

# X20(c)IF1063-1

Data sheet  
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**Publishing information**

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# 1 General information

## 1.1 Other applicable documents

For additional and supplementary information, see the following documents.

### Other applicable documents

Document name	Title
MAX20	<a href="#">X20 System user's manual</a>

## 1.2 Coated modules

Coated modules are X20 modules with a protective coating for the electronics component. This coating protects X20c modules from condensation and corrosive gases.

The modules' electronics are fully compatible with the corresponding X20 modules.



For simplification purposes, only images and module IDs of uncoated modules are used in this data sheet.

The coating has been certified according to the following standards:

- Condensation: BMW GS 95011-4, 2x 1 cycle
- Corrosive gas: EN 60068-2-60, method 4, exposure 21 days



### 1.2.1 Starting temperature

The starting temperature describes the minimum permissible ambient temperature in a voltage-free state at the time the coated module is switched on. This is permitted to be as low as -40°C. During operation, the conditions as specified in the technical data continue to apply.



#### Information:

It is important to absolutely ensure that there is no forced cooling by air currents in the closed control cabinet, e.g. due to the use of a fan or ventilation slots.

## 1.3 Order data


Order number	Short description	Figure
	<b>X20 interface module communication</b>	
X20IF1063-1	X20 interface module, for DTM configuration, 1 PROFIBUS DP V1 slave interface, electrically isolated	
X20cIF1063-1	X20 interface module, coated, for DTM configuration, 1 PROFIBUS DP V1 slave interface, electrically isolated	
	<b>Optional accessories</b>	
	<b>Infrastructure components</b>	
OG1000.00-090	Bus connector, RS485, for PROFIBUS networks	

Table 1: X20IF1063-1, X20cIF1063-1 - Order data

## 1.4 Module description

The interface module is equipped with a PROFIBUS DP V1 interface. This allows the B&R system (I/O modules, POWERLINK, etc.) to be connected to systems from other manufacturers and makes it possible to quickly and easily transfer data in both directions.

Functions:

- [PROFIBUS DP V1 slave](#)

### PROFIBUS DP

PROFIBUS DP is designed for efficient data exchange at the field level. Data exchange with the decentralized devices based on X2X Link is primarily cyclic.

## 2 Technical description

### 2.1 Technical data

Order number	X20IF1063-1	X20cIF1063-1
Short description		
Communication module	1x PROFIBUS DP V0/V1 slave	
General information		
B&R ID code	0xA717	0xE235
Status indicators	Module 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	1.8 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>B</b> (0 to 55°C) Humidity: <b>B</b> (up to 100%) Vibration: <b>B</b> (4 g) EMC: <b>B</b> (bridge and open deck)	
CCS	Yes	-
LR	ENV1	
KR	Yes	
ABS	Yes	
BV	<b>EC33B</b> Temperature: 5 - 55°C Vibration: 4 g EMC: Bridge and open deck	
KC	Yes	-
Interfaces		
Interface IF1		
Fieldbus	PROFIBUS DP V0/V1 slave	
Variant	9-pin female DSUB connector	
Max. distance	1200 m	
Transfer rate	Max. 12 Mbit/s	
Controller	netX100	
Cyclic data		
Input data	Max. 244 bytes	
Output data	Max. 244 bytes	
Electrical properties		
Electrical isolation	PLC isolated from PROFIBUS (IF1)	
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: X20IF1063-1, X20cIF1063-1 - Technical data

Technical description

Order number	X20IF1063-1		X20cIF1063-1
Ambient conditions			
Temperature			
Operation			
Horizontal mounting orientation	-25 to 60°C		
Vertical mounting orientation	-25 to 50°C		
Derating	-		
Starting temperature	-		Yes, -40°C
Storage	-40 to 85°C		
Transport	-40 to 85°C		
Relative humidity			
Operation	5 to 95%, non-condensing	Up to 100%, 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	In the X20c PLC and expandable bus controller X20cBC1083	


Table 2: X20IF1063-1, X20cIF1063-1 - Technical data

2.2 Operating and connection elements



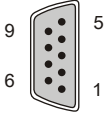
1	IF1 - PROFIBUS DP	2	LED status indicators
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2.2.1 LED status indicators

Figure	LED	Color	Status	Description
	READY/RUN	Green/red	Off	No power to module
		Green	On	PCI bus communication in progress
		Red	Blinking	Boot error
		On		Communication on the PCI bus has not yet been started
	STATUS DP	Green	On	RUN, cyclic communication
		Red	On	Faulty configuration (e.g. master configuration and interface card configuration do not match)
			Cyclic flash	STOP, no communication, connection error
			Acyclic flash	Slave not configured
	RxD	Yellow	On	The module is receiving data via the PROFIBUS DP slave interface.
	TxD	Yellow	On	The module is transmitting data via the PROFIBUS DP slave interface.

## 2.2.2 PROFIBUS DP interface

A shielded line must be used for the interface.

Interface	Pinout		
	Pin	RS485	
 <p>9-pin female DSUB connector</p>	1	Reserved	
	2	Reserved	
	3	RxD/TxD-P	Data <sup>1)</sup>
	4	CNTR-P	Transmit enable
	5	DGND	Power supply
	6	VP	Power supply
	7	Reserved	
	8	RxD/TxD-N	Data <sup>2)</sup>
	9	CNTR-N	Transmit enable\
	CNTR ... Direction switch for external repeaters		

- 1) Cable color: Red  
2) Cable color: Green

## 3 Function description

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### 3.1 PROFIBUS DP

PROFIBUS DP is designed for efficient data exchange at the field level. Data exchange with the decentralized devices based on X2X Link is primarily cyclic. The communication functions required for this are defined by the DP basic functions. Beyond these basic functions, DP also offers acyclic communication services.

PROFIBUS DP is based on the physics of the RS485 interface. Data transfer is controlled using a hybrid bus access procedure: Active stations receive communication rights via a token passing procedure and can then access all stations on the network according to the master-slave principle. The maximum time of circulation for a token can be configured, which results in a defined cycle time.

For additional information, see [The PROFIBUS 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 Minimum DTM version for coated modules



#### Information:

The minimum DTM version required for coated modules is 1.0370.140220.12186. This version is included starting with Automation Studio upgrade packs V4.0.18.x and V3.0.90.29.

### 4.2 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).

### 4.3 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.

#### 4.3.1 Use in the expandable X20BC1083 POWERLINK bus controller

##### 4.3.1.1 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.

##### 4.3.1.2 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.

##### 4.3.1.3 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 The PROFIBUS interface

Two steps are generally necessary for connecting module X20IF1063-1 to an external master environment.

- 1) Add and configure the X20 interface module in B&R's Automation Studio.
- 2) Add the PROFIBUS slave GSD device description file in the external master environment, e.g. Siemens STEP 7 or Siemens TIA-Portal. The interface module must then be configured.



### Information:

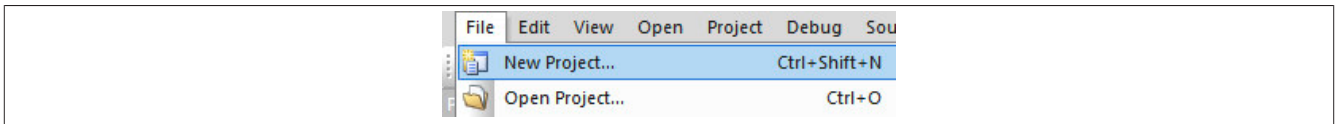
**To ensure error-free PROFIBUS communication between master and slave, the settings for the interface module in Automation Studio must match the settings of the GSD device description file in the master environment.**

### 5.1 Settings in Automation Studio

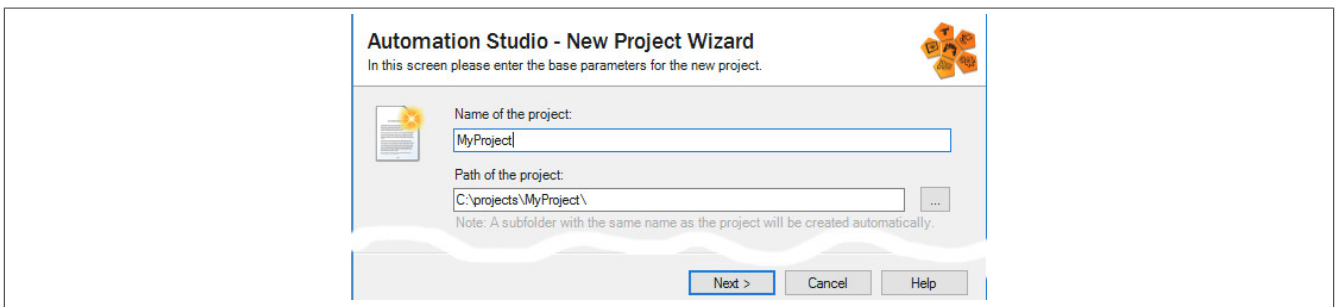
To configure the interface, a new Automation Studio project is created and the suitable settings are made on the module.

#### 5.1.1 Creating an Automation Studio project

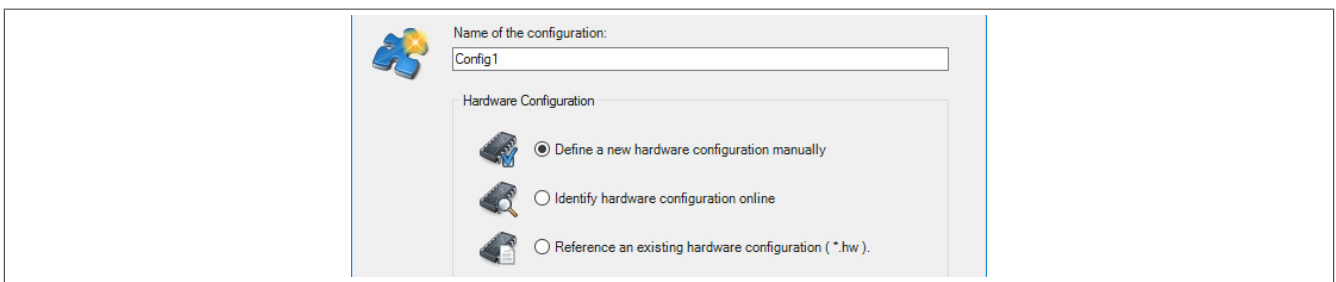
- Create a new Automation Studio project by selecting "New project".



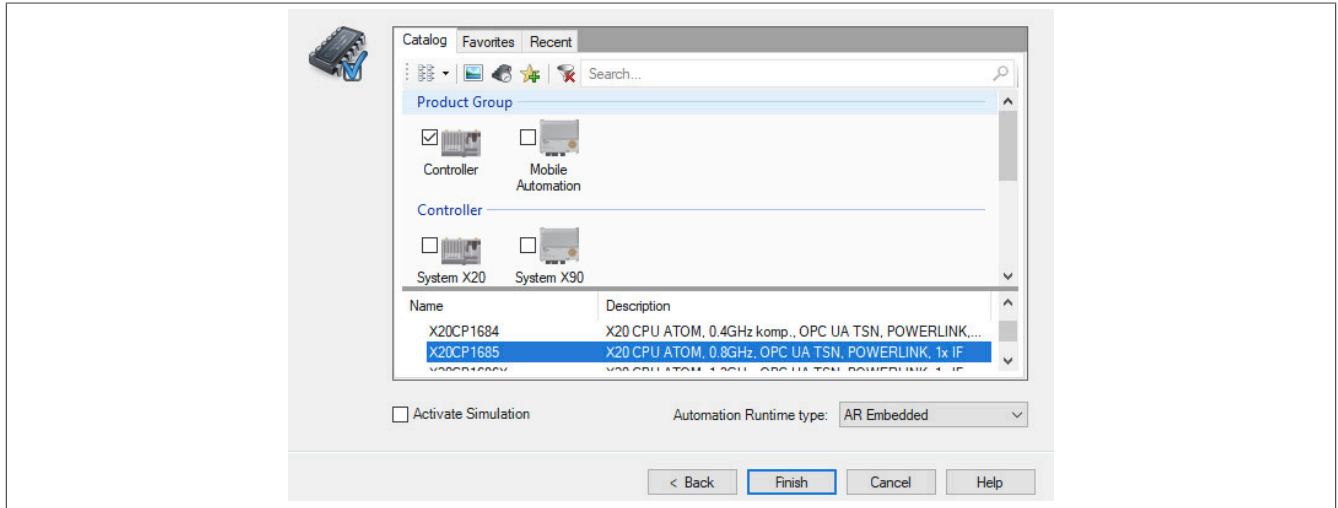
- Assign a project name and set up the project path.



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

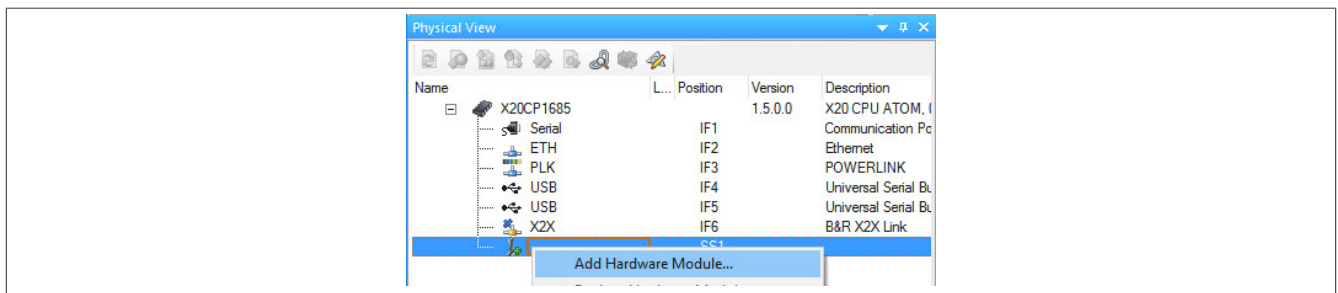


- If "Define a new hardware configuration manually" was selected, the hardware is selected in the next step. In order to simplify the search, different filters can be set for this in the Hardware Catalog. Finally, the Automation Studio project is created by selecting the required hardware and clicking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

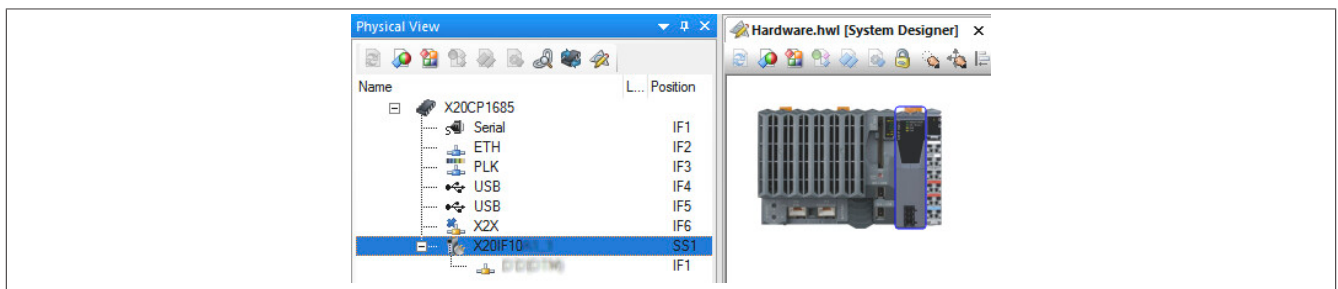


### 5.1.2 Adding and configuring the interface module

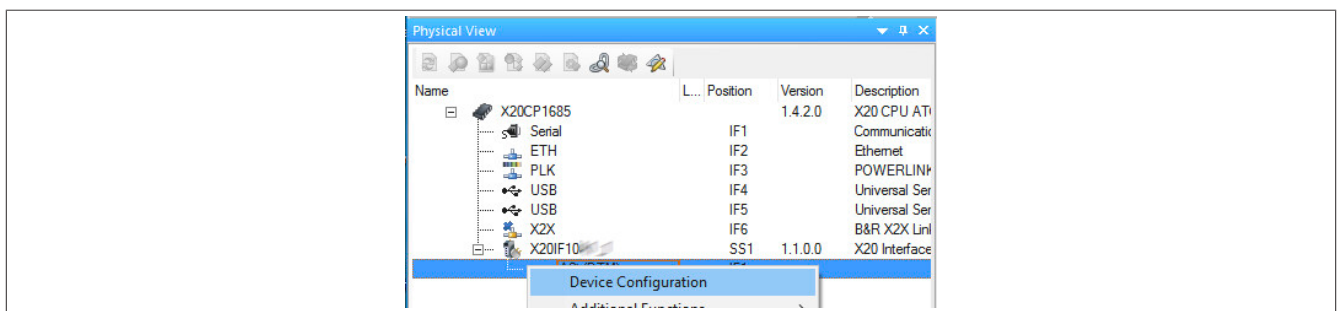
- In this example, the interface card is connected in the slot of a controller. Right-clicking on the slot and selecting "Add hardware module" opens the Hardware Catalog.



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

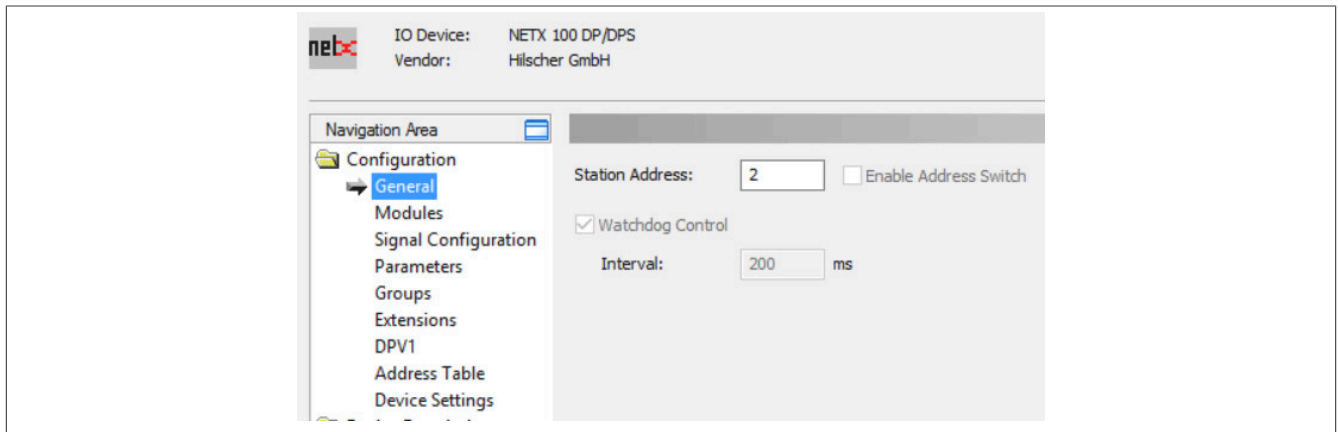


- Additional module settings can be made under "Device configuration". This configuration environment is opened by right-clicking on the IF interface and selecting "Device configuration".



## The PROFIBUS interface

- General settings are made in the device configuration.



### 5.1.2.1 General

Only the station addresses can be set here. No other setting options are supported for this module.

Parameter	Explanation	Values
Station address	The desired station address.	0 to 125
Enable address switch	This parameter is not supported.	
Watchdog control and interval	These parameters are only displayed.	

### 5.1.2.2 Modules

#### - Available modules

All available modules are listed in this table. Modules can be added to the configuration using buttons **Insert** and **Append**.

- **Insert:** Adds a new module before the selected module.
- **Append:** Adds a new module at the end of the configured modules list.

#### - Configured modules

The configured modules are listed in this table. If necessary, these can be removed with button **Remove**.

### 5.1.2.3 Signal configuration

The data structure of the individual modules can be defined here; the name and data type of the inputs and outputs can also be adjusted. Data types can also be combined.

Parameter	Explanation
Slot	Position of the slot
Name	Name of the slot
Module type	Number of bytes and type of connection (input or output)

After selecting a slot, the type, data type and offset are displayed in another table below.

After right-clicking on the signal to be configured, the following options can be selected in the shortcut menu:

- **Edit signal**

This allows the currently selected signal to be edited.

Parameter	Explanation
Name	The new name for the signal
New type	The new data type for the signal
Count	Number of individually listed data type elements for the signal. Only the data of the original type is restructured; the quantity is not adjusted. - The maximum number corresponds to the quantity that the new data type requires to display the original type. - If fewer elements are selected, the last data type element is listed as an array of all remaining elements.
Apply as array	If selected, the new data type is displayed as an array. Otherwise, the data type elements set under "Count" are displayed.

Slot 5   12 Bytes Out		
Name	Type	Offset
Output_3	byte	3
Output_4	byte	4
Output_5	byte	5
Output_6	byte	6
Output_7	byte	7
Output_8	byte	8
Output_9	byte	9
Output_10	byte	10
Output_11	4 byte array	11

- **Reset**

This can be used to undo the signal change or a merge previously completed with "Merge signal".

- **Merge signal**

This allows all signals between "First in group" and "Last in group" to be merged to form a new group. The same settings can be made for the new group as under "Edit signal".

The settings made are reflected in the process image (I/O mapping).

Configuring the signal

Slot	Name
Slot 1	8 Bytes In

Name	Type	Offset
Temp_1	byte	0
Pressure_5	byte	1
Input_3_Byte_0_Bit_0	bit	2.0
Input_3_Byte_0_Bit_1	bit	2.1
Input_3_Byte_0_Bit_2	bit	2.2
Input_3_Byte_0_Bit_3	bit	2.3
Input_3_Byte_0_Bit_4	bit	2.4
Input_3_Byte_0_Bit_5	bit	2.5
Input_3_Byte_0_Bit_6	bit	2.6
Input_3_Byte_0_Bit_7	bit	2.7
Input_4	byte	3
Counter_Airflow_1	dword	4

Process image

Module001_Temp_1	0	<input type="checkbox"/>	0	USINT
Module001_Pressure_5	0	<input type="checkbox"/>	0	USINT
Module001_Input_3_Byte_0_Bit_0	FALSE	<input type="checkbox"/>	FALSE	BOOL
Module001_Input_3_Byte_0_Bit_1	FALSE	<input type="checkbox"/>	FALSE	BOOL
Module001_Input_3_Byte_0_Bit_2	FALSE	<input type="checkbox"/>	FALSE	BOOL
Module001_Input_3_Byte_0_Bit_3	FALSE	<input type="checkbox"/>	FALSE	BOOL
Module001_Input_3_Byte_0_Bit_4	FALSE	<input type="checkbox"/>	FALSE	BOOL
Module001_Input_3_Byte_0_Bit_5	FALSE	<input type="checkbox"/>	FALSE	BOOL
Module001_Input_3_Byte_0_Bit_6	FALSE	<input type="checkbox"/>	FALSE	BOOL
Module001_Input_3_Byte_0_Bit_7	FALSE	<input type="checkbox"/>	FALSE	BOOL
Module001_Input_4	0	<input type="checkbox"/>	0	USINT
Module001_Counter_Airflow_1	0	<input type="checkbox"/>	0	UDINT

### 5.1.2.4 Parameters

These settings are not relevant since data types Byte and Word do not have parameter data.

### 5.1.2.5 Groups

These settings are configured in the GSD device description file on the PROFIBUS master. The master communicates the configuration to the slave via PROFIBUS.

The selected group memberships are transferred to the slave during startup. The group membership acts as a filter for global commands "Sync" and "Freeze". These are output as broadcast telegrams in order to synchronize the input and output data of the slaves. Only the slaves that have assigned to the group with the command respond to it.

Parameter	Explanation
Groups 1 through 8	Selectable group memberships

### 5.1.2.6 Extensions

These settings are configured in the GSD device description file on the PROFIBUS master. The master communicates the configuration to the slave via PROFIBUS.

#### - Auto clear

Function "Auto clear" is only used if "Auto clear on" has been enabled on the master.

Parameter	Explanation
Process "Auto clear"	In the event of a communication error, the master is put into standby mode and communication to the other slaves is aborted.
Ignore "Auto clear"	Communication errors to this slave are ignored. The master remains in mode "Operate" and communication to the other slaves is maintained.

#### - Fail safe behavior

The "Fail safe" behavior shows the master whether the affected slave is working in mode "Fail safe".

Parameter	Explanation
Slave receives zero data in Clear Mode	Mode "Fail safe" is enabled. In mode "Standby", the slave receives output data with a length of zero.
Slave receive no data in Clear Mode	Mode "Fail safe" is disabled. In mode "Standby", the slave does not receive output data.

#### - Configuration data convention

Defines how configuration data is interpreted.

Parameter	Explanation
DPV1 compliant	Not supported by the module
EN50170 compliant	Configuration data interpreted per EN 50170

#### - Error on cyclic data exchange

Defines the behavior of the master in the event of error during cyclic data exchange.

Parameter	Explanation
Continue if slave not responding.	The master remains in state DATA_EXCHANGE and retains the connection to the slave, even though the slave no longer responds and the master is not receiving any data from the slave.
Do not try to connect to slave on failure	The master does not remain in state DATA_EXCHANGE for the affected slave if the slave was detected as incorrect.

#### - Diagnosis update delay

Some slaves require more time for the consistency check to process the SET\_PRM configuration telegrams. In this case, the standard diagnostic cycle after the configuration phase is not sufficient for recognizing the arrangement of the slave for the DATA\_EXCHANGE. "Diagnosis update delay" extends the number of diagnostic cycles after the configuration phase.

Parameter	Explanation	Values
Diagnosis update delay	Specifies the delay time in cycles which the master waits before starting a new configuration phase.	0 to 255

### 5.1.2.7 DPV1

These settings are configured in the GSD device description file on the PROFIBUS master. The master communicates the configuration to the slave via PROFIBUS.

Acyclic data exchange and alarm handling can be configured here.

Parameter	Explanation	Values
Enable DPV1	Enables or disables the acyclic data exchange and alarm handling.	
Max. channel data length	Specifies the maximum length of the DPV1 alarm telegrams. The slave adapts its buffer size to the amount of data.	4 to 244
Max. alarm PDU length	Specifies the maximum number of active alarms	4 to 64

### - Alarm mode

This determines which alarms are transmitted by the slave.

Parameter	Explanation
Alarm mode	Defines the maximum number of active alarms possible
Pull plug alarm Process alarm Diagnosis alarm Manufacturer specific alarm Status alarm Update alarm	Selection of alarms transmitted by the slave

### - Extra alarm SAP

This determines how the DPV1 master acknowledges an alarm from the DPV1 slave.

Parameter	Explanation
Alarm acknowledge via SAP 51	The PROFIBUS DPV1 master acknowledges alarms via SAP51 and uses SAP51 for DPV1 read/write.
Alarm acknowledge via SAP 50	The PROFIBUS DPV1 master acknowledges alarms via SAP50. Nevertheless, the master still uses SAP51 for DPV1 read/write services. SAP50 is only used for acknowledging alarms and is not delayed by running DPV1 read-write services; this allows a higher performance to be achieved.

### 5.1.2.8 Address table

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

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

Parameter	Explanation
Modules	Name of the module per the GSD file
Type	Type of input or output data
Length	Number of data types contained
Address	Offset address of the input or output data

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

## The PROFIBUS interface

### 5.1.2.9 Device settings

#### - Start of bus communication

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

Parameter	Explanation
Automatically by device <sup>1)</sup>	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.

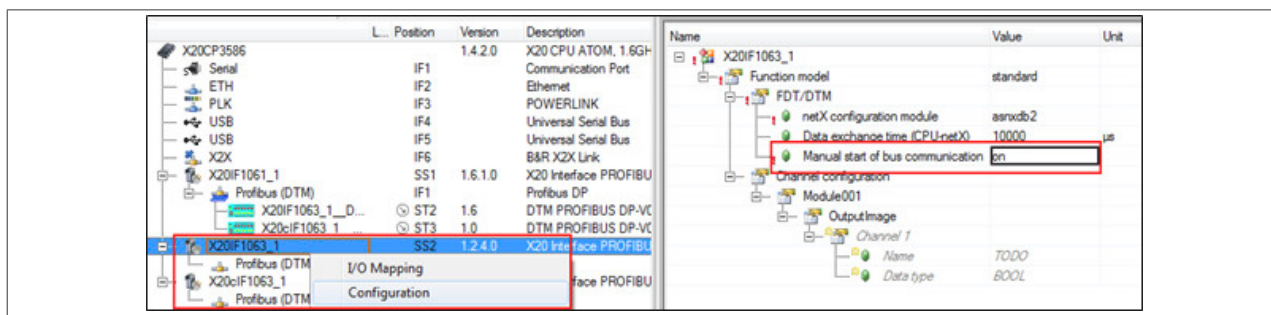


#### Information:

Parameter "Manual start of bus communication" can be enabled under the I/O configuration of the PROFIBUS slave.

The following settings must be made in order to avoid automatic data exchange:

- In the IF module configuration, "Manual start of bus communication" must be set to "On".



- "Start of bus communication" must be set to "Controlled by application".

With this setting, the communication can only be started via function block **AsNxDPs - nx dpsStartBusComm()**.

### - 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)

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

### - 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.

### - Configuration data flag

The configuration used is defined here.

Parameter	Explanation
Fixed configuration	Uses the configuration created in the slave DTM
Configuration from master	Not supported, i.e. no connection is established.

#### 5.1.2.10 Device description

General device information and the entire GSD file can be read here.

## 5.2 GSD device description file

The module description is made available to the master in an GSD file. This text file contains the description of the slave's complete range of functions. The GSD file can be downloaded from the B&R website ([www.br-automation.com](http://www.br-automation.com)) in the Downloads section for the interface module and then imported into the respective master environment.

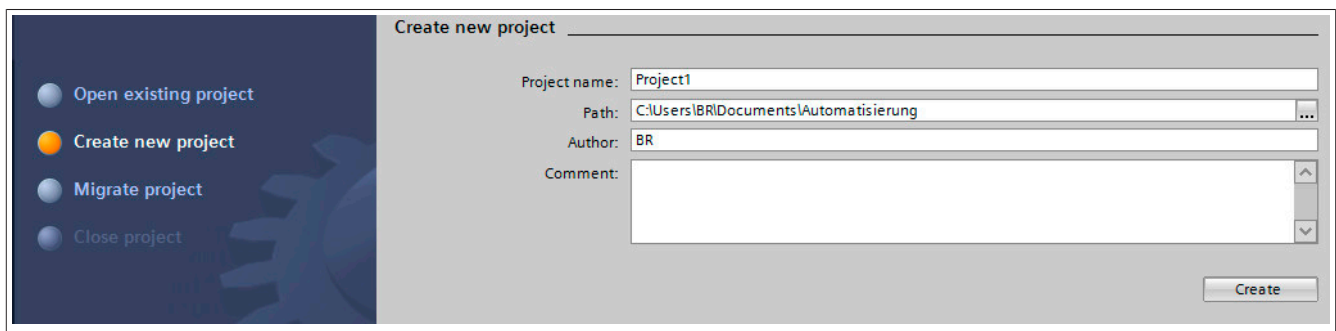
## 6 TIA portal

Software and hardware used for this example:

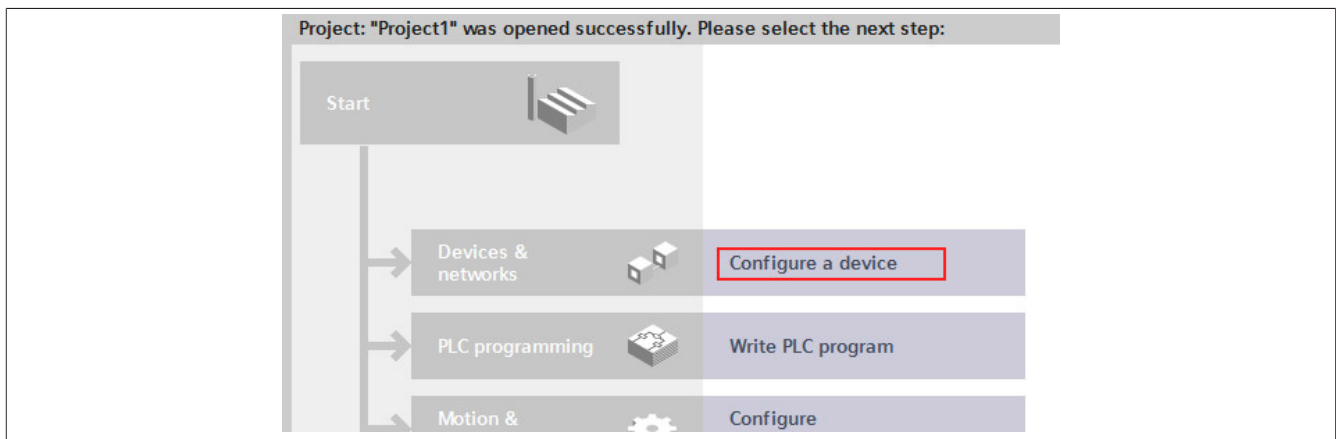
- X20IF1063-1 B&R PROFIBUS slave interface module
- GSD file from the B&R website
- CPU315-2 PN / DP Siemens controller as PROFIBUS master
- TIA portal version 13 (trial version)

### 6.1 Creating a new project

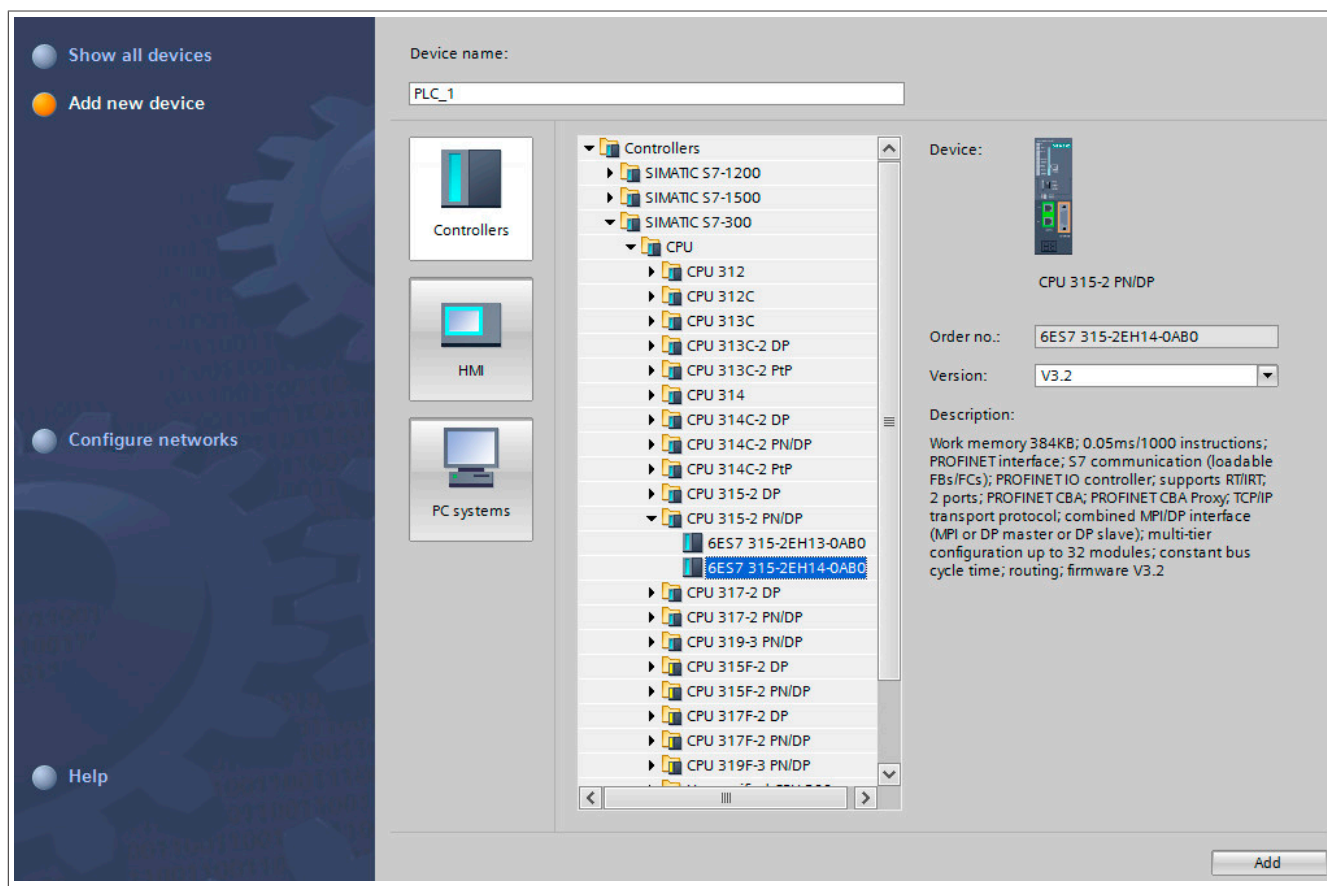
• After opening the TIA Portal development environment, a new project must first be created. To do this, select **Create new project** and specify the name and path of the new project. The new project is created with button **Create**.



• After the project is created, the necessary devices can be added and configured. The first step is to select **Configure a device**.

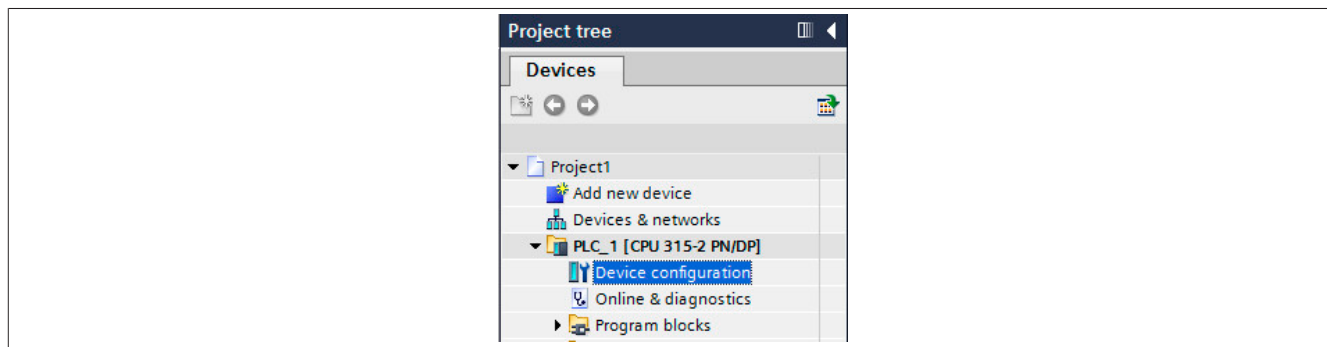


- The controller used is selected using **Add new device** and added to the configuration with button **Add**.

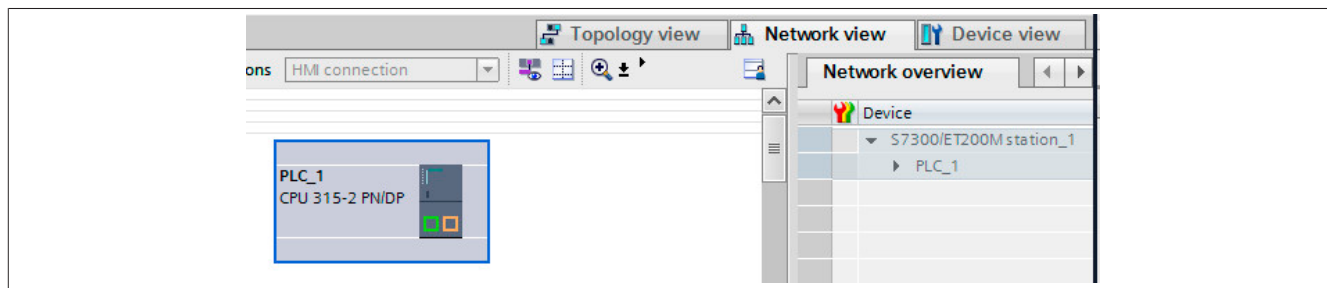


## 6.2 Add slave

- To add a slave, you must switch to the hardware view. To do this, select **Device configuration** by double-clicking in column **Project tree**.

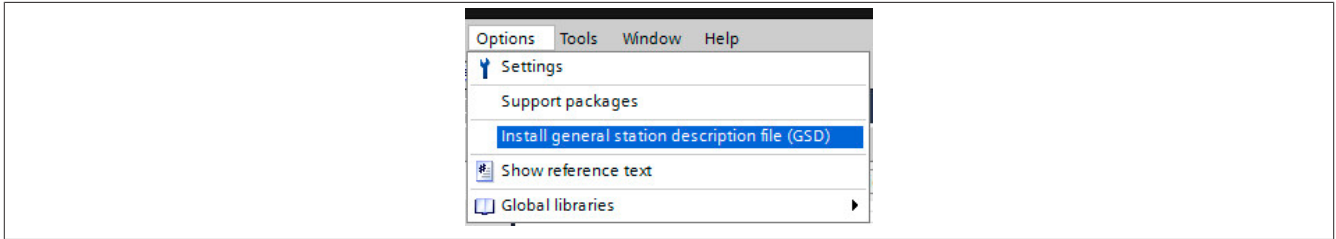


- The hardware structure can be checked or updated via tab **Network view**.

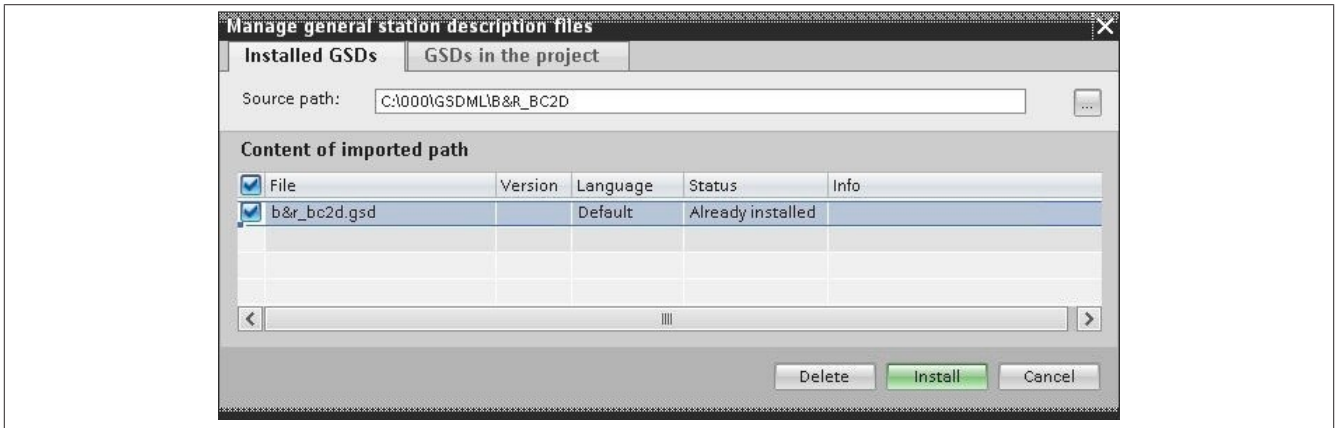


## TIA portal

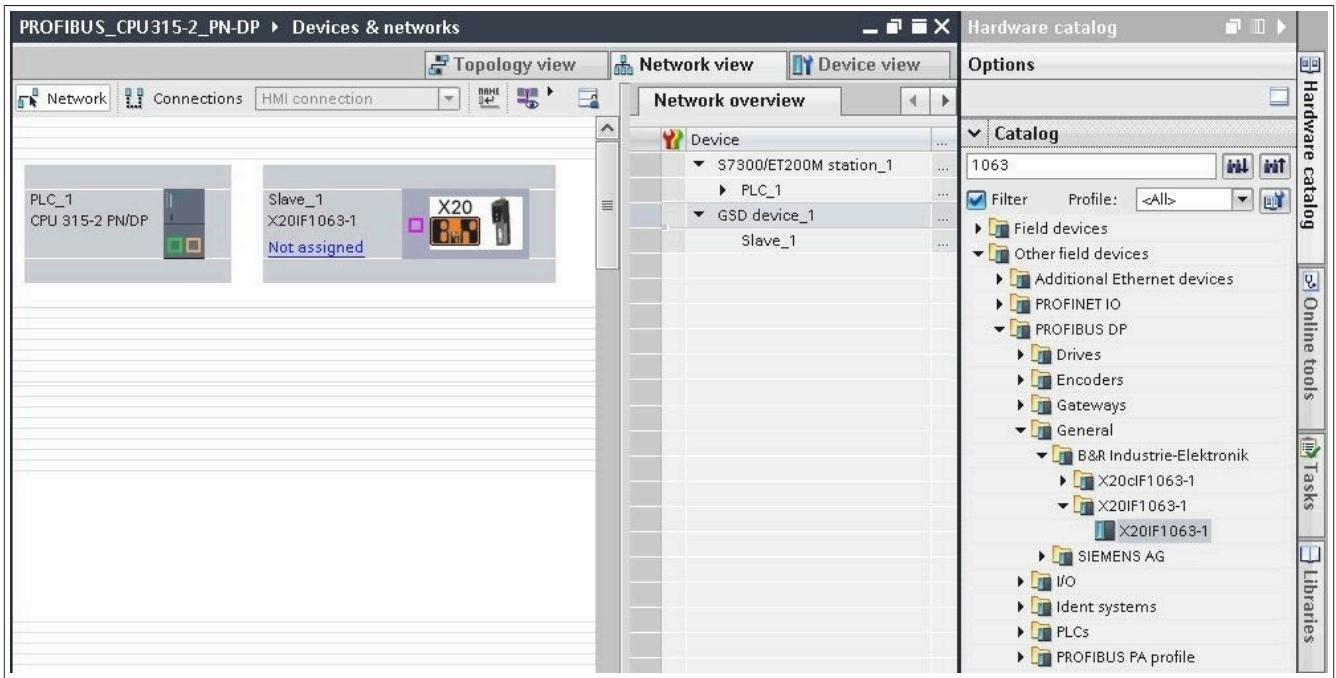
- In order to use the interface module, its description file must first be installed. The description file can be downloaded from the B&R website and installed via Options → Install general station description file (GSD).



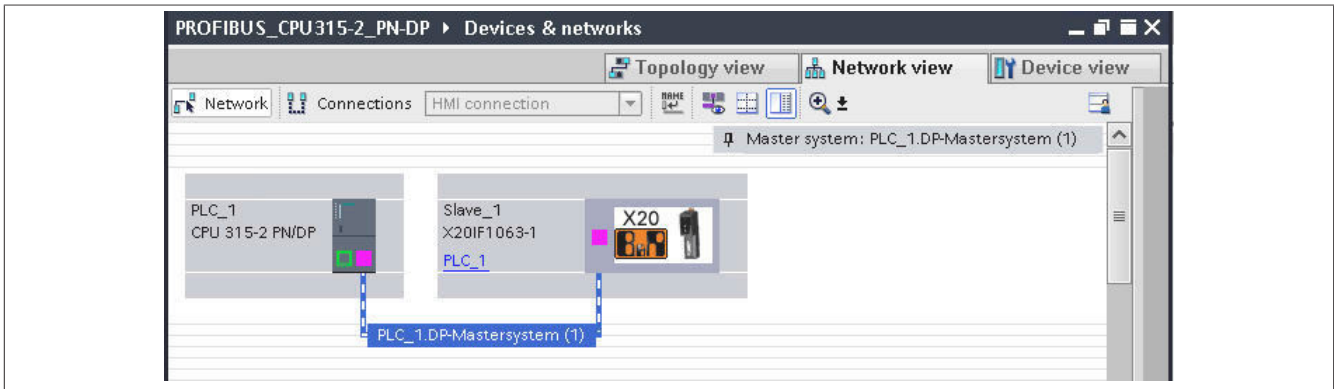
- The downloaded description file is selected in the dialog box and added to the project with button **Install**. This adds the interface module to the Hardware Catalog of the TIA portal.



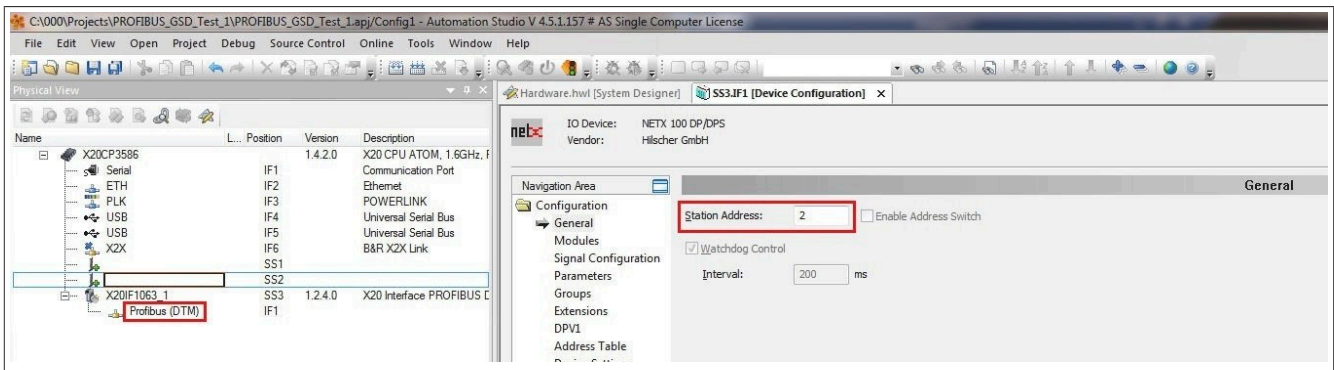
- Now the installed interface module can be used in the project. The interface module is selected in the Hardware Catalog and then dragged and dropped into the project.



- The installed controller and the interface module are connected via PROFIBUS. For this purpose, the PROFIBUS interface of the controller is connected to the PROFIBUS interface of the interface module via drag-and-drop.



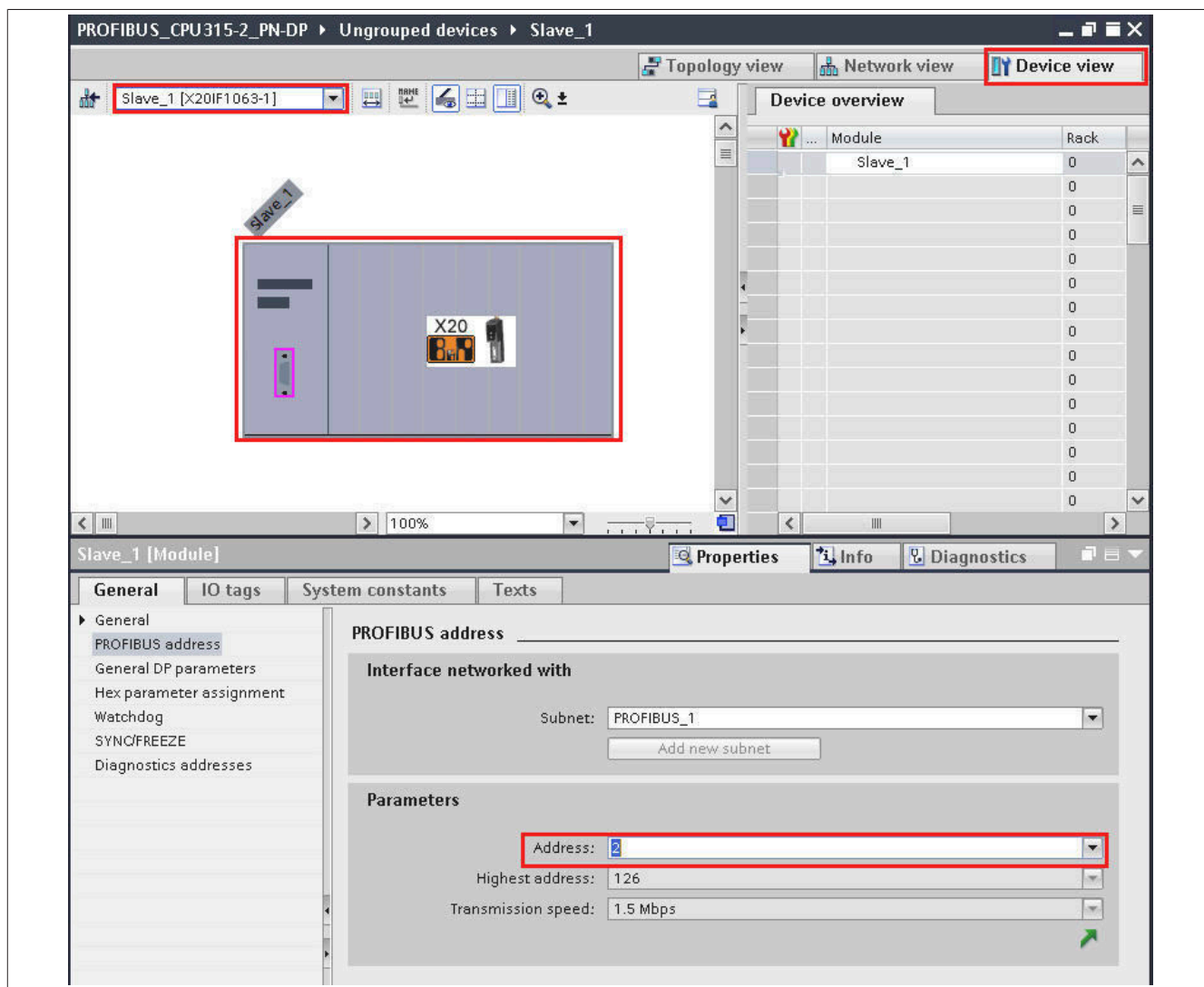
- To establish the communication between PROFIBUS master and PROFIBUS slave, the PROFIBUS address of the slave must be set. This must match the set PROFIBUS address of the interface module in Automation Studio.



## TIA portal

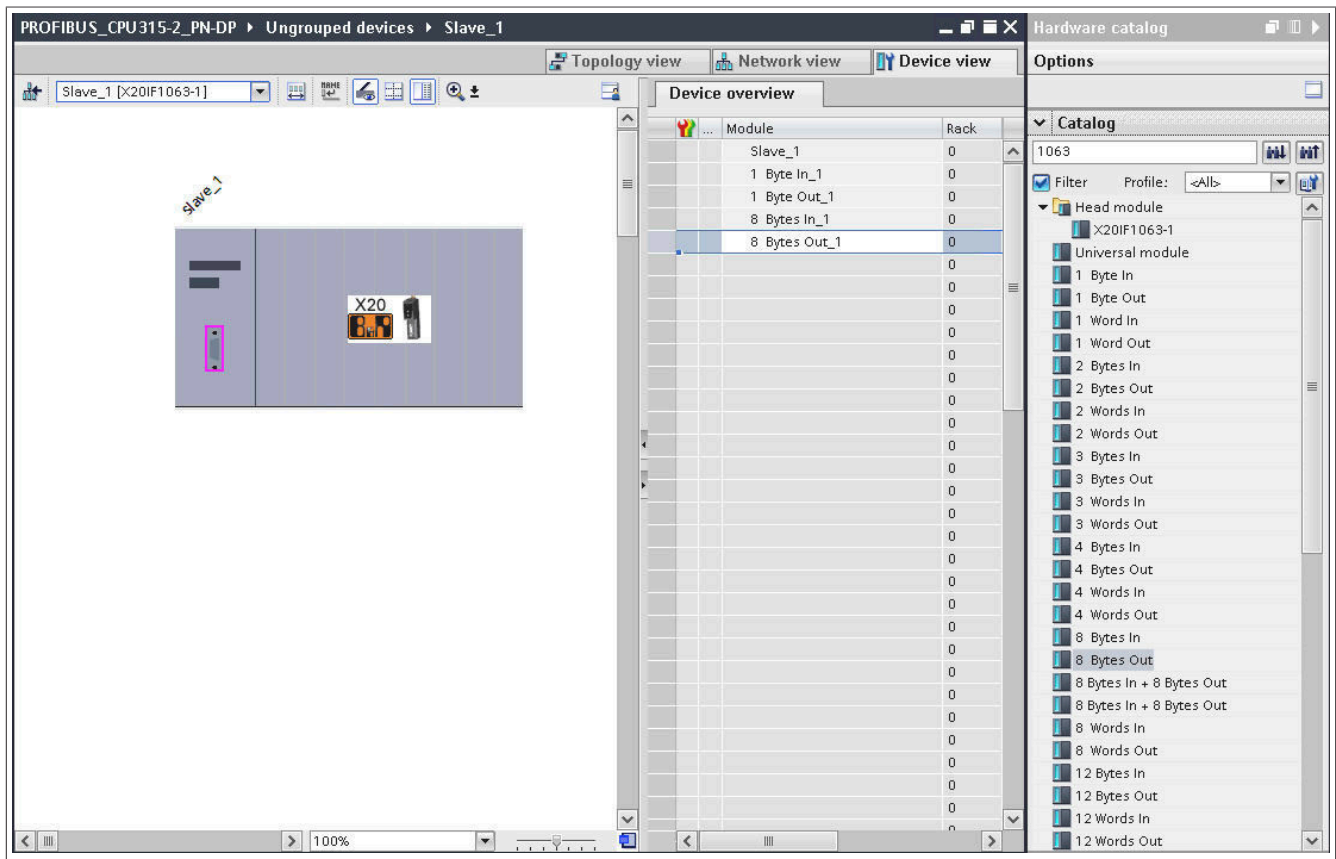
To set the PROFIBUS address in the TIA portal, select the PROFIBUS interface module (X20IF1063-1) from the **Device overview** in the drop-down list.

By double-clicking on the image of the module, the setting options become visible below. The desired PROFIBUS address must be set here.



In addition, further configurations can be carried out for the module. All set parameters must match the settings in Automation Studio.

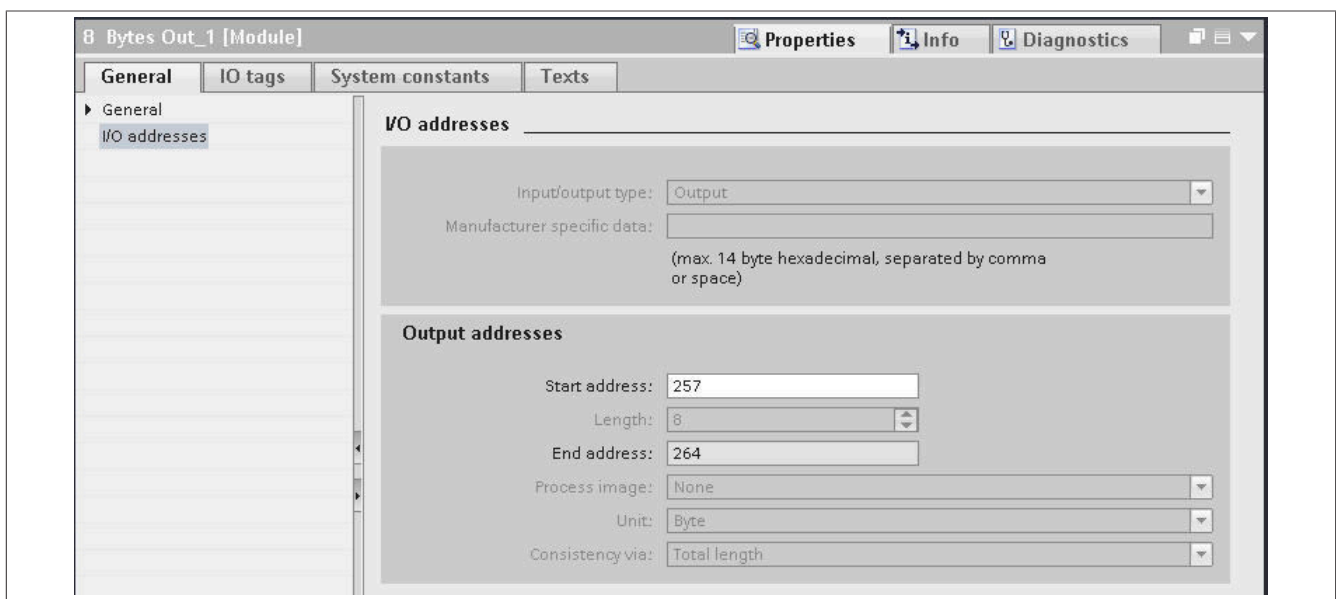
- Any additional modules can be added with the Hardware Catalog. To do this, drag and drop the modules into the **Device overview**.



- After modules are added, they can be easily configured by selecting them.

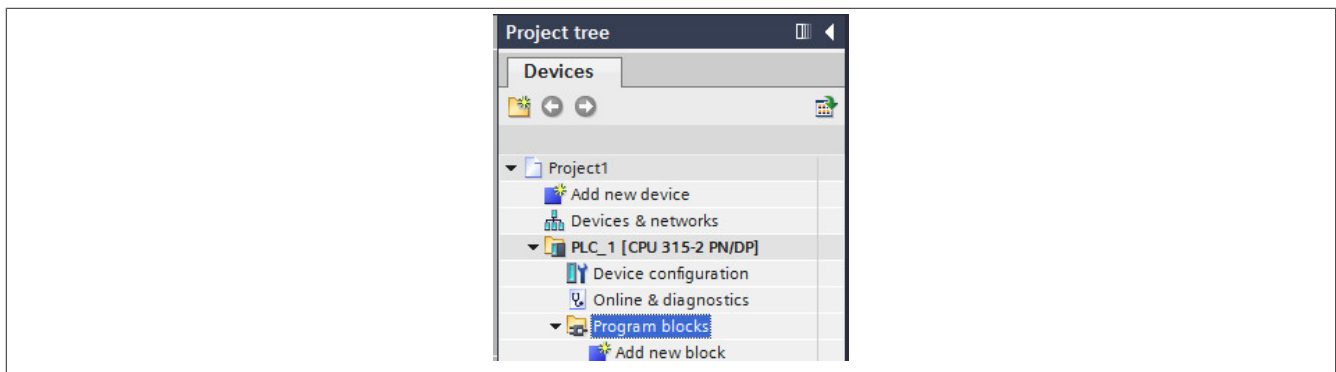
### Example

"End address" of a module is read out via Properties → General → I/O addresses in order to be able to link it with a variable created in the application.

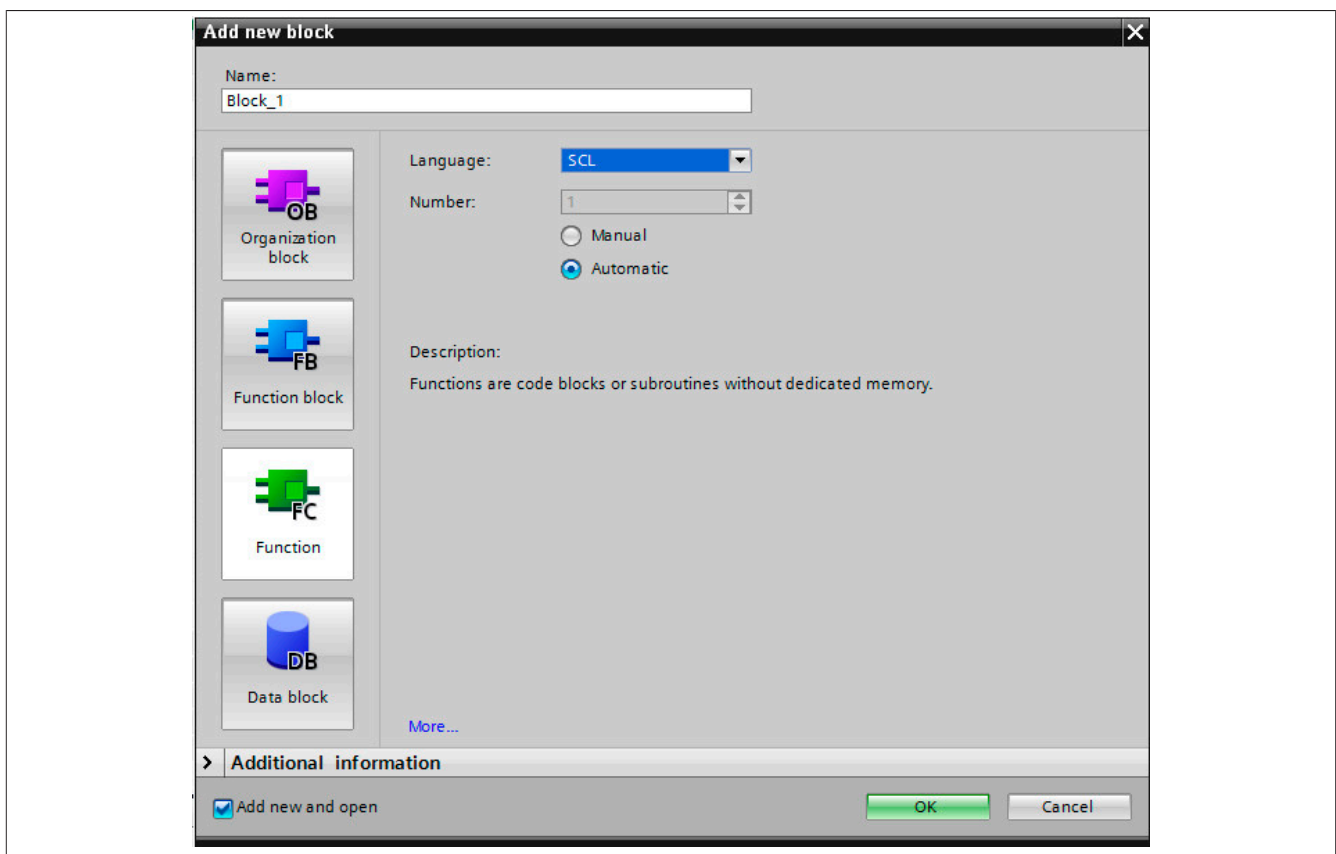


## 6.3 Creating an application

- An application can be added via Project tree → Program blocks.



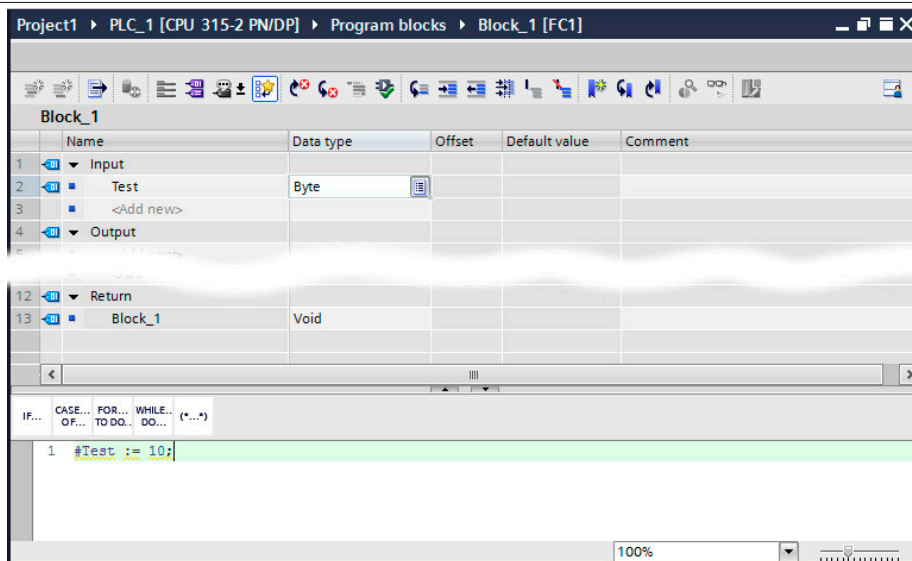
- If a new program is created using **Add new block**, the name of the block and the programming language are first set and confirmed with **OK**.  
In this example, this is **SCL** (Structured Text), but any programming language can be used.



- The block is divided into two parts.
  - Variables can be created in the upper part of the block.
  - The application is programmed in the lower part.

### Example

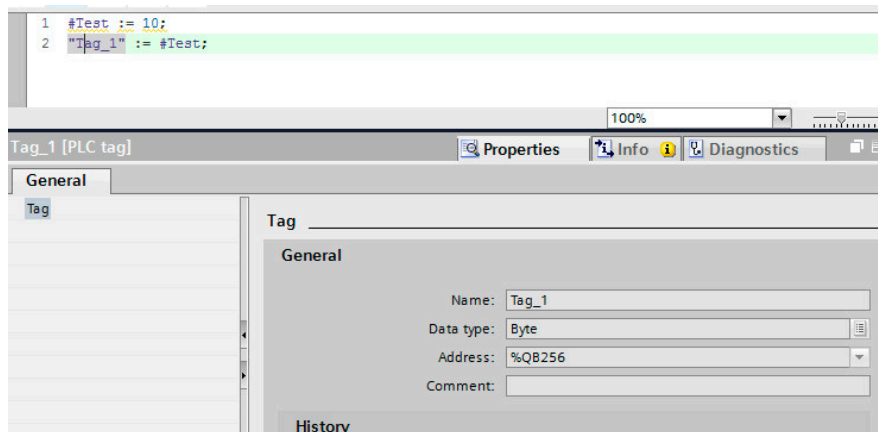
A variable named "Test" of data type "BYTE" should be created and assigned value 10 using the application.



- A **tag** can now be created in the application to link the variable to an output via an address. This is created with "%QB + Address" or "%IB + Address":

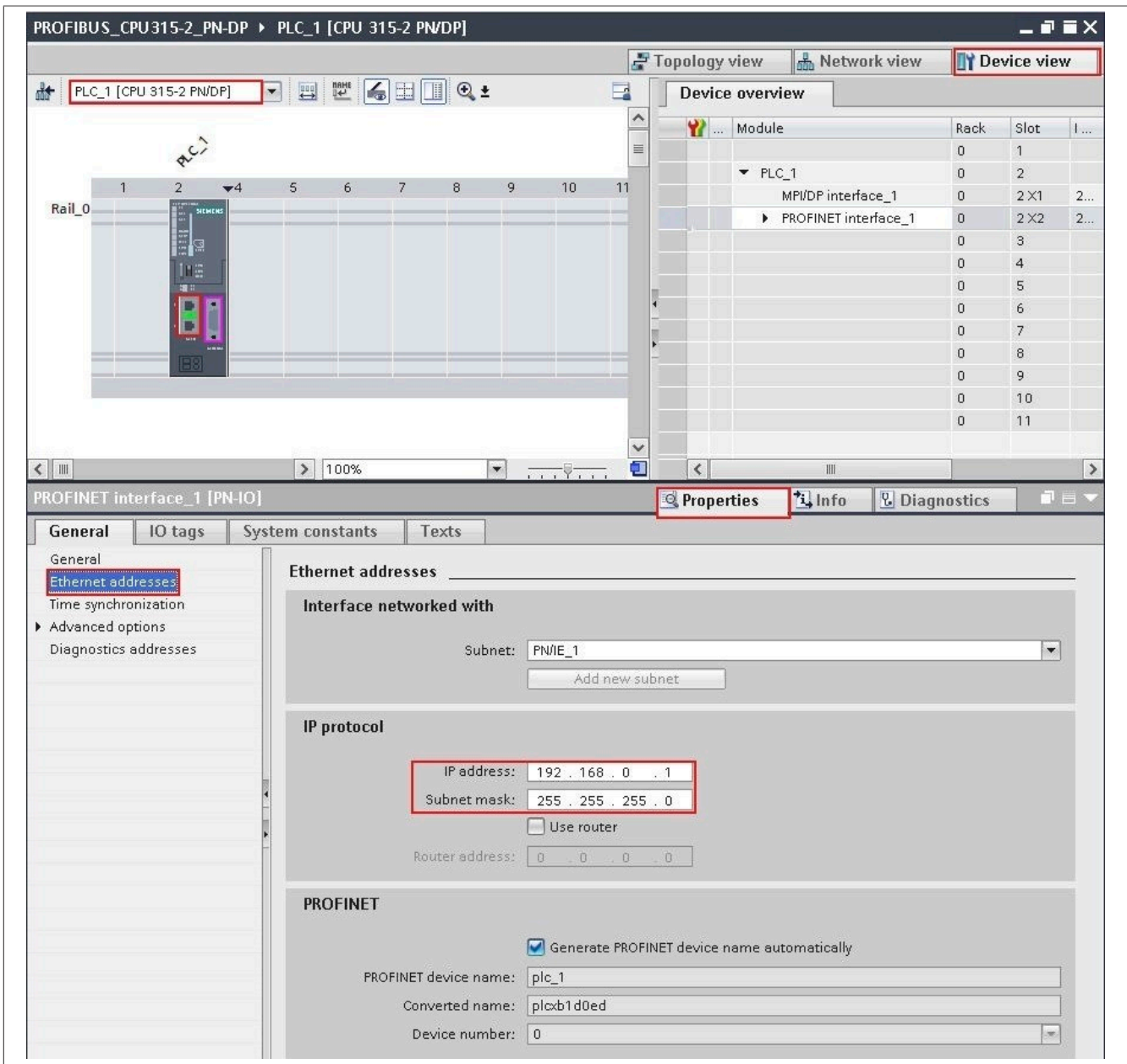
### Example

Tag %QB256 is assigned to variable "#Test".

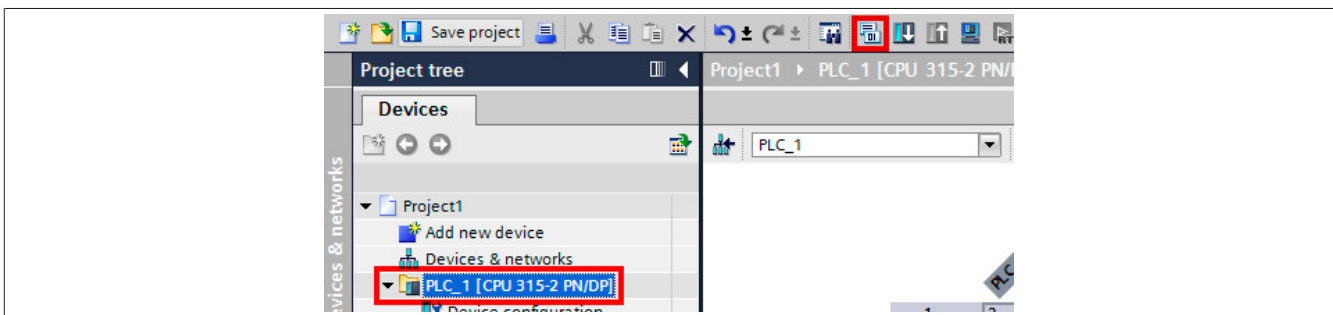


## 6.4 Establishing a connection to hardware

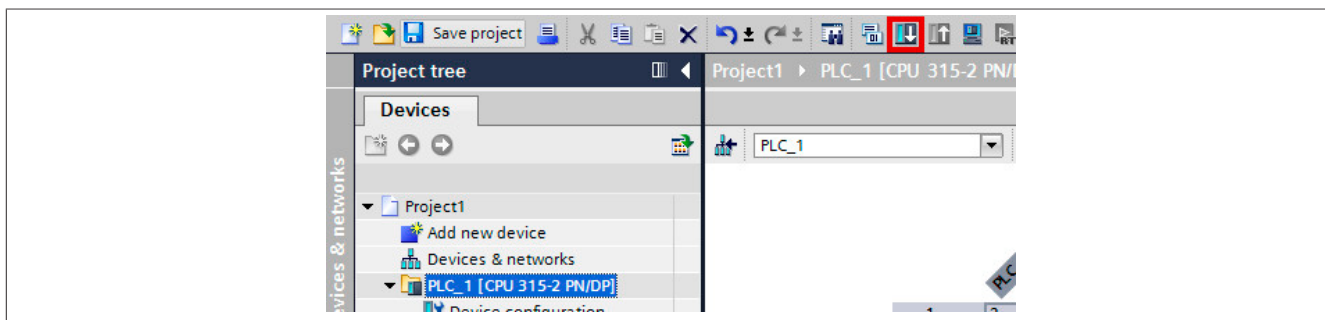
- To establish a connection from the TIA Portal to the controller, the IP address and controller subnet mask must be configured in the TIA Portal. This is done by selecting the controller in the **Device view**. Clicking on the Ethernet interfaces with the mouse opens the corresponding window in menu "Properties". The IP address and subnet mask can be entered here.



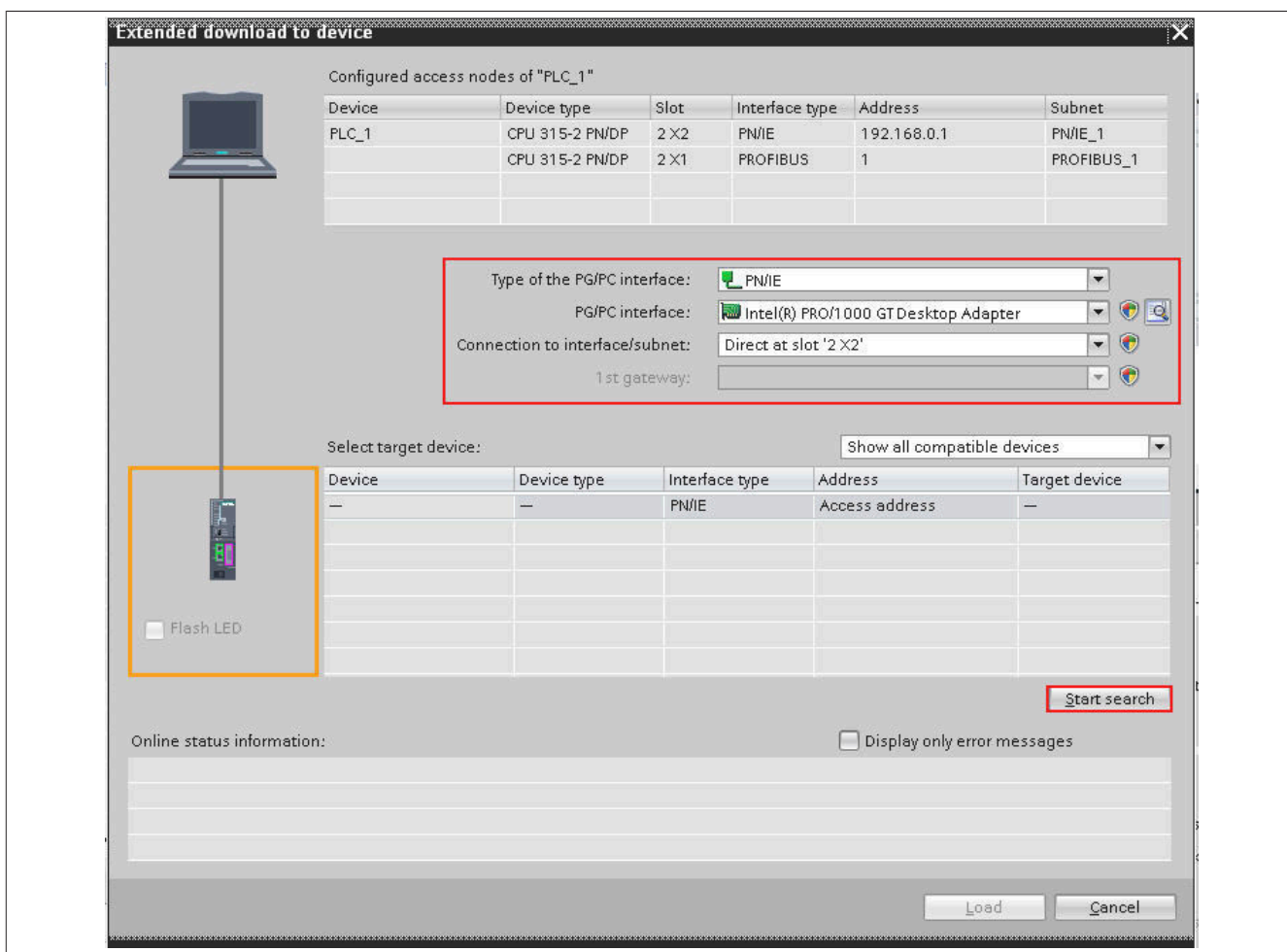
- Now the project can be compiled. This is done by selecting controller "PLC\_1[CPU 315-2 PN/DP]" in the **Project tree** view and button **Compile** in the toolbar.



- After the project has been successfully compiled, it can be loaded onto the device. To do this, select button **Download to device** in the toolbar.

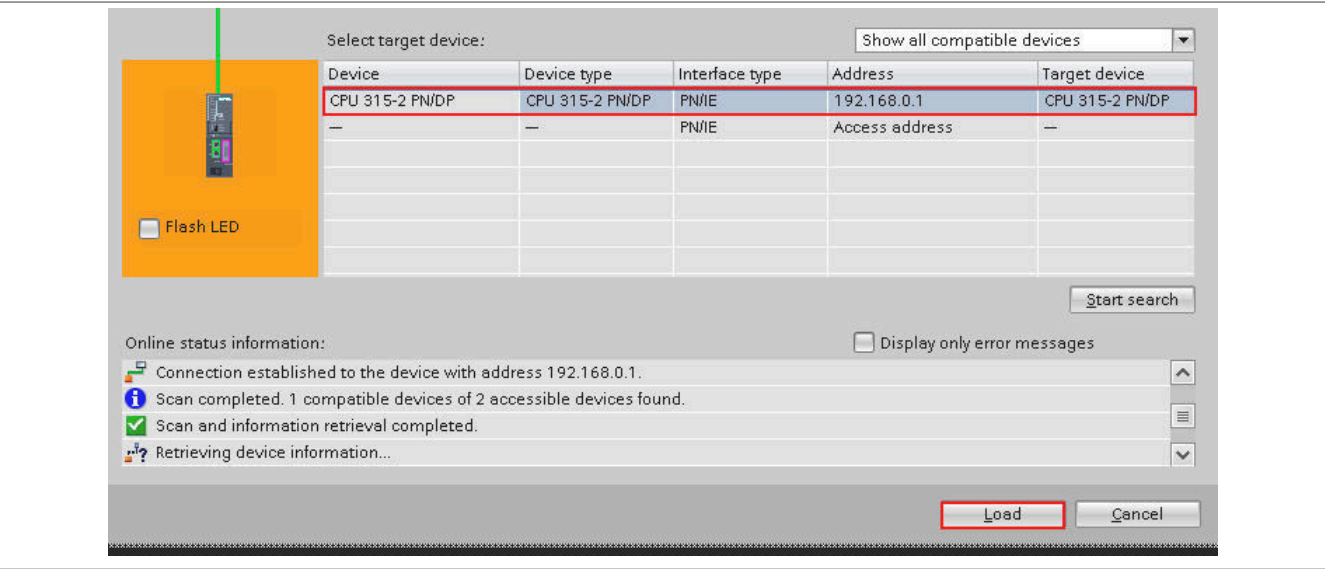


- A query dialog box opens in which the interface configuration is set. With button **Start search**, the network is scanned for devices. If no devices are found, this indicates that an incorrect IP address was set in the controller.

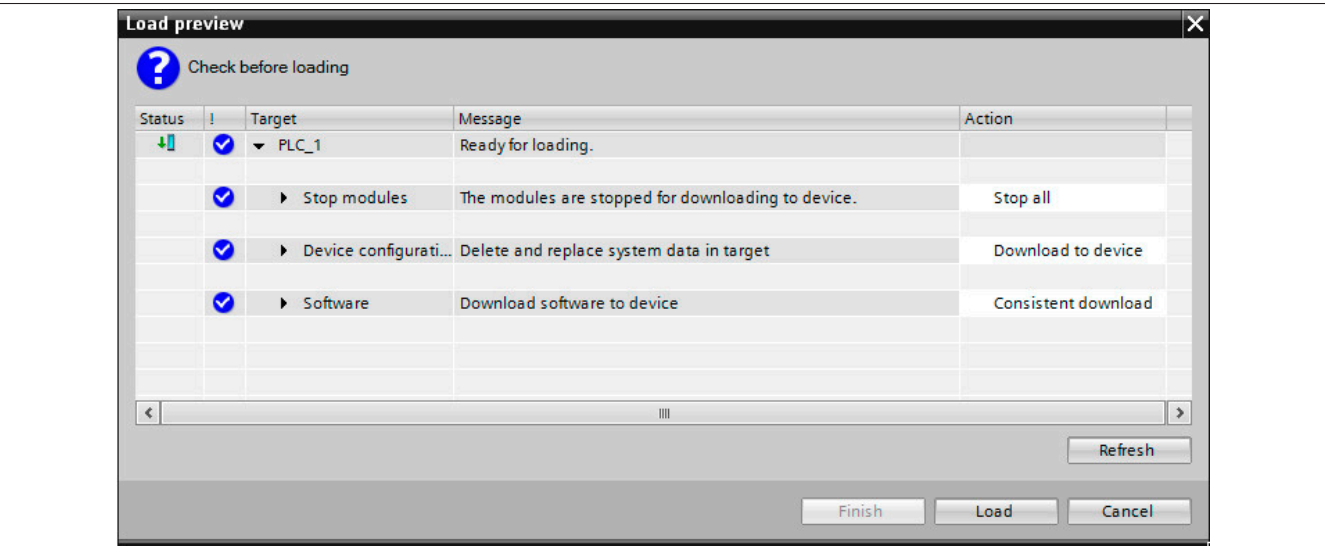


TIA portal

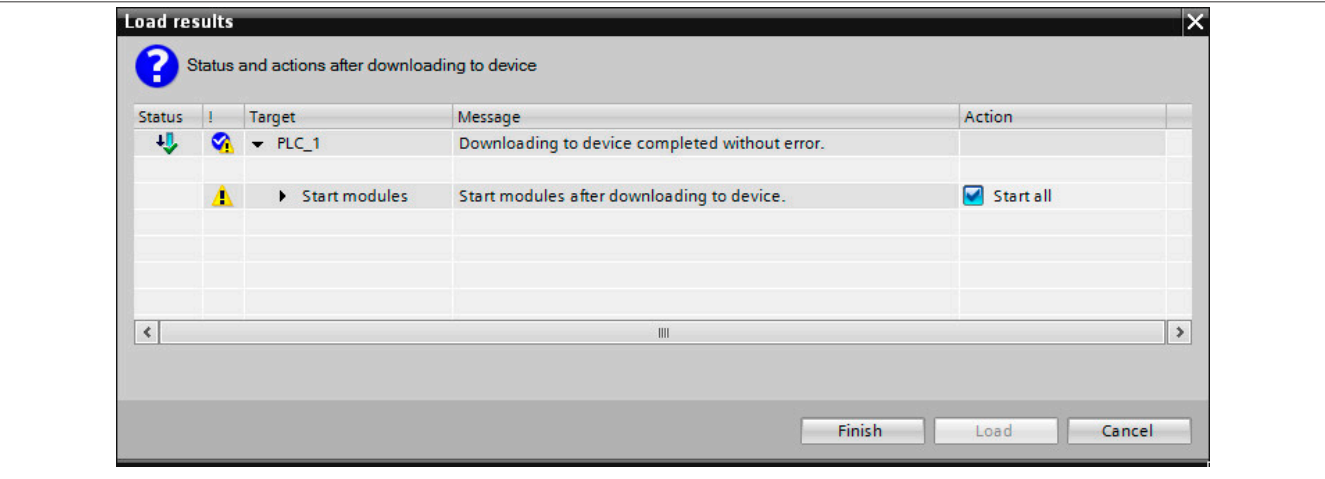
- If the search is successful, the devices found are listed under **Compatible devices in target subnet**. After selecting the controller, the data can be loaded to the controller with button **Load**.



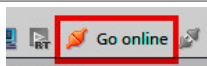
- Before loading, a notification window opens and lists a preview of all loading processes. This can be used to check whether the correct data is being transferred. The data is transferred after pressing **Load**.



- The result of the loading process is listed and must be confirmed with **Finish**.



- Button **Go online** is selected to establish a connection to the controller. The connection is established and, if configured correctly, the slave is set to state "Run".  
In state "Run", no changes can be made to the configuration or application.



- The connection to the controller can be disconnected again with button **Go offline**.



- The application can be started or stopped in the toolbar via buttons **Start CPU** and **Stop CPU**.

