMATIC S7 address of the analog/multistate input/output is obtained directly from the subslot address parameterized in the channel.
The offsets specified in the tables are also assigned.

Example

Submodule input address	26
SIMATIC S7 address	PEW 26

The SIMATIC addresses of the channel process data are given below.
Local override information is indicated separately for each individual TX-I/O module.

7.2 TXM1.8D

Designation

8-channel digital input module

Supported functions

- Binary input (static)
- Binary input (pulsed)
- Counter input

7.2.1 Process Data Channel Mapping

BI – channels configured as binary input

BI channel		Offset to input address	
Channel 1	Subslot 1	Byte 0	Bit 0
Channel 2	Subslot 1	Byte 0	Bit 1
Channel 3	Subslot 1	Byte 0	Bit 2
Channel 4	Subslot 1	Byte 0	Bit 3
Channel 5	Subslot 1	Byte 0	Bit 4
Channel 6	Subslot 1	Byte 0	Bit 5
Channel 7	Subslot 1	Byte 0	Bit 6
Channel 8	Subslot 1	Byte 0	Bit 7

CI – channels configured as counter input

CI channel		Offset to input address			
Channel 1	Subslot 2	Byte 3	Byte 2	Byte 1	Byte 0
Channel 2	Subslot 3	Byte 3	Byte 2	Byte 1	Byte 0
Channel 3	Subslot 4	Byte 3	Byte 2	Byte 1	Byte 0
Channel 4	Subslot 5	Byte 3	Byte 2	Byte 1	Byte 0
Channel 5	Subslot 6	Byte 3	Byte 2	Byte 1	Byte 0
Channel 6	Subslot 7	Byte 3	Byte 2	Byte 1	Byte 0
Channel 7	Subslot 8	Byte 3	Byte 2	Byte 1	Byte 0
Channel 8	Subslot 9	Byte 3	Byte 2	Byte 1	Byte 0

7.2.2 Counter Value Default Channel Mapping

CI – channels configured as counter input

The table below shows the counter value set command value assignment of the CI-configured channels.
The command is triggered by setting the relevant bit from 0 to 1. It sets the [NewCIValue] parameter to the counter value.

CI channel		Offset to input address	
Channel 1	Subslot 2	Byte 0	Bit 0
Channel 2	Subslot 3	Byte 0	Bit 0
Channel 3	Subslot 4	Byte 0	Bit 0
Channel 4	Subslot 5	Byte 0	Bit 0
Channel 5	Subslot 6	Byte 0	Bit 0
Channel 6	Subslot 7	Byte 0	Bit 0
Channel 7	Subslot 8	Byte 0	Bit 0
Channel 8	Subslot 9	Byte 0	Bit 0

7.3 TXM1.16D

7.3.1 Process Data Channel Mapping

Designation

16-channel digital input module

Supported functions

- Binary input (static)
- Binary input (pulsed)
- Counter input

BI – channels configured as binary input

BI channel		Offset to input address	
Channel 1	Subslot 1	Bit 0	Byte 0
Channel 2	Subslot 1	Bit 1	Byte 0
Channel 3	Subslot 1	Bit 2	Byte 0
Channel 4	Subslot 1	Bit 3	Byte 0
Channel 5	Subslot 1	Bit 4	Byte 0
Channel 6	Subslot 1	Bit 5	Byte 0
Channel 7	Subslot 1	Bit 6	Byte 0
Channel 8	Subslot 1	Bit 7	Byte 0
Channel 9	Subslot 1	Bit 0	Byte 1
Channel 10	Subslot 1	Bit 1	Byte 1
Channel 11	Subslot 1	Bit 2	Byte 1
Channel 12	Subslot 1	Bit 3	Byte 1
Channel 13	Subslot 1	Bit 4	Byte 1
Channel 14	Subslot 1	Bit 5	Byte 1
Channel 15	Subslot 1	Bit 6	Byte 1
Channel 16	Subslot 1	Bit 7	Byte 1

CI – channels configured as counter input

CI channel		Offset to input address			
Channel 1	Subslot 2	Byte 3	Byte 2	Byte 1	Byte 0
Channel 2	Subslot 3	Byte 3	Byte 2	Byte 1	Byte 0
Channel 3	Subslot 4	Byte 3	Byte 2	Byte 1	Byte 0
Channel 4	Subslot 5	Byte 3	Byte 2	Byte 1	Byte 0
Channel 5	Subslot 6	Byte 3	Byte 2	Byte 1	Byte 0
Channel 6	Subslot 7	Byte 3	Byte 2	Byte 1	Byte 0
Channel 7	Subslot 8	Byte 3	Byte 2	Byte 1	Byte 0
Channel 8	Subslot 9	Byte 3	Byte 2	Byte 1	Byte 0
Channel 9	Subslot 10	Byte 3	Byte 2	Byte 1	Byte 0
Channel 10	Subslot 11	Byte 3	Byte 2	Byte 1	Byte 0
Channel 11	Subslot 12	Byte 3	Byte 2	Byte 1	Byte 0
Channel 12	Subslot 13	Byte 3	Byte 2	Byte 1	Byte 0
Channel 13	Subslot 14	Byte 3	Byte 2	Byte 1	Byte 0
Channel 14	Subslot 15	Byte 3	Byte 2	Byte 1	Byte 0
Channel 15	Subslot 16	Byte 3	Byte 2	Byte 1	Byte 0
Channel 16	Subslot 17	Byte 3	Byte 2	Byte 1	Byte 0

7.3.2 Counter Value Default Channel Mapping

CI – channels configured as counter input

CI channel		Offset to output address	
Channel 1	Subslot 2	Byte 0	Bit 0
Channel 2	Subslot 3	Byte 0	Bit 0
Channel 3	Subslot 4	Byte 0	Bit 0
Channel 4	Subslot 5	Byte 0	Bit 0
Channel 5	Subslot 6	Byte 0	Bit 0
Channel 6	Subslot 7	Byte 0	Bit 0
Channel 7	Subslot 8	Byte 0	Bit 0
Channel 8	Subslot 9	Byte 0	Bit 0
Channel 9	Subslot 10	Byte 0	Bit 0
Channel 10	Subslot 11	Byte 0	Bit 0
Channel 11	Subslot 12	Byte 0	Bit 0
Channel 12	Subslot 13	Byte 0	Bit 0
Channel 13	Subslot 14	Byte 0	Bit 0
Channel 14	Subslot 15	Byte 0	Bit 0
Channel 15	Subslot 16	Byte 0	Bit 0
Channel 16	Subslot 17	Byte 0	Bit 0

Only channels 1-8 can be used in this module for CI configurations.

7.4 TXM1.8U, TXM1.8U-ML TXM1.8X, TXM1.8X-ML

Designation

TXM1.8U : 8-channel Universal module
TXM1.8U-ML: 8-channel Universal module with local override and LCD

Supported functions

AI_NI1K	AI_PT1K385	AO_U10N
AI_NTC100K	AI_R2K5	BI_STATIC
AI_NTC10K	AI_T1	BI_PULSE
AI_PT1K375	AI_U10N	CI

Designation

TXM1.8X : 8-channel Super Universal module
TXM1.8X-ML: 8-channel Super Universal module with local override and LCD

Supported functions

AI_NI1K	AI_R2K5	AO_U10N
AI_NTC100K	AI_T1	BI_STATIC
AI_NTC10K	AI_I020	BI_PULSE
AI_PT1K375	AI_420N	CI
AI_PT1K385	AI_U10N	

7.4.1 Process Data Channel Mapping

BI – channels configured as binary input

BI channel		Offset to input address	
Channel 1	Subslot 1	Byte 0	Bit 0
Channel 2	Subslot 1	Byte 0	Bit 1
Channel 3	Subslot 1	Byte 0	Bit 2
Channel 4	Subslot 1	Byte 0	Bit 3
Channel 5	Subslot 1	Byte 0	Bit 4
Channel 6	Subslot 1	Byte 0	Bit 5

Channel 7	Subslot 1	Byte 0	Bit 6
Channel 8	Subslot 1	Byte 0	Bit 7

CI – channels configured as counter input

CI channel		Offset to input address			
Channel 1	Subslot 2	Byte 3	Byte 2	Byte 1	Byte 0
Channel 2	Subslot 3	Byte 3	Byte 2	Byte 1	Byte 0
Channel 3	Subslot 4	Byte 3	Byte 2	Byte 1	Byte 0
Channel 4	Subslot 5	Byte 3	Byte 2	Byte 1	Byte 0
Channel 5	Subslot 6	Byte 3	Byte 2	Byte 1	Byte 0
Channel 6	Subslot 7	Byte 3	Byte 2	Byte 1	Byte 0
Channel 7	Subslot 8	Byte 3	Byte 2	Byte 1	Byte 0
Channel 8	Subslot 9	Byte 3	Byte 2	Byte 1	Byte 0

AI – channels configured as analog input

AI channel		Offset to input address	
Channel 1	Subslot 2	Byte 1	Byte 0
Channel 2	Subslot 3	Byte 1	Byte 0
Channel 3	Subslot 4	Byte 1	Byte 0
Channel 4	Subslot 5	Byte 1	Byte 0
Channel 5	Subslot 6	Byte 1	Byte 0
Channel 6	Subslot 7	Byte 1	Byte 0
Channel 7	Subslot 8	Byte 1	Byte 0
Channel 8	Subslot 9	Byte 1	Byte 0

AO – channels configured as analog output

AO channel		Offset to output address	
Channel 1	Subslot 2	Byte 1	Byte 0
Channel 2	Subslot 3	Byte 1	Byte 0
Channel 3	Subslot 4	Byte 1	Byte 0
Channel 4	Subslot 5	Byte 1	Byte 0
Channel 5	Subslot 6	Byte 1	Byte 0
Channel 6	Subslot 7	Byte 1	Byte 0
Channel 7	Subslot 8	Byte 1	Byte 0
Channel 8	Subslot 9	Byte 1	Byte 0

Note
Only the channels 5 – 8 can be used for the signal type **Y420** (SIMATIC: **AO_I420N**).

7.4.2 Local Override Channel Mapping

AO – channels configured as analog output

AO channel		Offset to output address	
Channel 1	Subslot 2	Byte 1	Byte 0
Channel 2	Subslot 3	Byte 1	Byte 0
Channel 3	Subslot 4	Byte 1	Byte 0
Channel 4	Subslot 5	Byte 1	Byte 0
Channel 5	Subslot 6	Byte 1	Byte 0
Channel 6	Subslot 7	Byte 1	Byte 0
Channel 7	Subslot 8	Byte 1	Byte 0
Channel 8	Subslot 9	Byte 1	Byte 0

7.4.3 Counter Value Default Channel Mapping

CI – channels configured as counter input

CI channel		Offset to input address	
Channel 1	Subslot 2	Byte 0	Bit 0
Channel 2	Subslot 3	Byte 0	Bit 0
Channel 3	Subslot 4	Byte 0	Bit 0
Channel 4	Subslot 5	Byte 0	Bit 0
Channel 5	Subslot 6	Byte 0	Bit 0
Channel 6	Subslot 7	Byte 0	Bit 0
Channel 7	Subslot 8	Byte 0	Bit 0
Channel 8	Subslot 9	Byte 0	Bit 0

7.5 TXM1.6R, TXM1.6R-M, TXM1.6RL

Designation

TXM1.6R : Relay module
TXM1.6R-M : Relay module with local override

Supported functions

AO_Y250T_2Cha	Mo_2Pulse_6Cha	Mo_Map_4Cha
BO_Q250	BO_Q250_P	Mo_Map_5Cha
Mo_2Pulse_3Cha	BO_Q250_P_2Cha	Mo_Map_6Cha
Mo_2Pulse_4Cha	Mo_Map_2Cha	
Mo_2Pulse_5Cha	Mo_Map_3Cha	

Designation

TXM1.6RL : Light module

Supported functions

BO_Bistabil

7.5.1 Process Data Channel Mapping

BO – channels configured as binary output

BO channel		Offset to output address	
Channel 1	Subslot 1	Byte 0	Bit 0
Channel 2	Subslot 1	Byte 0	Bit 1
Channel 3	Subslot 1	Byte 0	Bit 2
Channel 4	Subslot 1	Byte 0	Bit 3
Channel 5	Subslot 1	Byte 0	Bit 4
Channel 6	Subslot 1	Byte 0	Bit 5
Channel 7	Subslot 1	Byte 0	Bit 6
Channel 8	Subslot 1	Byte 0	Bit 7

MO – channels configured as multioutput (static)

The following table shows the configured channels' process data allocation of the MO-configured channels.

Note

The first n channels apply to the n-channel MO function.

Example
The following values apply to the function Mo_Map_4Cha:
'None', 'Channel 1', 'Channel 2', 'Channel 3', 'Channel 4'.

The MO channel 1 begins with the channel number of the MO-configured submodule.

Example
The following MO channel mapping applies to the function Mo_Map_4Cha in the Subslot 4:

MO channel 1: Channel 3	MO channel 3: Channel 5
MO channel 2: Channel 4	MO channel 4: Channel 6

Mapping function

Module channels are configured with a mapping function by assigning the MO_Map_xCha function to the start channel of the function.

Mapping type

The mapping type is selected in the [MappingKind] parameter of the function.
Three (3) different mapping types are provided:

- Mapping_1_n
- Mapping_UpDown
- Mapping_Binary

1:n mapping

The mapping types differ in their activation/deactivation of the channel outputs.

Only the values shown in the table below are valid for this mapping type. Other values cause an 'invalid value' diagnostics alarm.

Channel number	SIMATIC value					
	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
No channel	0	0	0	0	0	0
MO channel 1	0	0	0	0	0	1
MO channel 2	0	0	0	0	1	0
MO channel 3	0	0	0	1	0	0
MO channel 4	0	0	1	0	0	0
MO channel 5	0	1	0	0	0	0
MO channel 6	1	0	0	0	0	0

UpDown mapping

Only the values shown in the table below are valid for this mapping type. Other values cause an 'invalid value' diagnostics alarm.

Channel number	SIMATIC value					
	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
No channel	0	0	0	0	0	0
MO channel 1	0	0	0	0	0	1
MO channel 1,2	0	0	0	0	1	1
MO channel 1,2,3	0	0	0	1	1	1
MO channel 1,2,3,4	0	0	1	1	1	1
MO channel 1,2,3,4,5	0	1	1	1	1	1
MO channel 1,2,3,4,5,6	1	1	1	1	1	1

Binary mapping

Only some of the values possible for binary mapping are listed for this mapping type in the table below. All MO channel combinations are valid.

Channel number	SIMATIC value					
	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
No channel	0	0	0	0	0	0
MO channel 1	0	0	0	0	0	1
MO channel 2	0	0	0	0	1	0
MO channel 3	0	0	0	1	0	0
MO channel 4	0	0	1	0	0	0
MO channel 5	0	1	0	0	0	0
MO channel 6	1	0	0	0	0	0
MO channel 1,2	0	0	0	0	1	1
MO channel 1,3	0	0	0	1	0	1
MO channel 1,4	0	0	1	0	0	1
MO channel 1,5	0	1	0	0	0	1
MO channel 1,6	1	0	0	0	0	1

MO – multioutput pulse-configured channels

Only the values shown in the table below are valid for the 'pulse' function type. Other values cause an 'invalid value' diagnostics alarm.

Pulse	SIMATIC value					
	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
No channel	0	0	0	0	0	0
MO channel 1	0	0	0	0	0	1
MO channel 2	0	0	0	0	1	0
MO channel 3	0	0	0	1	0	0
MO channel 4	0	0	1	0	0	0
MO channel 5	0	1	0	0	0	0
MO channel 6	1	0	0	0	0	0

AO – analog output-configured channels

AO channel		Offset to output address	
Channel 1	Subslot 2	Byte 1	Byte 0
Channel 2	Subslot 3	Byte 1	Byte 0
Channel 3	Subslot 4	Byte 1	Byte 0
Channel 4	Subslot 5	Byte 1	Byte 0
Channel 5	Subslot 6	Byte 1	Byte 0
Channel 6	Subslot 7	Byte 1	Byte 0
Channel 7	Subslot 8	Byte 1	Byte 0
Channel 8	Subslot 9	Byte 1	Byte 0

7.5.2 Local Override Channel Mapping

BO-, AO-, MO-configured channels

BO, AO, MO channel		Offset to input address	
Channel 1	Subslot 1	Byte 0	Bit 0
Channel 2	Subslot 1	Byte 0	Bit 1
Channel 3	Subslot 1	Byte 0	Bit 2
Channel 4	Subslot 1	Byte 0	Bit 3
Channel 5	Subslot 1	Byte 0	Bit 4
Channel 6	Subslot 1	Byte 0	Bit 5
Channel 7	Subslot 1	Byte 0	Bit 6
Channel 8	Subslot 1	Byte 0	Bit 7

The last bit (bit 0–7) in each case is responsible for the mode (active/inactive) of the local override function. For details, refer to the appropriate local override mode parts in Section 4 – Parameters.

7.6 TXM1.8P

Designation

TXM8P : PT100 module

Supported functions

AI_NI1K	AI_PT1K375
AI_PT100_4_Climatic	AI_R250
AI_PT100_4_Climatic	AI_R2K5

7.6.1 Channel Process Data Channel Mapping

The table below shows the AI-configured channels.

AI – analog input-configured channels

AI channel		Offset to input address	
Channel 1	Subslot 2	Byte 1	Byte 0
Channel 2	Subslot 3	Byte 1	Byte 0
Channel 3	Subslot 4	Byte 1	Byte 0
Channel 4	Subslot 5	Byte 1	Byte 0
Channel 5	Subslot 6	Byte 1	Byte 0
Channel 6	Subslot 7	Byte 1	Byte 0
Channel 7	Subslot 8	Byte 1	Byte 0
Channel 8	Subslot 9	Byte 1	Byte 0

7.6.2 Local Override Channel Mapping

AO – analog output-configured channels

The table below shows the channel mapping of local override information of AO-configured channels.

AO channel		Offset to input address	
Channel 1	Subslot 2	Byte 0	Bit 0
Channel 2	Subslot 3	Byte 0	Bit 0
Channel 3	Subslot 4	Byte 0	Bit 0
Channel 4	Subslot 5	Byte 0	Bit 0
Channel 5	Subslot 6	Byte 0	Bit 0
Channel 6	Subslot 7	Byte 0	Bit 0
Channel 7	Subslot 8	Byte 0	Bit 0
Channel 8	Subslot 9	Byte 0	Bit 0

The last bit (bit 0–7) in each case is responsible for the mode (active/inactive) of the local override function. For details, refer to the appropriate local override mode parts in Section 4 – Parameters.

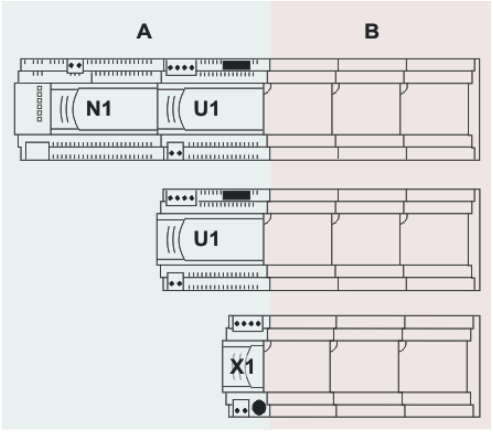
8 Hardware

8.1 Installing the Devices

Note

This is an overview of the most important steps in the installation and replacement of the devices. Further information (e.g., dimensioning, bus extension, etc.) can be found in the corresponding **installation manual**.

Start the installation **in all cases** with one or two 'A' devices that provide the bus signal, the module power supply and the field power supply (e.g., a power supply module).



N1 BIM (Bus Interface Modul) *without* integrated power supply

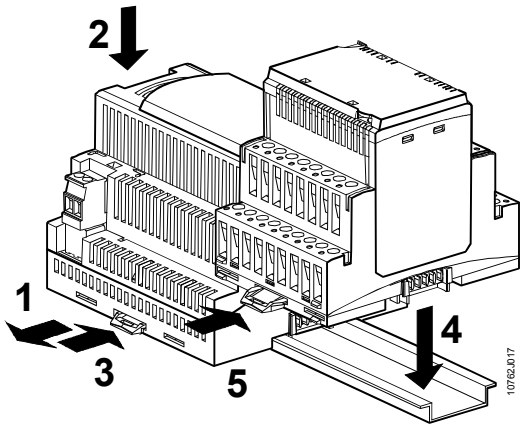
U1 Power supply module TXS1.12F10

X1 Bus interface module TXS1.EF10

Install each I/O row **from left to right** (or from top to bottom). Install the devices **in an upright position** in succession on the standard mounting rail.
The island bus constructs itself as a result.

Procedure

1. Start the installation **in all cases** with one or two 'A' devices that provide the bus signal, the module power supply and the field power supply (e.g., a power supply module).
   - Pull out the mounting slider (1)
   - Press the device onto the rail (2)
   - Slide in the mounting slider (3)
2. Insert the I/O modules in succession on (4), (5).



3. **Optional:** Add additional bus interface modules between the modules and no more than one further power supply module ('A') for each I/O row.

8.2 Replacing a Module

Electronic unit

An **electronic unit** can be replaced at any time by a similar or compatible type, even if the system is in operation.

Module including socket

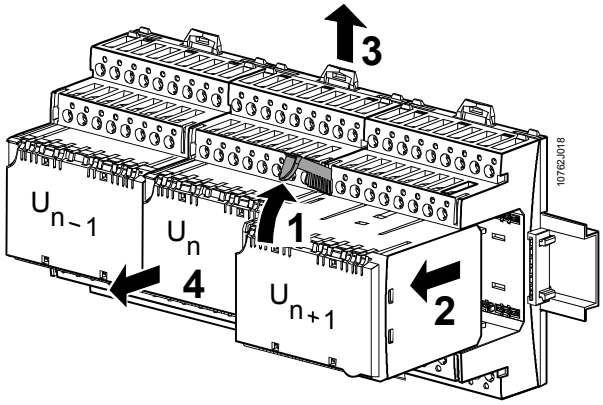
When replacing a **whole module** (including socket), the following points must be observed:

- The bus connector protrudes from all TX-I/O devices on the right. For this reason, the electronic unit must first be removed from the neighboring module on the right.
- The removal of the terminal socket interrupts the island bus so that modules on the right no longer receive power.

Procedure

To replace the module U (including socket) with the number n:

1. **First** swivel out the address key at the neighboring module U_{n+1} (1)
2. Remove the electronic unit U_{n+1} (2)
3. Remove the mounting slider at the terminal socket U_n (3)
4. Remove the whole module U_n with the terminal socket (4)
5. Install the new module U_n with terminal socket – without an address key
6. Push in the mounting slider U_n
7. Insert the address key of the old module in the new module and swivel it into position carefully
8. Insert the electronic unit at the neighboring module U_{n+1} again and carefully swivel the address key into position.



Once the new electronic unit has a connection with the bus master, it is configured in accordance with the module address and begins to work after a brief period of time.

Note ⚠

If you need a previously used electronic unit or used module as the replacement part, **it must be reset to the factory settings with the deletion key** before the address key is permitted to be swiveled into place.

BIM, power supply module, bus interface module

- The same procedure is used as for replacing an I/O module.
- These devices have pluggable terminals for fast connection.

8.3 Labeling and Addressing Devices

8.3.1 Flow and Allocation of the Labelling

Different flows

Depending on the project work flow and organization of the goods flow, the labels
- are supplied with the devices to install *or*
- are used when taking them into commission at the system site.

8.3.2 Labeling the I/O Modules

Labeling positions

The information applied at the following positions is used for unique identification of each I/O module and its connections:

- Module front
  - Module type and symbols for the display and control elements
  - Insertable label, can be freely labeled

- Address key
  - Address numbers from 1...120

Labels

The insertable labels for the I/O modules can be freely labeled.

A4 sheets with the corresponding divisions and perforations can be ordered under the order number TXA1.LA4.

These sheets can be printed with the easy-to-use Excel file **IoLabel.xls**.

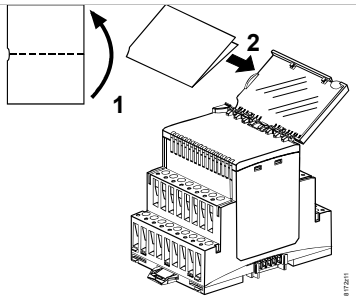
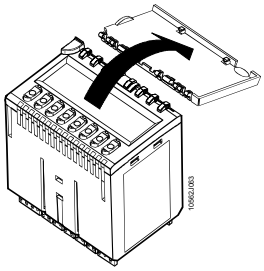
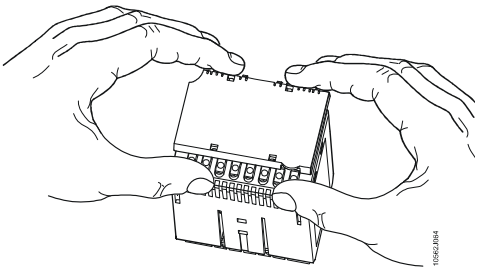
The module address and the function of each I/O point can be printed on the labels created in this way.
A function is integrated into the TX-I/O tool that enables the label sheets to be automatically printed in accordance with the generated module assignment.

Connection terminals

The connection terminals have only general names since the I/O points can have different functions.

Inserting the labels

- The electronic unit has a removable transparent cover (label holder) into which the label can be inserted (A, C).
- The modules can also be operated without this 'cover' (B).

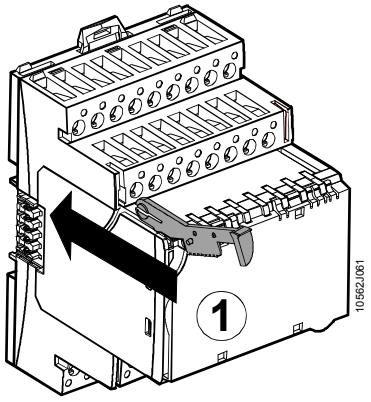
A Inserting the label	B Removing the cover	Assembly
		

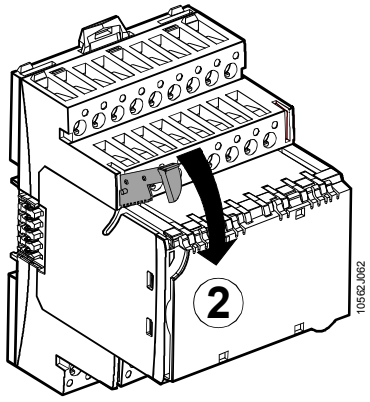
8.3.3 Addressing

- In order for the automation station to be able to identify and address a specific I/O module, each I/O module needs its own address.
- Without an address key, the module is in a secure, inactive state.
- The module is fully functional with the address key.
- The module address is mechanically coded in the address key. It is inserted in the I/O module socket and swiveled into the electronic unit.
- Based on the address, the module is configured by the bus master via the island bus and in this way receives the information as to what peripheral devices are connected and what function is required for the periphery.
- If the electronic unit is replaced, the address key must **first** be swiveled out.
- The load is disabled as a result. The values remain stored in the bus master. The key is left inserted in the terminal socket so that the bus master can inform the new electronic unit of its function.

Note ⚠ If you need a previously used electronic unit or used module as the replacement part, **it must be reset to the factory settings with the deletion key** before the address key is permitted to be swiveled into place.

⚠ The address key must first be **firmly inserted in the terminal socket** and then **carefully swiveled into the electronic part**.



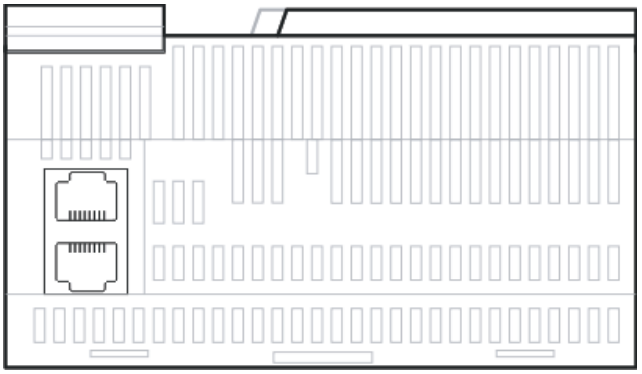


8.4 Technical Data

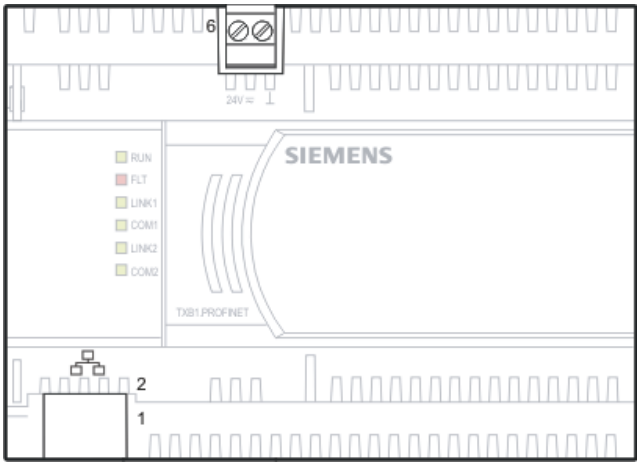
Parameter		Type		Value
Power supply	**(6, 7)**	Operating voltage		AC / DC 24 V
		Frequency		50 / 60 Hz
Power consumption		Without loading by modules and field devices		3 VA, corresponding to 25 kWh/a
Island bus		Island bus connector		TX-I/O-compatible
Profinet	**(1, 2)**	2 x RJ45 (switch)		10 / 100 Mbit/s
Connection terminals, pluggable		Construction type		Pluggable screw terminals
		Cu-wire or Cu-strand with wire end sleeve		1 x 0.6 mm∅ to 2.5 mm^2 or 2 x 0.6 mm∅ to 1.0 mm^2
		Cu-strand without wire end sleeve		1 x 0.6 mm∅ to 2.5 mm^2 or 2 x 0.6 mm∅ to 1.5 mm^2
		Screwdriver		Slot screws Screwdriver, size 1 with shaft ø ≤ 4.5 mm
		Max. tightening torque		0.6 Nm
Assignment as per EN 60730		Operation of automatic controller		Type 1
		Level of contamination		2
		Construction type		Protection class III
Housing protection type		Protection type as per EN 60529		
		Front parts in the DIN section		IP30
		Terminal part		IP20
Environmental conditions		Operation		According to IEC 60721-3-3
		Climatic conditions		Class 3K5
		Temperature		–5 ... 50 °C
		Relative humidity		5 ... 95 % r.H.
		Mechanical conditions		Class 3M2
		Transport		According to IEC 60721-3-2
		Climatic conditions		Class 2K3
		Temperature		–25 ... 70 °C
		Relative humidity		5 ... 95 % r.H.
		Mechanical conditions		Class 2M2
Standards and guidelines		Product security		
		Automatic electronic controllers for household use and similar applications		EN 60730-1
		Electromagnetic compatibility		
		Noise immunity	Industrial environment	EN 61000-6-2
		Emitted interference environment,	Residential light industry	EN 61000-6-3
		CE conformance		
		EMC guidelines		2004/108/EG
		c-Tick conformance		
		Australian EMC framework radio emission		AS/NZS 61000-6-3
		UL-Approbation		

Parameter	Type	Value
	Energy management equipment	UL 916 (PAZX)
Environmental compatibility	Product environmental declaration CM1E8186 contains data for environmental-compatible product design and evaluation (RoHS conformance, material composition, packaging, environmental benefits, disposal)	ISO 14001 (environment) ISO 9001 (quality) SN 36350 (environmental-compatible products) 2002/95/EG (RoHS)
Color	Housing	RAL 7035 (light-gray)
Dimensions	See dimension images	
	Width in DIN pitch units	7.5
Weight	Including packaging	0.201 kg

8.5 Connections



Face view



Top view

Power supply

G	6, 7	AC / DC 24 V

PROFINET BIM connection

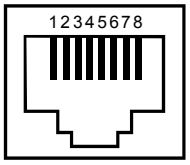
PROFINET	1, 2	2 x RJ45 (switch)

Status LEDs

RUN	Firmware / hardware status (in connection with FLT)[1)]
FLT	Firmware / hardware status (in connection with RUN)[1)]
LINK1	Connection Ethernet port 1[1)]
COM1	Communication Ethernet port 1[1)]
LINK2	Connection Ethernet port 2[1)]
COM2	Communication Ethernet port 1[1)]

[1)] For details on the LEDs, refer to 5.2 – Diagnostics on the TX-I/O BIM

RJ45 pin assignment



1	GND	**5**	VPP
2	RxD	**6**	CHM
3	not assigned	**7**	BTL
4	TxD	**8**	GND

⚠ Note

The PROFINET BIM **must not** be connected with either a **hub,** a **router**, or a **non real-time switch!**

Always connect the PROFINET BIM with either a **S7 CPU,** a **S7 CP,** or a **real-time switch!**

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