# X20IF10E1-1

Data sheet
2.11 (May 2025)

1282159634903-2.11

# 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<br>IP20, Ta (see X20 user's manual)<br>FTZÚ 09 ATEX 0083X |
|    UL | cULus E115267<br>Industrial control equipment |
|    HazLoc | cCSAus 244665<br>Process control equipment<br>for hazardous locations<br>Class I, Division 2, Groups ABCD, T5 |
|    DNV | Temperature: **B** (0 to 55°C)<br>Humidity: **B** (up to 100%)<br>Vibration: **B** (4 g)<br>EMC: **B** (bridge and open deck) |
|    CCS | Yes |
|    LR | ENV1 |
|    KR | Yes |
|    ABS | Yes |
|    BV | **EC33B**<br>Temperature: 5 - 55°C<br>Vibration: 4 g<br>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
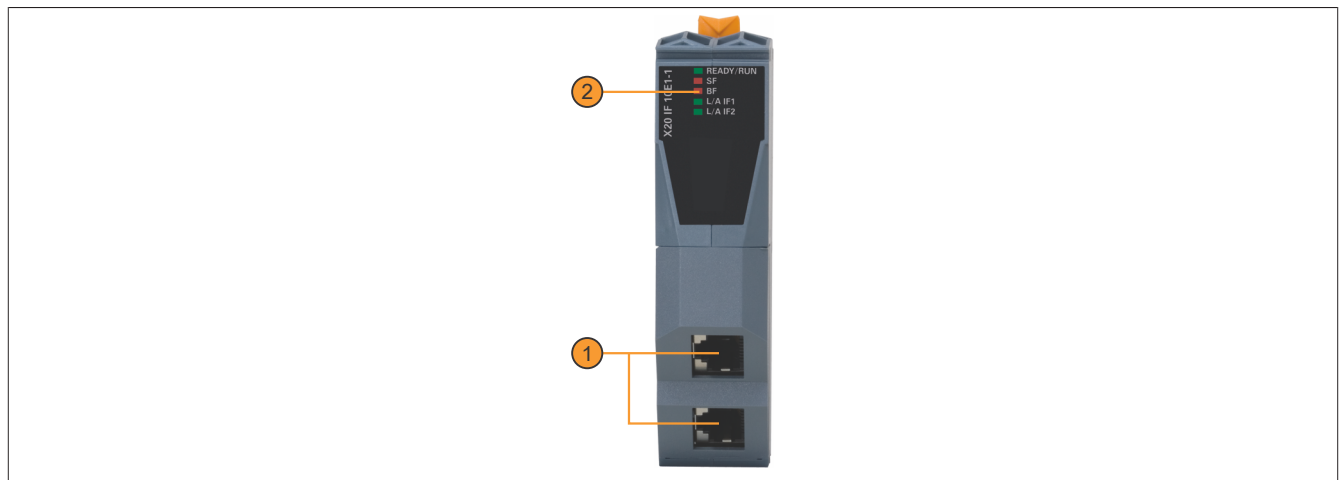


| 1 | PROFINET IO connection with 2x RJ45 for simple wiring | 2 | LED status indicators |
|---|---|---|---|
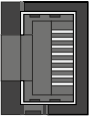
## 2.2.1 LED status indicators

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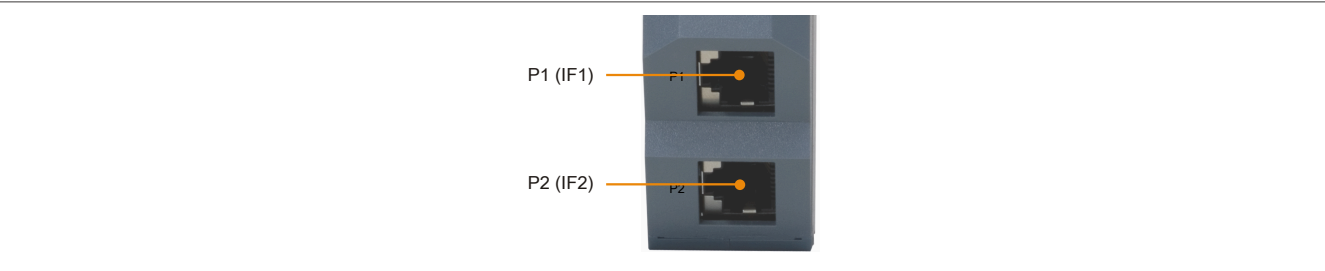


| Interface | Pinout | | |
|---|---|---|---|
| | **Pin** | **Ethernet** | |
| | 1 | RXD | Receive data |
| | 2 | RXD\ | Receive data\ |
| | 3 | TXD | Transmit data |
| | 4 | Termination | |
| | 5 | Termination | |
| | 6 | TXD\ | Transmit data\ |
| Shielded RJ45 | 7 | Termination | |
| | 8 | Termination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

# 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 ≥ 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.**
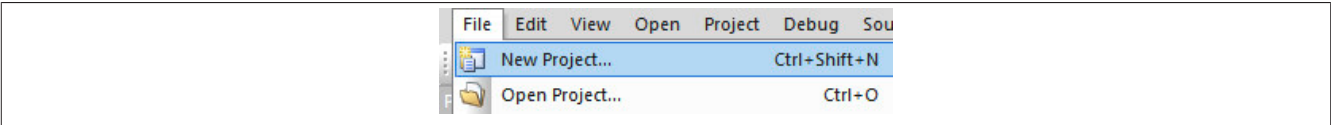
# 5 PROFINET IO interface
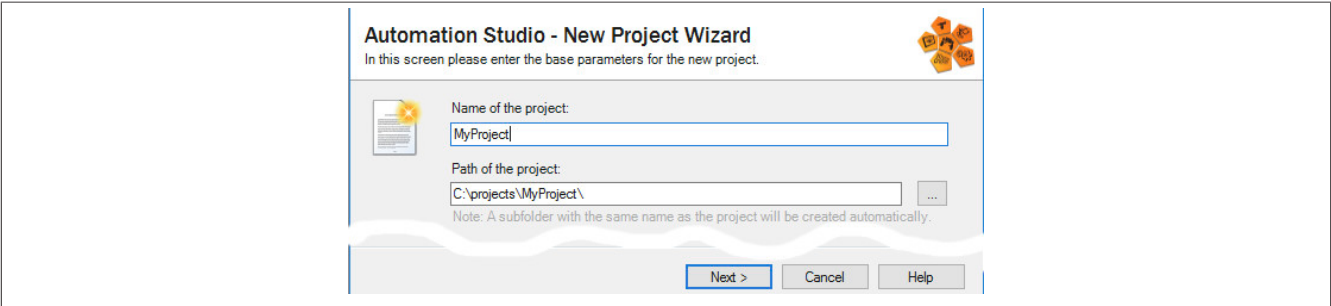
## 5.1 Settings in Automation Studio

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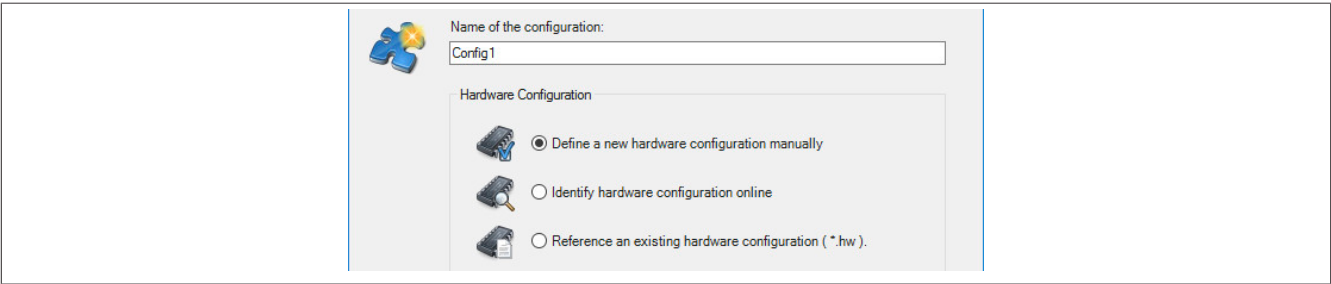
### 5.1.1 Creating an Automation Studio project

- 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.

• 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 is and clicking "Finish".
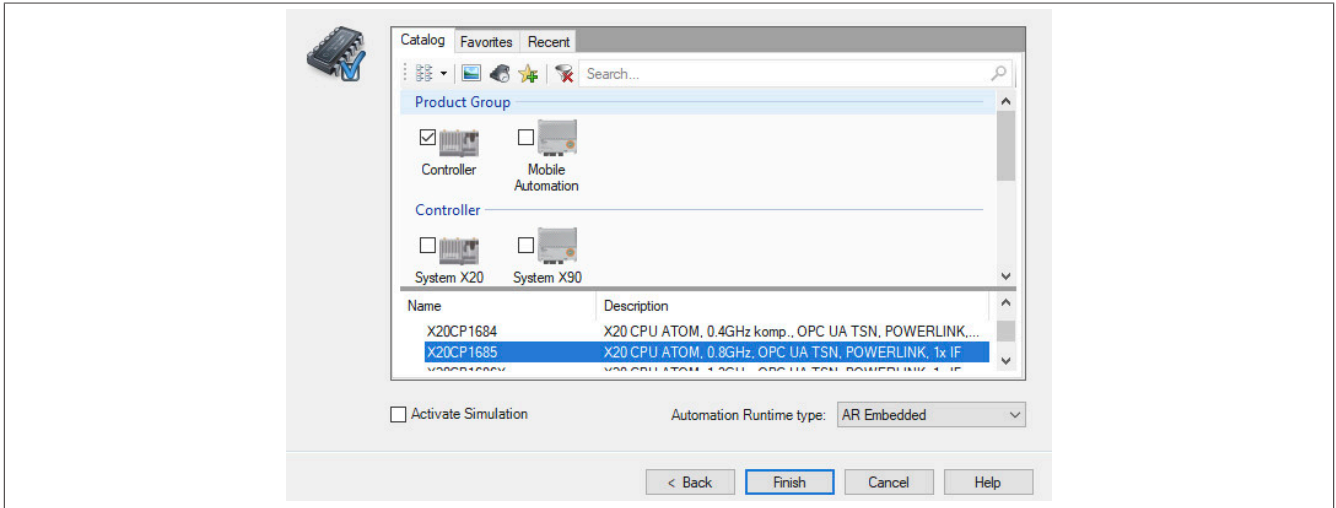


## 5.1.2 Adding and configuring the interface module

• 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.
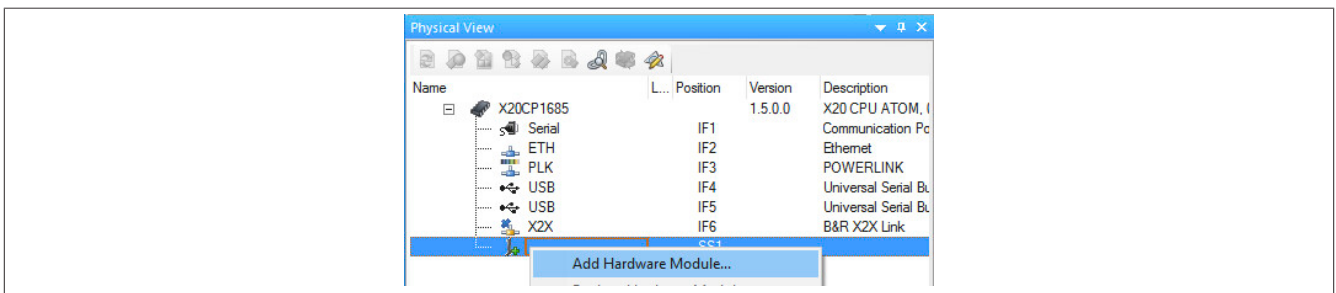


• The module is added to the project via drag-and-drop or by double-clicking on the interface card.
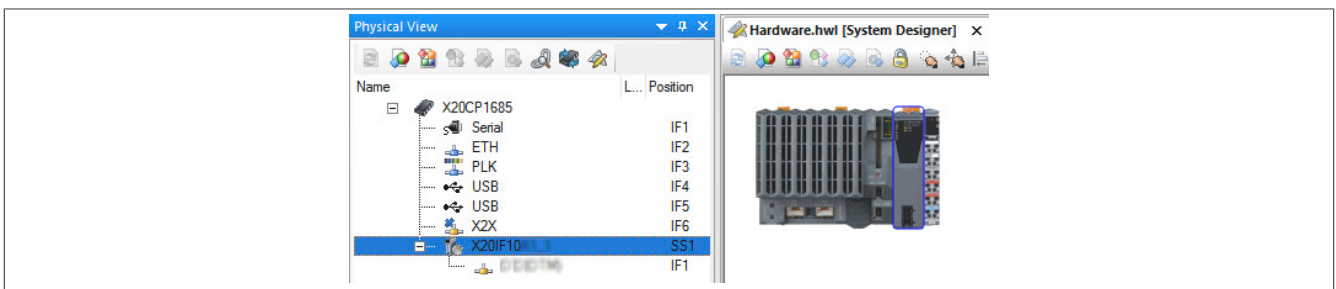


• Additional module settings can be made under "Device configuration". This configuration environment is opened by right-clicking on the IF interface and selecting "Device configuration".
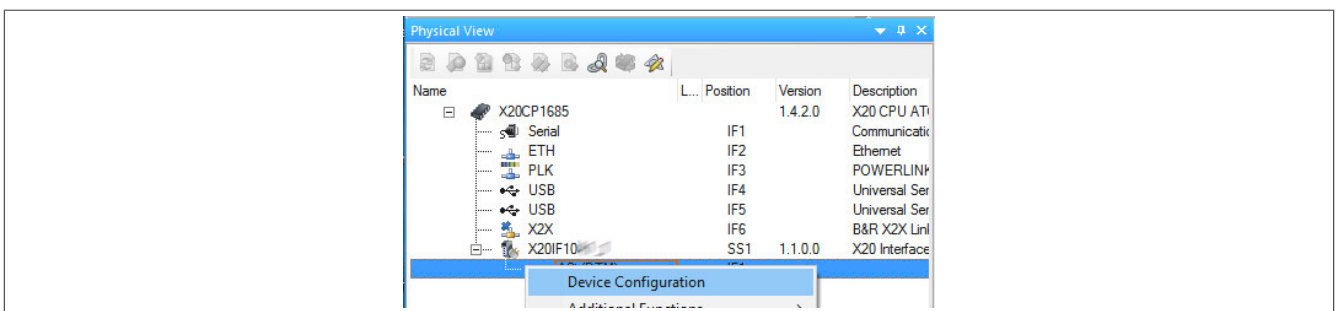
• General settings are made in the device configuration.



### 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.<br><br>• **Enabled:** Process memory is reserved and data is exchanged.<br><br>• **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.<br><br>• **Selected:** Network mask and gateway address are obtained from the master.<br><br>• **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.

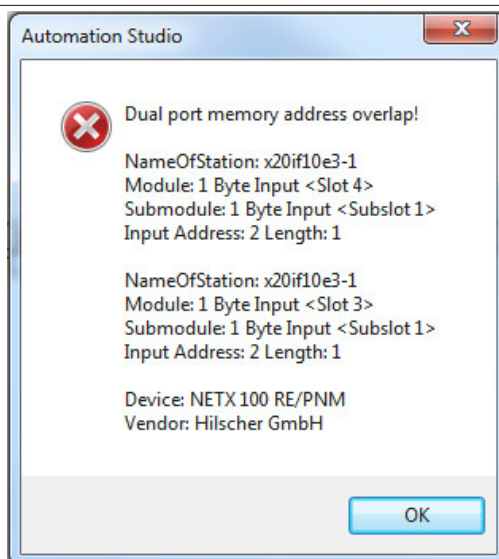| Parameter | Explanation |
|---|---|
| Type | Device designation specified by the hardware. Further description of modules configured on the device or the input or output signals. |
| Tag | Name of the input or output data. |
| SCADA | This parameter is not supported. |

### 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.<br><br>• **Auto:** The connection between 2 adjacent devices is established automatically and takes about 2 to 3 seconds.<br>• **100BASETXFD:** The connection between adjacent devices is established with 100 Mbit / full-duplex. |
| FSU | Enables or disables fast startup (FSU).<br><br>ⓘ 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. |

> **ⓘ 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 [1] | Data exchange is started automatically after the module is initialized. |
| Controlled by application | Data exchange is started by Automation Runtime. |

1) If "Automatically by device" is used, it is possible that the interface module already boots up and establishes a connection to the remote station before the entire system has booted up. If the system requires another restart during startup, however, the interface module will also be restarted. **Note:** In some situations, this may mean that a connection can no longer be established with the remote station.

**Information:**

**"Controlled by application" should preferably be used on the expandable POWERLINK bus controller.**

#### - 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. Default value: 1000 ms | 20 to 65535 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) | | | | Storage format - Big-endian | | | |
|---|---|---|---|---|---|---|---|
| Module002_Output_1 16#00 | ☐ | 16#00 | USINT | Module002_Output_1 16#00 | ☐ | 16#00 | USINT |
| Module003_Input_2 16#3344 | ☐ | 16#0000 | UINT | Module003_Input_2 16#4433 | ☐ | 16#0000 | UINT |
| Module004_Output_2 16#0000 | ☐ | 16#0000 | UINT | Module004_Output_2 16#0000 | ☐ | 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.<br>• Respective bit set to 1: Data is valid.<br>• 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.<br>• Respective byte set to 0x80: Data is valid.<br>• 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)".
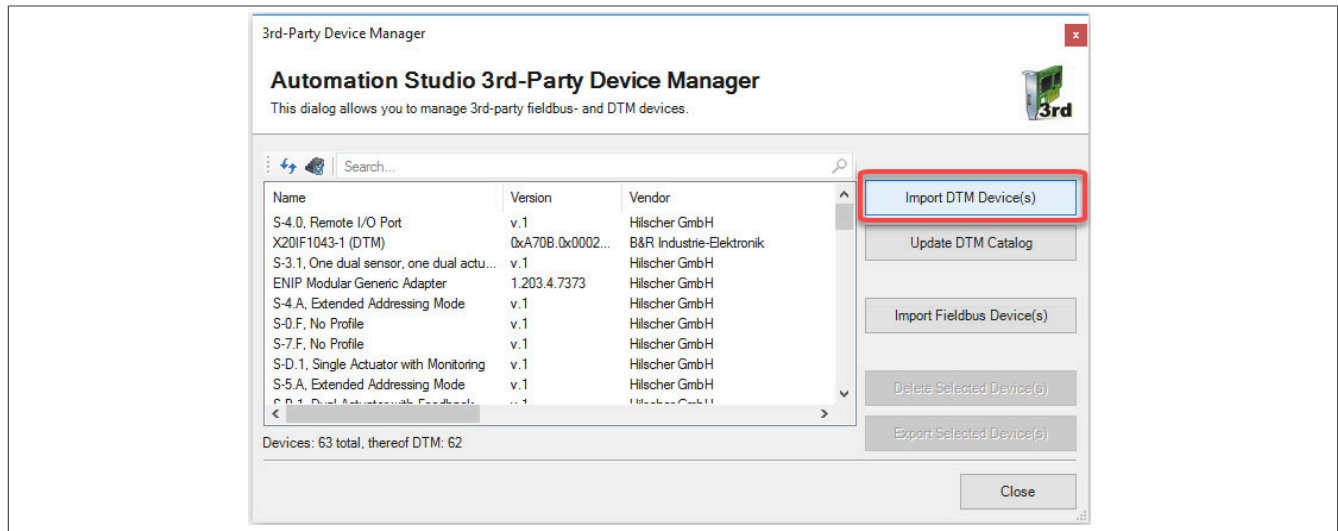


• Select the GSDML file to be imported and confirm with OK. The GSDML file is imported into Automation Studio.
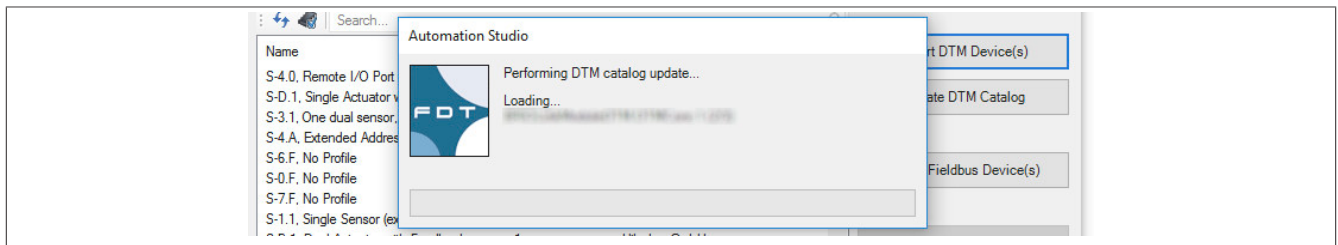


• Click on "PROFINET (DTM)" on PROFINET IO controller X20IF10E1-1, drag the GSDML file from the Hardware Catalog and attach it to the PROFINET IO controller.
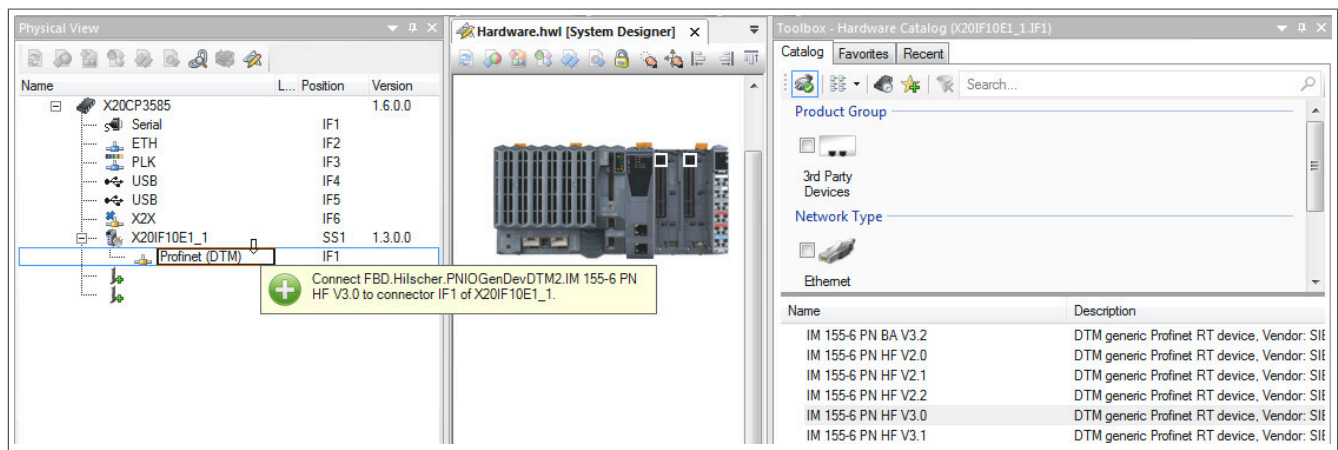
**PROFINET IO interface**

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