X20IF1051-1

Data sheet
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B&R Industrial Automation GmbH

B&R Strasse 1

5142 Eggelsberg

Austria

Telephone: +43 7748 6586-0

Fax: +43 7748 6586-26

office@br-automation.com

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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	
X20IF1051-1	X20 interface module, for DTM configuration, 1 DeviceNet scanner (master) interface, electrically isolated, order 1x terminal block TB2105 separately!	
	Required accessories	
	Terminal blocks	
0TB2105.9010	Accessory terminal block, 5-pin, screw clamp terminal block 2.5 mm²	
0TB2105.9110	Accessory terminal block, 5-pin, push-in terminal block 2.5 mm²	

Table 1: X20IF1051-1 - Order data

1.3 Module description

The interface module is equipped with a DeviceNet scanner 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.

Functions:

- DeviceNet scanner
- Error monitoring

DeviceNet

DeviceNet is a CAN-based fieldbus and mainly used in automation technology.

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	X20IF1051-1
Short description	
Communication module	DeviceNet scanner (master)
General information	
B&R ID code	0xA70C
Status indicators	Module status, network status, data transfer, terminating resistor
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
Terminating resistor	Yes, using LED status indicator
Power consumption	1.1 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) FTZÚ 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	
Interface IF1	
Fieldbus	DeviceNet scanner (master)
Variant	5-pin male multipoint connector
Max. distance	500 m
Transfer rate	Max. 500 kbit/s
Terminating resistor	Integrated in module
Controller	netX100
Memory	8 MB SDRAM
Electrical properties	
Electrical isolation	PLC isolated from DeviceNet (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: X20IF1051-1 - Technical data

Order number	X20IF1051-1
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	
Note	Order 1x terminal block TB2105 separately.
Slot	In the X20 PLC and expandable bus controller X20BC1083

Table 2: X20IF1051-1 - Technical data

2.2 Operating and connection elements



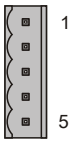
1	IF1 - DeviceNet	2	LED status indicators
3	Switch for terminating resistor on the bottom of the module	4	-

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	On	Communication on the PCI bus has not yet been started
	MOD/NET	Green/Red	Off	Module not supplied with power or not online
		Green	Blinking	Module online but no I/O connection active
			On	Module online and I/O connection active ("operating")
		Red	Blinking	The red LED blinks if at least one of the following errors has occurred: • Minor fault (recoverable fault) • Connection error • No DeviceNet supply voltage
			On	Critical fault or critical connection error (duplicate MAC ID, bus off or module defective)
	TxD	Yellow	Flickering or on	The module is transmitting data via the DeviceNet interface.
	TERM	Yellow	On	The terminating resistor integrated in the module is switched on.

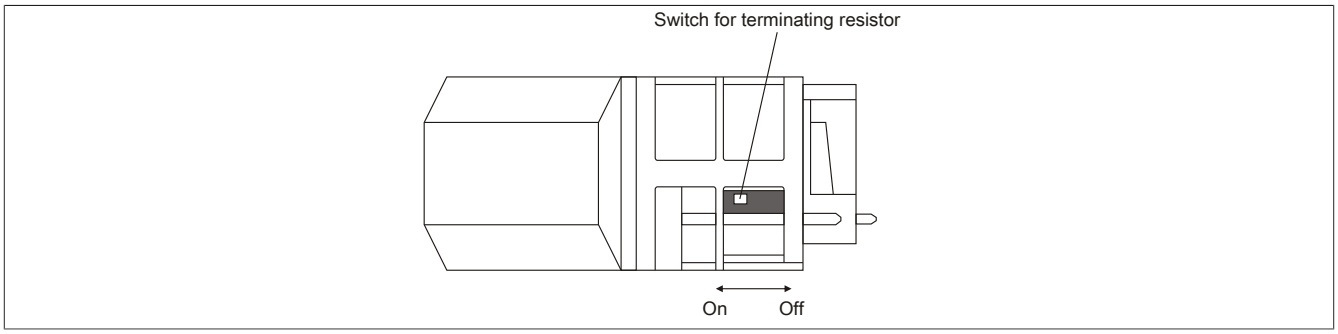
2.2.2 DeviceNet interface

The interface is a 5-pin multipoint connector. Terminal block 0TB2105 must be ordered separately.

Interface	Pinout		
 5-pin male multipoint connector	**Terminal**	**DeviceNet**	
	1	CAN⊥ (V-)	CAN ground
	2	CAN_L	CAN low
	3	SHLD	Shield
	4	CAN_H	CAN high
	5	V+	Supply voltage[1)]

1) The 24 VDC in the DeviceNet network must be fed in externally in order to guarantee correct operation and data exchange. 24 VDC is not made available by the device.

2.2.3 Terminating resistor



A terminating resistor is integrated in the interface module. It can be switched on or off with a switch on the bottom of the housing. A switched-on terminating resistor is indicated by LED "TERM".

3 Function description

3.1 DeviceNet

DeviceNet was developed by Allen-Bradley as a CAN bus-based automation network. It is based on a producer/consumer protocol. From the user's point of view, data handling is completely decoupled from the CAN bus transfer options, e.g. longer data packets are automatically fragmented by DeviceNet. Access takes place via I/O messages with defined properties.

For additional information, see The DeviceNet 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 The DeviceNet interface

The interface module is equipped with a DeviceNet scanner interface. Up to 63 slaves can be operated on the master.

UCMM (Unconnected Message Manager) is supported.

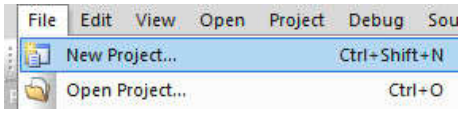
Poll, change of state, cyclic, bit strobe and explicit peer-to-peer messaging are supported as connection types.

5.1 Settings in Automation Studio

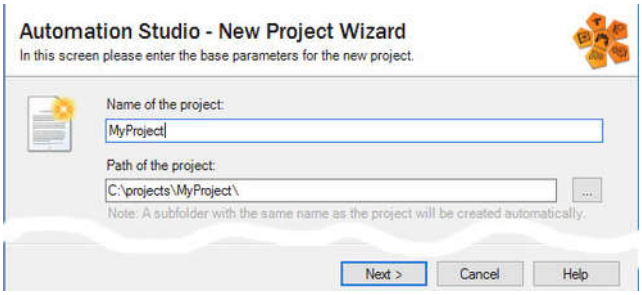
To configure the interface, a new Automation Studio project is created and the suitable settings are made on the module.

5.1.1 Creating an Automation Studio project

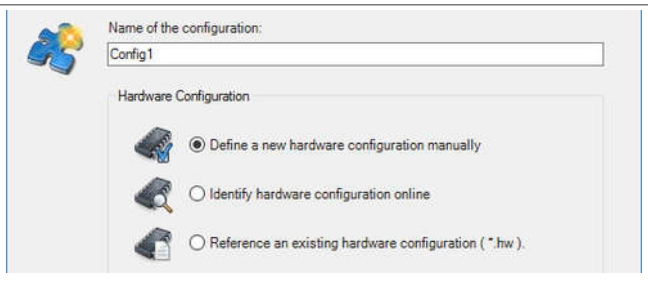
- Create a new Automation Studio project by selecting "New project".



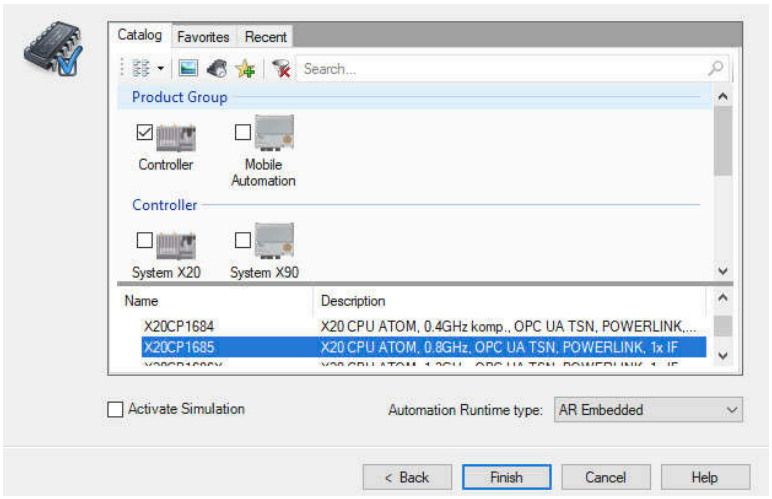
- Assign a project name and set up the project path.



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

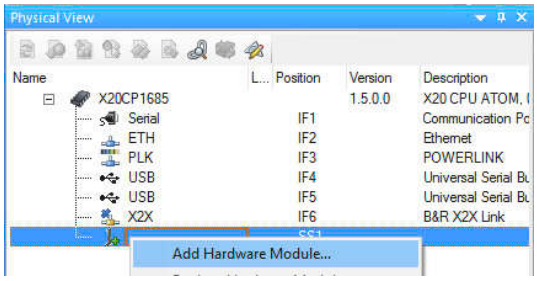


- If "Define a new hardware configuration manually" was selected, the hardware is selected in the next step. In order to simplify the search, different filters can be set for this in the Hardware Catalog. Finally, the Automation Studio project is created by selecting the required hardware is and clicking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

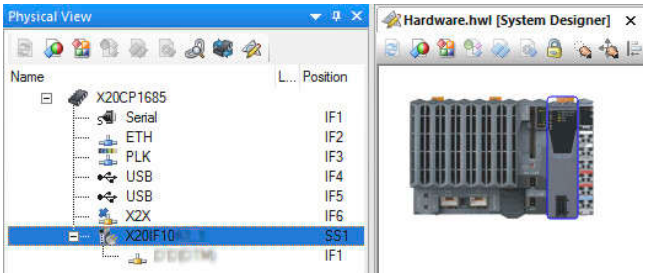


5.1.2 Adding and configuring the interface module

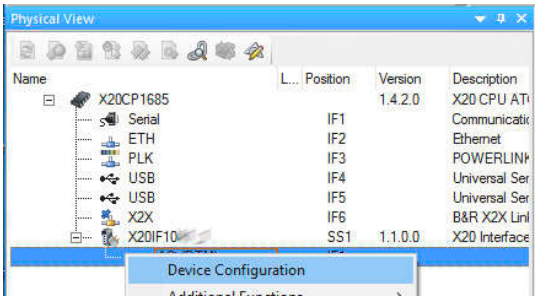
- In this example, the interface card is connected in the slot of a controller. Right-clicking on the slot and selecting "Add hardware module" opens the Hardware Catalog.



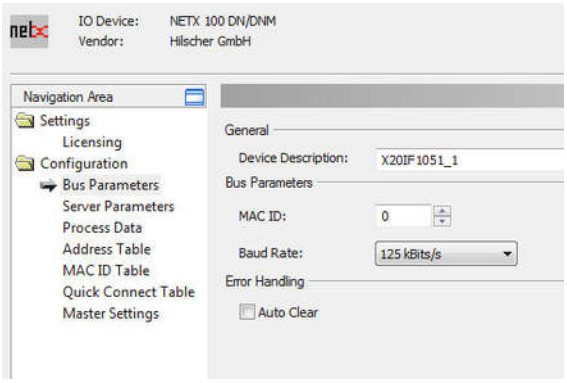
- The module is added to the project via drag-and-drop or by double-clicking on the interface card.



- 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 Bus parameters

- General

The name of the device can be changed here. However, this is only used by the configuration dialog boxes and not by Automation Studio.

- Bus parameters

The MAC ID and baud rate can be set here.

- The MAC ID serves as the unique identification for a DeviceNet device in the network and is not permitted to be used twice. The range of values for available MAC IDs is between 0 and 63.
- The baud rate can be set between 125 and 500 kbit/s.

- Error handling

"Auto clear" ON is used for error handling.

Parameter	Explanation
Enabled	The master changes to mode "Clear" first in the event of a communication error and then to mode "Stop". Communication to all slaves is stopped. The only way to exit mode "Stop" is by resetting the system.
Disabled	The master remains in mode "Operate" in the event of a communication error. The master is still connected to the other slaves and attempts to reestablish communication with the defective or missing slave.

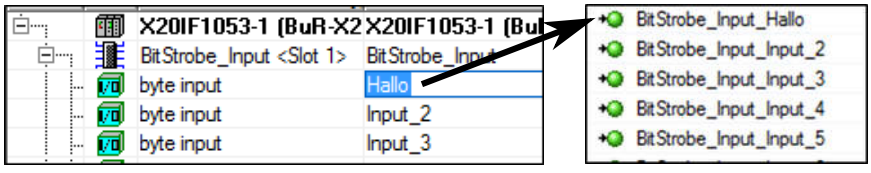
5.1.2.2 Server parameters

This parameter is not supported.

5.1.2.3 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	The name of the input and output data can be changed in column "Tag".
SCADA	This parameter is not supported.



5.1.2.4 Address table

This table provides information about the addresses of the input and output data. If auto-addressing is disabled, addresses can be entered manually.

Parameter	Explanation
MAC ID	Network address of the device
Device	Device name of the slave
Name	Description of slave
Connection mode	Mode for the input and output data
Length	Length of the input and output data
Address	Address offset for the input and output data

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



Information:

Using the same address twice is not permitted. Addresses used twice are marked with a red exclamation point and an additional error message is displayed.

5.1.2.5 MAC ID table

All slaves are listed here. "Activate" is used to activate or deactivate the slaves.

Parameter	Explanation
Activate	• **Enabled slaves:** Process memory is reserved and data is exchanged. It is also possible to assign the slave a different MAC ID. • **Deactivated slaves:** The master reserves memory in the process data image for the slave, but no data is exchanged.
MAC ID	Editable network address of the device. The new MAC ID must be unique; otherwise, an error message will appear.
Device	Device name of the slave
Name	Description of slave
Vendor	Slave manufacturer

5.1.2.6 Quick connect table

This function allows for a quick startup of a device after it is replaced.

Parameter	Explanation	Values
Quick connect	Function "Quick connect" must be enabled separately for each slave. The following system requirements must be met in order to optimally use "Quick connect": • The master muss support "Quick connect". • Additionally, the slave must support "UCMM" or "Predefined master/slave connection.".	
MAC ID	Network address of the device.	0 to 63
Device	Device name of the slave and the EDS file	
Name	Name of the slave and the EDS file	

Depending on the type of quick connect support, the following times may apply:

Quick connect support		Time to connect
Master	Slave	
Yes	Yes	Under 200 ms
Yes	No	Approx. 2 s
No	Yes	Approx. 2 to 3 s
No	No	Approx. 2 to 5 s

5.1.2.7 Master 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. Default value: 1000 ms	20 to 65535 ms

Information:

The watchdog time is reset automatically by Automation Runtime.

- Process data handshake

This parameter configures the handshake for the data exchange between application and device. Only "Buffered, host-controlled" is supported here.

- Advanced

This parameter is not supported.

- Device status offset

Here, the status offset can be set to be calculated automatically or using a predefined value.

Status offset	Explanation
Automatic calculation	The device status always directly follows the input bytes. If input data is added in the configuration, the start address of the device status is moved back in the dual-ported memory.
Static	Here, the distance (free buffer) between the last input byte and the start of the device status can be set. This way, the start address of the device status never changes in the dual-port memory. If additional input data is added, the distance (free buffer) is reduced. If more data is added than free buffer exists, the start address of the device status in the dual-port memory must be shifted. If the offset is too small, an error is output. To correct the error, the free buffer must be increased to a sufficient size. 

Information:

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

5.1.3 I/O mapping

The I/O mapping resulting from the module configuration is opened by double-clicking on the DeviceNet master. General information such as the serial number and module ID are listed in the mapping along with DeviceNet-specific data points.

For a description of the general data points, see "Additional information - General data points" in the X20 system user's manual.

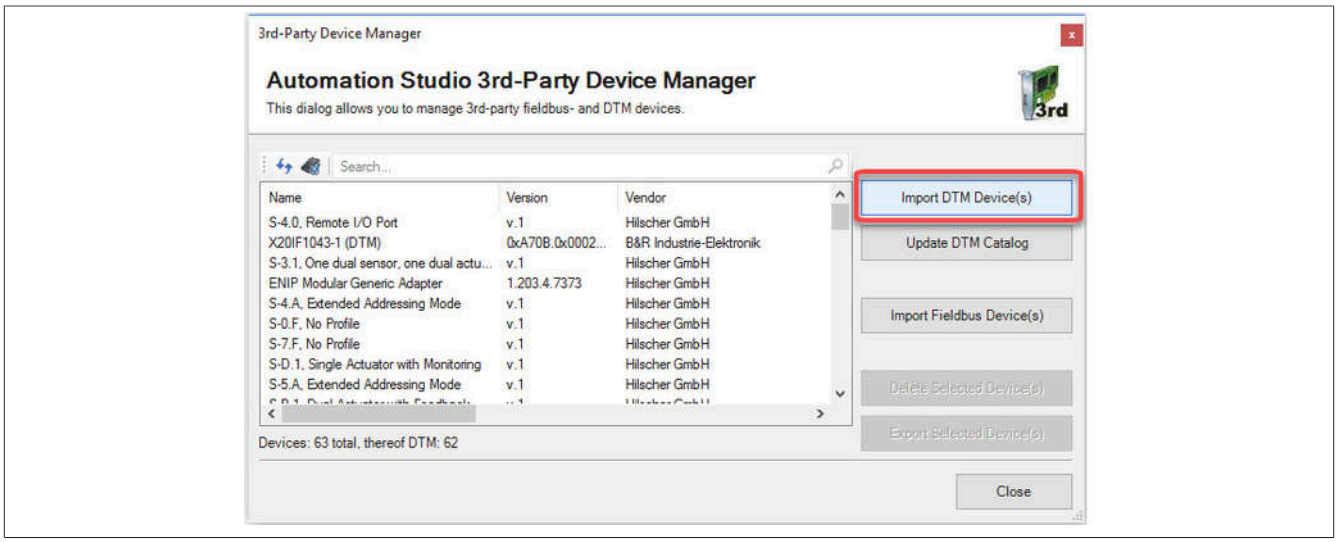
For a description of the DeviceNet data points, see Communication / Fieldbus systems / Support with FDT/ DTM / Diagnostic functions / Diagnostics on the runtime system / Master diagnostics in Automation Help.

5.1.4 Adding the EDS file in Automation Studio

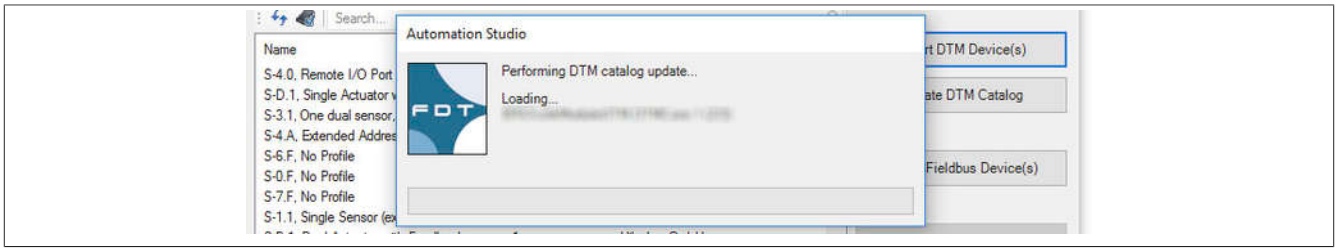
A device description file (EDS file) is required to inform the DeviceNet master which slaves were connected and how they were configured.

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

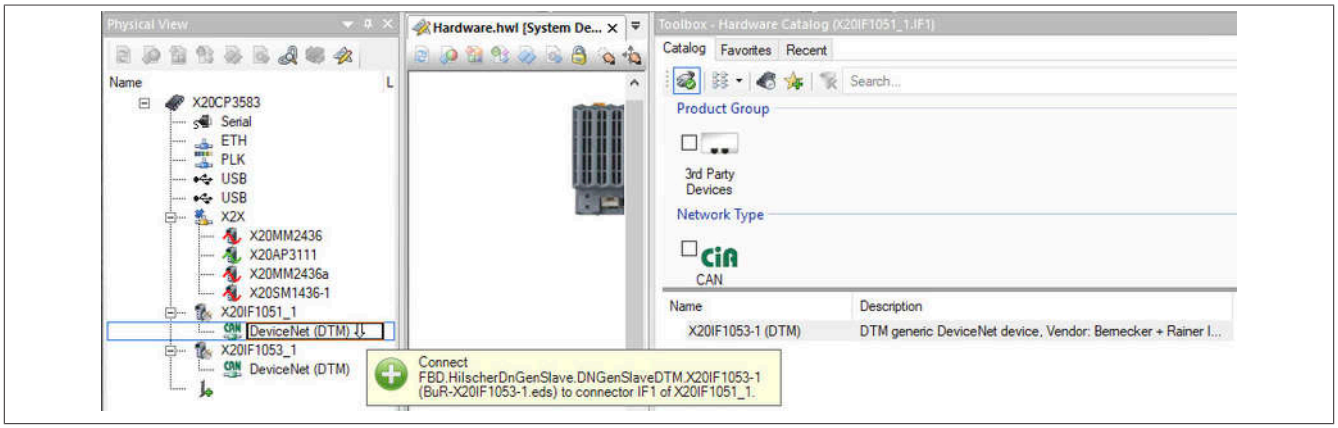
- If the B&R DeviceNet slave is used, download the EDS file from the B&R website (www.br-automation.com) and unzip the ZIP file.
- Open the dialog box in Automation Studio under "Tools - Manage 3rd-party devices" and select "Import DTM device(s)".



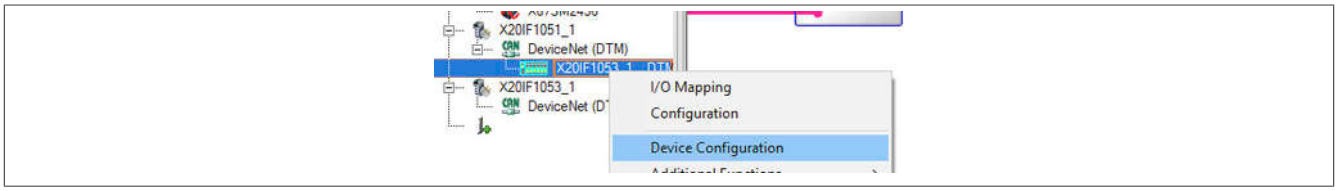
- Select the EDS file to be imported and confirm with OK. The EDS file is imported into Automation Studio.



- Click "DeviceNet(DTM)" on the DeviceNet master X20IF1051-1, drag the EDS file from the Hardware Catalog and attach it to the DeviceNet master.



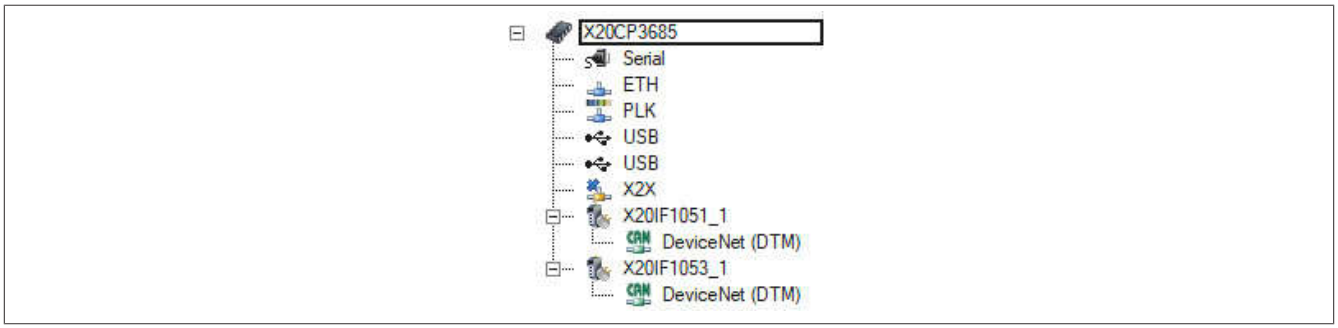
• Right-click on the device description file and select "Device configuration" to open the configuration environment for the EDS file.



5.2 Configuration example

In this example, a connection between a DeviceNet master and slave is established. Module X20IF1051-1 is used as the DeviceNet master; module X20IF1053-1 is used as the DeviceNet slave.

For this example, the DeviceNet master interface card is operated in the first slot of an X20CP3685 and the DeviceNet slave interface card in the second slot.



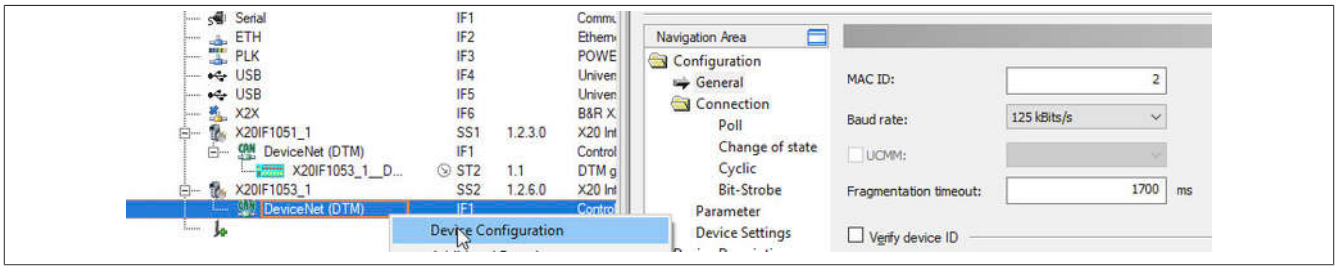
• To establish a connection between master and slave, the master must know the configuration data of the slave. To do this, the device description file of the X20IF1053-1 slave is imported into Automation Studio and attached to the master.

For details, see "Adding the EDS file in Automation Studio" on page 14.

The settings on the DeviceNet slave and on the master (device description file) must match; otherwise, no connection is established.

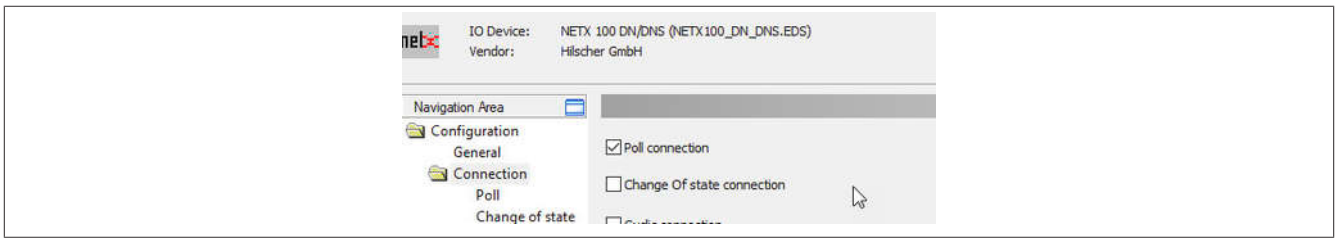
Settings on the slave

• In this example, the MAC ID "2" and a baud rate of 125 kbit/s were defined for the slave. These are set in "Device configuration" under "General" on the slave.

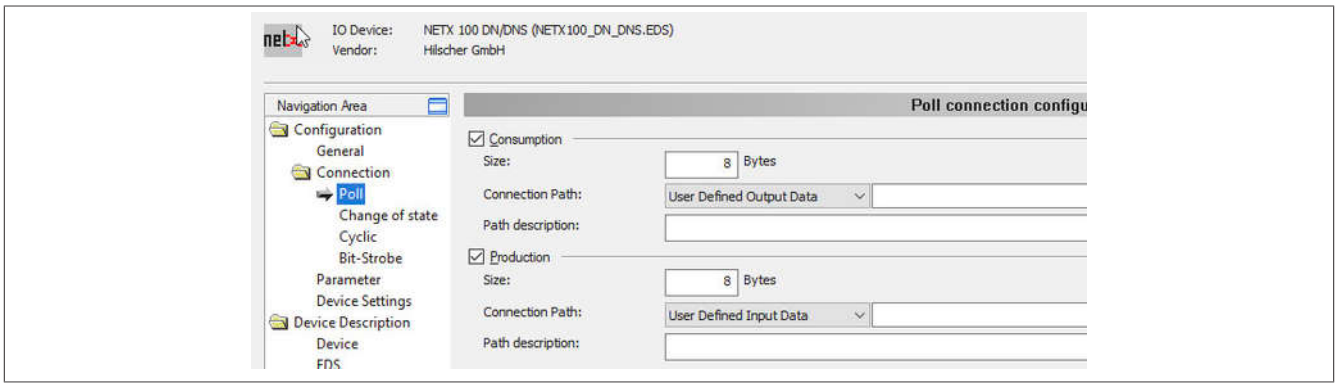


• Next, the connection type and I/O mapping are each defined with 8 bytes of input and output data.

"Poll connection" is enabled in the "Connection" configuration.

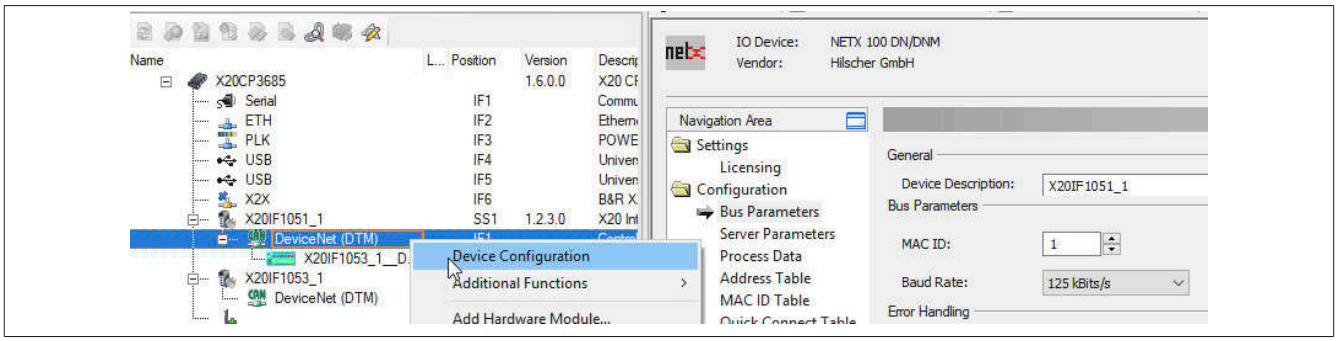


- Under "Poll connection configuration", 8 bytes each are entered for the input and output directions.

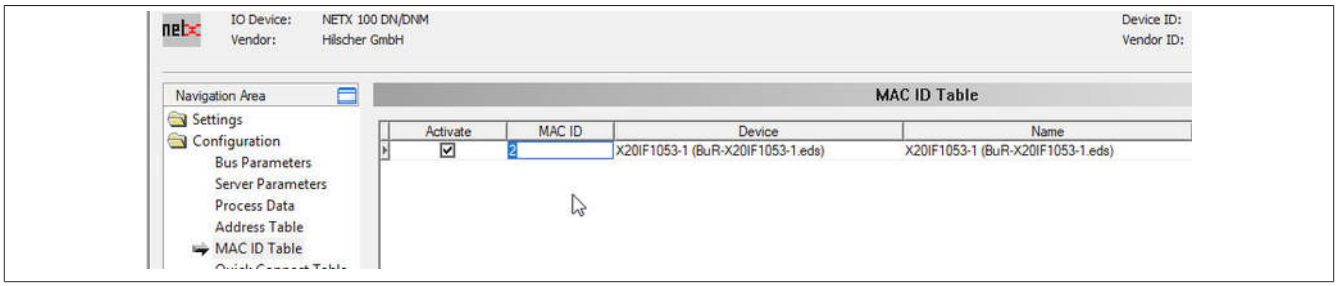


Settings on the master

- On the master, the MAC ID and the same baud rate as on the slave must be set. These are set in "Device configuration" under "Bus parameters".

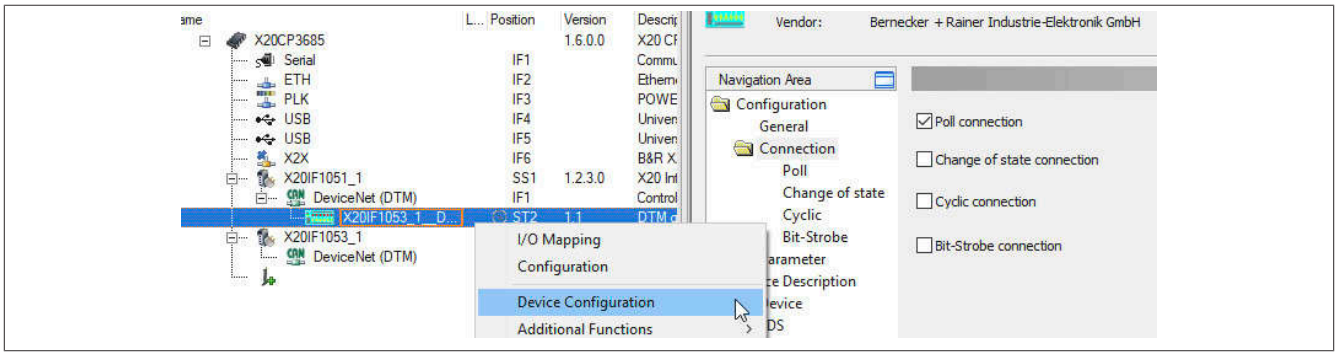


- Then the MAC ID of the slave is set under "MAC ID table".



Settings in the device description file

- The I/O mapping is set in the device description file under "Device configuration". The same settings are made here as on the DeviceNet slave.



By default, 8 bytes of input and output data are defined. If a different number of bytes should be set, the "Connection path" must be changed to "User defined consumption data".

- Confirm and save all settings with OK. The configuration is transferred to the CPU and, if correct, a connection between master and slave is automatically established.

The connection status can be checked with the ModulOK bit in the device description file. When ModulOK = True, data can be exchanged between master and slave.

