X20IF1053-1

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	
X20IF1053-1	X20 interface module, for DTM configuration, 1 DeviceNet adapter (slave) 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: X20IF1053-1 - Order data

1.3 Module description

The interface module is equipped with a DeviceNet 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:

- DeviceNet slave
- 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	X20IF1053-1
Short description	
Communication module	DeviceNet adapter (slave)
General information	
B&R ID code	0xA715
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 adapter (slave)
Variant	5-pin male multipoint connector
Max. distance	500 m
Transfer rate	Max. 500 kbit/s
Terminating resistor	Integrated in module
Controller	netX100
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
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

Table 2: X20IF1053-1 - Technical data

Order number	X20IF1053-1
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: X20IF1053-1 - Technical data

2.2 Operating and connection elements

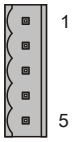
1	IF1 - DeviceNet	2	LED status indicators
3	Switch for terminating resistor on the bottom of the module	4	-

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.

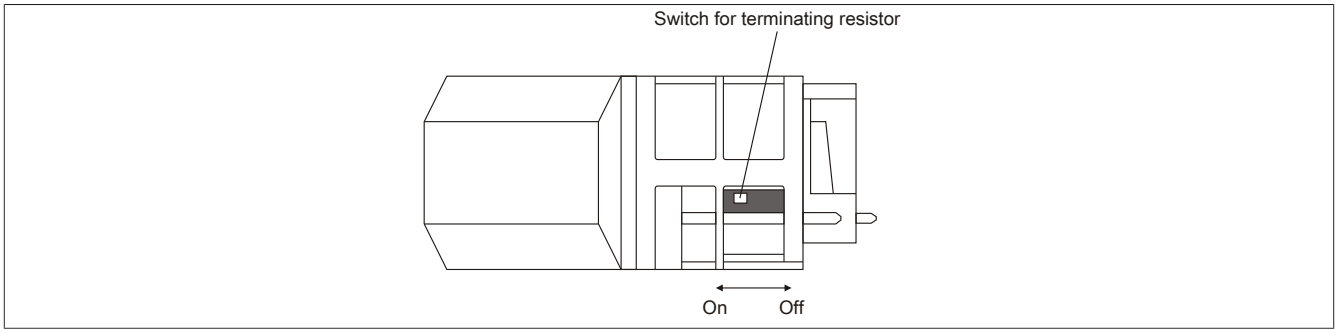
2.2.2 DeviceNet interface

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 slave (adapter) interface. Explicit messaging is supported.

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

Information:

Neither UCMM nor quick connect are supported.

Information:

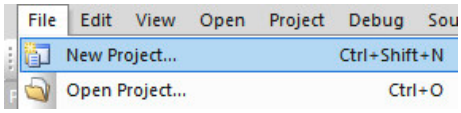
The settings on the slave must match the settings of the corresponding device description file; otherwise, no connection can be established.

5.1 Settings in Automation Studio

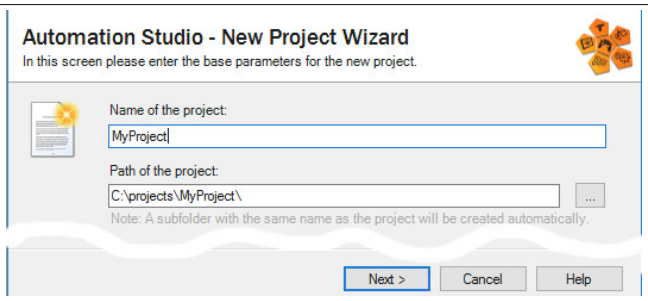
To configure the interface, a new Automation Studio project is created and the suitable settings are made on the module.

5.1.1 Creating an Automation Studio project

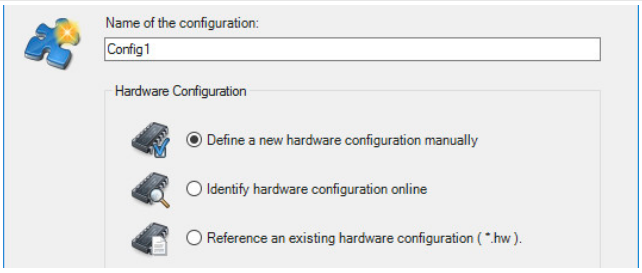
- Create a new Automation Studio project by selecting "New project".



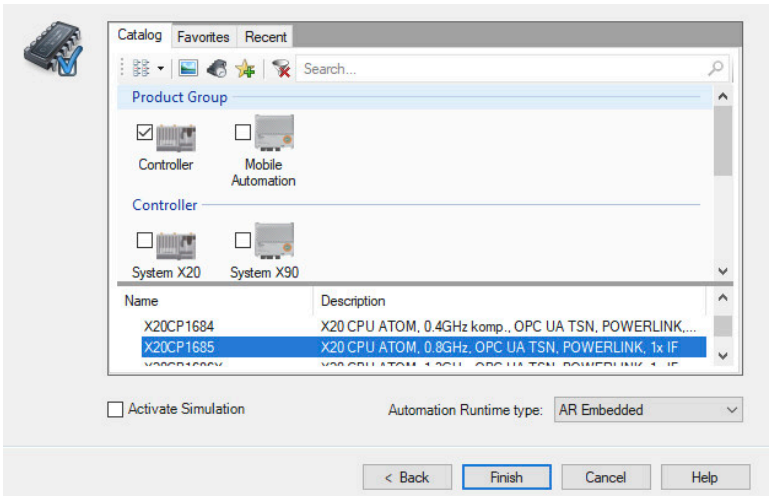
- Assign a project name and set up the project path.



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

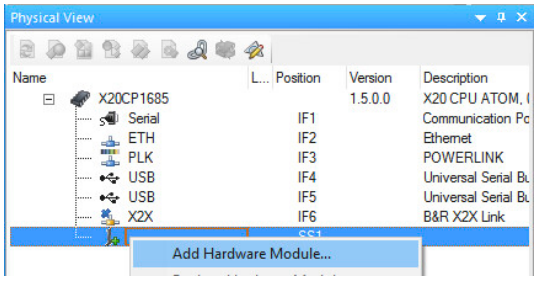


- If "Define a new hardware configuration manually" was selected, the hardware is selected in the next step. In order to simplify the search, different filters can be set for this in the Hardware Catalog. Finally, the Automation Studio project is created by selecting the required hardware is and clicking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

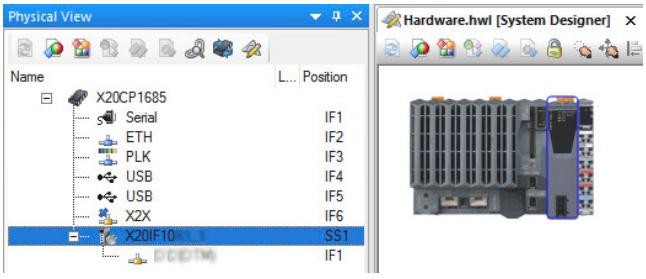


5.1.2 Adding and configuring the interface module

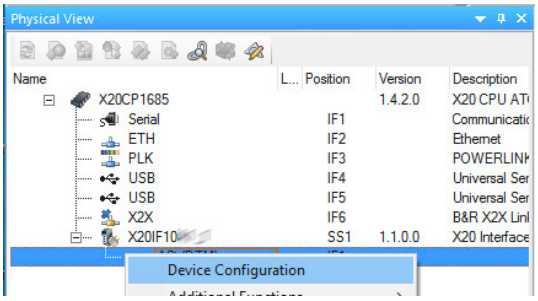
- In this example, the interface card is connected in the slot of a controller. Right-clicking on the slot and selecting "Add hardware module" opens the Hardware Catalog.



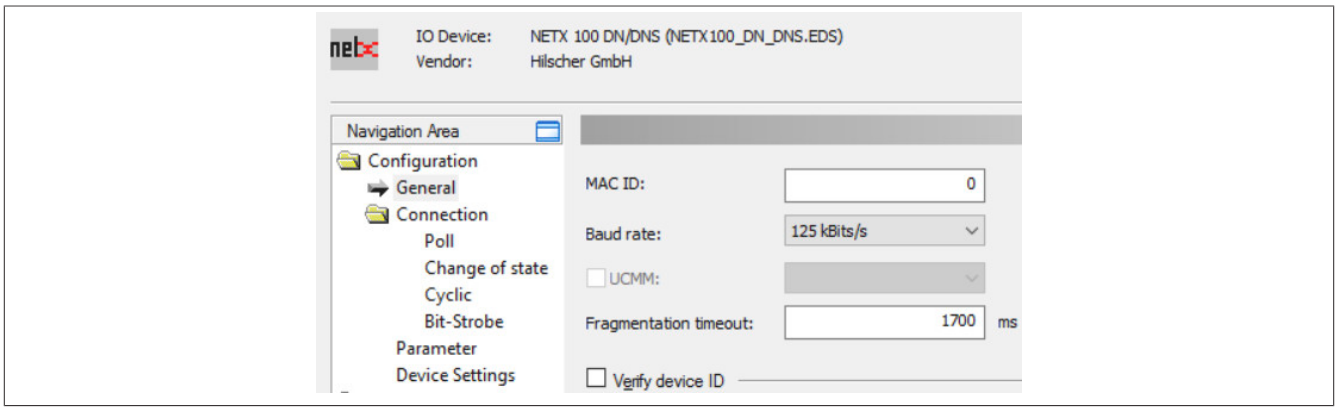
- The module is added to the project via drag-and-drop or by double-clicking on the interface card.



- 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.



Information:

The settings of the slave must match the settings of the corresponding EDS device description file; otherwise, no connection can be established.

5.1.2.1 General

General settings are configured here.

- MAC ID

This 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.

Information:

MAC ID addresses must be the same for both the master (device description file) and slave.

- Baud rate

This rate can be set between 125 and 500 kbit/s.

- Fragmentation timeout

This parameter defines how long the master waits until a slave answers a fragmented telegram.

- UCMM

This parameter is not supported.

- Verify device ID

This enables a comparison of the device description file with the existing hardware. The comparison only applies to the attributes selected in this area.

- Enable address switch

This parameter is not supported.

5.1.2.2 Connection

The connection type between master and slave can be selected here. The corresponding tab for additional configuration options can be activated by enabling a connection type.

All possible combinations are listed under "Valid combinations". If a combination is invalid, a corresponding error message will be sent.

Configure connection type

There is a tab marked with the respective name of the connection type (e.g. "Poll") that can be opened for additional settings. When selecting multiple connection types, Automation Studio generates a combination of the selected connection types. The inputs and outputs of ALL connection types are then combined in a single process image.

Information:

When combining connections, the number of inputs and outputs must be identical for all individual connection types.

A different number of inputs or outputs for the connection types results in an error message on the slave.

Example

Connection	Inputs/Outputs	Resulting process image		Inputs/Outputs	Resulting process image
Change of state:	10 inputs and 8 outputs	10 inputs and 8 outputs		10 inputs and 8 outputs	Results in an error message.
Cyclic connection:	10 inputs and 8 outputs			10 inputs and 7 outputs	

Connecting the slave with the master

The used inputs and outputs must be defined on the slave as well as in the device description file for this. If multiple connection types are selected on the slave, the inputs and outputs of all used connection types are listed as one single process image (see above). In the device description file on the master, however, the inputs and outputs are listed separately in the I/O mapping for each connection type.

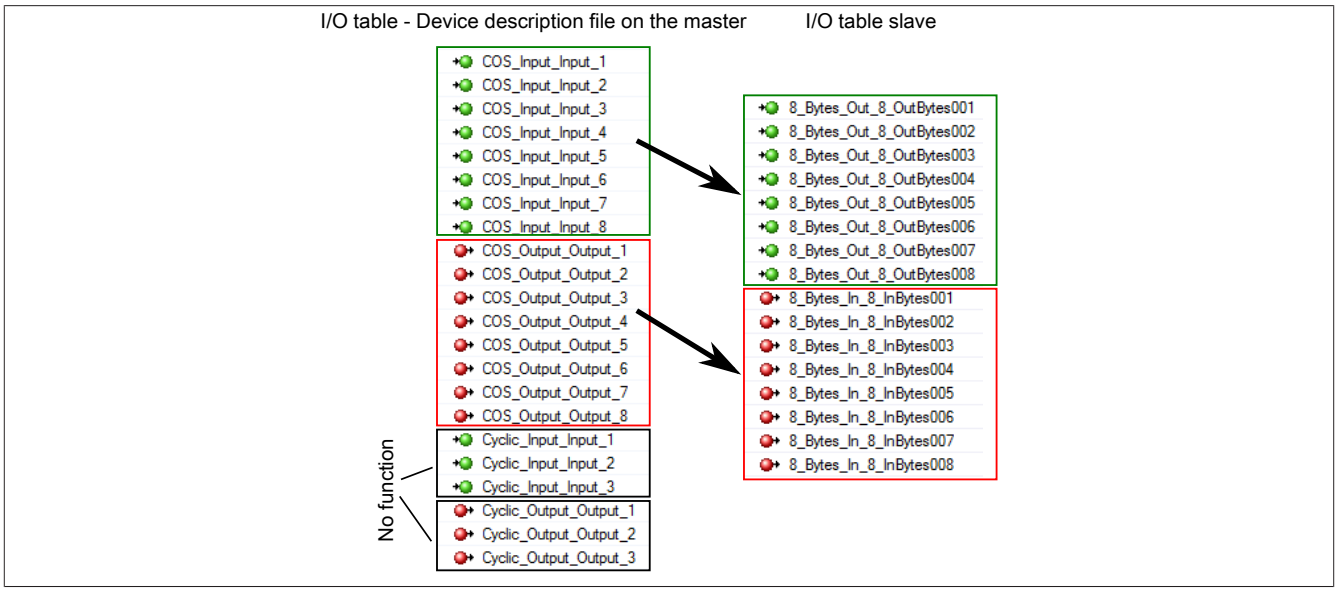
To ensure that the connection works properly, the following points must be observed:

- The number of defined inputs and outputs should be identical in the device description file and on the slave due to the fact that only the inputs and outputs defined on the slave are evaluated.
  - If there are more inputs or outputs in the device description file, these are ignored.
  - If there are less inputs or outputs in the device description file, the inputs or outputs on the slave remain without a function.
- Connection type "Bit strobe" only works via function block **AsNxDnM - AcyclicBitStrobing**. "Bit strobe" must also be enabled on the slaves.

Example

The change of state and cyclic connections are each set on the slave with 8 inputs and 8 outputs.
In the device description file on the master, the change of state connection is specified with 8 inputs and 8 outputs. The cyclic is specified with 3 inputs and 3 outputs.

The image shows the generated and evaluated data points:



Information:

The number of connection types used is only determined by the slave. Therefore, only the inputs and outputs of one connection type should be defined in the device description file.

The following settings can be assigned for each connection type.

- Length of the input and output data

The maximum length is 255 bytes; for bit strobes, it is 8 bytes.

- Timing

Parameter	Explanation
Production inhibit time	This parameter sets the time (in ms) within which identical telegrams are not permitted to be sent. This can be used to avoid sending identical telegrams too frequently and to reduce the bus load. A new telegram is only permitted to be sent after the delay time has expired. **Examples** Value 0: Telegrams can be sent without delay. Value 1000 in polling connection mode: A poll request telegram is sent every second (1000 ms). This parameter is not available for every connection type.
Expected packet rate	This parameter is always transmitted before an I/O transfer. If there is no response from the remote station within 4 times the time of the transmitted value, a timeout error occurs for the connection.
Watchdog timeout action	This parameter defines the behavior of the slave if the watchdog ("Expected packet rate") in the module has expired. • **Timeout:** The connection goes into a timeout state and remains in this state until the connection is reset or deleted. • **Auto reset:** The connection remains established and immediately resets the watchdog. • **Auto delete:** The connection is deleted when a timeout occurs.

5.1.2.3 Parameter

This parameter is not supported.

5.1.2.4 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	Data exchange is started automatically after the module is initialized.
Controlled by application	Data exchange is started by Automation Runtime.

Information:

Parameter "Manual start of bus communication" can be enabled under the I/O configuration of the DeviceNet 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 **AsNxDnS - nxdnsStartBusComm**.

- 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.

5.1.2.5 Device description

Device

This table displays the manufacturer information as defined in the EDS file.

EDS

The contents of the EDS file can be viewed and searched here.

5.1.3 I/O mapping

The I/O mapping resulting from the module configuration is opened by double-clicking on the DeviceNet slave.

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.

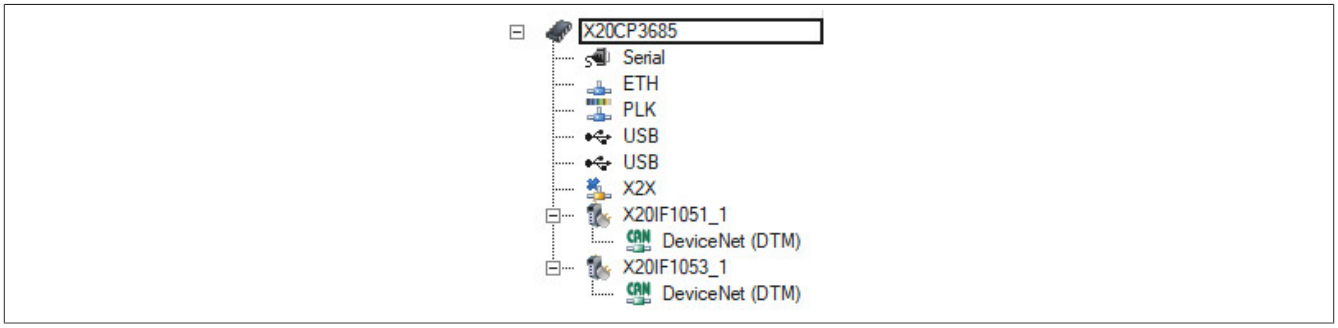
5.2 EDS device description file

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

5.3 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.



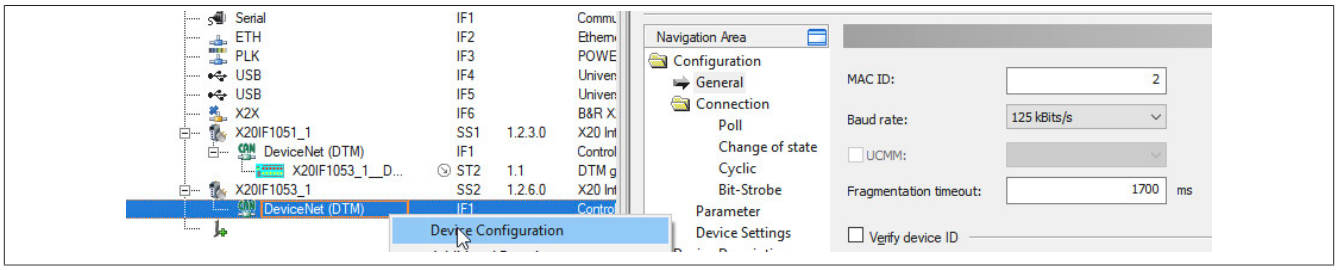
- To establish a connection between master and slave, the master must know the configuration data of the slave. To do this, the device description file of the X20IF1053-1 slave is imported into Automation Studio and attached to the master.

For details, see X20IF1051-1, section "Adding the EDS file in Automation Studio".

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

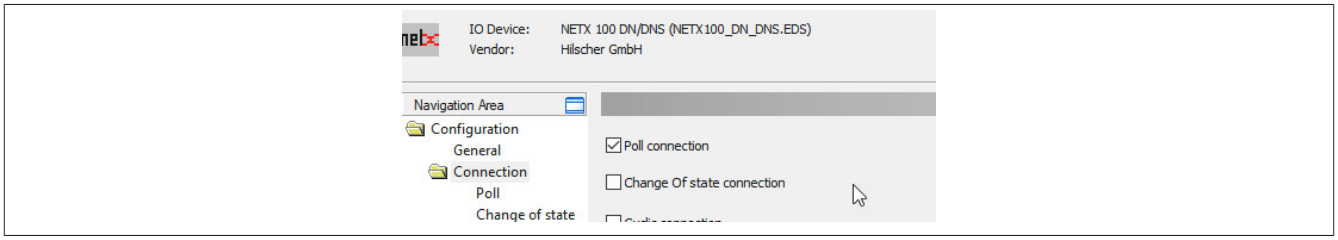
Settings on the slave

- 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.

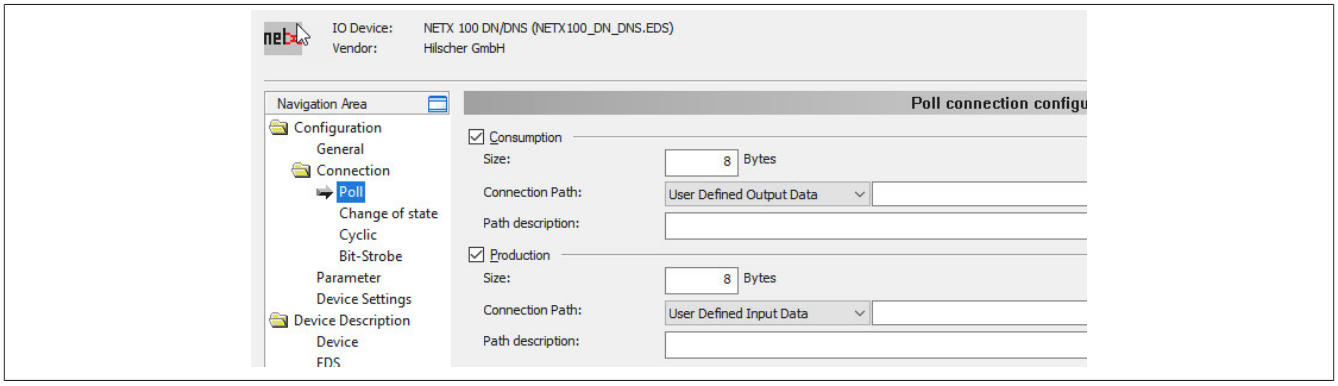


- Next, the connection type and I/O mapping are each defined with 8 bytes of input and output data.

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

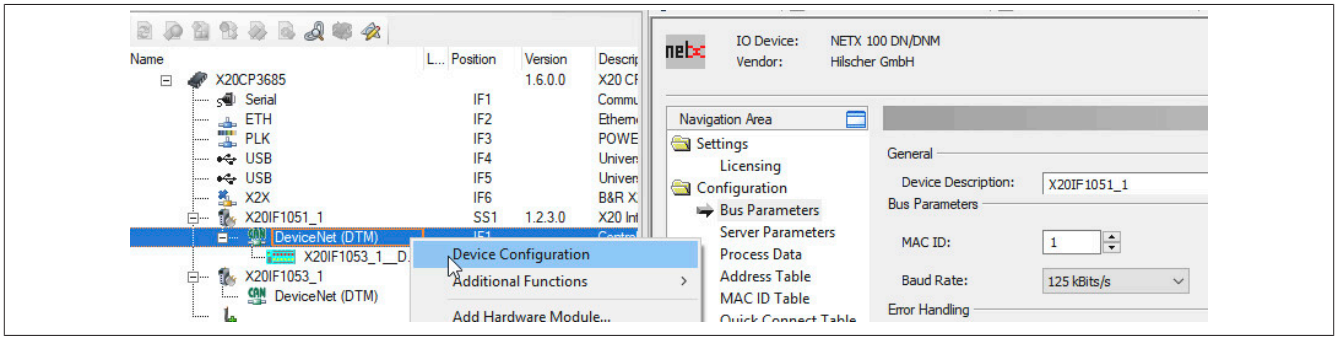


- Under "Poll connection configuration", 8 bytes each are entered for the input and output directions.

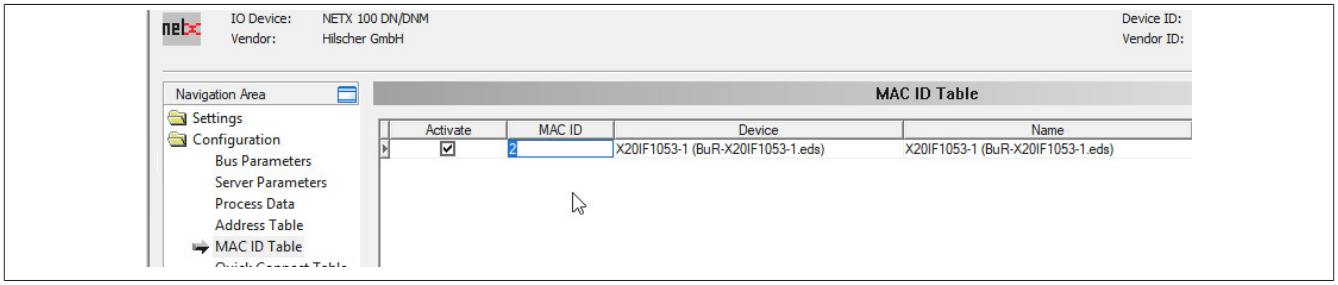


Settings on the master

- 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".

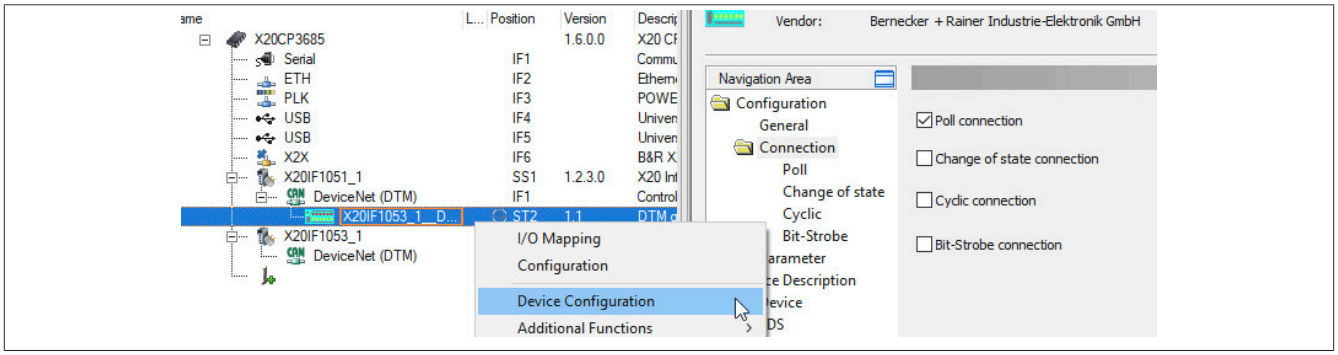


- Then the MAC ID of the slave is set under "MAC ID table".



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.