X20(c)IF1061-1

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 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
	X20 interface module communication	
X20IF1061-1	X20 interface module, for DTM configuration, 1 PROFIBUS DP V0/V1 master interface, electrically isolated	
X20cIF1061-1	X20 interface module, coated, for DTM configuration, 1 PROFIBUS DP V0/V1 master interface, electrically isolated	
	Optional accessories	
	Infrastructure components	
0G1000.00-090	Bus connector, RS485, for PROFIBUS networks	

Table 1: X20IF1061-1, X20cIF1061-1 - Order data

1.4 Module description

The interface module is equipped with a PROFIBUS DP V1 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:

- PROFIBUS DP V1 master
- Error monitoring

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.

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

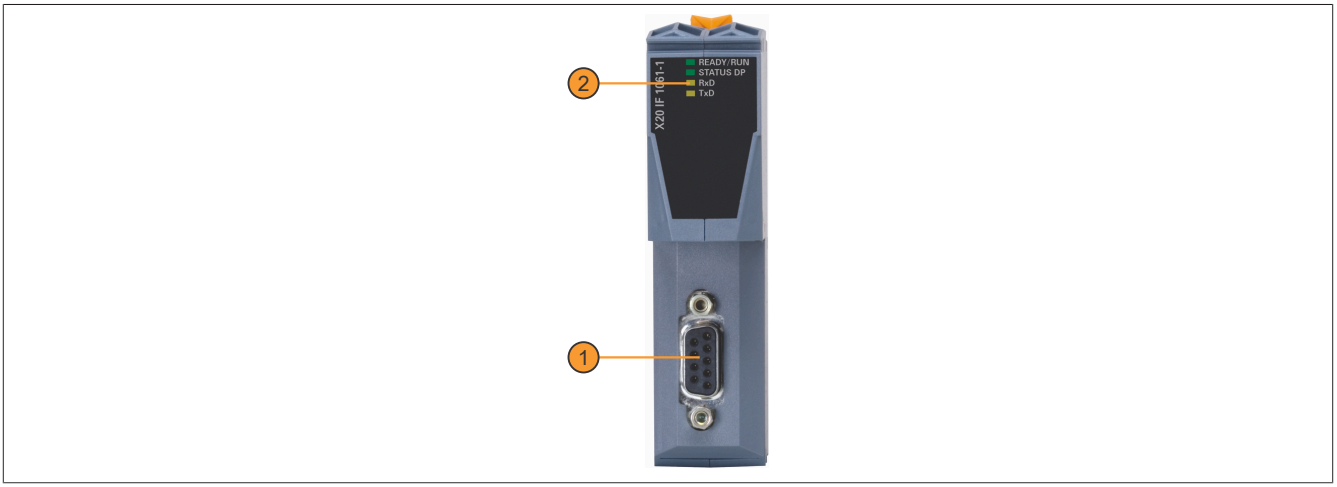
Order number	X20IF1061-1	X20cIF1061-1
Short description		
Communication module	1x PROFIBUS DP V0/V1 master	
General information		
B&R ID code	0xA716	0xE234
Status indicators	Module status, data transfer	
Diagnostics		
Module status	Yes, using LED status indicator and software	
Network status	Yes, using 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) 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	PROFIBUS DP V0/V1 master	
Variant	9-pin female DSUB connector	
Max. distance	1200 m	
Transfer rate	Max. 12 Mbit/s	
Controller	netX100	
Memory	8 MB SDRAM	
Cyclic data		
Input data	Max. 3.5 kB	
Output data	Max. 3.5 kB	
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: X20IF1061-1, X20cIF1061-1 - Technical data

Order number	X20IF1061-1	X20cIF1061-1
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: X20IF1061-1, X20cIF1061-1 - Technical data

2.2 Operating and connection elements



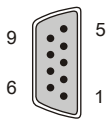
1	IF1 - PROFIBUS DP	2	LED status indicators

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	Acyclic blinking	No configuration or stack error
			Cyclic blinking	The bus is configured, but communication is not yet enabled by the application.
			On	Communication to all slaves established
		Red	Cyclic blinking	Communication to at least one slave interrupted
			On	Communication to all slaves / one slave interrupted
	RxD	Yellow	On	The module is receiving data from the PROFIBUS DP master interface.
	TxD	Yellow	On	The module is transmitting data via the PROFIBUS DP master interface.

2.2.2 PROFIBUS DP interface

A shielded line must be used for the interface.

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

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

3 Function description

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 PROFIBUS DP 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 ≥ 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.

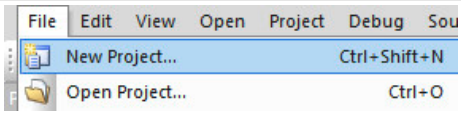
5 PROFIBUS DP interface

5.1 Settings in Automation Studio

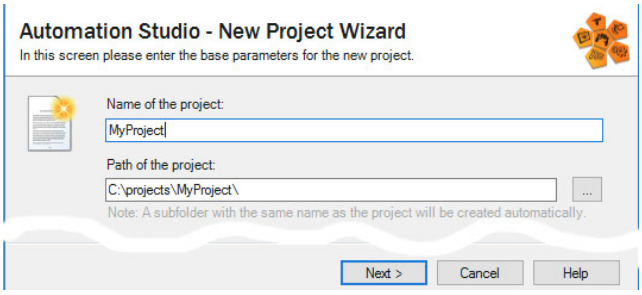
To configure the interface, a new Automation Studio project is created and the suitable settings are made on the module.

5.1.1 Creating an Automation Studio project

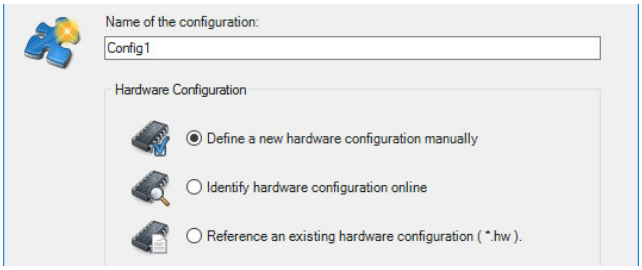
- Create a new Automation Studio project by selecting "New project".



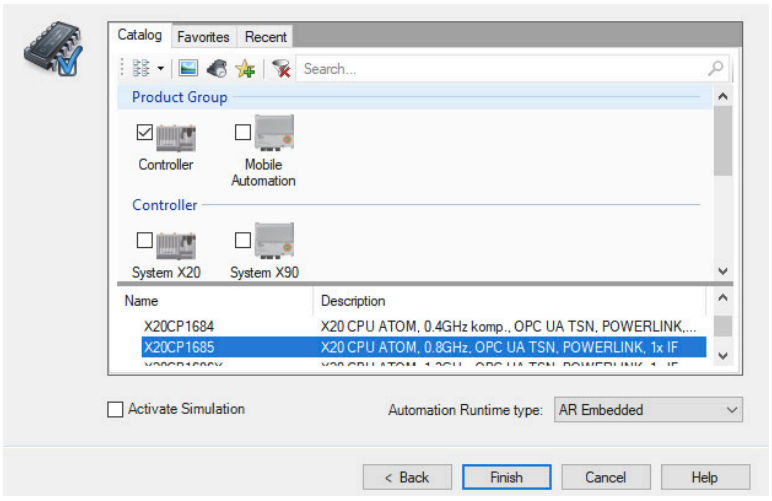
- Assign a project name and set up the project path.



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

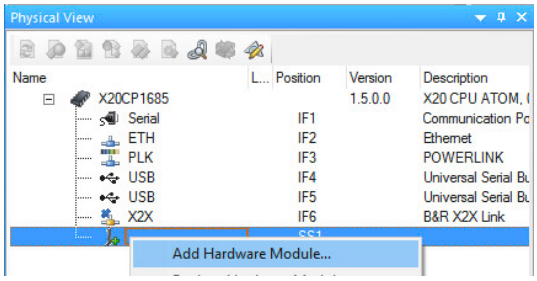


• If "Define a new hardware configuration manually" was selected, the hardware is selected in the next step. In order to simplify the search, different filters can be set for this in the Hardware Catalog. Finally, the Automation Studio project is created by selecting the required hardware is and clicking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

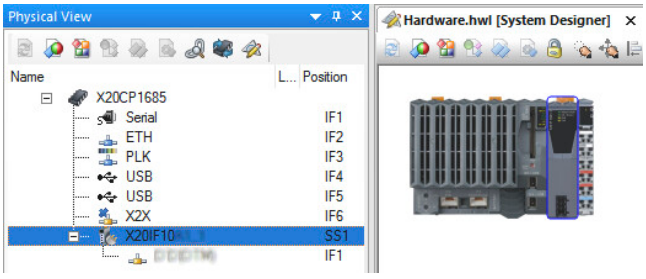


5.1.2 Adding and configuring the interface module

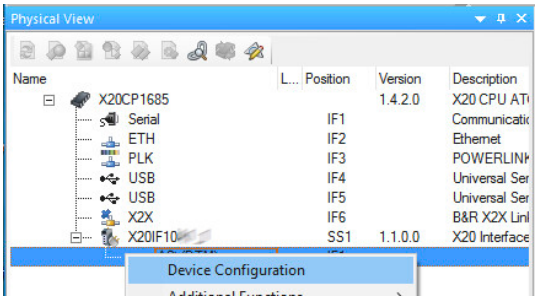
• In this example, the interface card is connected in the slot of a controller. Right-clicking on the slot and selecting "Add hardware module" opens the Hardware Catalog.



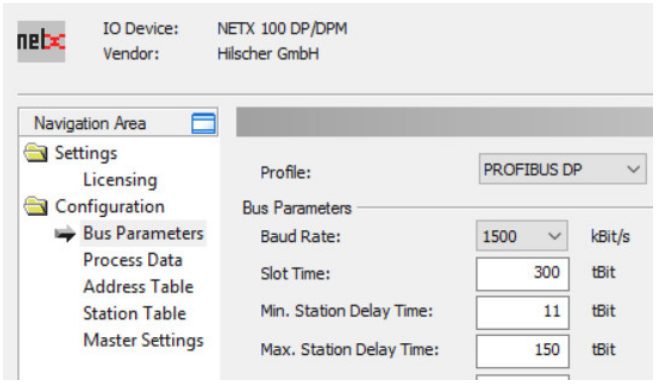
• The module is added to the project via drag-and-drop or by double-clicking on the interface card.



• 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 Bus parameters

- Profile

The desired PROFIBUS profile is set here.

Parameter	Explanation
PROFIBUS DP	**Decentralized peripherals:** Used to control sensors and actuators and to connect several controllers with each other.
PROFIBUS PA	**Process automation:** Runs protocol-based via PROFIBUS DP V1 class 2 services just like PROFIBUS DP. PROFIBUS PA runs on a different physical layer, however.

Both profiles can be connected using a media converter.

- Bus parameters

The bus parameters must be set depending on the profile used. When switching the profile, the default settings of the respective profile are automatically added.

Parameter	Explanation	Values
Baud rate	This parameter must be set the same for all devices. Changing the baud rate results in an automatic recalculation of dependent parameters, such as "Slot time".	
Slot time	This parameter is the monitoring time of the telegram transmitter and is used for the acknowledgment of the recipient.	37 to 16383
Min. station delay time	This parameter (min T_{SDR}) is the shortest time that must elapse between receiving the last bit of the telegram and transmitting the first bit of the following one.	1 to 65535
Max. station delay time	This parameter (max T_{SDR}) is the longest time span that must elapse between receiving the last bit of the telegram and transmitting the first bit of the following one. If an unanswered telegram (e.g. broadcast) is received, the transmitter must wait for this time to elapse before transmitting a new telegram.	1 to 65535
Quiet time	This parameter (T_{QUI}) defines the time delay that occurs with modulators and repeaters for the change from transmit to receive.	0 to 127
Setup time	This parameter (T_{SET}) is the response time of the transmitter. It determines the minimum time between receiving a confirmation and transmitting a new poll telegram.	0 to 255
Station address	This parameter defines the station address of the master.	0 to 125
Target rotation time	This parameter (T_{TR}) is the nominal token cycle time in milliseconds. The time the master has for transmitting the telegrams to the slaves depends on the difference between normal and actual token cycle time. The default value depends on the number of slaves and how they have been configured.	1 to 2^{24}-1
GAP actualization factor	This parameter (G) determines after how many token cycles an added station is included in the token ring. After time "G * T_{TR}" has elapsed, the station searches for other stations who want to be included in the logical ring.	0 to 255
Max. retry limit	This parameter determines the maximum number of retries to search for a station.	1 to 15
Highest station address (HSA)	This parameter is the highest bus address up to which the master searches to pass on the token to another master. ⓘ The address must always be higher than the station address of the master	1 to 126

Settings for correct communication:

T_{QUI} < min T_{SDR}
T_{RDY} < min T_{SDR}
T_{QUI} < T_{RDY}

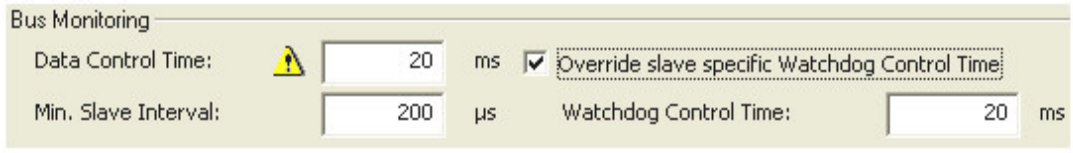
t_{BIT} (Bit time) is composed as follows:
t_{BIT} = 1 / Baud rate (in bit/s)
Bit time = Time[ms] * baud rate

- Bus monitoring

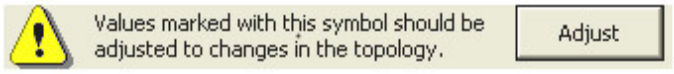
Parameter	Explanation	Values
Data control time	This parameter defines the time in which Data_Transfer_List is updated at least once. After this time has elapsed, the master automatically reports its operating state via command "Global_Control".	10 to 655,350
Min. slave interval	This parameter defines the minimum time period between 2 slave list cycles. The maximum value required by the active stations is specified here.	100 to 6,553,500
Override slave-specific watchdog control time	Each slave transmits a specific watchdog control time back to the master. This parameter makes it possible to overwrite individual slave-specific settings with the same value for all slaves configured on this master, for example, to set a consistent value for slower transfer rates for critical environments.	
Watchdog control time	The DP slaves use the watchdog control time setting to detect communication errors on the assigned master. If the slave detects an interruption in an already operational communication defined by a watchdog time, the slave performs an independent reset and sets the outputs to the safe state.	

Information:

If the bus configurations are changed and this change affects the bus parameters, a symbol (yellow exclamation mark) is displayed next to the affected parameters.



The bus parameters can be recalculated by clicking on "Adjust".



Error handling

"Auto clear" ON is used for error handling.

Parameter	Explanation
Enabled	The master changes from mode Operate to mode Clear (standby mode) and ends communication with all slaves as soon as at least one slave does not respond within the data control time.
Disabled	The master remains in mode Operate and communication with all accessible slaves is maintained.

- Calculated timing

Calculated timing is the time the transmitter remains idle after receiving the last bit of a telegram on the bus until the first bit of a new telegram is transmitted on the bus.

Bus time	Explanation	Formula
Tid1	Tid1 starts after the initiator has received an acknowledgment, response or token telegram.	Tid1 = max (T_{QUI} + 2 * T_{SET} + 2 + T_{SYN}, min TSDR) T_{SYN} (*)
Tid2	Tid2 starts after the initiator has transmitted a telegram that is not confirmed.	Tid2 = max (T_{QUI} + 2 * T^{SET} + 2 + T_{SYN}, max T_{SDR}) T_{SYN} (*)

5.1.2.2 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.

5.1.2.3 Address table

This table lists all slaves categorized according to their input and output data. The respective length of the input and output data as well as the assigned address can be read.

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

Parameter	Explanation
Station address	Station address of the assigned slave device
Device	Actual device name of the slave assigned from the GSD file.
Name	Name of the assigned slave device
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.

If auto-addressing is disabled, addresses can be entered manually.

Information:

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

5.1.2.4 Station table

All slaves are listed in this table.

Parameter	Explanation
Activate	This allows the slaves to be enabled or disabled. • **Slave disabled:** The master reserves memory in the process data image for the slave, but no data is exchanged. • **Slave enabled:** The master reserves memory in the process data image for the slave, and data is exchanged.
Station address	Station address of the assigned slave device. This address can be changed.

5.1.2.5 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.

- Process image storage format

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

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

Input process image

Storage format - Little-endian (default setting)

Module002_Output_1	16#00	16#00	USINT	
Module003_Input_2	16#3344	16#0000	UINT	
Module004_Output_2	16#0000	16#0000	UINT	

Storage format - Big-endian

Module002_Output_1	16#00	16#00	USINT	
Module003_Input_2	16#4433	16#0000	UINT	
Module004_Output_2	16#0000	16#0000	UINT	

- Advanced

Information:

Function "Enable configuration download during network state operate" is not permitted to be enabled.

- 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:

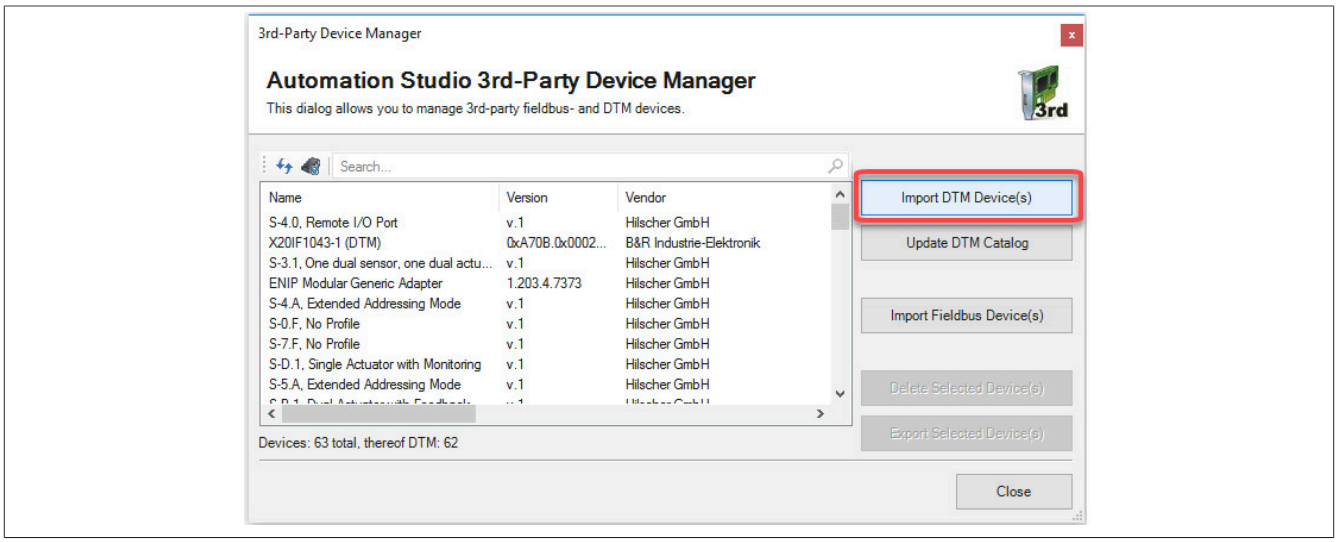
This configuration is automatically managed by Automation Runtime and is not permitted to be changed (default setting).

5.1.3 Adding the GSD file in Automation Studio

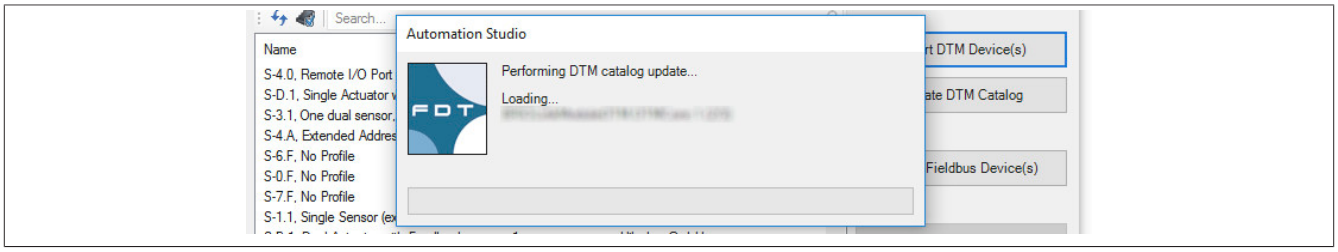
A device description file (GSD file) is required to inform the PROFIBUS DP master which slaves were connected and how they were configured.

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

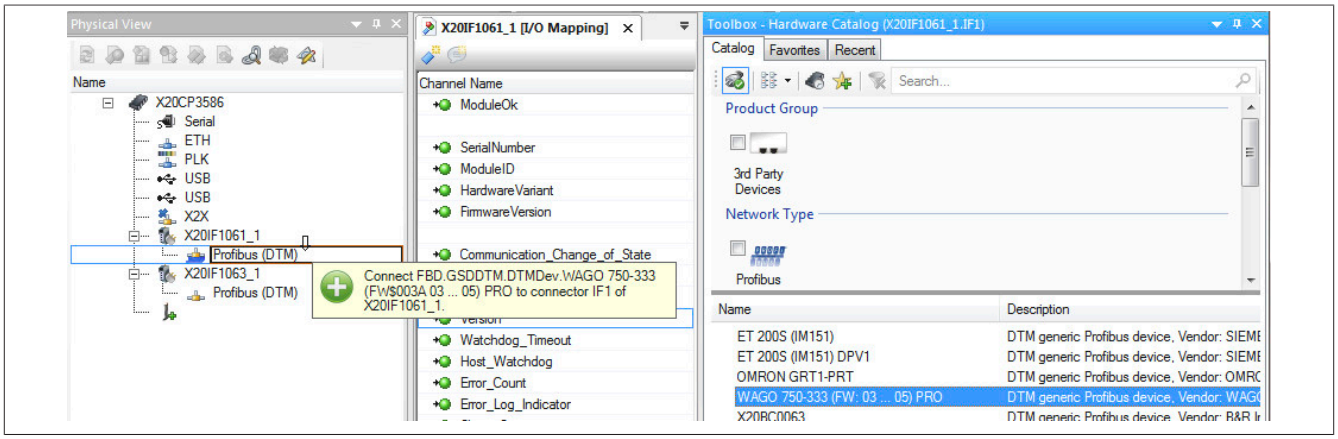
- If the PROFIBUS slave from B&R is used, download the GSD file from the B&R website (www.br-automation.com) and unzip the ZIP file.
- Open the dialog box in Automation Studio under "Tools - Manage 3rd-party devices" and select "Import DTM device(s)".



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



- Click on "PROFIBUS (DTM)" on PROFIBUS DP master X20IF1061-1, drag the GSD file from the Hardware Catalog and attach it to the PROFIBUS DP master.



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