

X20IF10E1-1

Data sheet
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Version history

B&R makes every effort to keep documents as current as possible. The most current versions are available for download on the B&R website (www.br-automation.com).

1 General information

1.1 Other applicable documents

For additional and supplementary information, see the following documents.

Other applicable documents

Document name	Title
MAX20	X20 System user's manual

1.2 Order data


Order number	Short description	Figure
	X20 interface module communication	
X20IF10E1-1	X20 interface module, for DTM configuration, 1 PROFINET IO controller (master) interface, electrically isolated	

Table 1: X20IF10E1-1 - Order data

Optional accessories

Model number	Short description
X20CA0E61.xxxxx	POWERLINK/Ethernet connection cable, RJ45 to RJ45, 0.2 to 20 m
X20CA0E61.xxxx	POWERLINK/Ethernet connection cable, RJ45 to RJ45, 20 m and longer

1.3 Module description

The interface module is equipped with a PROFINET IO controller interface. This allows third-party components to be integrated in the B&R system and makes it possible to quickly and easily transfer data in both directions.

The interface is equipped with 2 RJ45 connections. Both connections result in an integrated switch. This makes it easy to implement daisy chain cabling.

Functions:

- [PROFINET IO controller](#)
- [Error monitoring](#)

PROFINET IO

PROFINET IO (Process Field Network) is a real-time TCP/IP industrial Ethernet protocol.

Error monitoring

The status of the module and fieldbus is monitored. An error code is returned if an error occurs.

2 Technical description

2.1 Technical data

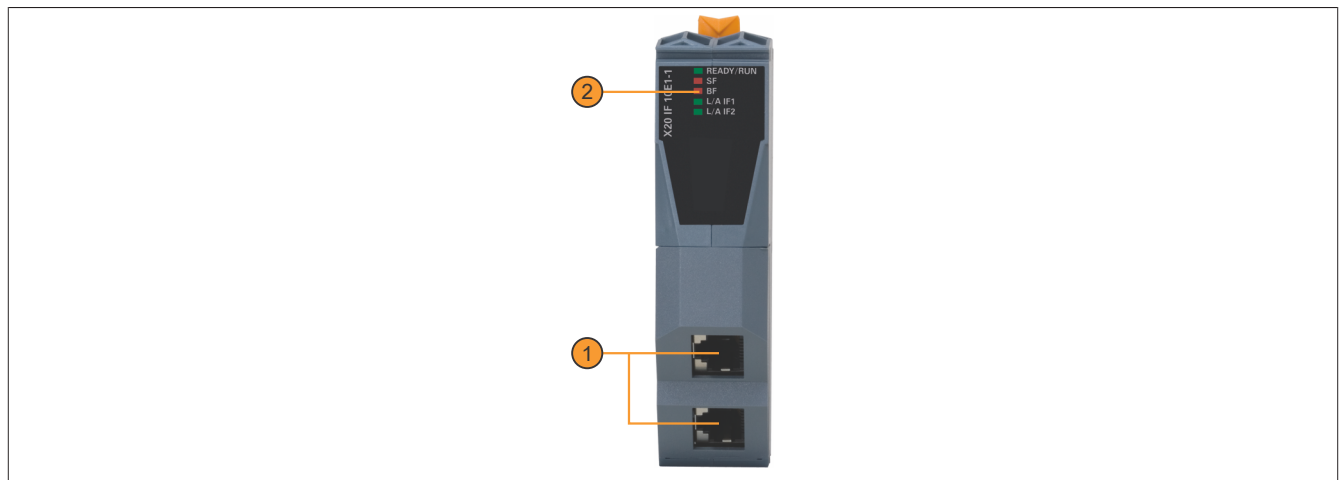
Order number	X20IF10E1-1
Short description	
Communication module	PROFINET IO controller (master)
General information	
B&R ID code	0xA71D
Status indicators	Module status, network status, data transfer
Diagnostics	
Module status	Yes, using LED status indicator and software
Network status	Yes, using LED status indicator and software
Data transfer	Yes, using LED status indicator
Power consumption	2 W
Additional power dissipation caused by actuators (resistive) [W]	-
Certifications	
CE	Yes
UKCA	Yes
ATEX	Zone 2, II 3G Ex nA nC IIA T5 Gc IP20, Ta (see X20 user's manual) FTZÜ 09 ATEX 0083X
UL	cULus E115267 Industrial control equipment
HazLoc	cCSAus 244665 Process control equipment for hazardous locations Class I, Division 2, Groups ABCD, T5
DNV	Temperature: B (0 to 55°C) Humidity: B (up to 100%) Vibration: B (4 g) EMC: B (bridge and open deck)
CCS	Yes
LR	ENV1
KR	Yes
ABS	Yes
BV	EC33B Temperature: 5 - 55°C Vibration: 4 g EMC: Bridge and open deck
KC	Yes
Interfaces	
Fieldbus	PROFINET IO controller (master)
Variant	2x shielded RJ45 (switch)
Line length	Max. 100 m between 2 stations (segment length)
Transfer rate	100 Mbit/s
Transfer	
Physical layer	100BASE-TX
Half-duplex	Yes
Full-duplex	Yes
Autonegotiation	Yes
Auto-MDI/MDIX	Yes
Controller	netX100
Memory	8 MB SDRAM
Electrical properties	
Electrical isolation	PLC isolated from PROFINET IO (IF1 and IF2)
Operating conditions	
Mounting orientation	
Horizontal	Yes
Vertical	Yes
Installation elevation above sea level	
0 to 2000 m	No limitation
>2000 m	Reduction of ambient temperature by 0.5°C per 100 m
Degree of protection per EN 60529	IP20

Table 2: X20IF10E1-1 - Technical data

Order number	X20IF10E1-1	
Ambient conditions		
Temperature		
Operation		
Horizontal mounting orientation	-25 to 60°C	
Vertical mounting orientation	-25 to 50°C	
Derating	-	
Storage	-40 to 85°C	
Transport	-40 to 85°C	
Relative humidity		
Operation	5 to 95%, non-condensing	
Storage	5 to 95%, non-condensing	
Transport	5 to 95%, non-condensing	
Mechanical properties		
Slot	In the X20 PLC and expandable bus controller X20BC1083	

Table 2: X20IF10E1-1 - Technical data

2.2 Operating and connection elements



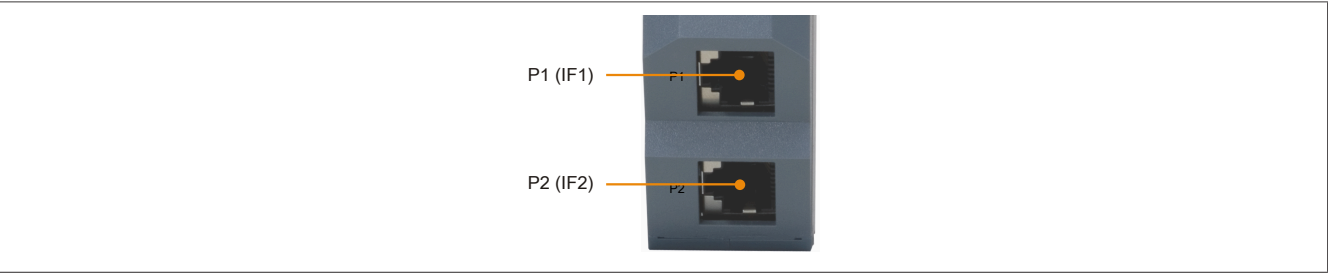
1	PROFINET IO connection with 2x RJ45 for simple wiring	2	LED status indicators
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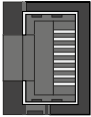
2.2.1 LED status indicators

Figure	LED	Color	Status	Description
	READY/RUN	Green/red	Off	No power to module
		Red	Blinking	Boot error
		Green	On	Communication on the PCI bus has not yet been started
	SF	Red	On	PCI bus communication in progress
			Off	No error
			Blinking	Invalid configuration
	BF	Red	On	System errors
			Off	No error
			Blinking	Configuration error: Not all configured I/O modules are connected
	L/A IF1/IF2	Green	On	No link to remote station
			Off	No link to remote station
			Flickering	A link to the remote station has been established. The LED blinks when Ethernet activity is taking place on the bus.
			On	A link to the remote station has been established.

2.2.2 Ethernet interface

For information about wiring X20 modules with an Ethernet interface, see section "Mechanical and electrical configuration - Wiring guidelines for X20 modules with Ethernet cables" in the X20 user's manual.



Interface	Pinout		
	Pin	Ethernet	
 1 Shielded RJ45	1	RXD	Receive data
	2	RXD\	Receive data\
	3	TXD	Transmit data
	4	Termination	
	5	Termination	
	6	TXD\	Transmit data\
	7	Termination	
	8	Termination	

3 Function description

3.1 PROFINET IO

PROFINET (Process Field Network) is an Industrial Ethernet protocol. It uses TCP/IP and is real-time capable.

PROFINET IO is specially designed for communication between a controller and decentralized field devices and describes the entire data exchange between controllers (masters) and devices (slaves) as well as configuration and diagnostics. It follows the producer-consumer model.

2 transfer variants are available:

- Real-time (RT) communication
- Isochronous real-time (IRT) communication.

Within PROFINET IO, process data and alarms are always transferred in real time (RT). RT communication is the basis for data exchange with PROFINET IO. Clock-synchronous data exchange with PROFINET is defined in the isochronous real-time (IRT) concept. The difference to real-time communication lies essentially in the determinism so that the start of a bus cycle is maintained with the highest precision.

For additional information, see [PROFINET IO interface](#).

3.2 Error codes

The module returns an error code if an error occurs. A complete list of all error codes in PDF format is available in under item "Communication_Error" in section "Communication / Fieldbus systems / Support with FDT/DTM / Diagnostic functions / Diagnostics on the runtime system / Master diagnostics" in Automation Help.

4 Commissioning

4.1 Firmware

The module comes with preinstalled firmware. The firmware is part of the Automation Studio project. The module is automatically brought up to this level.

A hardware upgrade must be performed to upgrade the firmware included in Automation Studio (see Help "Project management - Workspace - Upgrades" in Automation Help).

4.2 Operating the module

The interface module can be operated in the slot of a controller or in the slot of an expandable POWERLINK bus controller.

4.2.1 Use in the expandable X20BC1083 POWERLINK bus controller

4.2.1.1 Cyclic data

If this module is connected to the expandable POWERLINK bus controller, the amount of cyclic data is limited by the POWERLINK frame. This is 1488 bytes each in the input and output directions.

When using multiple X20IF10xx-1 interfaces or other X2X modules with a POWERLINK bus controller, the 1488 bytes are divided between all connected modules.

4.2.1.2 Operation

It is important to note the following in order to operate the module with the bus controller without problems:

- A minimum revision $\geq E0$ is required for the bus controller.
- The module can only be operated with the POWERLINK V2 setting. V1 is not permitted.
- With SDO access to POWERLINK object 0x1011/1 on the bus controller, the firmware and configuration stored on the bus controller are not reset. They can only be overwritten by accessing them again. This affects objects 0x20C0 and 0x20C8, subindexes 92 to 95.

4.2.1.3 Timing characteristics

The internal data transfer results in an additional runtime shift of one cycle per direction.



Information:

For additional information about runtime behavior, see section "Runtime shift" in X20BC1083.

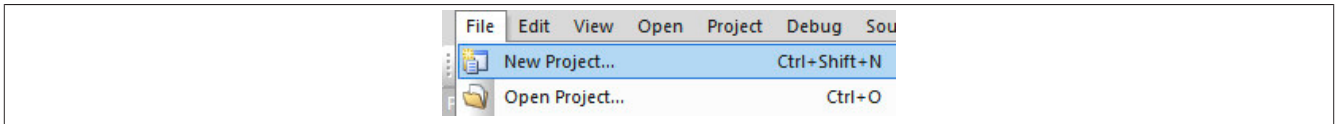
5 PROFINET IO interface

5.1 Settings in Automation Studio

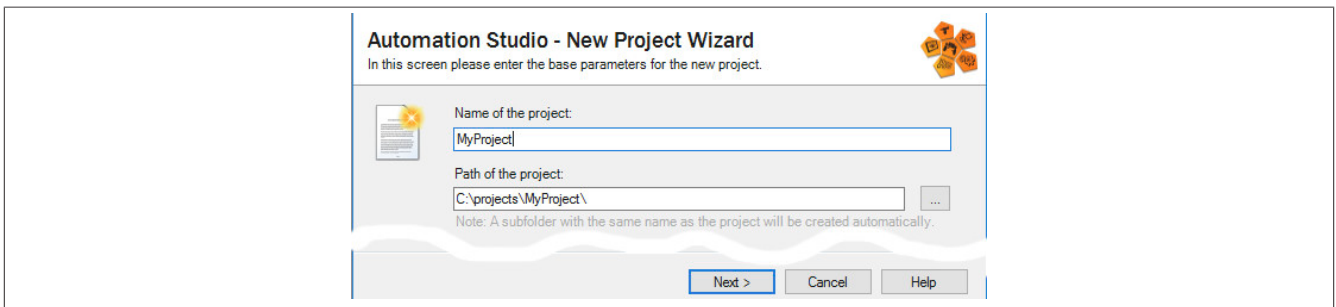
To configure the interface, a new Automation Studio project is created and the suitable settings are made on the module.

5.1.1 Creating an Automation Studio project

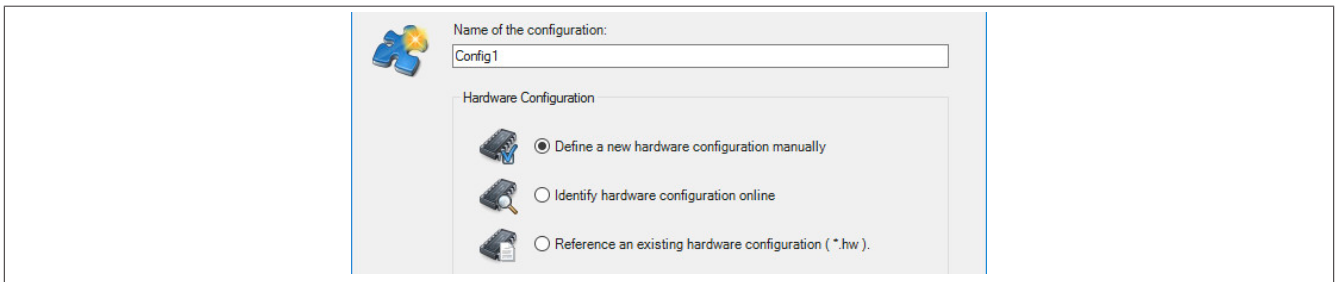
- Create a new Automation Studio project by selecting "New project".



- Assign a project name and set up the project path.

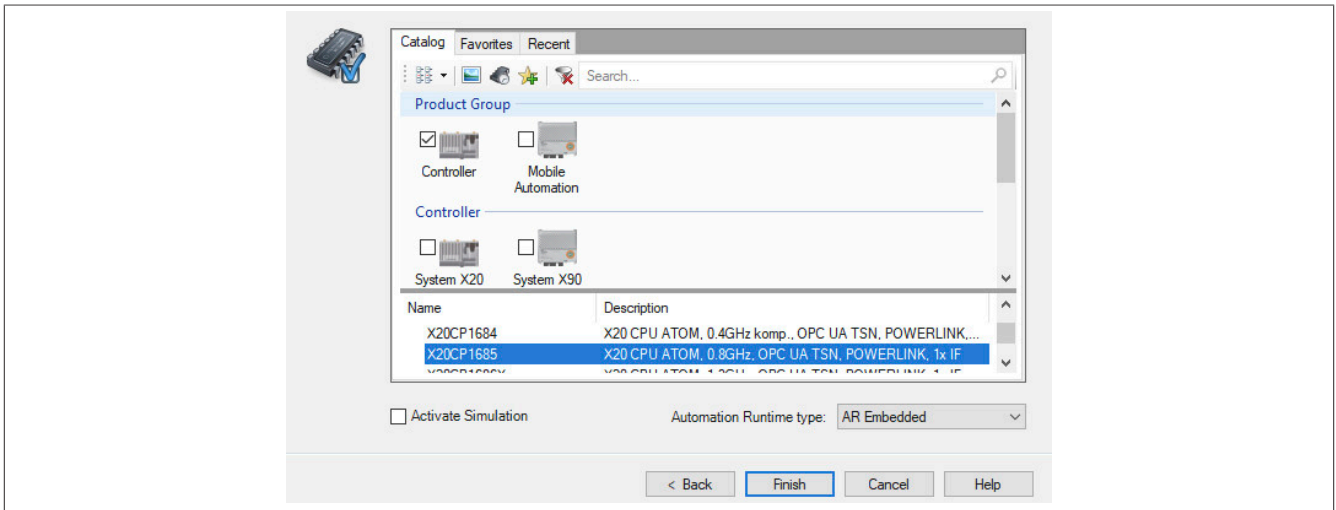


- The type of hardware configuration is selected, and the name of the configuration is assigned.



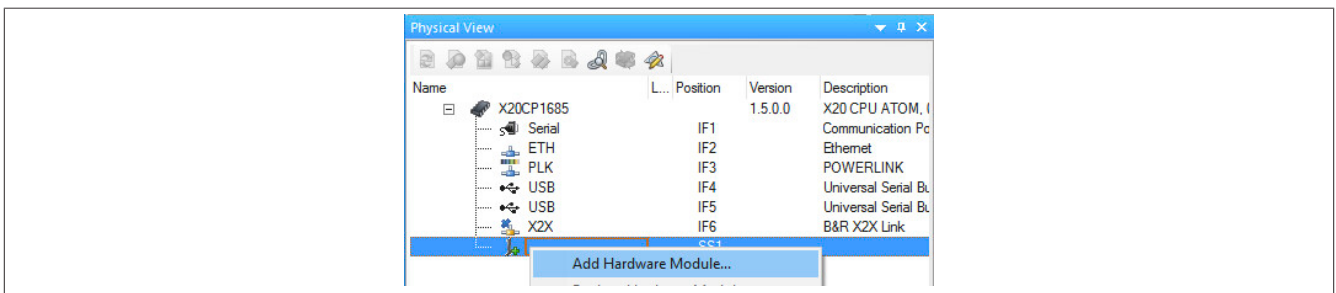
PROFINET IO interface

- If "Define a new hardware configuration manually" was selected, the hardware is selected in the next step. In order to simplify the search, different filters can be set for this in the Hardware Catalog. Finally, the Automation Studio project is created by selecting the required hardware and clicking "Finish".

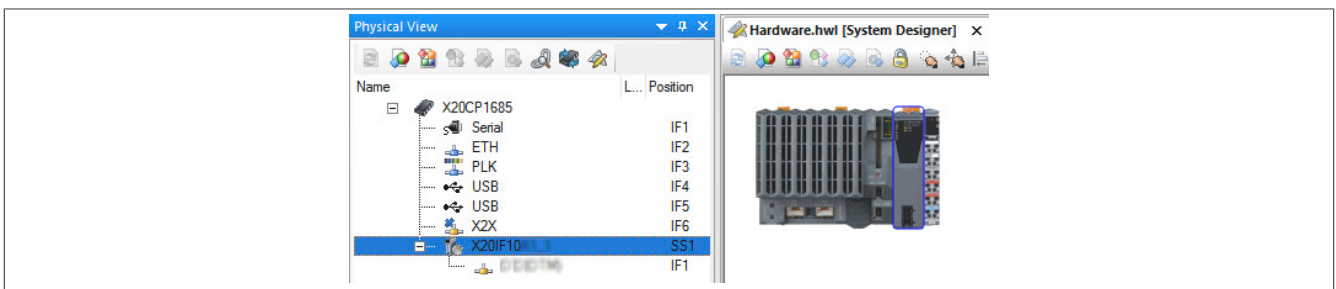


5.1.2 Adding and configuring the interface module

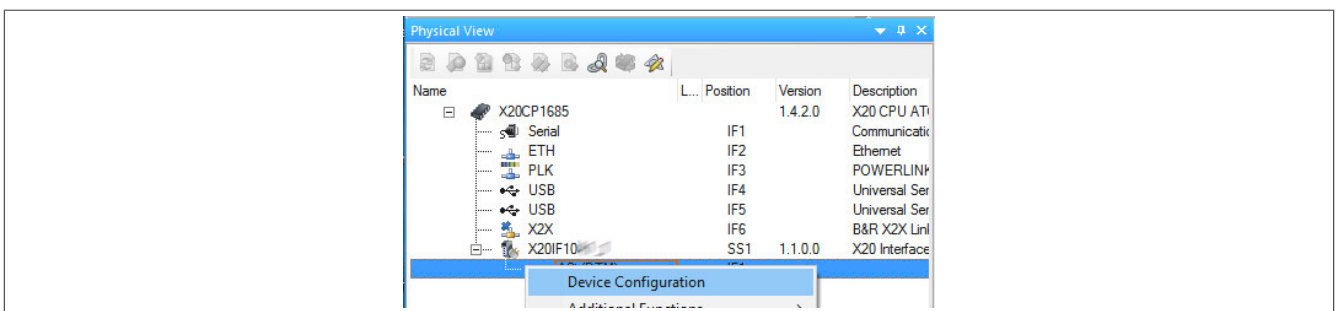
- In this example, the interface card is connected in the slot of a controller. Right-clicking on the slot and selecting "Add hardware module" opens the Hardware Catalog.



- The module is added to the project via drag-and-drop or by double-clicking on the interface card.



- Additional module settings can be made under "Device configuration". This configuration environment is opened by right-clicking on the IF interface and selecting "Device configuration".



- General settings are made in the device configuration.

IO Device: NETX 100 RE/PNM
Vendor: Hilscher GmbH

Navigation Area

- Settings
 - Licensing
 - Ethernet Devices
- Configuration
 - Controller Network Settings**
 - Device Table
 - IP Address Table
 - Process Data
 - Address Table
 - FSU-/Port- Settings
 - Stations Timing
 - Controller Settings

Controller Ne

Name of station: controller

Description: X20IF10E1_1

IP Settings

IP address: 192 . 168 . 0 . 1

Network mask: 255 . 255 . 255 . 0

5.1.2.1 Controller network settings

Contains the name and symbolic name of the PROFINET IO controller.

Parameter	Explanation	Values
Name of station	Name	1 to 240 characters
Description	Symbolic name	

- IP settings

Contains the IP address of the PROFINET IO controller.

Parameter	Explanation
IP address	IP address
Network mask	Subnet mask
Gateway address	Gateway address

5.1.2.2 Device table

All PROFINET IO devices configured on the PROFINET IO controller are listed here.

Parameter	Explanation	Values
Activate	This allows the slaves to be enabled or disabled. <ul style="list-style-type: none"> • Enabled: Process memory is reserved and data is exchanged. • Disabled: The master reserves memory in the process data image for the slave, but no data is exchanged. 	
Index	Consecutive numbering of the PROFINET IO devices in the scan list.	
Name of station	Editable station name.	1 to 240 characters
Device	Physical, non-editable station name	
Description	Symbolic, non-editable station name	
Vendor	Vendor information	

5.1.2.3 IP address table

The IP addresses of the slaves are set here.

Parameter	Explanation
Name of station	Network name of the PROFINET station. The value is set in the DTM of the PROFINET IO controller.
IP address	IP address of the PROFINET station
Inherit	This permits the network mask and gateway address to be obtained from the master. <ul style="list-style-type: none"> • Selected: Network mask and gateway address are obtained from the master. • Not selected: The network mask and gateway address are configured manually.
Network mask	Subnet mask of the PROFINET station.
Gateway address	Gateway address of the PROFINET station

5.1.2.4 Process data

This table lists the process data of the individual slaves.

Parameter	Explanation
Type	Device designation specified by the hardware. Further description of modules configured on the device or the input or output signals.
Tag	Name of the input or output data.
SCADA	This parameter is not supported.

5.1.2.5 Address table

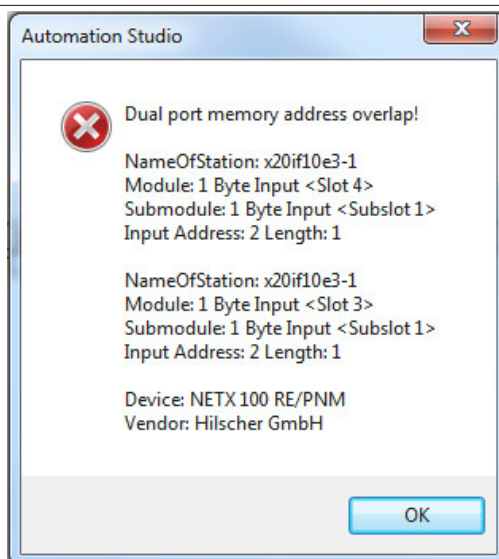
This table provides information about the addresses of the input and output data (in decimal or hexadecimal notation).

Auto addressing is used to select whether the addresses are assigned automatically or manually.



Information:

If addresses are assigned twice, an error is output and the addresses affected are marked with a red exclamation point.



"Display mode" allows toggling between decimal and hexadecimal display.

Parameter	Explanation
Name of station	Network name of the PROFINET station. The value is set in the DTM of the PROFINET IO controller.
Modules	Module name
Submodule	Submodule name
Type	Data type
Length	Length of the module/submodule in bytes.
Address	Data offset address

The address table can also be exported as a CSV file.

5.1.2.6 FSU / Port settings

The medium attachment unit (MAU) type can be set and fast startup (FSU) enabled here.

Parameter	Explanation
Name of station	Network name of the PROFINET station. The value is set in the DTM of the PROFINET IO controller.
MAU type	The MAU type must be set individually for each interface. <ul style="list-style-type: none"> Auto: The connection between 2 adjacent devices is established automatically and takes about 2 to 3 seconds. 100BASETXFD: The connection between adjacent devices is established with 100 Mbit / full-duplex.
FSU	Enables or disables fast startup (FSU). <div style="display: flex; align-items: center; margin-top: 10px;"> <p>If FSU is enabled, MAU type "100BASETXFD" should always be used, otherwise autonegotiation and auto-crossover (with MAU type = "AUTO") prevent a fast Ethernet connection.</p> </div>



Information:

The interfaces that are connected to each other must have the same MAU type; otherwise, no connection can be established. When FSU is enabled, the slave uses the fast start up connection to establish the cyclic data exchange.

5.1.2.7 Station timing

The timing of the individual PROFINET devices can be adjusted here.

Parameter	Explanation
Name of station	Device names of all PROFINET IO devices connected to the PROFINET IO controller.
Updating time	Configurable cycle time of the PROFINET IO device for exchanging cyclic data.
Watchdog time	Time after which the PROFINET IO device reports the absence of cyclic data and changes to the error state. The watchdog time must be a multiple of the update time.



Information:

Different update and watchdog times can be set for each PROFINET IO device.

5.1.2.8 Controller settings

- Start of bus communication

It is possible here to select how data exchange is started on the module.

Parameter	Explanation
Automatically by device	Data exchange is started automatically after the module is initialized.
Controlled by application	Data exchange is started by Automation Runtime.

- Module alignment

The addressing mode is defined by the process image here. The addresses (offsets) of the process data are always interpreted as byte addresses.

Addressing mode	Explanation
Byte boundaries	The module address can start on any offset.
2 byte boundaries	The module address can only start on even byte offsets.



Information:

This configuration is automatically managed by Automation Runtime and is not permitted to be changed (default setting).

- Application monitoring

The module-internal watchdog time can be set here. If the watchdog has been enabled (watchdog time not equal to 0), the hardware watchdog must be reset after the set time at the latest.

Parameter	Explanation	Values
Watchdog time	Software watchdog disabled	0 ms
	Permissible range of values.	20 to 65535 ms
	Default value: 1000 ms	



Information:

The watchdog time is reset automatically by Automation Runtime.



Information:

This value refers exclusively to the software watchdog and not to the PROFINET watchdog time set in the station timing.

- Process image storage format

This is used to define how data is stored in the process image (I/O mapping). The storage format is only applied to data type "Word". This change has no effect on other data types.

Storage format	Explanation
Big-endian	MSB/LSB = Higher/Lower byte (Motorola format)
Little-endian	MSB/LSB = Higher/Lower byte (Intel format)

Input process image

Storage format - Little-endian (default setting)

Module002_Output_1	16#00	<input type="checkbox"/>	16#00	USINT
Module003_Input_2	16#3344	<input type="checkbox"/>	16#0000	UINT
Module004_Output_2	16#0000	<input type="checkbox"/>	16#0000	UINT

Storage format - Big-endian

Module002_Output_1	16#00	<input type="checkbox"/>	16#00	USINT
Module003_Input_2	16#4433	<input type="checkbox"/>	16#0000	UINT
Module004_Output_2	16#0000	<input type="checkbox"/>	16#0000	UINT

— Port settings

The settings must be made separately for each of the 2 interfaces.

Setting	Explanation
Auto	The connection between 2 adjacent devices is established automatically and takes about 2 to 3 seconds.
100BASETXFD	The connection between adjacent devices is established with 100 Mbit / full-duplex.



Information:

The interfaces that are connected to each other must have the same settings; otherwise, no connection can be established.

— I/O state information

The IOPS interface can be configured here. If configured, the PROFINET input/output object provider state (IOPS) permits the PROFINET IO device application program to recognize whether the received data from the PROFINET device is valid or not and declares the output data as valid or invalid.

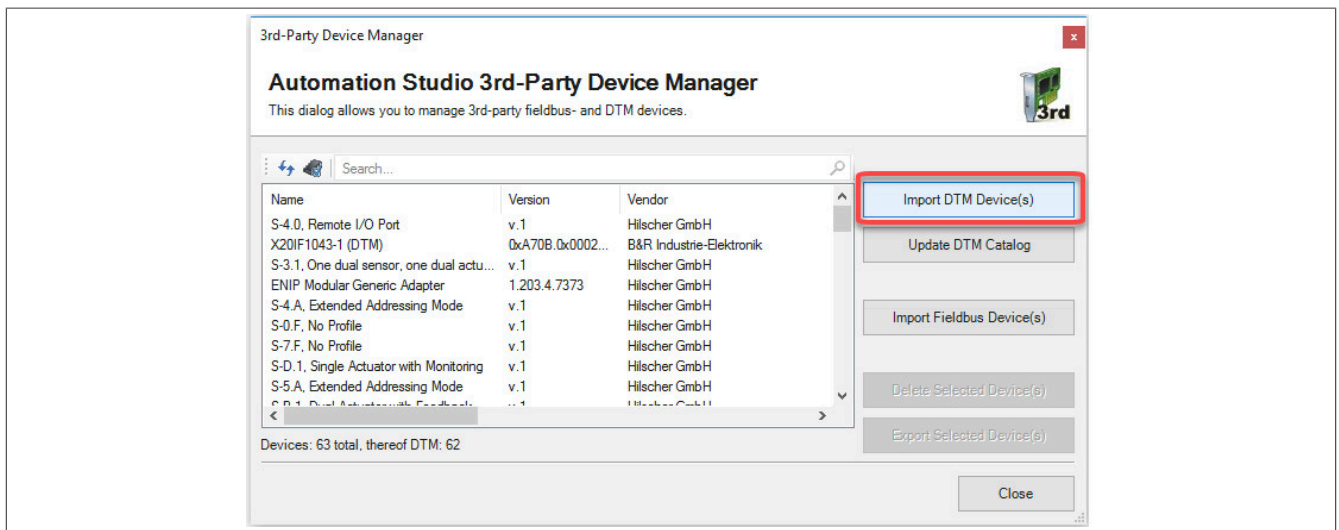
Setting	Explanation
Disabled	I/O state information disabled.
Bit	The IOPS is treated as a bit list in the DPM (Dual Port Memory) of the PROFINET IO device. For this purpose, 2 I/O data points (InIOPS and OutIOPS) are listed in the I/O assignment for the individual input and output data. <ul style="list-style-type: none"> Respective bit set to 1: Data is valid. Respective bit set to 0: Data is invalid.
Byte	The IOPS is treated as a byte array in the dual-ported memory (DPM) of the PROFINET IO device. For this purpose, 2 I/O data points (InIOPS and OutIOPS) are listed in the I/O assignment for the individual input and output data of the slave. <ul style="list-style-type: none"> Respective byte set to 0x80: Data is valid. Respective bit set to not equal to 0x80: Data is invalid.

5.1.3 Adding the GSD file in Automation Studio

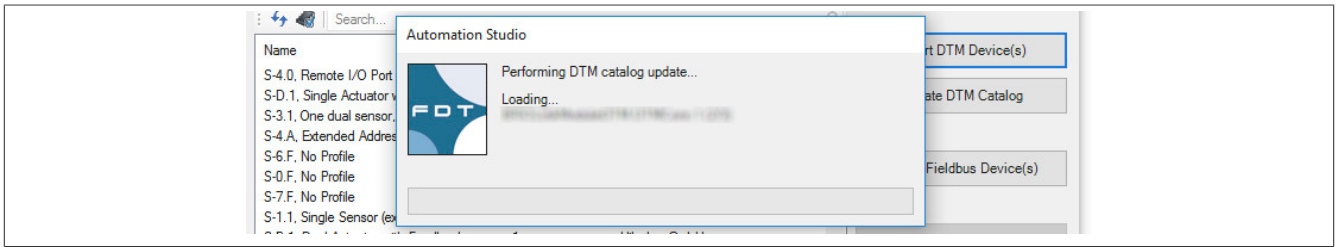
A device description file (GSDML file) is required to inform the PROFINET IO controller which slaves were connected and how they were configured.

To add and use a device description file in Automation Studio, perform the following steps:

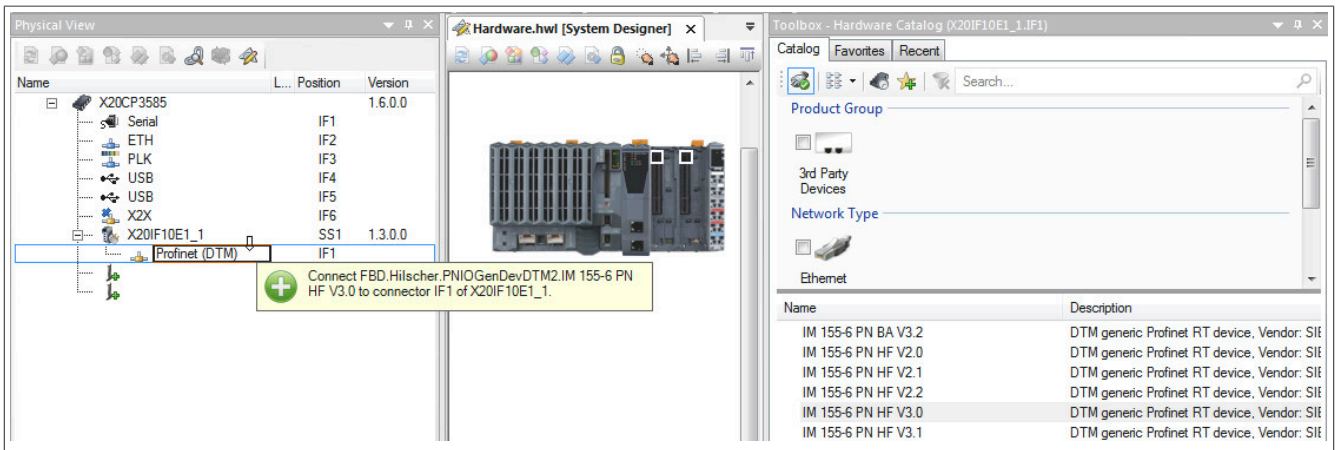
- If the PROFINET slave from B&R is used, download the GSDML file from the B&R website (www.br-automation.com) and unzip the ZIP file.
- Open the dialog box in Automation Studio under "Tools - Manage 3rd-party devices" and select "Import DTM device(s)".



- Select the GSDML file to be imported and confirm with OK. The GSDML file is imported into Automation Studio.



- Click on "PROFINET (DTM)" on PROFINET IO controller X20IF10E1-1, drag the GSDML file from the Hardware Catalog and attach it to the PROFINET IO controller.



- Right-click on the IF interface and select "Device configuration" to open the configuration environment for the GSDML file.

