User Manual

netTAP NT 100

Gateway Devices

Language: English

www.hilscher.com

Table of Contents

1 Introduction

1.1 About the User Manual

This user manual describes the hardware, configuration and diagnostic software, installation, commissioning, and operation of the netTAP NT 100 series of gateways.

1.1.1 List of Revisions

Index	Date	Chapter	Revisions
1	7 October 2008	all	Created
2	31 January 2009	1	Expanded and updated
		8	Chapter Factory Settings added
		11	Chapter Technical Data updated

Table 1: List of Revisions

1.1.2 Reference on Hardware, Software and Firmware

Device Type	Revision
NT 100-RE-DP	Revision 1
NT 100-RE-CO	Revision 1
NT 100-RE-DN	Revision 1
NT 100-DP-CO	Revision 1

Table 2: Reference on Hardware

Software

Software	Software Version
SYCONnet netTAP setup.exe	1.103.x.x

Table 3: Reference on Software

Firmware

Firmware File	Gateway (Conversion)	Firmware Version
NTPNSDPM.NXF	PROFINET IO Device / PROFIBUS-DP Master	1.1.x.x
NTEISDPM.NXF	EtherNet/IP Adapter / PROFIBUS-DP Master	1.1.x.x
NTOMBDPM.NXF	Open Modbus/TCP / PROFIBUS-DP Master	1.1.x.x
NTEISCOM.NXF	EtherNet/IP Adapter / CANopen Master	1.1.x.x
NTOMBCOM.NXF	Open Modbus/TCP / CANopen Master	1.1.x.x
NTECSDNM.NXF	EtherCAT Slave / DeviceNet Master	1.1.x.x
NTOMBDNM.NXF	Open Modbus/TCP / DeviceNet Master	1.1.x.x
NTDPSCOM.NXF	PROFIBUS-DP Slave / CANopen Master	1.1.x.x

Table 4: Reference on Firmware

1.1.3 Conventions in this Manual

Operating Instructions, a result of an operation step or notes are marked as follows:

Operating Instructions:

➢ <instruction>

Or

- <instruction>
- <instruction>

Results:

➪ <result>

Notes:

Note: <note>

1.2 Contents of the Product CD

The product CD for the netTAP NT 100 contains:

- Setup program for the configuration and diagnostic program SYCON.net
- USB Driver
- Documentation
- Firmware
- Device Description Files (GSD, GSDML, EDS, ...)

1.2.1 Directory Structure of the CD

All manuals on this CD are delivered in the Adobe Acrobat® Reader format (PDF).

Directory Name	Description
Adobe Flash Player	Adobe Flash Player installation program
Documentation	Documentation in the Acrobat® Reader Format (PDF)
Driver	USB driver for Windows (for netTAP NT 100)
EDS	Device Description File
Firmware	Loadable Firmware
Software	Configuration and diagnostic program SYCON.net

Table 5: Directory Structure of the CD

1.2.2 Device Description Files

The directory EDS on the CD provides device description files for the netTAP NT 100 device.

netTAP NT 100 as	File name
EtherCAT Slave	Hilscher NT 100-ECS-XX V2.0.xml
EtherNet/IP Adapter	HILSCHER NT 100-RE EIS V1.1.EDS
PROFIBUS-DP Slave	HIL_0C0E.GSD
PROFINET IO Device	GSDML-V2.1-HILSCHER-NT 100-RE PNS-20090123.xml

Table 6: Device description files for netTAP NT 100 on the CD

The device description files are fort he configuration of the used master.

1.2.3 Documentation for netTAP

The following documentation overview gives information, for which items you can find further information in which manual.

Note: Further information: All manuals listed in the overview below can be found in the Documentation directory on the CD delivered, in the Adobe Acrobat® Reader format (PDF).

Manual	Contents	Document name
User manual	netTAP NT 100 Installation, Operation and Hardware	netTAP_usermanual_en.pdf (this manual)
Operating Instruction Manual	netSlave DTM Configuration of the netTAP NT 100 as PROFINET IO Device (with gateway functionality), EtherNet/IP Adapter, Open Modbus/TCP Server, EtherCAT Slave, PROFIBUS-DP Slave.	netSlave_DTM_en.pdf
Operating Instruction Manual	DTM for PROFIBUS-DP Master devices	PROFIBUS_Master_netX_DTM_en.pdf
Operating Instruction Manual	Generic DTM for PROFIBUS-DP Slave devices	PROFIBUS_Generic_Slave_DTM_en.pdf
Operating Instruction Manual	DTM for CANopen Master devices	CANopen_Master_netX_DTM_en.pdf
Operating Instruction Manual	Generic DTM for CANopen Slave devices	CANopen_Generic_Slave_DTM_en.pdf
Operating Instruction Manual	DTM for DeviceNet Master devices	DeviceNet_Master_netX_DTM_en.pdf
Operating Instruction Manual	Generic DTM for DeviceNet Slave devices	DeviceNet_Generic_Slave_DTM_en.pdf

Table 7: Documentation for netTAP NT 100

1.3 Legal Notes

1.3.1 Copyright

1.3.2 Important Notes

The user manual, accompanying texts and the documentation were created for the use of the products by qualified experts, however, errors cannot be ruled out. For this reason, no guarantee can be made and neither juristic responsibility for erroneous information nor any liability can be assumed. Descriptions, accompanying texts and documentation included in the user manual do not present a guarantee nor any information about proper use as stipulated in the contract or a warranted feature. It cannot be ruled out that the user manual, the accompanying texts and the documentation do not correspond exactly to the described features, standards or other data of the delivered product. No warranty or guarantee regarding the correctness or accuracy of the information is assumed.

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- for the design, construction, maintenance or operation of nuclear facilities;
- in air traffic control systems, air traffic or air traffic communication systems;
- in life support systems;
- in systems in which failures in the software could lead to personal injury or injuries leading to death.

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1.3.6 Registered Trademarks

Windows® 2000 / Windows® XP are registered trademarks of Microsoft Corporation.

Adobe-Acrobat® is a registered trademark of the Adobe Systems Incorporated.

Modbus® is a registered trademark of Schneider Automation

1.4 Licenses

If the netTAP NT 100 device is used with a firmware with master functionality a master license in the netTAP device must be present.

2 Safety

2.1 Intended Use

The devices

- NT 100-RE-DP
- NT 100-RE-CO
- NT 100-RE-DN
- NT 100-DP-CO

described in this user manual are devices for communication and connect two communication networks. The NT 100 devices work as a gateway between these two networks.

The NT 100 devices are in a compact housing and suitable for DIN rail mounting according to DIN EN 60715.

2.2 Personnel Qualification

The netTAP NT 100 Gateway must only be installed, configured and removed by qualified personnel.

2.3 Labeling of Safety Instructions

The safety instructions are pinpointed particularly. The instructions are highlighted with a specific safety symbol, a warning triangle and a signal word according to the degree of endangerment. Inside the note the danger is exactly named. Instructions to a property damage message do not contain a warning triangle.

Symbol	Sort of Warning or Principle
	Safety symbol for the warning to personal injury
	Warning of danger by electrical current
	Warning of damages by electrostatic discharge

Table 8: Safety Symbols and Sort of Warning or Principle

2.3.1.1 Signal Words

Signal Word	Meaning
DANGER	indicates a direct hazard with high risk, which will have as consequence death or grievous bodily harm if it isn't avoided. The use of this signal word shall be restricted to extremely hazard.
WARNING	indicates a possible hazard with medium risk, which will have as consequence death or (grievous) bodily harm if it isn't avoided.
CAUTION	indicates a minor hazard with medium risk, which could have as consequence simple battery if it isn't avoided.
Note	Indicates an important note in the manual.

Table 9: Signal Words

2.3.1.2 Signal Words USA

Signal Word	Meaning
DANGER	Indicates a Hazardous Situation Which, if not Avoided, will Result in Death or Serious Injury.
WARNING	Indicates a Hazardous Situation Which, if not Avoided, could Result in Death or Serious Injury.
CAUTION	Indicates a Hazardous Situation Which, if not Avoided, may Result in Minor or Moderate Injury.
NOTICE	Indicates a Property Damage Message.
Note	Indicates an Important Note in the Manual.

Table 10: Signal Words according to ANSI

3 Description and Requirements

3.1 Description

The devices

- NT 100-RE-DP
- NT 100-RE-CO
- NT 100-RE-DN
- NT 100-DP-CO

described in this user manual are devices for communication and connect two communication networks. The NT 100 devices work as a gateway between these two networks.

The netTAP NT 100 devices provide a modular structure with either two different Fieldbus interfaces or one Fieldbus interface and one Ethernet interface. Both interface are available as connection at the housing of the netTAP (X2, X3 front connection).

Furthermore an USB interface for configuration and diagnostic purposes with a PC is available at the netTAP.

The following table gives information about the possible protocol conversions and the needed NT 100 device type.

NT 100 device type	Protocol on X2	Protocol on X3
NT 100-RE-DP	PROFINET IO Device	PROFIBUS-DP Master
	EtherNet/IP Adapter	PROFIBUS-DP Master
	Open Modbus/TCP	PROFIBUS-DP Master
NT 100-RE-CO	EtherNet/IP Adapter	CANopen Master
	Open Modbus/TCP	CANopen Master
NT 100-RE-DN	EtherCAT Slave	DeviceNet Master
	Open Modbus/TCP	DeviceNet Master
NT 100-DP-CO	PROFIBUS-DP Slave	CANopen Master

Table 11: List of possible protocol conversions and NT 100 device types

The gateway function is specified by the loadable firmware in each case.

The configuration of the device is performed with the configuration and diagnostic software SYCON.net for netTAP.

The firmware stores the cyclic send and receive data of the protocol on port X2 and the protocol on port X3 in an device internal memory for each port. The data received by the protocol on port X2 can be mapped to the data send by the protocol on port X3 and the data received by the protocol on port X3 can be mapped to the data send by the protocol on port X2 using the configuration software.

Status information of the protocol on port X2 can be mapped to the data send by the protocol on port X3 and visa versa.

The firmwares of the netTAP NT 100 devices with gateway functionality don’t support any mapping of acyclic services/telegrams.

3.2 System Requirements

For correct application of the netTAP NT 100, the gateway device must be mounted on a DIN-rail according to DIN EN 60715.

A suitable power supply is required. The voltage to be applied must be in the allowed range 24 V ± 6 V DC. The power supply must be able to deliver at least a current of 100 mA at 24 V.

Power supply is possible via pins 1 (GND) and 2 (24V) of the netTAP NT 100 power supply connector located on the upper side of the device..

CAUTION!

Device Destruction!

- The voltage must not exceed 30 V significantly, otherwise the device may be destroyed or damaged.

NOTICE

Device Destruction!

- The voltage must not exceed 30 V significantly, otherwise the device may be destroyed or damaged.

In order to avoid damage caused by overheating or freezing, it is necessary that the temperature of the device does not exceed the limits of the allowed temperature range.

The following preconditions must additionally be met in order to operate the Gateway device successfully:

1. The Gateway device must have been provided with the correctly suiting firmware.
2. The Gateway device must have been configured correctly using the SYCON.net System Configurator.

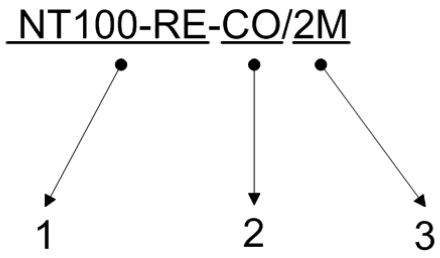
3.3 System Requirements for SYCON.net System Configurator

The system requirements necessary for the application of the SYCON.net System Configurator are these:

1. PC with Pentium® processor or higher, minimum 1 GHz
2. Operating system: Windows® 2000 or Windows® XP
3. Free space on hard disk: min. 150 MByte
4. CD ROM drive
5. RAM: min. 256 MByte
6. Graphics resolution: min 1024 x 768 pixels
7. Keyboard and mouse for input and operation

4 Device Versions and Usage Scenarios

4.1 Device Names



The descriptive device name of netTAP devices consists of the following parts

1. Network on port X2 (left part of device), in the example RE for Real-time Ethernet
2. Network on port X3 (right part of device), in the example CO for CANopen
3. Number of master licenses within the device (max. 2)

The following communication systems are currently supported as basic network:

Code	Supported Communication System
RE	Real-time Ethernet (2* RJ45 connectors)
DP	PROFIBUS-DP

Table 12: Network on port X2

The following communication systems are currently supported as subnetwork:

Code	Supported Communication System
DP	PROFIBUS-DP
CO	CANopen
DN	DeviceNet

Table 13: Network on port X3

4.1.1 Usage Scenarios

The following scenarios can be handled with gateway devices from netTAP NT 100 series:

- Fieldbus Slave to Fieldbus Master
- Ethernet to Fieldbus Master

4.1.2 Scenario 1: Fieldbus Slave to Fieldbus Master

The netTAP NT 100 acts as a fieldbus slave on port X2 and as a master on port X3.

The following devices of the netTAP 100 series support this scenario:

Device Name	Supported Fieldbus System (port X2)	Supported Fieldbus System (port X3)
NT100-DP-CO	PROFIBUS-DP Slave	CANopen Master

Table 14: NT 100 for Fieldbus Slave to Fieldbus Master

4.1.3 Scenario 2: Ethernet to Fieldbus Master

The netTAP NT 100 acts as a Ethernet (slave) on port X2 and as a fieldbus master on port X3.

The following devices of the netTAP 100 series support this scenario:

Device Name	Supported Ethernet System (port X2)	Supported Fieldbus System (port X3)
NT100-RE-DP	PROFINET IO Device	PROFIBUS-DP Master
	EtherNet/IP Adapter	PROFIBUS-DP Master
	Open Modbus/TCP (Server)	PROFIBUS-DP Master
NT 100-RE-CO	EtherNet/IP Adapter	CANopen Master
	Open Modbus/TCP (Server)	CANopen Master
NT 100-RE-DN	EtherCAT Slave	DeviceNet Master
	Open Modbus/TCP (Server)	DeviceNet Master

Table 15: NT 100 for Ethernet to Fieldbus Master

5 Install the NT 100 device

5.1 Mounting the NT 100 at the DIN Rail

Install the DIN rail according to DIN EN 60715 for the netTAP NT 100 at the designated mounting place.

- **[A]** Insert the netTAP with the upper side of the mounting plate into the DIN rail.

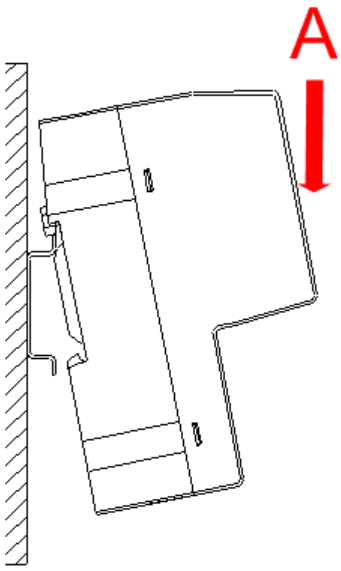


Figure 1: Mounting of netTAP NT 100 Device at DIN Rail - Step A

➢ **[B]** Then press the netTAP at its lower side towards the mounting plate until it engages at the DIN rail.

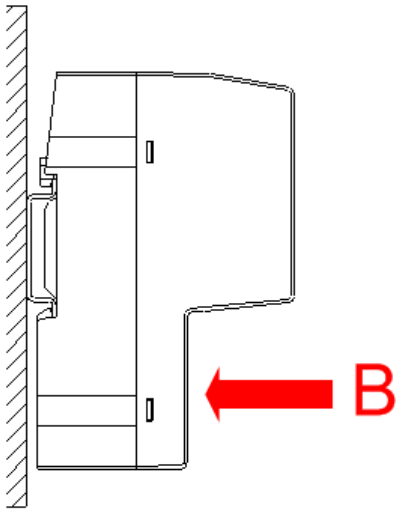


Figure 2: Mounting of netTAP NT 100 Device at DIN Rail - Step B

Afterwards connect the 24 V power supply to the device. The grounding is made by the earth terminal to the DIN rail at the back side of the device.

5.2 Taking the NT 100 off the DIN Rail

For dismounting the netTAP, first remove the power supply of the device.

To remove the device from the DIN rail, use a screw driver, which has to be applied in the mounting link at the lower side of the netTAP and open the interlock.

6 Installing Software and Driver

6.1 Installing the USB Device Driver

In the netTAP NT 100 device is connected the first time to a Windows PC, the operating system Windows detects a new device and the USB device driver is needed. The USB driver is necessary that the configuration and diagnostic program SYCON.net can communication with the netTAP device.

To install the USB device driver do the following:

- Connect with an USB cable the USB connector of the netTAP device with the USB connector of the PC.

⇘ Windows® 2000 / Windows® XP recognize the netTAP NT 100 device automatically. The message **Found New Hardware** is displayed and the **Found new Hardware Wizard** is started.

- Insert the installation CD in the local CD ROM drive now.
- Click to the button **Next >**.

⇘ The **Found new Hardware Wizard** asks you to select the research- and installation options.

- Select **Search for the best driver in these locations**.
- Activate the checkbox Search removable media (floppy, CD-ROM...).
- Click to the button **Next >**.

⇘ The USB driver is located in the directory Driver on the CD-ROM.

- Click in **Found new Hardware Wizard > Completing the Found new Hardware Wizard** to the button **Finish**.

⇘ The installation of the **USB Driver** is complete.

6.2 Installing SYCON.net

To install the configuration and diagnostic program **SYCON.net**:

- Close all application programs on the system!
- Insert the netTAP CD to the local CD ROM drive.
- Start in the directory **Software/SYCON.net** the SYCON.net setup program *SYCONnet netX setup.exe*.

Or:

- Select **Configuration and diagnostic with SYCON.net** of the autostart menu.

Note: Administrator privileges are required on Windows® 2000/ Windows® XP systems for installation!

- Follow the instruction of the setup program

7 Configuration of the NT 100 device

7.1 Configuration of NT 100 as Gateway

The configuration of the NT 100 devices is explained exemplarily with the protocol conversion PROFINET IO Device to PROFIBUS-DP Master.

The device NT 100-RE-DP with one master license is necessary for the protocol conversion from PROFINET IO Device to PROFIBUS-DP Master.

The following steps have to be done to configure the device:

1. Start SYCON.net

➢ Select **Start > Programs > SYCON.net > SYCON.net FDT Container**

➪ SYCON.net is startet

2. User Login

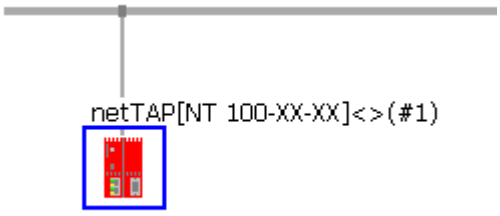
➢ In the window SYCON.net User Login press the button OK to login or enter your password and then press the button OK to login

➪ SYCON.net frame application appears

3. Insert NT 100-XX-XX device

➢ Go to the device catalog under vendor **Hilscher GmbH** to the category Gateway. Use drag and drop with the **NT 100-XX-XX** device to insert it at the bus line.

➪ The NT 100-XX-XX device appears in the project

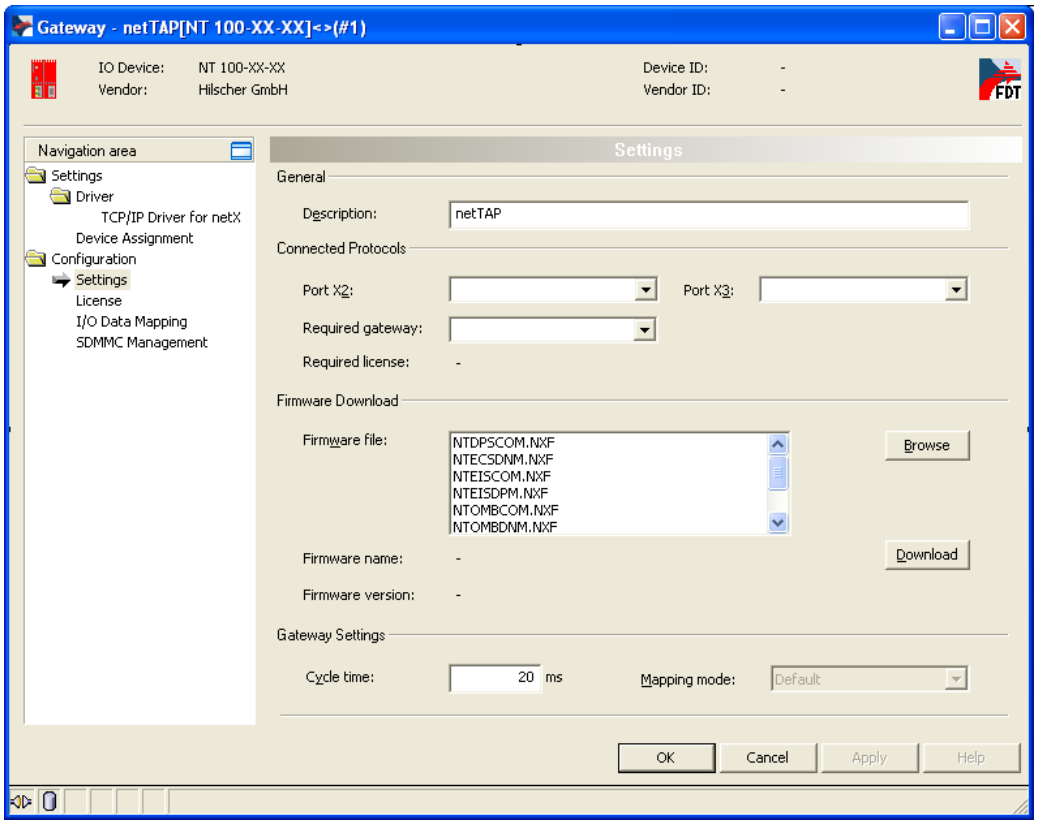


4. Open the Gateway configuration window

➢ Select from the context menu of the NT 100-XX-XX symbol (right mouse click) the entry **Configuration > Gateway**

➢ The Gateway configuration window opens

➢ Select in the Navigation area **Configuration** > **Settings**



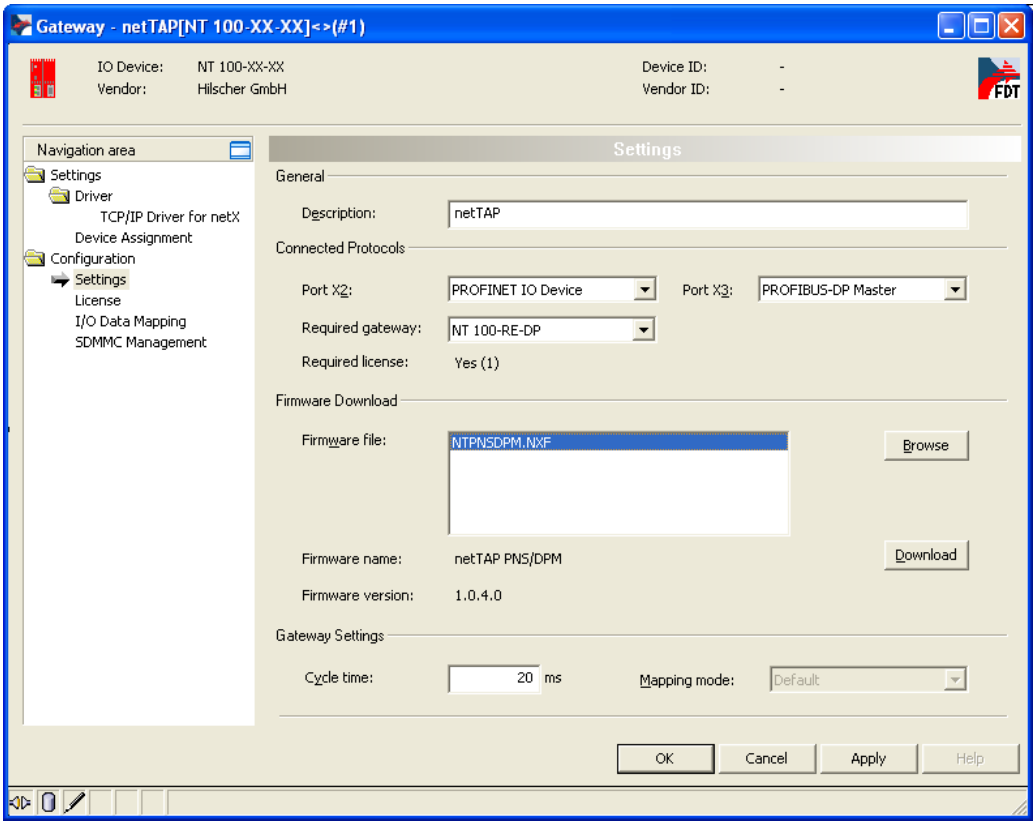
5. Select the protocols

➢ Select in the window **Configuration > Settings** at **Connetced Protocols** for **Port X2** the protocol PROFINET IO Device

➢ Select then for **Port X3** the protocol PROFIBUS-DP Master

➢ Click the button **Apply**

➢ The Gateway configuration window shows the following



6. Close the Gateway configuration window

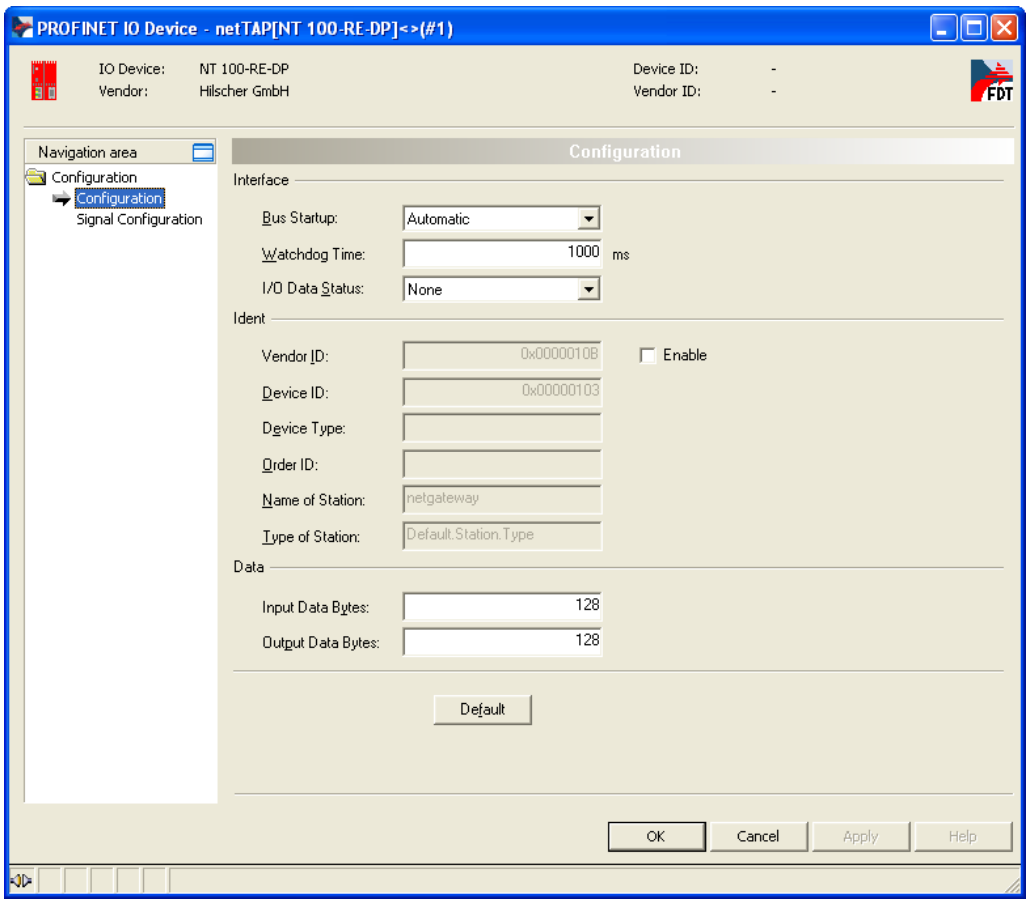
➢ Click on the button **OK**

➢ The Gateway configuration window closes

7. Configure the base network (network on Port X2)

➢ Select from the context menu of the NT 100-XX-XX symbol the entry **Configuration > PROFINET IO Device**

➢ The PROFINET IO Device configuration window opens



➢ Set the parameters. Set especially the number of Input Data Bytes and Output Data Bytes.

More information about PROFINET IO Device parameter are in section *NT 100 – Configuration PROFINET IO Device* on page *43*.

8. Close the configuration window

➢ Click on the button **OK**

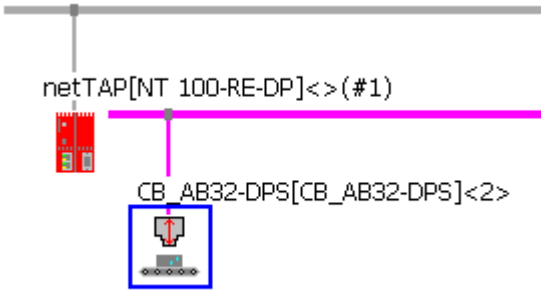
➢ The configuration window closes

9. Insert the PROFIBUS-DP Slave devices into the PROFIBUS network

➢ Go to the device catalog. Use drag and drop with one or more PROFIBUS-DP Slave devices to insert it/them at the PROFIBUS bus line.

➢ Missing PROFIBUS-DP Slave devices can be added to the dvice catalog using the menu **Netzwork > Import Device Descriptions**. Import the GSD file of the PROFIBUS-DP Slave.

➢ The PROFIBUS-DP Slave device icons appear at the PROFIBUS network line



10. Configure the PROFIBUS-DP Slave device

➢ Open the configuration window with a double click on the device icon of the PROFBUS-DP Slave

➢ The configuration window of the PROFIBUS-DP Slave device opens

More information about the configuration of PROFIBUS-DP Slave devices are in the document PROFIBUS_Generic_Slave_DTM_en.pdf in section *Configuration*

11. Open the PROFIBUS-DP Master (Port X3) configuration window

➢ Select from the context menu of the NT 100-XX-XX symbol the entry **Configuration > PROFIBUS-DP Master**

➢ The PROFIBUS-DP Master configuration window opens

12. Configure the PROFIBUS-DP Master

➢ Set the parameter. Set especially under **Configuration > Bus Parameter** the bus parameter and under **Configuration > Stationtable** the station addresses (stations addresses of the PROFIBUS-DP Slave devices)

More information about the configuration of PROFIBUS-DP Master devices are in the document PROFIBUS_Master_netX_DTM_en.pdf in section *Configuration*

13. Close the configuration window

➢ Click on the button **OK**

➢ The configuration window closes

14. Open the Gateway configuration window

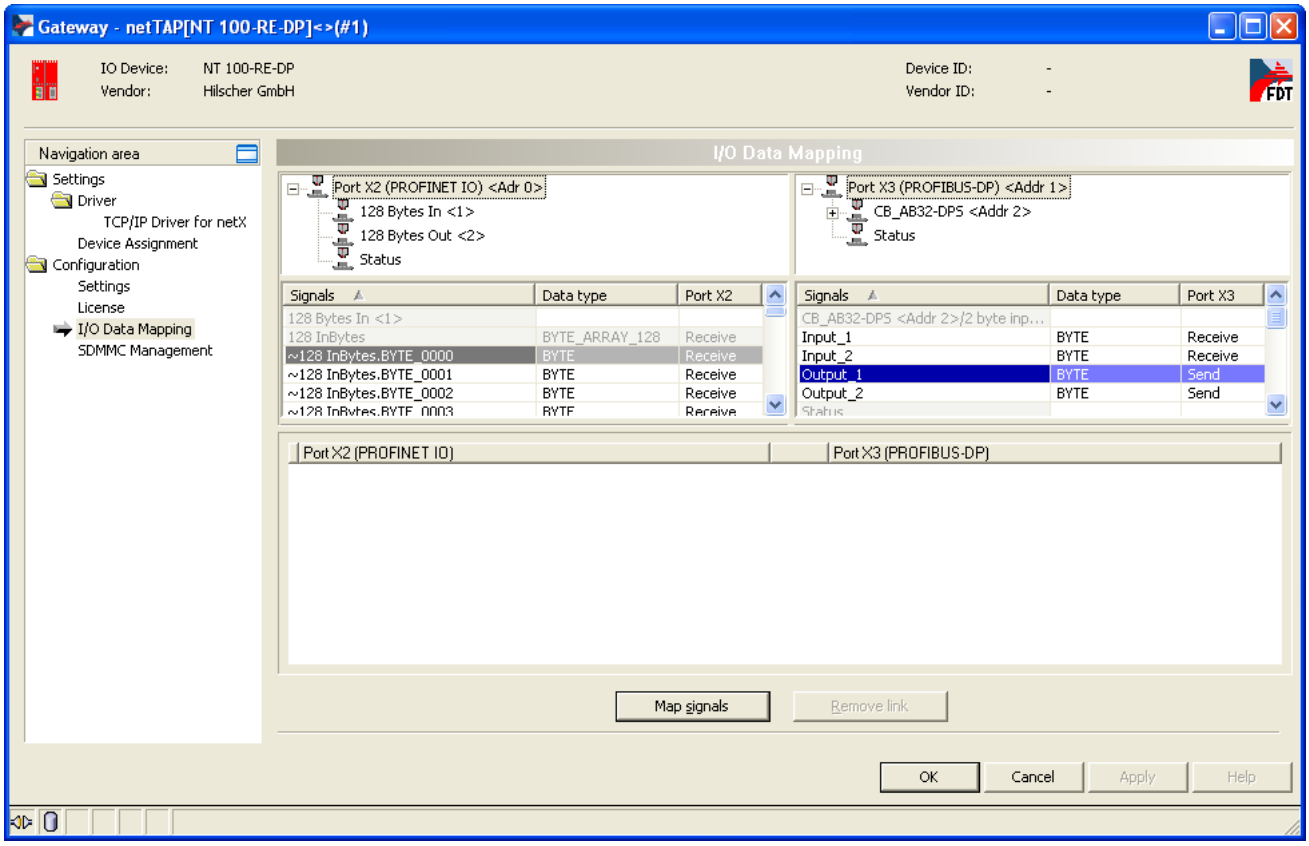
➢ Select from the context menu of the NT 100-XX-XX symbol the entry **Configuration > Gateway**

➢ The Gateway configuration window opens

15. Open the I/O Data Mapping window

➢ Select **Configuration > I/O Data Mapping**

➢ The window I/O Data Mapping opens



16. I/O Mapping: Data transfer from Port X2 to Port X3

➢ Map the signals, which are received on Port X2 (Port X2 receive), with signals, which should be send on Port X3 (Port X3 send).

➢ For this, mark the signal received (Port X2) and the signal to be send (Port X3) and the click the button **Map Signals**
Or
Map the signal using drap and drop. For this, drag the signal received (Port X2 receive) and drop it on the signal to be send (Port X3 send)

17. I/O Mapping: Data transfer from Port X3 to Port X2

- Map the signals, which are received on Port X3 (Port X§ receive), with signals, which should be send on Port X2 (Port X2 send).
- For this, mark the signal received (Port X§) and the signal to be send (Port X2) and the click the button **Map Signals**
  Or
  Map the signal using drap and drop. For this, drag the signal received (Port X3 receive) and drop it on the signal to be send (Port X2 send)

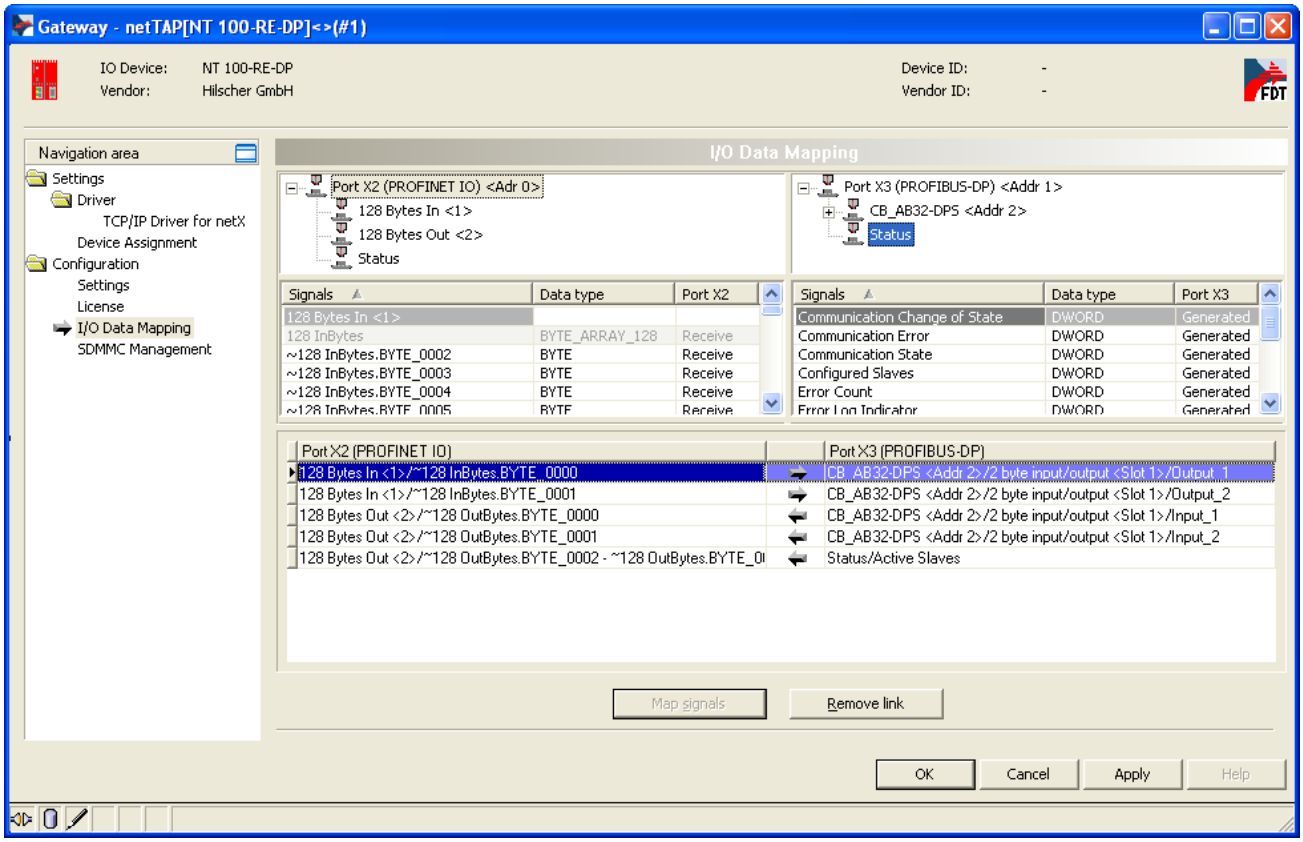
18. I/O Mapping: Transfer status info of Port X2 to Port X3

- If necessary, map the status information of Port X2 (Port X2 generated, which are generated device internal) to signals which should be send on Port X3 (Port X3 send)
- For this mark the status signal (Port X2) and the signal which should be send (Port X3) and click the button **Map Signals**
  Or
  Map the signal using drag and drop. For this, drag the status signal (Port X2 generated) and drop it on the signal to be send (Port X3 send)

19. I/O Mapping: Transfer status info of Port X3 to Port X2

- If necessary, map the status information of Port X3 (Port X3 generated, which are generated device internal) to signals which should be send on Port X2 (Port X2 send)
- For this mark the status signal (Port X3) and the signal which should be send (Port X2) and click the button **Map Signals**
  Or
  Map the signal using drag and drop. For this, drag the status signal (Port X3 generated) and drop it on the signal to be send (Port X2 send)

➧ An example of the I/O Data Mapping window after steps 16 to 19 shows the following figure



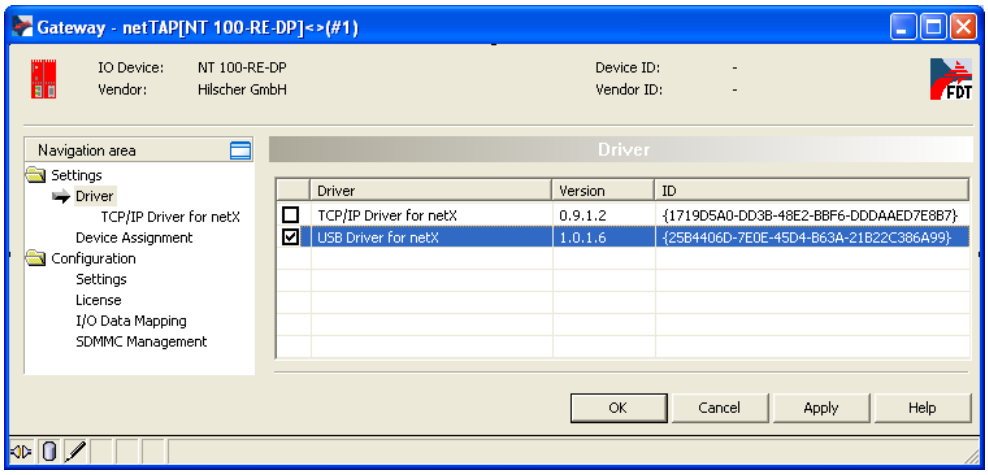
20. Connect the USB cable

➢ Connect with an USB cable the USB connector of the netTAP device with the USB connector of the PC.

21. Select the USB driver

➢ Select **Settings > Driver** and then check **USB Driver for netX**

➧ The following figure shows the selected USB Driver



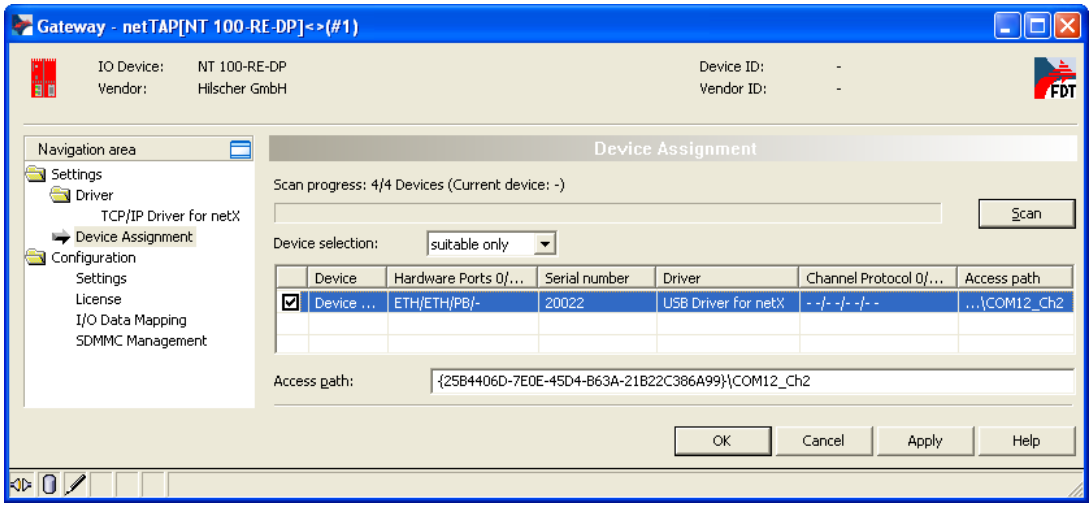
22. Device Assignment

➢ Select **Settings > Device Assignment**

➢ Click the button **Scan**

➢ Check the found netTAP device

➧ The following figure shows the assigned device



23. Load Firmware

➢ Select **Configuration > Settings**

➢ Mark the Firmware file in section Firmware Download

➢ Click the button **Download**

➧ The firmware is loaded into the netTAP device

24. Close the Gateway configuration window

➢ Click the button **OK**

➧ The Gateway configuration window closes

25. Download configuration

➢ Select from the context menu of the NT 100-XX-XX symbol the entry **Download**

➢ Answer the security question with Yes, if the download should start

➧ The configuration is transfered info the netTAP device

26. Device Description File for the configuration of the Master

➢ Use fort he configuration of the PROFINET IO Controller the device description file GSDML-V2.1-HILSCHER-NT 100-RE PNS-20090123.xml from the CD from the directory EDS/PROFINET.

7.2 NT 100 – Configuration EtherCAT Slave

The NT 100 device as EtherCAT Slave needs parameter.

To open the configuration window:

- Select from the context menu of the NT 100-XX-XX symbol the entry **Configuration > EtherCAT Slave**

↬ The EtherCAT Slave configuration window opens

Set the number of input data bytes and of the output data bytes:

- Enter in the field Input Data Bytes the number of data bytes, that the EtherCAT Master should transfer to the NT 100 device, e. g. 32
- Enter in the field Output Data Bytes the number of data bytes, that the NT 100 device should transfer to the EtherCAT Master, e. g. 64

Note: Default values can be used normally for the other parameters. Depending on additionally requirements parameters needs to be adjusted if necessary.

7.2.1 EtherCAT Slave Parameter

Parameter	Meaning	Range of Value / Value
Interface		
Bus Startup	Communication start: automatic	Automatic
Watchdog Time [ms]	Watchdog time within which the device watchdog must be retriggered from the application program while the application program monitoring is activated. When the watchdog time value is equal to 0 the watchdog respectively the application program monitoring is deactivated. This function is not supported.	[0, 20 … 65535] ms, default = 1000 ms, 0 = Off
I/O Data Status	Status of the input or the output data. For each input and output data the following status information (in Byte) is memorized in the dual-port memory: Status 0 = None (default) Status 1 = 1 Byte (for future use) Status 2 = 4 Byte (for future use)	None, (1 Byte, 4 Byte) Default: None
Ident		
Vendor ID	Identification number of the manufacturer	0 … (2^{32} - 1), Hilscher: 0044 (hex), (68)
Product Code	Product code of the device	0 … (2^{32} - 1), Default: NT 100: 0x000D
Revision Number	Revision number of the device	0 … (2^{32} - 1), Default: 0x00000000
Serial Number	Serial number of the device	0 … (2^{32} - 1) Default: 0x00000000
Data		
Input Length	Length of the input data in Byte	0 … 196, 200 Byte Default: 4 Byte
Output Length	Length of the output data in Byte	0 … 196, 200 Byte Default: 4 Byte

Table 16: EtherCAT Slave Parameters

7.2.2 Settings at the used EtherCAT Master

Note: To configure the Master a XML file (device description file) is required. The settings in the used Master must comply with the settings in the Slave, to establish a communication. Important parameters are: Vendor ID, Product Code, Serial Number, Revision Number, Output and Input length.

For the configuration of the EtherCAT Master an XML file (device description file) is needed. On the provided CD the XML file for the NT 100 has the name ‚Hilscher NT 100-ECS-XX V2.0.xml' and is located in the directory EDS/EtherCAT.

In order that the EtherCAT Master can communicate with the NT 100 device (as EtherCAT Slave):

- Enter at the EtherCAT Master the number of data bytes (number of input data), that are configured in the NT 100, e. g. 64.
- Enter at the EtherCAT Master the number of data bytes (number of output data), that are configured in the NT 100, e. g. 32.
- You can set at the EtherCAT Master, if the Master verifies identification numbers of the EtherCAT Slave. This verification can be activated or deactivated at the EtherCAT Master. If the verification is used, then use or check for the following values for the NT 100 device: vendor 68 (0x0044), product code 13 (0x000D), revision nummer 0 (0x0000).

7.3 NT 100 – Configuration EtherNet/IP Adapter

The NT 100 device as EtherNet/IP Adapter needs parameter.

To open the configuration window:

- Select from the context menu of the NT 100-XX-XX symbol the entry **Configuration > EtherNet/IP Adapter**

↬ The EtherNet/IP Adapter configuration window opens

To set a fix IP address:

- Deselect the flag DHCP and BootP.
- Select IP address Enable and enter a valid IP address for the NT 100 device.
- Select netmask enable and enter a valid netmask.
- If needed: Select the gateway enable and enter a valid IP address for the gateway.

Set the number of Input Data Bytes and Output Data Bytes:

- Enter in the field Input Data Bytes the number of data bytes, which should be transfered from the EtherNet/IP Scanner to the NT 100 device, e. g. 32
- Enter in the field Output Data Bytes the number of data bytes, which should be transfered from the NT 100 device to the EtherNet/IP Scanner, e. g. 64

Note: Default values can be used normally for the other parameters. Depending on additionally requirements and the design of the EtherNet/IP network as well as the used devices parameters needs to be adjusted if necessary.

7.3.1 EtherNet/IP Adapter Parameter

Parameter	Meaning	Range of Value / Value
Interface		
Bus Startup	Communication start: automatic	Automatic
Watchdog Time [ms]	Watchdog time within which the device watchdog must be retriggered from the application program while the application program monitoring is activated. When the watchdog time value is equal to 0 respectively the application program monitoring is deactivated. This function is not supported.	[0, 20 … 65535] ms, default = 1000 ms, 0 = Off
I/O Data Status	Status of the input or the output data. For each input and output data the following status information (in Byte) is memorized in the dual-port memory: Status 0 = None (default) Status 1 = 1 Byte (for future use) Status 2 = 4 Byte (for future use)	None, (1 Byte, 4 Byte) Default: None
Ident		
Vendor ID	Identification number of the manufacturer	0x0000 … 0xFFFF, Defaut: 0x011B (283)
Product Code	Product code of the device	0x0000 … 0xFFFF, Default NT 100: 0x010F (271)
Product Type	Communication Adapter	0x0000 … 0xFFFF, Default: 0x000C (0012)
Major Rev	Major Revision	0 ... 255, Default: 1
Minor Rev	Minor Revision	0 ... 255, Default: 1
Device name	Device name of the device station, e. g. EtherNet/IP Adapter (Slave)	Character string, 0 - 31 characters

For more see next page

Parameter	Meaning	Range of Value / Value
Bus		
IP Address	Valid IP address for the device	
Netmask	Valid Network mask for the device	
Gateway	Valid Gateway address for the device	
Flags	BootP: If set, the device obtains its IP Address, Netmask, Gateway Address from a BOOTP server. Default: not set DHCP: If set, the device obtains its IP Address, Netmask, Gateway Address from a DHCP server. Default: set 100Mbit: Speed Selection, If set, the device will operate at 100 MBit/s, else at 10 MBit/s. This parameter will not be in effect, when auto-negotiation is active. Default: not set FullDuplex: Duplex Operation, If set, full-duplex operation will be used. The device will operate in half-duplex mode, if this parameter is set to zero. This parameter will not be in effect, when auto-negotiation is active. Default: not set Auto-neg.: Auto-Negotiation, If set, the device will auto-negotiate link parameters with the remote hub or switch. Default: set	Default: DHCP, Auto-neg
Data		
Input Length	Maximum allowed length of the input data in Byte. This parameter should be equal to or higher than the complete projected input data length, otherwise the EtherNt IP Device will reject the cyclic communication requests.	0 … 504 Byte Default:16 Byte
Output Length	Maximum allowed length of the output data in Byte. This parameter should be equal to or higher than the complete projected output data length, otherwise the EtherNt IP Device will reject the cyclic communication requests.	0 … 504 Byte Default:16 Byte

Table 17: EtherNet/IP Adapter Parameters

7.3.2 Settings at the used EtherNet/IP Adapter

Note: To configure the Scanner/Master an EDS file (device description file) is required. The settings in the used Scanner/Master must comply with the settings in the Adapter/Slave, to establish a communication. Important parameters are: Input, Output length, Vendor ID, Product Type, Product Code, Major Rev, Minor Rev, IP Address and Netmask.

For the configuration of the EtherNet/IP Scanner/Master an EDS file (device description file) is needed. On the provided CD the EDS file for the NT 100 has the name , HILSCHER NT 100-RE EIS V1.1.EDS' and is located in the directory EDS/EtherNetIP.

In order that the EtherNet/IP Scanner/Master can communicate with the NT 100 device (as EtherNet/IP Adapter):

- Enter at the EtherNet/IP Scanner the IP address of the NT 100 device.
- Use at the EtherNet/IP Scanner the instance ID 101, to receive data of the NT 100 device.
- Enter at the EtherNet/IP Scanner for this instance ID (101) the number of data (number of receive data bytes), which were configured in the NT 100 device, e. g. 64.

Note: Some EtherNet/IP Scanners need for setting this value (number of receive data) a value increased by 4 (this is the length of the Run/Idle header, that can be transferred in front of the user data). With the example of 64 bytes above therefore 68 (64 + 4) needs to be set for the number of data.

- If adjustable at the EtherNet/IP Scanner, set that the EtherNet/IP Scanner sends the 32-Bit Run/Idle header.
- Use at the EtherNet/IP Scanner the instance ID 100, to send data to the NT 100 device
- Enter at the EtherNet/IP Scanner for this instance ID (100) the number of data (number of send data bytes), which were configured in the NT 100 device, e. g. 32.
- If adjustable at the EtherNet/IP Scanner, set that the EtherNet/IP Scanner receives the 32-Bit Run/Idle header.
- You can set at the EtherNet/IP Scaner, if the Scanner verifies identification numbers of the EtherNet/IP Adapter (named keying). This verification can be activated or deactivated at the EtherNet/IP Scanner. If the verification is used, then use or check for the following values for the NT 100 device: vendor 283 (0x011B), product code 271 (0x010F), product type 12 (0x000C), major revision 1, minor revision 1.

7.4 NT 100 – Configuration Open Modbus/TCP

The NT 100 device with Open Modbus/TCP communication works as a server and needs parameter.

To open the configuration window:

- Select from the context menu of the NT 100-XX-XX symbol the entry **Configuration > Open Modbus/TCP**

⇨ The Open Modbus/TCP configuration window opens

To set a fix IP address:

- Deselect the flag DHCP and BootP.
- Select IP address Enable and enter a valid IP address for the NT 100 device.
- Select netmask enable and enter a valid netmask.
- If needed: Select the gateway enable and enter a valid IP address for the gateway.

Note: Default values can be used normally for the other parameters. Depending on additionally requirements and the design of the Ethernet network as well as the used devices parameters needs to be adjusted if necessary.

7.4.1 Open Modbus/TCP Parameter

Parameter	Meaning	Range of Value / Value
Interface		
Bus Startup	Communication start: automatic	Automatic
Watchdog Time [ms]	Watchdog time within which the device watchdog must be retriggered from the application program while the application program monitoring is activated. When the watchdog time value is equal to 0 the watchdog respectively the application program monitoring is deactivated. This function is not supported.	[0, 20 … 65535] ms, default = 1000 ms, 0 = Off
Mode	Mode of data exchange: Message-Mode (not for NT 100) or I/O Mode	I/O Mode
Swap	Data-storage mode: Data will not be swapped or Data will be swapped.	Data will be swapped (default), Data will not be swapped
Bus		
Open Server Sockets	Server Connections Number of sockets to provide for server requests* *A value of 0 means that the Open Modbus/TCP task exclusive works as Client, while a Value of 16 means that the Open Modbus/TCP task exclusive works as Server in Message-Mode. The parameters Send Timeout, Connect Timeout and Close Timeout are for the Timeout between the Open Modbus/TCP Task and the TCP Task.	0 ... **4** ... 16
Omb Open Time	Connection remain open time Only for client jobs in message-mode. The connection to the destination-device stays open, until timeout is expired. Value is multiplied with 100 ms. Note: This timeout starts, after receiving the answer to a command	100 ... **1000** ... 6000000
Answer Timeout	Telegram Timeout Only for client jobs in message-mode. After expiration of this time, the job will be canceled and an error is send to the application. Value is multiplied with 100 ms. Note: This timeout starts after command is send to the destination device via TCP	100 ... **2000** ... 6000000
Send Timeout	TCP Task SendTimeout Parameter Parameter for TCP task (in milliseconds) . Used OMB task internal. It specifies the timeout for trying to send messages via TCP/IP 0 is the default value of 31000 milliseconds	**0** ... 2.000.000.000
Connect Timeout	TCP Task Connect Timeout Parameter Parameter for TCP task (in milliseconds). Used OMB task internal. It specifies the timeout for trying to establish a connection with the TCP task. 0 is the default value of 31000 milliseconds	**0** ... 2.000.000.000

For more see next page

Parameter	Meaning	Range of Value / Value
Close Timeout	TCP Task Close Timeout Parameter Parameter for TCP task (in milliseconds). Used OMB task internal. It specifies the timeout for trying to close a connection with the TCP task. 0 is the default Value of 13000 milliseconds	**0** ... 2.000.000.000
IP Address	IP address for the device.	Valid IP address
Net Mask	Netmask for the subnet of the device.	Valid Netmask
Gateway	IP address of the default gateway.	Valid IP address
Flags	BootP: If set, the device obtains its IP Address, Netmask, Gateway Address from a BOOTP server. Default: not set. DHCP: If set, the device obtains its IP Address, Netmask, Gateway Address from a DHCP server. Default: set.	

Table 18: Open Modbus/TCP Parameters

7.4.2 Setting at the used Open Modbus/TCP Client

In order that the Open Modbus/TCP Client can communicate with the NT 100 device as Open Modbus/TCP Server:

- Enter at the Open Modbus/TCP Client the IP address of the NT 100 device.
- Use at the Open Modbus/TCP Client port numer 502 an. Port 502 is used by the NT 100 device to receive and send Open Modbus telegrams.
- Use at the Open Modbus/TCP Client funktion code 4, to read data from the NT 100 device. Data address 30001 to 32880
- Use at the Open Modbus/TCP Client funktion code 16, to write data into the NT 100 device. Data address 40001 to 42880
- Use at the Open Modbus/TCP Client funktion code 3, to read data from the NT 100 device. Data address 40001 to 42880

Function codes (FC) 1, 2, 3, 4, 5, 6, 15, 16 can be used.

7.5 NT 100 – Configuration PROFINET IO Device

The NT 100 device as PROFINET IO Device needs parameter.

To open the configuration window:

- Select from the context menu of the NT 100-XX-XX symbol the entry **Configuration > PROFINET IO Device**

→ The PROFINET IO Device configuration window opens

Set the number of Input Data Bytes and Output Data Bytes:

- Enter in the field Input Data Bytes the number of data bytes, which should be transfered from the PROFINET IO Controller to the NT 100 device, e. g. 32
- Enter in the field Output Data Bytes the number of data bytes, which should be transfered from the NT 100 device to the PROFINET IO Controller, e. g. 64

The default name for the **Name of Station** for the NT 100 device is nt100repns. If you need to set an other name of station or you use several NT 100 devices in the PROFINET network, then set a unique name of station as follows:

- Select Enable in the Ident area.
- Enter in the field Name of Station the name of station, which the NT 100 devices should use in the PROFINET netzwork.
- Enter in the field Vendor ID the value 0x011E.
- Enter in the field Device ID the value 0x010B.
- Values in the fields Device Type, Order ID and Type of Station are optional.

Note: Default values can be used normally for the other parameters. Depending on additionally requirements and the design of the PROFINET network as well as the used devices parameters needs to be adjusted if necessary.

7.5.1 PROFINET IO Device Parameter

Parameter	Meaning	Range of Value / Value
Interface		
Bus Startup	Communication start: automatic	Automatic
Watchdog Time [ms]	Watchdog time within which the device watchdog must be retriggered from the application program while the application program monitoring is activated. When the watchdog time value is equal to 0 respectively the application program monitoring is deactivated. This function is not supported.	[0, 20 … 65535] ms, default = 1000 ms, 0 = Off
I/O Data Status	Status of the input or the output data. For each input and output data the following status information (in Byte) is memorized in the dual-port memory: Status 0 = None (default) Status 1 = 1 Byte (for future use) Status 2 = 4 Byte (for future use)	None, (1 Byte, 4 Byte)
Ident		
Vendor ID	Identification number of the manufacturer, assigned by PROFIBUS Nutzerorganisation e. V.	0 … (2^{32} - 1), Hilscher: 0x011E (286)
Device ID	Identification number of the device, freely eligibly by the manufacturer, fixed for every device.	0 … (2^{16} - 1), NT 100 (Gateway) 0x010B (267)
Device Type	Description of the device type, freely eligible	Character string, 0 - 25 characters
Order ID	Hilscher device number (e. g. 1610 100) or order description of the customer for its device	Character string, 0 - 20 characters
Name of Station	Station name of the PROFINET IO-Device station. It has to match the station name configured in the PROFINET IO-Controller for this device. Must be DNS compatible name.	Character string, 1 - 240 characters, Default: nt100repns
Type of Station	Type name of the PROFINET station; name can be assigned freely.	Character string, 1 - 240 characters Default: See GSDML-File

For more see next page

Parameter	Meaning	Range of Value / Value
Data		
Input Data Length	Maximum allowed length of the input data in Byte. This parameter should be equal to or higher than the complete projected input data length, otherwise the IO Device will reject the cyclic communication requests.	0 … 1024 Byte Default:128 Byte
Output Data Length	Maximum allowed length of the output data in Byte. This parameter should be equal to or higher than the complete projected output data length, otherwise the IO Device will reject the cyclic communication requests.	0 … 1024 Byte Default:128 Byte

Table 19: PROFINET IO-Device Parameters

7.5.2 Settings at the used PROFINET IO Controller

Note: To configure the Controller a GSDML file (device description file) is required. The settings in the used Controller must comply with the settings in the Device, to establish a communication. Important parameters are: Name of Station, Vendor ID, Device ID, Input and Output data length.

Note: Under **Name of Station** in the PROFINET IO Controller the name must be used, which was configured in the NT 100 device.

For the configuration of the PROFINET IO Controller an GSDML file (device description file) is needed. On the provided CD the GSDML file for the NT 100 has the name ‚GSDML-V2.1-HILSCHER-NT 100-RE PNS-20090123.xml' and is located in the directory EDS/PROFINET.

In order that the PROFINET IO Controller can communicate with the NT 100 device (as PROFINET IO Device):

- Enter at the PROFINET IO Controller the Name of Station, which is configured in the NT 100 device.
- Use for the configuration of the PROFINET IO Controller modules e. g. ‚32 Bytes In', for receiving data from the NT 100 device. Several modules can also be used, e. g. 2 times the module ‚16 Bytes In'. The number of data (counted in bytes), that results from the used modules for input data, has to match with the number of input data configured in the NT 100 device.
- Use for the configuration of the PROFINET IO Controller modules e. g. ‚64 Bytes Out', for sending data to the NT 100 device. Several modules can also be used, e. g. 4 times the module ‚16 Bytes Out'. The number of data (counted in bytes), that results from the used modules for output data, has to match with the number of output data configured in the NT 100 device.
- The PROFINET IO Controller verifies identification numbers of the NT 100 device: Vendor ID (value 0x011E (286)), device type (value 0x010B (267)). The PROFINET IO Controller gets these numbers from the GSDML file (name see above).

7.6 NT 100 – Configuration PROFIBUS-DP Slave

The NT 100 device as PROFIBUS-DP Slave needs parameter.

To open the configuration window:

- Select from the context menu of the NT 100-XX-XX symbol the entry **Configuration > PROFIBUS-DP Slave**

⇘ The PROFIBUS-DP Slave configuration window opens

Set station address:

- Enter in the field Station address the address, which the NT 100 device uses on the PROFIBUS network to be addressed by the PROFIBUS-DP Master.

Set baud rate:

- Set the baud rate for the NT 100 device, which the NT 100 device has to use on the PROFIBUS network, oder
- use the setting Auto-Detect, if the NT 100 device should detect the baudrate on the PROFIBUS network.

Set the number of Input Data and Output Data:

- Enter for the output module type and size of the output module. Up to 4 output modules can be set. With the output modules the number of data is configured which the NT 100 device should receive from the PROFIBUS-DP Master.
- Enter for the input module type and size of the input module. Up to 4 input modules can be set. With the input modules the number of data is configured which the NT 100 device should send to the PROFIBUS-DP Master.

Note: The input and output modules are ‚with consistence'.

Note: Default values can be used normally for the other parameters. Depending on additionally requirements and the design of the PROFIBUS network as well as the used devices parameters needs to be adjusted if necessary.

7.6.1 PROFIBUS-DP Slave Parameter

Parameter	Meaning	Range of Value / Value
Interface		
Bus Startup	Communication start: automatic	Automatic
Watchdog Time [ms]	Watchdog time within which the device watchdog must be retriggered from the application program while the application program monitoring is activated. When the watchdog time value is equal to 0 respectively the application program monitoring is deactivated. This function is not supported.	[0, 20 … 65535] ms, default = 1000 ms, 0 = Off
I/O Data Status	Status of the input or the output data. For each input and output data the following status information (in Byte) is memorized in the dual-port memory: Status 0 = None (default) Status 1 = 1 Byte (for future use) Status 2 = 4 Byte (for future use)	None, (1 Byte, 4 Byte)
Ident		
Ident Number	PROFIBUS Identification Number If 'enabled' is unchecked, the default value is used.	0 … 65535 NT 100: 0x0C0E
Bus		
Station Address	PROFIBUS address of the device	0 … 125
Baudrate	Network Baud Rate, Available Baud Rate: 9,6 kBit/s — 3 MBit/s 19,2 kBit/s — 6 MBit/s 93,75 kBit/s — 12 MBit/s 187,5 kBit/s — 31,25 kBit/s 500 kBit/s — 45,45 kBit/s 1,5 MBit/s — Auto detect	
Flags	Sync supported: Flag that indicates if set that the slave stack shall support the SYNC command and the SYNC mode is activated. Otherwise, if not set, the slave stack will not support the SYNC command. Freeze supported: Flag that indicates if set that the slave stack shall support the FREEZE command and the FREEZE mode is activated. Otherwise if not set, the slave stack will not support the FREEZE command. Fail safe supported: Flag that indicates whether 'Fail safe' operation is supported. If set, FAILSAFE mode is activated. Otherwise, FAILSAFE mode will not be available. DPV1 Enable: Flag that indicates whether DPV1 is supported. If set, DPV1 functions are activated. Otherwise, DPV1 functions will not be available. Address change not allowed: Flag that indicates if set that the slave stack does not support the "Set Slave Address" command. If not set, changing the bus address via the master is activated and the slave stack does support the "Set Slave Address" command.	

For more see next page

Parameter	Meaning	Range of Value / Value
Data		
Output or Input	**Module:** for output modules for input modules **Type:** Byte or word. **Size:** The number of bytes respectively words of the module.	 1 … 4 5 … 8 „Byte“, „Word“ Each with consistence 0, 1, 2, 3, 4, 8, 12, 16, 20, 32, 64 (Byte)
Output Data Bytes	Total of the output identifier bytes of the modules 1 to 4	0 … 244
Input Data Bytes	Total of the input identifier bytes of the modules 5 to 8	0 … 244
Configuration Data	Configuration data for the output and input identifier Bytes. The identifier Byte consists of the Type and the Size.	Default: A1, 91 (hex)

Table 20: Parameters - PROFIBUS-DP Slave

7.6.2 Settings at the used PROFIBUS-DP Master

Note: To configure the Master a GSD file (device description file) is required. The settings in the used Master must comply with the settings in the Slave, to establish a communication. Important parameters are: Station Address, Ident Number, Baudrate and Config Data (the configuration data for the output and input length).

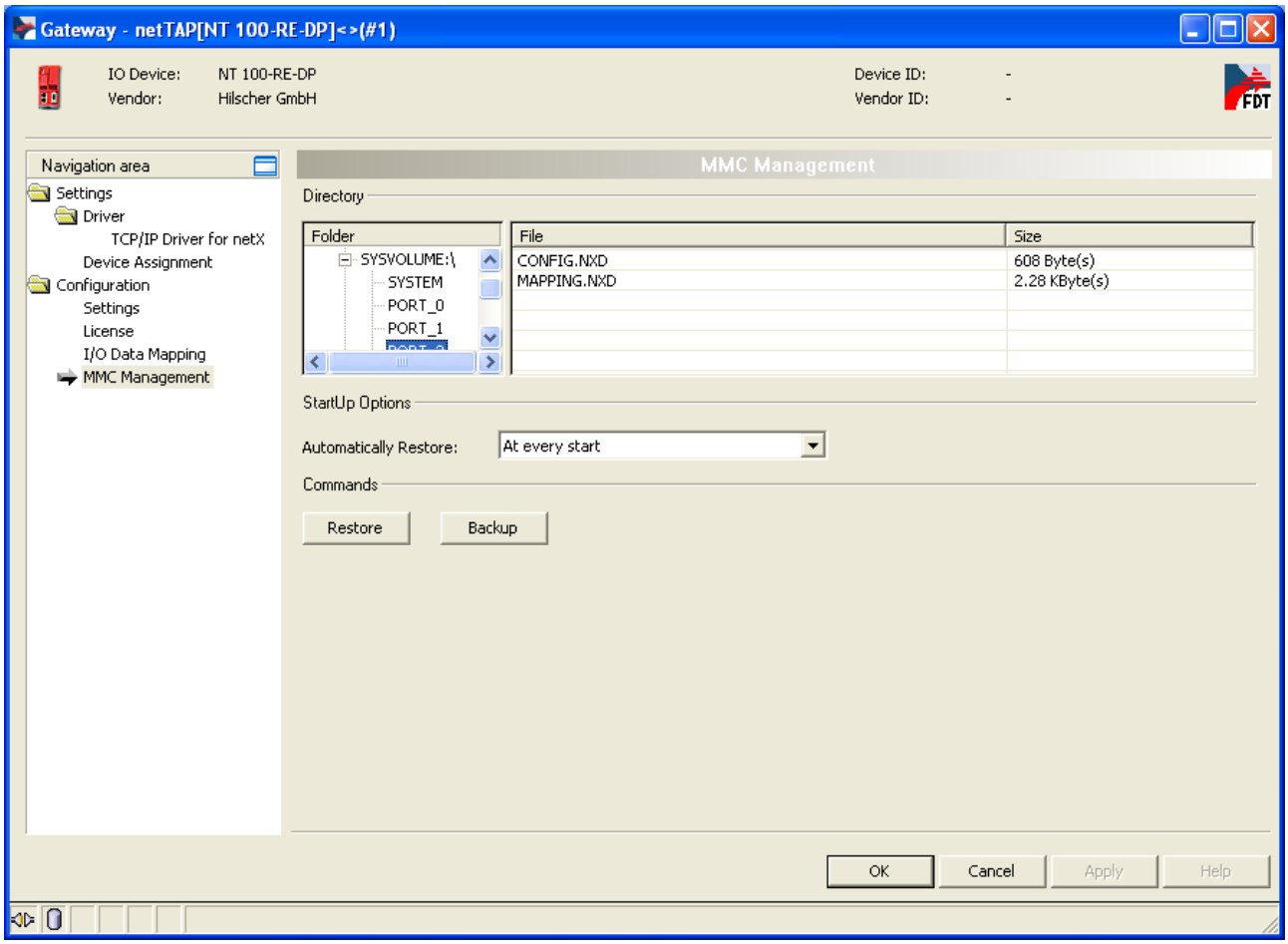
For the configuration of the PROFIBUS Master an GSD file (device description file) is needed. On the provided CD the GSD file for the NT 100 has the name ‚HIL_0C0E.GSD' and is located in the directory EDS/PROFIBUS.

In order that the PROFIBUS-DP Master can communicate with the NT 100 device (as PROFIBUS-DP Slave):

- Enter at the PROFIBUS-DP Master the station address, which is configured in the NT 100 device.
- Use for the configuration of the PROFIBUS-DP Master module(s) e. g. ‚64 Bytes Out', for sending data to the NT 100 device. Use the module(s), which are configured in the NT 100 device. (Modules with the size of zero in the NT 100 configuration needs not to be considered for the configuration of the PROFIBUS-DP Master.)
- Use for the configuration of the PROFIBUS-DP Master module(s) e. g. ‚32 Bytes In', for receiving data from the NT 100 device. Use the module(s), which are configured in the NT 100 device. (Modules with the size of zero in the NT 100 configuration needs not to be considered for the configuration of the PROFIBUS-DP Master.)

8 Store / Restore Configuration Data

On the pane MMC Management you can backup and resotore the firmware and the configuration to respectiveliy from an MMC card.



The **Folder** on the pane shows the directory structure of the file system of the netTAP device named **SYSVOLUME** and if an MMC card is inserted also the directory structure of the MMC card named **SDMMC**.

Backup: To backup the firmware and configuration files insert a formated (Format FAT) MMC card into the MMC slot of the netTAP NT 100 device. When the directory named **SDMMC** is shown, then click on the button **Backup** to copy the firmware and configuration files from the netTAP NT 100 device to the MMC card.

Restore: To load the firmware and configuration files from an MMC card into the netTAP NT 100 device, insert an MMC card into the MMC slot of the netTAP NT 100 device which contains the firmware and configuration files. When the directory named SDMMC is shown, then click the button Restore to copy the firmware and configuration files from the MMC card into the netTAP NT 100 device.

9 Factory Settings

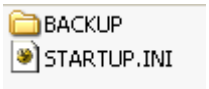
9.1 How to set the NT 100 Device back to Factory Settings

The netTAP NT 100 device can be set back to factory settings with a MMC card and the base firmware on it.

Copy from CD from the directory

Firmware\NT100 Factory Settings\MMC Images

the file STARTUP.INI and the directory BACKUP with all subdirectories onto an empty MMC-Karte into the root directory of the MMC card.



How to proceed:

1. Disconnect power supply from the netSWITCH SERCOS III device.
2. Slot the MMC card into the MMC card connector until it engages.
3. Connect the 24-V power supply to the device.

➪ The device loads the base firmware and indicates this by the following states of the SYS LED: Fast change between green and yellow (for appr. 8 s), then yellow on (for appr. 10 s), then off for a short moment and finally it turns to green on.

➪ The device then has factory settings.

Afterwards the device has to be configured as described in chapter *Configuration of the NT 100 device* from page *24*.

10 Device Drawings and Connections

10.1 Device Drawings

The following table lists the NT 100 device types. Each device contists of a left and of a right part. The table gives information for the corresponding device drawing for the left respectively for the right part.

Device Type	Device drawing for left part with connector (X2)	Device drawing for right part with connector (X3)
NT 100-RE-DP	Section *Device Drawing NT 100-RE-XX*	Section *Device Drawing NT 100-XX-DP*
NT 100-RE-CO	Section *Device Drawing NT 100-RE-XX*	Section *Device Drawing NT 100-XX-CO*
NT 100-RE-DN	Section *Device Drawing NT 100-RE-XX*	Section *Device Drawing NT 100-XX-DN*
NT 100-DP-CO	Section *Device Drawing NT 100-DP-XX*	Section *Device Drawing NT 100-XX-CO*

10.1.1 Device Drawing NT 100-RE-XX

The device drawing below applies to the following versions of NT 100-RE-DP, NT 100-RE-CO and NT 100-RE-DN. The figure shows the left part of the device.

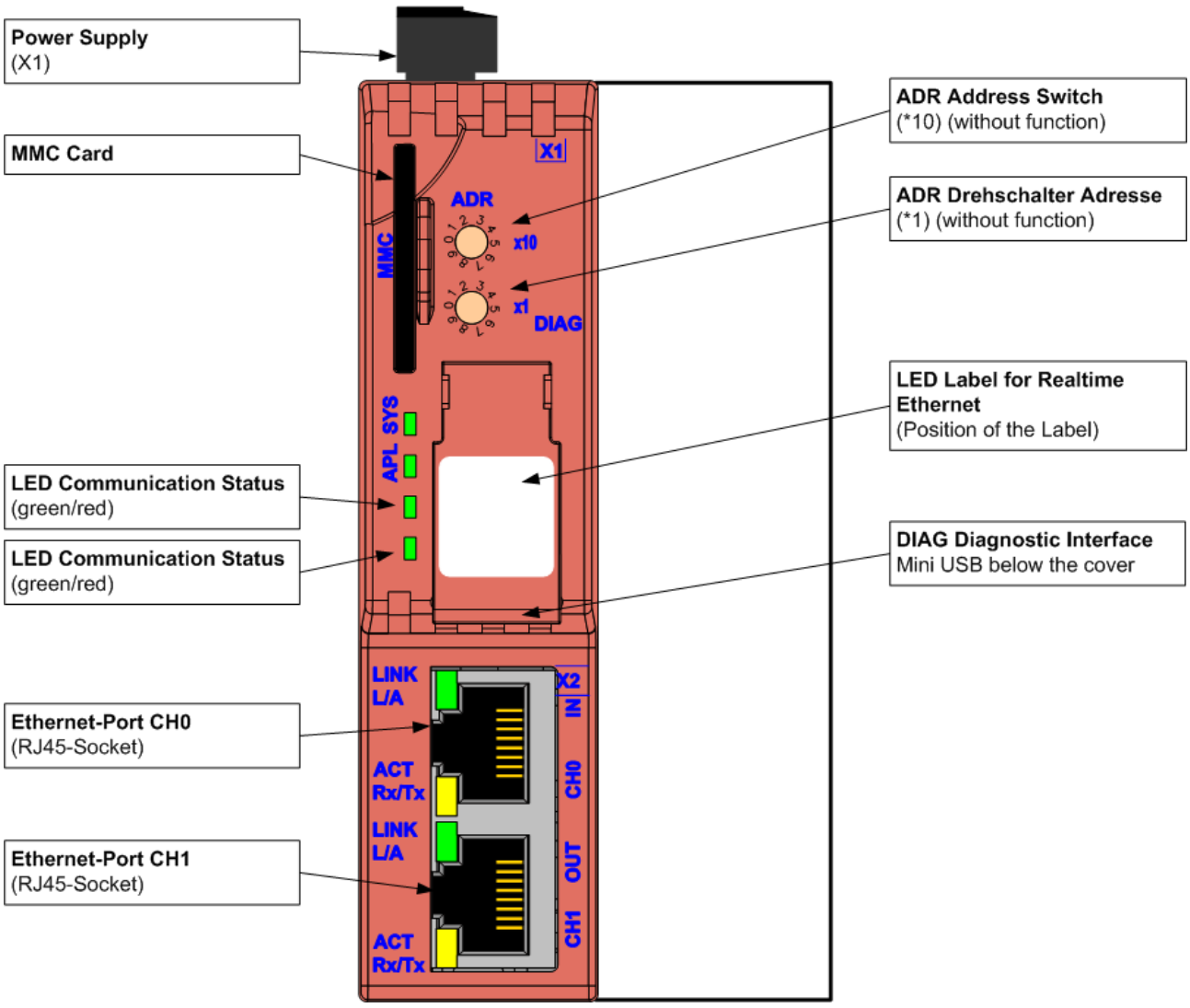


Figure 3: Device Drawing netTAP 100-RE-XX

LED labels for Realtime EtherNet/IP, EtherCAT, Open Modbus/TCP and PROFINET IO

EtherNet/IP	EtherCAT	Modbus IDA	PROFINET
MS	RUN	RUN	SF
NS	ERR	ERR	BF

10.1.2 Device Drawing NT 100-DP-XX

The device drawing below applies to the following versions of NT 100-DP-CO. The figure shows the left part of the device.

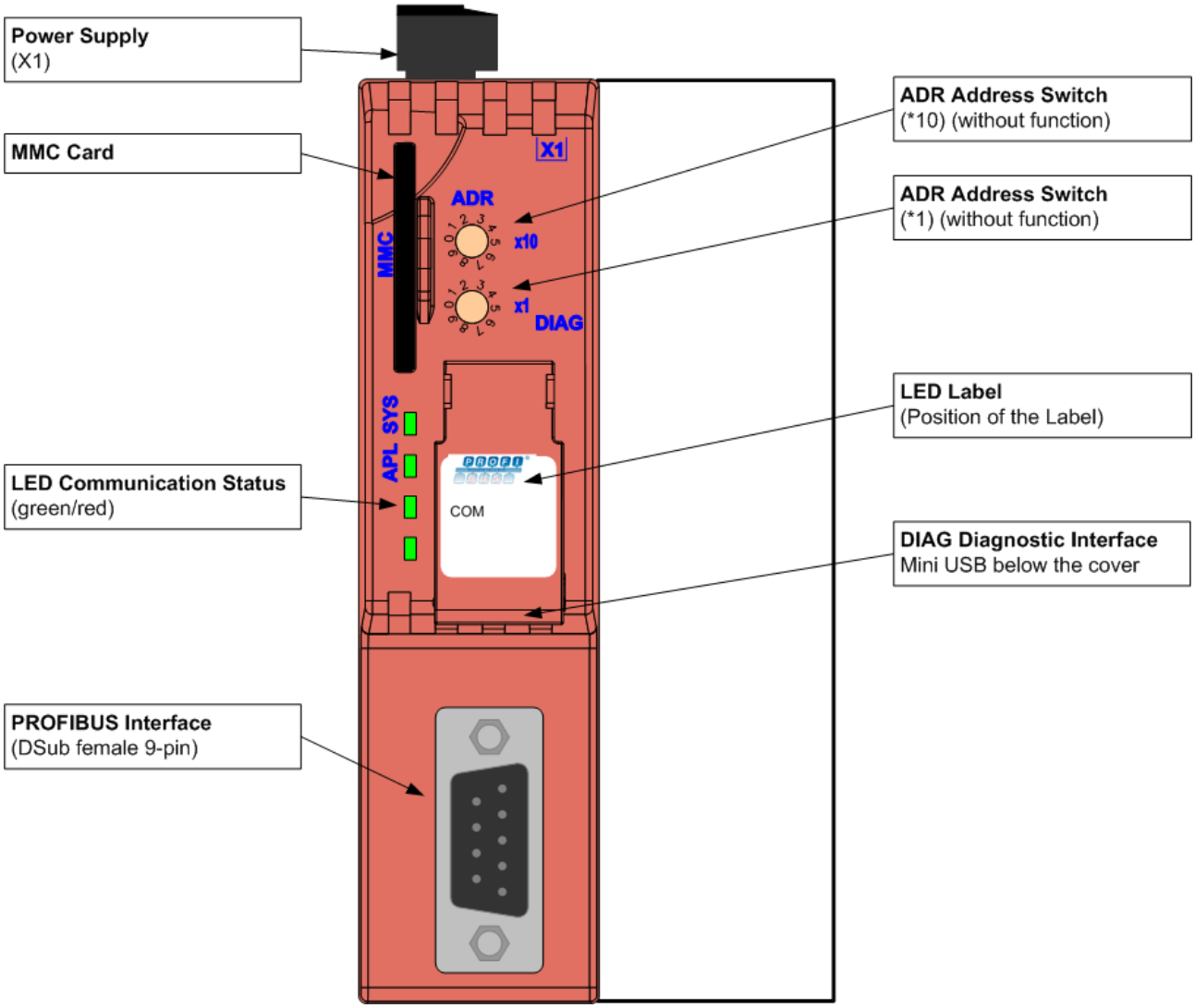


Figure 4: Device Drawing netTAP 100-DP-XX

10.1.3 Device Drawing NT 100-XX-DP

The device drawing below applies to the following versions of NT 100-RE-DP. The figure shows the right part of the device.

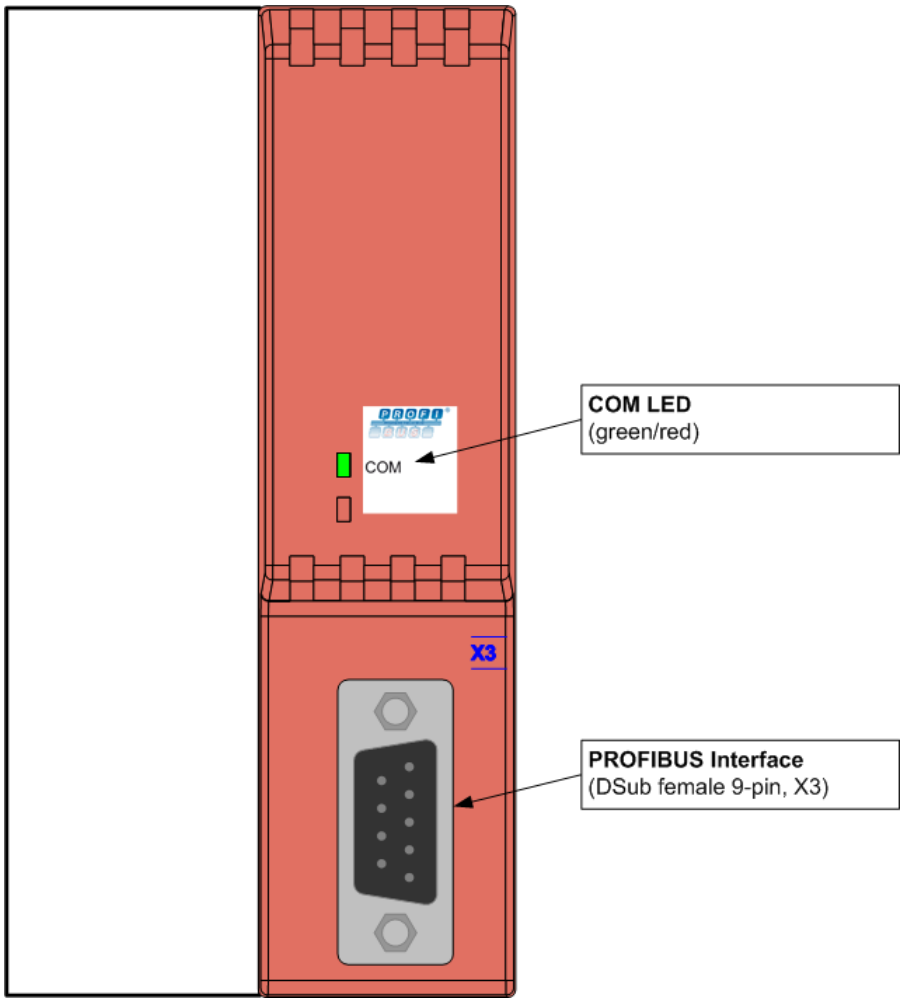


Figure 5: Device Drawing netTAP 100-XX-DP

10.1.4 Device Drawing NT 100-XX-CO

The device drawing below applies to the following versions of NT 100-RE-CO. The figure shows the right part of the device.

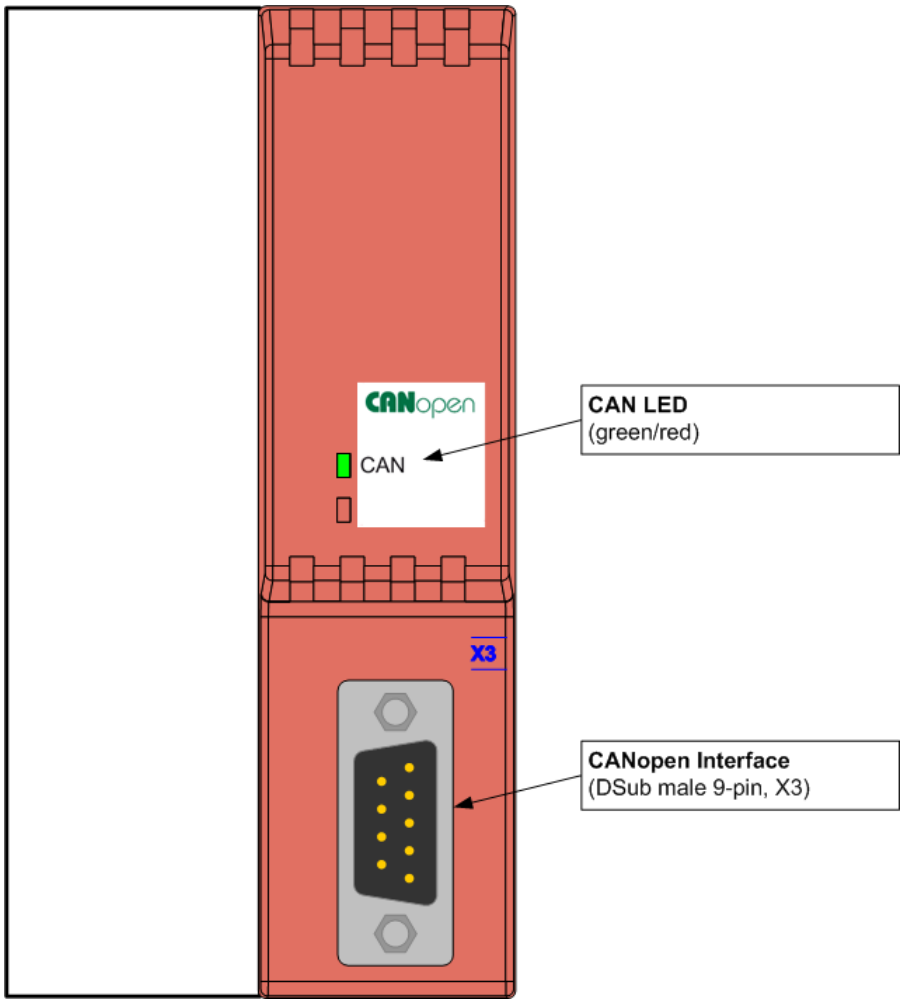


Figure 6: Device Drawing netTAP 100-XX-CO

10.1.5 Device Drawing NT 100-XX-DN

The device drawing below applies to the following versions of NT 100-RE-DN. The figure shows the right part of the device.

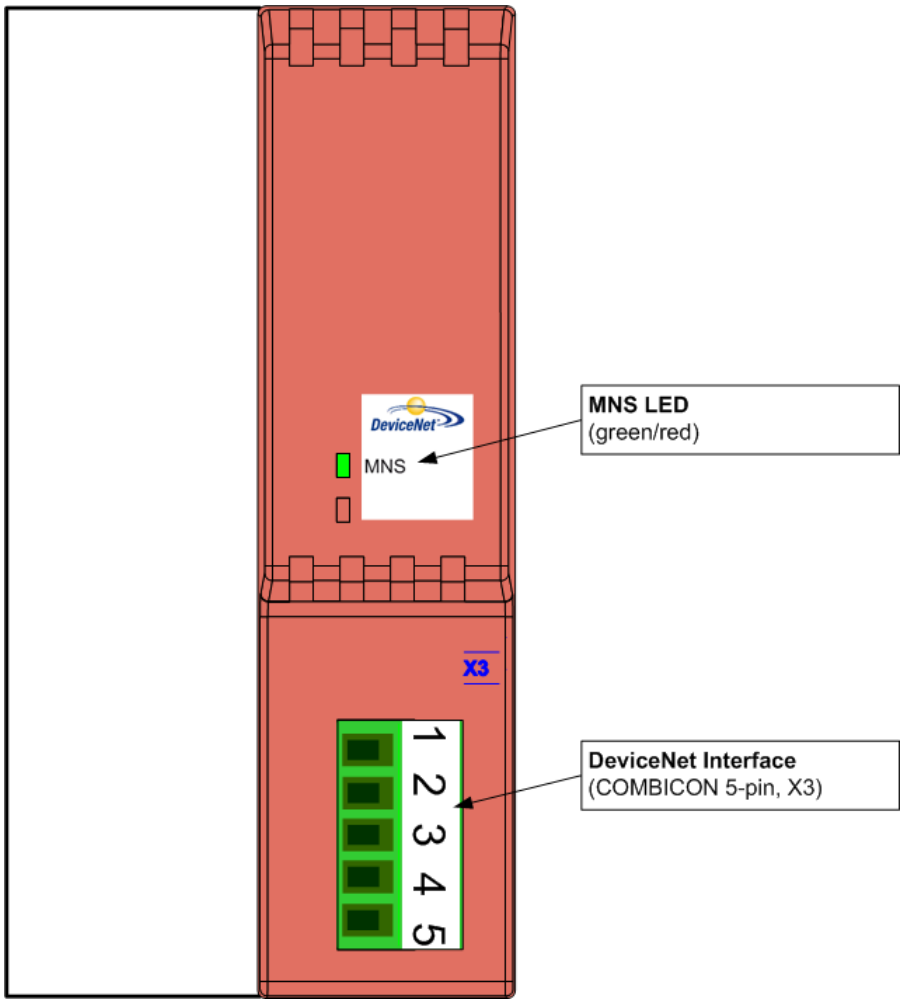


Figure 7: Device Drawing netTAP 100-XX-DN

10.2 Connections

10.2.1 X1 Power Supply

The power supply of the netTAP 100 gateway has to be connected to the power connector X1. The power supply voltage must be in the range between 18 V and 30 V DC.

Pin	Description
1	Ground
2	24 V

10.2.2 X2/X3 Front Connection

Depending on its exact type, the netTAP gateway device can have one of the front connections described in this subsection:

- X2/X3 PROFIBUS Interface
- X3 CANopen Interface
- X3 DeviceNet Interface
- X2 Ethernet Interface

10.2.2.1 X2/X3 PROFIBUS Interface

The PROFIBUS interface X2/X3 is designed as RS-485 interface according to the PROFIBUS standard EN 50170.

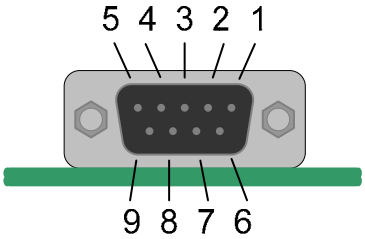


Figure 8: Connector X2 (DSub female connector, 9 pin), used as PROFIBUS Interface

Connection with DSub female connector	Signal	Meaning
3	RxD/TxD-P	Receive / Send Data-P respectively connection B plug
5	DGND	Reference potential
6	VP	Positive power supply
8	RxD/TxD-N	Receive / Send Data-N respectively connection A plug

Table 21: X2 PROFIBUS Interface, Signals

Please ensure that termination resistors are available at both ends of the cable. If special PROFIBUS connectors are being used, these resistors are often found inside the connector and must be switched on.

For baud rates above 1.5 MBaud use only special connectors, which also include additional inductance.

It is not permitted to have T stubs on PROFIBUS high baud rates. Use only a special cable which is approved for PROFIBUS-DP. Make a solid connection from the cable shield to ground at every device and make sure that there is no potential difference between the grounds at the devices.

If the netTAP is linked with only one other device on the bus, they must be at the ends of the bus line. The reason is that these devices must deliver the power supply for the termination resistors. Otherwise the device can be connected at any desired position.

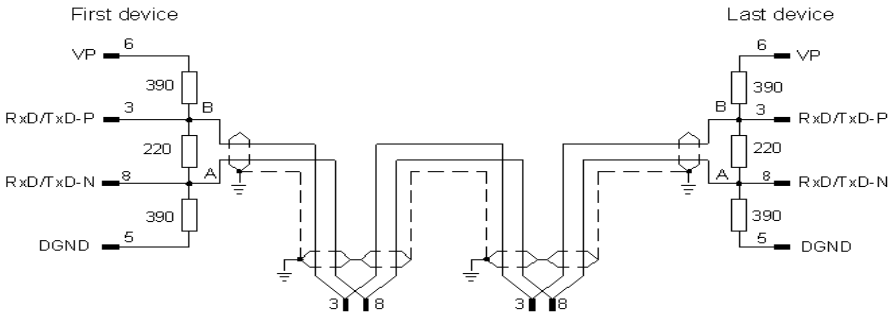


Figure 9: Termination of PROFIBUS cables

Up to 32 PROFIBUS devices can be connected to one bus segment. If several bus segments are linked to each other with repeaters, there can be up to 127 devices on the network.

The maximum length of a bus segment depends on the baud rate used. Only PROFIBUS certified cable, preferably the cable type A, should be used.

The dependance of the maximum transmission distance from the Baud rate for PROFIBUS cables is listed in the following table:

Baud rate in kbit/s	Maximum distance in m
9,6	1.200
19,2	1.200
93,75	1.200
187,5	1.000
500	400
1.500	200
3.000	100
6.000	100
12.000	100

Table 22: Dependance of maximum Transmission Distance from Baud Rate for PROFIBUS cables

The following table contains the most important electric data required for PROFIBUS lines:

Parameter	Value
Impedance	150 Ω ± 15 Ω
Capacity	< 30 pF/m
Loop resistance	110 Ω/km
Wire gauge	0,64 mm

Table 23: Required Electric Parameters of PROFIBUS cables

10.2.2.2 X3 CANopen Interface

Connector X2 can be used to connect the netTAP 100 to a CANopen network with an external master device.

The CANopen interface X2 described here can be found exclusively at the front side of the netTAP 100-COS-X\Y devices. It is designed as ISO 11898 interface with connector pin assignment according to the CANopen standard CiA DS 102.

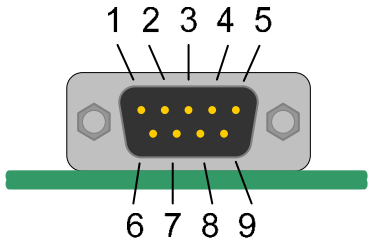


Figure 10: Connector X2 (DSub male connector, 9 pin) , X2, used as CANopen Interface

Pin	Name	Description
2	CAN_L	CAN_L Bus Line
3	CAN_GND	CAN Ground
7	CAN_H	CAN_H Bus Line

Table 24: Connector X3 used as CANopen Interface

Please use only special proved CAN cable with the following characteristics:

Parameter	Value
Impedance	120 Ω ± 12 Ω
Capacity	< 50 pF/m

Table 25: Required Electric Parameters of CANopen cables

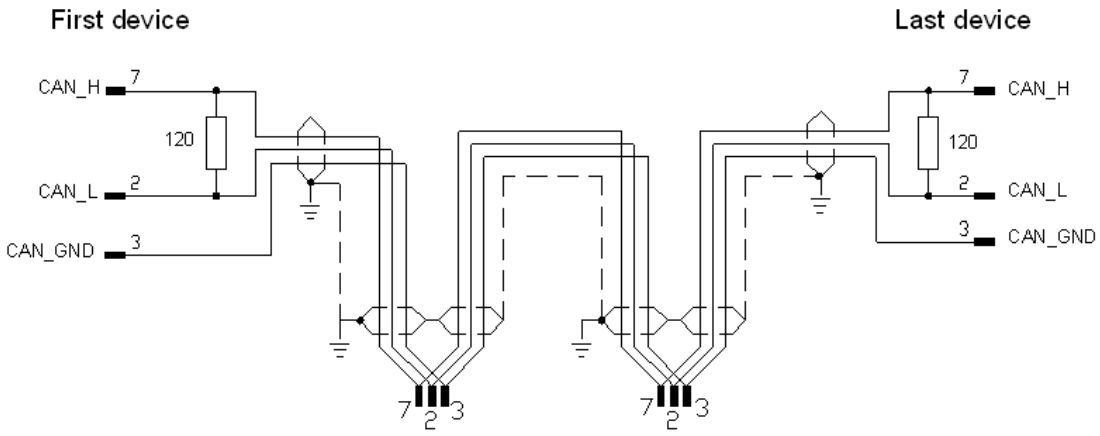


Figure 11: Termination of CANopen cables

At the ends of the network there must be two resistors of 120 Ohm to terminate the cable. It is allowed to use repeaters to increase the number of nodes, which may be connected, or to increase the maximum cable length.

The dependance of the maximum transmission distance, the necessary wire gauge and loop resistance from the Baud rate for PROFIBUS Lines is listed in the following table:

Baud rate in kbit/s	Maximum distance in m	Wire gauge	Loop resistance
20	1000	0.75 ... 0.80 mm^2	26 Ω/km
125	500	0.50 ... 0.60 mm^2	40 Ω/km
250	250	0.34 ... 0.60 mm^2	60 Ω/km
500	100	0.34 ... 0.60 mm^2	60 Ω/km
1.000	40	0.25 ... 0.34 mm^2	70 Ω/km

Table 26: Dependance of maximum Transmission Distance from Baud Rate for CANopen Lines

10.2.2.3 X3 DeviceNet Interface

The pin assignment of the DeviceNet interface X3 is according to the DeviceNet standard.

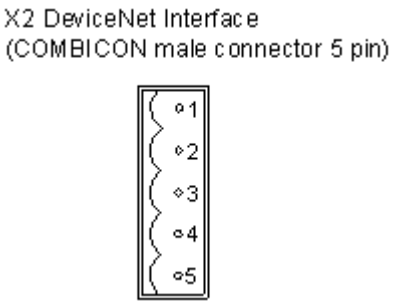


Figure 12: Connector X2 (COMBICON connector, 5 pin, male), used as DeviceNet Interface

Connection with COMBICON male connector	Signal	Color	Description
1	V-	Black	Reference potential for DeviceNet power supply
2	CAN_L	Blue	CAN Low-Signal
3	Drain		Shield
4	CAN_H	White	CAN High-Signal
5	V+	Red	+24 V line for DeviceNet power supply

Table 27: Connector X2, used as DeviceNet Interface

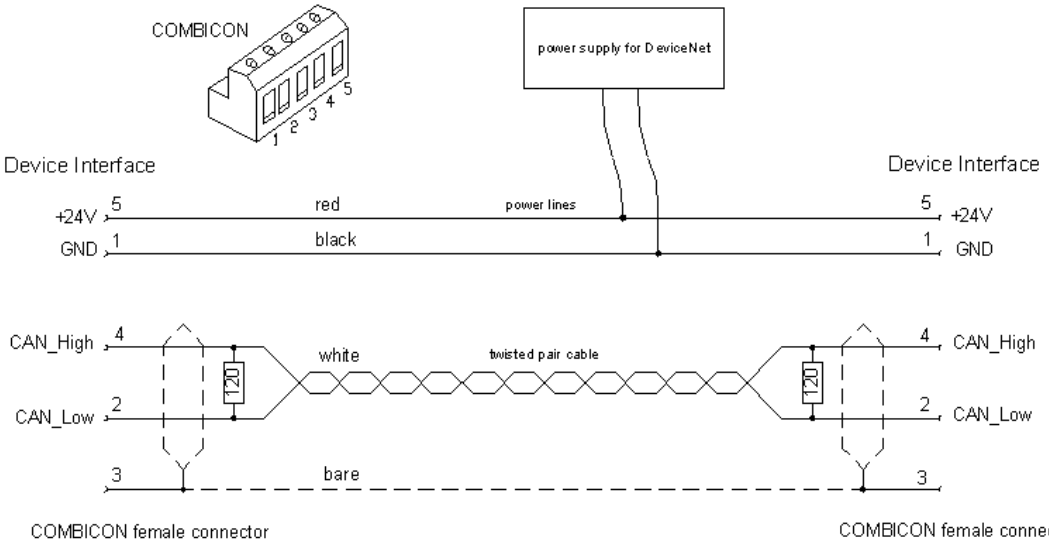


Figure 13: Termination of DeviceNet Lines

Please ensure that termination resistors with 120 Ohm are available at both ends of the cable.

Further devices can be connected via T stubs to the bus cable. The maximum length of all T stubs is 6 m. The whole length of the bus cable and all T stubs does not exceed the maximum length listed in the following table. There are two different types of cables. If both cables types are used within the same network, the maximum combined length of thick and thin cable segments can be calculated by the corresponding formula for the chosen baud rate given in the subsequent table:

Baud rate	Formula
125 kBit/s	$L_{thick} + 5 * L_{thin} <= 500$ m
250 kBit/s	$L_{thick} + 2,5 * L_{thin} <= 250$ m
500 kBit/s	$L_{thick} + L_{thin} <= 100$ m

Table 28: Formula for Calculation of maximum Transmission Distance for DeviceNet cables with thick and thin cables depending from Baud Rate

Up to 64 DeviceNet devices can be linked together over the bus. The maximum length of the bus cable depends on the used baud rate and the used cable type. Only special proved DeviceNet cable should be used.

The dependance of the maximum transmission distance from the Baud rate for DeviceNet cables is listed in the following table:

Baud rate in kbit/s	Maximum distance (thick cable)	Maximum distance (thin cable)
125	500 m	100 m
250	250 m	100 m
500	100 m	100 m

Table 29: Dependance of maximum Transmission Distance from Baud Rate for DeviceNet cables

The wires for data lines have to match the following requirements:

Parameter	Value (thick cable)	Value (thin cable)
Impedance	120 Ω	120 Ω
Capacity	< 39.4 pF/m	< 39.4 pF/m
Loop resistance	< 22.6 Ω/km	< 91.8 Ω/km
Wire gauge	2*1,1 mm	2*0,6 mm

Table 30: Required Electric Parameters of DeviceNet Data cables

The wires of the power supply lines have to match the following requirements:

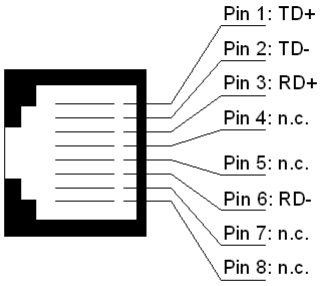
Parameter	Value (thick cable)	Value (thin cable)
Loop resistance	< 11.8 Ω/km	< 57.4 Ω/km
Wire gauge	2*1,4 mm	2*0,7 mm

Table 31: Required Electric Parameters of DeviceNet Power Supply Lines

10.2.2.4 X2 Ethernet Interface

For the Ethernet interface use RJ45 plugs and twisted pair cable of category 5 (CAT5) or higher, which consists of 4 twisted cores and has a maximum transmission rate of 100 MBit/s (CAT5).

Note: The device supports the Auto Crossover function. Due to this fact RX and TX can be switched. The following figure shows the RJ45 standard pinning.



Pin	Signal	Meaning
1	TX+	Transmit Data +
2	TX–	Transmit Data –
3	RX+	Receive Data +
4	Term 1	Connected to each other and terminated to PE through RC circuit*
5	Term 1	
6	RX–	Receive Data –
7	Term 2	Connected to each other and terminated to PE through RC circuit*
8	Term 2	
* Bob Smith Termination		

Table 32: Ethernet pinning at the RJ45 Socket

10.2.3 Diagnostic Interface (Mini-B USB)

The USB interface is for configuration and diagnostic purposes.

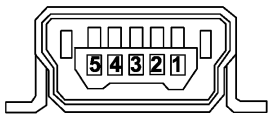


Figure 14: Mini-B USB Connector (5 Pin)

Pin	Name	Description
1	USB_EXT	USB Bus Power (+5 V, supplied externally)
2	D-	Data -
3	D+	Data +
4	ID	
5	GND	Ground

Table 33: Pin out of Mini-B USB Connector (5 Pin)

11 LED

11.1 The SYS LED

LED	Display color	Display state	Meaning
SYS	**Duo LED yellow/green**		
	(green)	On	Firmware started.
	(yellow)	On	This state is allowed for a short time only. Stays this LED with permanent yellow on, the a hardware defect is possible.
	(yellow/ green)	Blinking yellow/green	Bootloader active. This state is allowed for a short time only.
	(off)	Off	Missing power supply or a hardware error occurred.

11.2 The APL LED

LED	Display color	Display state	Meaning
APL	**Duo LED red/green**		
	(green)	On	The communication on X2 and X3 is in cyclic data exchange and the gateway function is executed
	(green)	Blinking with 2 s off, 0,5 s on	netTAP is initialized, but the communication on X2 is not in cyclic data exchange.
	(green)	Blinking with 2 s off, 0,5 s on, 0,5 s off, 0,5 s on,	netTAP is initialized, but the communication on X3 is not in cyclic data exchange.
	(red)	Blinking with 2 s off, 0,5 s on	netTAP is initialized, but the configuration for the communication protocol on X2 is missing or has an error
	(red)	Blinking with 2 s off, 0,5 s on, 0,5 s off, 0,5 s on,	netTAP is initialized, but the configuration for the communication protocol on X3 is missing or has an error
	(red)	On	netTAP has detected an error during the initialisation: Missing configuration, error in configuration or internal error

11.3 LED Real Time Ethernet Systems

11.3.1 LED EtherCAT Slave

LED	Color	State	Meaning
RUN	-	Off	**INIT:** The device is in state INIT
	(green)	Blinking	**PRE-OPERATIONAL:** The device is in state PRE-OPERATIONAL
	(green)	Single Flash	**SAFE-OPERATIONAL:** The device is in state SAFE-OPERATIONAL
	(green)	On	**OPERATIONAL:** The device is in state OPERATIONAL
ERR	-	Off	**No error:** The EtherCAT communication of the device is in working condition
	(red)	Blinking	**Invalid Configuration:** General Configuration Error (Example: State change commanded by master is impossible due to register or object settings.)
	(red)	Single Flash	**Unsolicited State Change:** Slave device application has changed the EtherCAT state autonomously: Parameter "Change" in the AL status register is set to 0x01:change/error (Example: Synchronization Error, device enters Safe-Operational automatically.)
	(red)	Double Flash	**Application Watchdog Timeout:** An application watchdog timeout has occurred. (Example: Sync Manager Watchdog timeout)
	(red)	On	**PDI Watchdog Timeout:** A PDI Watchdog timeout has occurred (Example: Application controller is not responding any more)
L/A IN / RJ45 Ch0 & Ch1	(green)	On	A link is established
	(green)	Flashing	The device sends/receives Ethernet frames
	-	Off	No link established
L/A OUT / RJ45 Ch0 & Ch1	(yellow)	-	-

Tabelle 1: EtherCAT Slave

RUN and ERR LED Indicator States EtherCAT Slave:

Indicator state	Definition
On	The indicator is constantly on.
Off	The indicator is constantly off.
Blinking	The indicator turns on and off phase with a frequency of 2,5 Hz: on for 200 ms followed by off for 200 ms.
Single Flash	The indicator shows one short flash (200 ms) followed by a long off phase (1,000 ms).
Double Flash	The indicator shows a sequence of two short flashes (each 200 ms), separated by a short off phase (200 ms). The sequence is finished by a long off phase (1,000 ms).

Tabelle 2: Indicator States EtherCAT Slave

11.3.2 LED EtherNet/IP Adapter (Slave)

LED	Color	State	Meaning
MS	(green)	On	**Device operational:** If the device is operating correctly, the module status indicator shall be steady green.
	(green)	Flashing	**Standby:** If the device has not been configured, the module status indicator shall be flashing green.
	(red)	On	**Major fault:** If the device has detected a non-recoverable major fault, the module status indicator shall be steady red.
	(red)	Flashing	**Minor fault:** If the device has detected a recoverable minor fault, the module status indicator shall be flashing red. NOTE: An incorrect or inconsistent configuration would be considered a minor fault.
	(red/green)	Flashing	**Self-test:** While the device is performing its power up testing, the module status indicator shall be flashing green / red.
	-	Off	**No power:** If no power is supplied to the device, the module status indicator shall be steady off.
NS	(green)	On	**Connected:** If the device has at least one established connection (even to the Message Router), the network status indicator shall be steady green.
	(green)	Flashing	**No connections:** If the device has no established connections, but has obtained an IP address, the network status indicator shall be flashing green.
	(red)	On	**Duplicate IP:** If the device has detected that its IP address is already in use, the network status indicator shall be steady red.
	(red)	Flashing	**Connection timeout:** If one or more of the connections in which this device is the target has timed out, the network status indicator shall be flashing red. This shall be left only if all timed out connections are reestablished or if the device is reset.
	(red/green)	Flashing	**Self-test:** While the device is performing its power up testing, the network status indicator shall be flashing green / red.
	-	Off	**Not powered, no IP address:** If the device does not have an IP address (or is powered off), the network status indicator shall be steady off.
LINK / RJ45 Ch0 & Ch1	(green)	On	A connection to the Ethernet exists
	-	Off	The device has no connection to the Ethernet
ACT / RJ45 Ch0 & Ch1	(yellow)	Flashing	The device sends/receives Ethernet frames

Table 34: LED EtherNet/IP Adapter (Slave)

11.3.3 LED Open Modbus/TCP

LED	Color	State	Meaning
RUN	-	Off	**Not Ready** OMB task is not ready
	(green)	Flashing cyclic with 1Hz	**Ready, not configured yet** OMB task is ready and not configured yet
	(green)	Flashing cyclic with 5Hz	**Waiting for Communication:** OMB task is configured
	(green)	On	**Connected:** OMB task has communication – at least one TCP connection is established
ERR	-	Off	No communication error
	(red)	Flashing cyclic with 2Hz (On/Off Ratio = 25 %)	System error
	(red)	On	Communication error active
LINK / RJ45 Ch0 & Ch1	(green)	On	A connection to the Ethernet exists
	-	Off	The device has no connection to the Ethernet
ACT / RJ45 Ch0 & Ch1	(yellow)	Flashing	The device sends/receives Ethernet frames

Table 35: LED Open Modbus/TCP

11.3.4 LED PROFINET IO-RT-Device

LED	Color	State	Meaning
SF	(red)	On	Watchdog timeout; channel, generic or extended diagnosis present; system error
	(red)	Flashing cyclic at 2 Hz (for 3 sec.)	DCP signal service is initiated via the bus
	-	Off	No error
BF	(red)	On	No configuration; or low speed physical link; or no physical link
	(red)	Flashing cyclic at 2 Hz	No data exchange
	-	Off	No error
LINK / RJ45 Ch0 & Ch1	(green)	On	A connection to the Ethernet exists
	-	Off	The device has no connection to the Ethernet
RX/TX / RJ45 Ch0 & Ch1	(yellow)	Flashing	The device sends/receives Ethernet frames

Table 36: PROFINET IO-RT-Device

11.4 LED Fieldbus Systems

11.4.1 LED PROFIBUS-DP Master

LED	Color	State	Meaning
COM	(red)	static	Communication to one / all Slaves is disconneced
	(green)	Flashing acyclic	No configuration or stack error
	(green)	Flashing cyclic	Profibus is configured, but bus communciation is not yet released from the application
	(green)	static	Communication to all Slaves is established

Table 37: LED PROFIBUS-DP Master

11.4.2 LED PROFIBUS-DP Slave

LED	Color	State	Meaning
COM	(red)	Flash 1:3	STOP, no communication, connection error
	(red)	Flash 1:1	not configured
	(green)	On	RUN, cyclic communication

Table 38: LED PROFIBUS-DP Slave

11.4.3 LED CANopen Master

LED	Color	State	Meaning
CAN	-	Off	**No Error:** The Device is in working condition
	(red)	Single flash	**Warning Limit reached:** At least one of the error counters of the CAN controller has reached or exceeded the warning level (too many error frames).
	(red)	Double flash	**Error Control Event:** A guard event (NMT Slave or NMT-master) or a heartbeat event (Heartbeat consumer) has occurred.
	(red)	On	**Bus Off:** The CAN controller is bus off
	(green)	Single flash	**STOPPED:** The Device is in STOPPED state
	(green)	Blinking	**PREOPERATIONAL:** The Device is in the PREOPERATIONAL state
	(green)	On	**OPERATIONAL:** The Device is in the OPERATIONAL state

Table 39: LED CANopen Slave

CAN LED Indicator States CANopen Master:

Indicator state	Definition
On	The indicator is constantly on.
Off	The indicator is constantly off.
Flickering	The indicator turns on and off phase with a frequency of 10 Hz: on for 50 ms followed by off for 50 ms.
Blinking	The indicator turns on and off phase with a frequency of 2,5 Hz: on for 200 ms followed by off for 200 ms.
Single Flash	The indicator shows one short flash (200 ms) followed by a long off phase (1,000 ms).
Double Flash	The indicator shows a sequence of two short flashes (each 200 ms), separated by a short off phase (200 ms). The sequence is finished by a long off phase (1,000 ms).
Triple Flash	The indicator shows a sequence of three short flashes (each 200 ms), separated by a short off phase (200 ms). The sequence is finished by a long off phase (1,000 ms).

Table 40: Indicator States CANopen Master, CAN

11.4.4 LED DeviceNet Master

LED	Color	State	Meaning
MNS	(green)	On	Device is online and has one or more connections in the established state
	(green)	Flashing	Device is online and has no connection in the established state
	(red)	On	Critical link failure; Device has detected a network error (duplicate MAC-ID or bus off)
	(red)	Flashing	Connection timeout
	(red/green)	Flashing	Communication faulted
	-	Off	After start of the device and during duplicate MAC-ID check

Table 41: LED DeviceNet Master

12 Technical Data

12.1 Technical Data netTAP 100 Gateway

12.1.1 NT 100

NT 100	Parameter	Value
Communication controller	Type	netX 100
Memory	RAM	8 MB SDRAM
	FLASH	4 MB serial Flash
Diagnostic Interface	Socket	Mini-USB, 5-pin
Display	LED Display	SYS System Status APL Application Status COM Communication Status LINK Link ACT Activity
Power supply	Voltage	24 V ± 6 V DC
	Current at 24 V (typically)	130 mA
	Power Consumption	3.2 W
	Connector	Mini-COMBICON, 2-pin
Environmental conditions	Temperature range	0 … + 50 °C
Device	Dimensions (L x W x H)	100 x 52 x 70 mm (without connector)
	Weight	appr. 150 g
	Mounting	on DIN rail EN 60715
	Protection Class	IP 20
	RoHS	Yes
CE Sign	CE Sign	Yes
	Emission	CISPR 11 Class A
	Immunity	EN 61131-2:2003
Configuration	Software	SYCON.net

Table 42: Technical Data NT 100 (Part 1)

NT 100	Parameter	Value
Ethernet Interface for the device types: NT 100-RE-DP, NT 100-RE-CO, NT 100-RE-DN	Transmission rate	100 MBit/s 10 MBit/s (depending on loaded firmware)
	Interface Type	100 BASE-TX, isolated 10 BASE-TX (depending on loaded firmware), isolated
	Half duplex/Full duplex	supported (at 100 MBit/s)
	Auto-Negotiation	supported (depending on loaded firmware)
	Auto-Crossover	supported
	Connector	2 * RJ45
PROFIBUS Interface for the device types: NT 100-RE-DP, NT 100-DP-CO	Transmission rate	9,6 kBit/s, 19,2 kBit/s, 31,25 kBit/s, 45,45 kBit/s, 93,75 kBit/s, 187,5 kBit/s, 500 kBit/s, 1,5 MBit/s, 3 MBit/s, 6 MBit/s, 12 MBit/s
	Interface Type	RS 485, optically isolated
	Connector	SubD female, 9-pin
CANopen Interface for the device type: NT 100-DP-CO	Transmission rate	10 kBit/s, 20 kBit/s, 50 kBit/s, 100 kBit/s, 125 kBit/s, 250 kBit/s, 500 kBit/s, 800 kBit/s, 1 MBit/s
	Interface Type	ISO 11898, optically isolated
	Connector	SubD male, 9-pin
DeviceNet Interface for the device type: NT 100-DP-DN	Transmission rate	125 kBit/s, 250 kBit/s, 500 kBit/s
	Interface Type	ISO 11898, optically isolated
	Connector	COMBICON, 5-pin

Table 43: Technical Data NT 100 (Part 2)

12.2 Technical Data of Real-Time Ethernet Communication Protocols

12.2.1 EtherCAT Slave

Parameter	Description
Maximum number of cyclic input data	400 bytes (netX 100/netX 500)
Type	Complex Slave
Functions	Emergency
FMMUs	3 (netX 100/netX 500)
SYNC Manager	4 (netX 100/500)
Baud rate	100 MBit/s
Data transport layer	Ethernet II, IEEE 802.3

Table 44: EtherCAT Slave

12.2.2 EtherNet/IP Adapter (Slave)

Parameter	Description
Maximum number of input data	504 bytes
Maximum number of output data	504 bytes
IO Connection	1 explicit owner, up to 2 listen only
IO Connection type	Cyclic, minimum 2 ms
Explicit Messages	Get_Attribute, Set_Attribute
UCMM	supported
Max. number of connections	8, explicit and implicit connections
Predefined standard objects	Identity Object Message Route Object Assembly Object Connection Manager Ethernet Link Object TCP/IP Object
DHCP	supported
BOOTP	supported
Baud rates	10 and 100 MBit/s
Data transport layer	Ethernet II, IEEE 802.3

Table 45: EtherNet/IP Adapter (Slave)

12.2.3 Open Modbus/TCP

Parameter	Description
Maximum number of input data	5760 bytes
Maximum number of output data	5760 bytes
Acyclic communication	Read/Write Register, Max. 125 Registers per Read Telegram (FC 3, 4, 23), Max. 121 Registers per Write Telegram (FC 23), Max. 123 Registers per Write Telegram (FC 6) Read/Write Coil, Max. 2000 Coils per Read Telegram (FC 1, 2), Max. 1968 Coils per Write Telegram (FC 15)
Modbus Function Codes	1, 2, 3, 4, 5, 6, 7, 15, 16, 23
Mode	I/O Mode: Server
Baud rates	10 and 100 MBit/s
Data transport layer	Ethernet II, IEEE 802.3

Table 46: Open Modbus/TCP

12.2.4 PROFINET IO-RT-Device

Parameter	Description
Maximum number of cyclic input data	1024 bytes
Maximum number of cyclic output data	1024 bytes
Maximum number of all submodules	80
Maximum slot address	300
Maximum subslot address	100
DCP	supported
Used Protocols (subset)	UDP, IP, ARP, ICMP (Ping)
Topology recognition	LLDP, SNMP V1, MIB2, physical device
Context Management by CL-RPC	
Minimum cycle time	1ms IO-Device can be configured with different cycle times
Baud rate	100 MBit/s
Data transport layer	Ethernet II, IEEE 802.3

Table 47: PROFINET IO-RT-Device

12.3 Technical Data of Fieldbus Communication Protocols

12.3.1 PROFIBUS-DP Master

Parameter	Description
Maximum number of supported DPV0/DPV1 slaves	125
Maximum number of total cyclic input data	3584 bytes
Maximum number of total cyclic output data	3584 bytes
Maximum number of cyclic input data	244 bytes/slave
Maximum number of cyclic output data	244 bytes/slave
Configuration data	max. 244 bytes per slave
Parameterization data per slave	7 bytes/slave standard parameters 237 bytes/slave application specific parameters
Baud rate	Fixed values from 9,6 kBits/s to 12 MBit/s Auto-detection mode is not supported.
Data transport layer	PROFIBUS FDL

Table 48: PROFIBUS DP Master

12.3.2 PROFIBUS-DP Slave

Parameter	Description
Maximum number of cyclic input data	244 bytes
Maximum number of cyclic output data	244 bytes
Configuration data	max. 244 bytes
Parameter data	237 bytes application specific parameters
Baud rate	Fixed values ranging from 9,6 kBits/s to 12 MBit/s Auto-detection mode is supported.
Data transport layer	PROFIBUS FDL

Table 49: PROFIBUS DP Slave

12.3.3 CANopen Master

Parameter	Description
Maximum number of cyclic input data	3584 bytes
Maximum number of cyclic output data	3584 bytes
Maximum number of supported slaves	126
Maximum number of receive PDOs	512
Maximum number of transmit PDOs	512
Exchange of process data	via PDO transfer (synchronized, remotely requested and event driven (change of date))
Functions	Emergency message (consumer and producer) Node guarding / life guarding, heartbeat PDO mapping NMT Master SYNC protocol (producer) Simple boot-up process, reading object 1000H for identification
Baud rates	10 kBits/s to 1 Mbits/s
Data transport layer	CAN Frames
CAN Frame type	11 Bit

Table 50: CANopen Master

12.3.4 DeviceNet Master

Parameter	Description
Maximum number of cyclic input data	3584 bytes
Maximum number of cyclic output data	3584 bytes
Maximum number of cyclic input data	255 bytes/connection
Maximum number of cyclic output data	255 bytes/connection
Maximum number of supported slaves	63
Maximum Configuration data	1000 bytes/slave
Baud rates	125 kBits/s, 250 kBit/s, 500 kBit/s Auto-detection mode is not supported.
Data transport layer	CAN frames
Connections	Bit Strobe Change of State Cyclic Poll Explicit Peer-to-Peer Messaging
Fragmentation	Explicit and I/O
UCMM	supported
Support	common and extended diagnostic
Objects	Identity Object (Class Code 0x01) Message Router Object (Class Code 0x02) DeviceNet Object (Class Code 0x03) Connection Object (Class Code 0x05) Acknowledge Handler Object (Class Code 0x06)

Table 51: DeviceNet Master

13 Appendix

13.1 Status Information

The status of the remote network coupled by the netTAP NT 100 can be mapped into the I/O data. It contains the items shown in the figures for master and slave and are described below.

Signals	Data type	Port X3
Status		
Active Slaves	UNSIGNED32	Generated
Communication Change of State	UNSIGNED32	Generated
Communication Error	UNSIGNED32	Generated
Communication State	UNSIGNED32	Generated
Configured Slaves	UNSIGNED32	Generated
Error Count	UNSIGNED32	Generated
Error Log Indicator	UNSIGNED32	Generated
Faulted Slaves	UNSIGNED32	Generated
Host Watchdog	UNSIGNED32	Generated
Slave Error Log Indicator	UNSIGNED32	Generated
Slave State	UNSIGNED32	Generated
Version	UNSIGNED16	Generated
Watchdog Timeout	UNSIGNED16	Generated

Figure 15: Statusinformation of the Master

Signals	Data type	Port X2
Status		
Communication Change of State	UNSIGNED32	Generated
Communication Error	UNSIGNED32	Generated
Communication State	UNSIGNED32	Generated
Error Count	UNSIGNED32	Generated
Error Log Indicator	UNSIGNED32	Generated
Host Watchdog	UNSIGNED32	Generated
Version	UNSIGNED16	Generated
Watchdog Timeout	UNSIGNED16	Generated

Figure 16: Statusinformation of the Slave

Some status information belong to the master firmware and to the slave firmware status and are marked with “Master and Slave”), others belong only to the master firmware status and are marked with “Master”.

Number of Active Slaves (Master)

The firmware maintains a list of slaves within the remote network to which the remote network’s master has successfully opened a connection. Ideally, the number of active slaves is equal to the number of configured slaves.

This field holds the number of active slaves.

Communication Change of State (Master and Slave)

The communication change of state register contains information about the current operating status of the communication channel and its firmware.

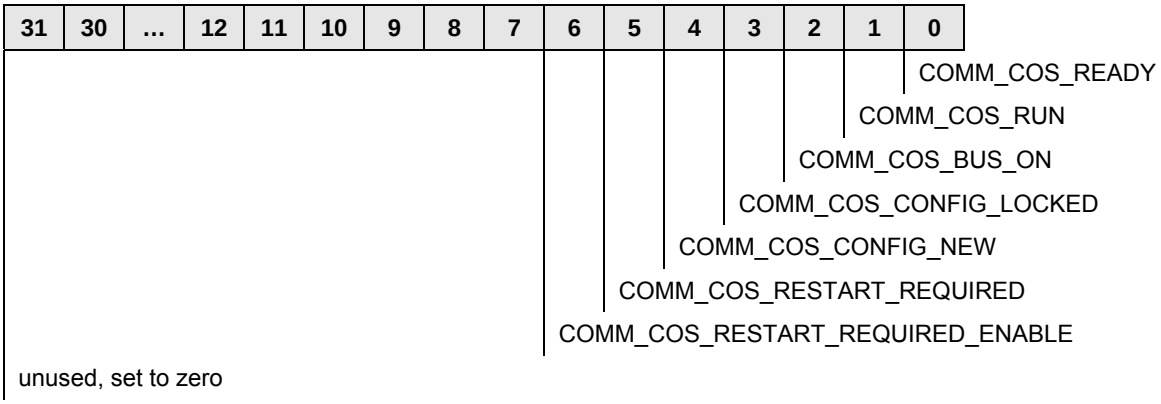


Table 52: Communication Change of State

The Communication Change of State Flags have the following meaning:

Status	Meaning
Ready (Bit 0)	The Ready flag is set as soon as the protocol stack is started properly. Then the protocol stack is awaiting a configuration. As soon as the protocol stack is configured properly, the Running flag is set, too.
Running (Bit 1)	The Running flag is set when the protocol stack has been configured properly. Then the protocol stack is awaiting a network connection. Now both the Ready flag and the Running flag are set.
Bus On (Bit 2)	The Bus On flag is set to indicate to the host system whether or not the protocol stack has the permission to open network connections. If set, the protocol stack has the permission to communicate on the network; if cleared, the permission was denied and the protocol stack will not open network connections.
Configuration Locked (Bit 3)	The Configuration Locked flag is set, if the communication channel firmware has locked the configuration database against being overwritten. Re-initializing the channel is not allowed in this state.
Configuration New (Bit 4)	The Configuration New flag is set by the protocol stack to indicate that a new configuration became available, which has not been activated. This flag may be set together with the Restart Required flag.
Restart Required (Bit 5)	The Restart Required flag is set when the channel firmware requests to be restarted. This flag is used together with the Restart Required Enable flag below. Restarting the channel firmware may become necessary, if a new configuration was downloaded from the host application or if a configuration upload via the network took place.
Restart Required Enable (Bit 6)	The Restart Required Enable flag is used together with the Restart Required flag above. If set, this flag enables the execution of the Restart Required command in the netX firmware.

Communication State (Master and Slave)

The communication state field contains information regarding the current network status of the communication channel of the remote network. Depending on the implementation of the protocol stack of the remote network, all or a subset of the definitions below is supported.

Status	Value
Unknown	0
Offline	1
Stop	2
Idle	3
Operate	4

Communication Channel Error (Master and Slave)

This field holds the current error code of the communication channel of the remote network. If the cause of error is resolved, the communication error field is set to zero again.

All values different from 0 indicate that an error has occurred.

Errors may be signalled either from the operating system rcX or from the used protocol.

Number of Configured Slaves (Master)

The firmware maintains a list of slaves within the remote network to which the master has to open a connection. This list is derived from the configuration database created by SYCON.net. This field holds the number of configured slaves.

Error Count (Master and Slave)

This field holds the total number of errors detected since power-up within the remote network, respectively after reset. The protocol stack counts all sorts of errors in this field no matter if they were network related or caused internally. After power cycling, reset or channel initialization this counter is being cleared again.

Error Log Indicator (Master and Slave)

Note: This field is not yet supported.

Number of Faulted Slaves (Master)

If a slave of the remote network encounters a problem, it can provide an indication of the new situation to the master in certain Fieldbus systems. As long as those indications are pending and not serviced, this field holds a value unequal to zero. If no more diagnostic information is pending, the field is set to zero.

Host Watchdog (Master and Slave)

Note: This field is not yet supported.

Slave Error Log Indicator (Master)

Note: This field is not yet supported.

Slave State (Master)

The slave state field indicates whether the master of the remote network is in cyclic data exchange to all configured slaves. In case there is at least one slave missing or if the slave has a diagnostic request pending, the status is set to FAILED. For protocols that support non-cyclic communication only, the slave state is set to OK as soon as a valid configuration is found.

Status	Wert
Undefiniert	0
Ok	1
Failed	2

Version (Master and Slave)

The version field holds the version number of this structure. The value is 1.

Watchdog Timeout (Master and Slave)

This field holds the configured watchdog timeout value of the protocol stack of the remote network. The value is specified in milliseconds.

14 Lists

14.1 List of Figures

14.2 List of Tables

15 Glossary

10-Base T

Standard for communication on Ethernet over twisted pair lines with RJ45 connectors and a baud rate of 10 MBit/s (according to the IEEE 802.3 specification).

100-Base TX

Standard for communication on Ethernet over unshielded twisted pair lines with RJ45 connectors and a baud rate of 100 MBit/s according to the IEEE 802. specification

Auto-Crossover

Auto-Crossover is a feature of an interface: An interface with Auto-Crossover capability will automatically detect and correct if the data lines have been exchanged vice versa.

Auto-Negotiation

Auto-Negotiation is a feature of an interface: An interface with Auto-Negotiation will automatically determine a set of correct communication parameters.

Baud rate

Data transmission speed of a communication channel or interface.

Boot loader

Program loading the firmware into the memory of a device in order to be executed.

DDF

Device Description File.

Device Description File

A file containing configuration information about a device being a part of a network that can be read out by masters for system configuration. Device Description Files use various formats which depend on the communication system. Often these formats are based on XML such as EDS files or GSDML files.Contains configuration information

DPM

Dual-Port Memory

EDS file

A special kind of Device Description File used by EtherNet/IP.

EtherCAT

A communication system for industrial Ethernet designed and developed by Beckhoff Automation GmbH.

EtherNet/IP

A communication system for industrial Ethernet designed and developed by Rockwell. It partly uses the CIP (Common Industrial Protocol).

Ethernet Powerlink

A communication system for industrial Ethernet designed and developed by B&R. It partly uses CANopen technologies.

Gateway

A device interfacing between two different communication standards.

GSDML file

A special kind of XML-based Device Description File used by PROFINET.

netX

networX on chip, next generation of communication controllers.

Open Modbus/TCP

A communication system for Industrial Ethernet designed and developed by Schneider Automation and maintained by the Modbus-IDA organization based on the Modbus protocols for serial communication.

PROFINET

A communication system for Industrial Ethernet designed and developed by PROFIBUS International. It uses some mechanisms similar to those of the PROFIBUS field bus.

Real-Time Ethernet

Real-Time Ethernet (also denominated as *Industrial Ethernet*) is an extension of the Ethernet networking technology for industrial purposes with very good Real-Time features and performance. There is a variety of different Real-Time Ethernet systems on the market which are incompatible with each other. The most important systems of these are

- EtherCAT
- EtherNet/IP
- Ethernet Powerlink
- Open Modbus/TCP
- PROFINET
- SERCOS III

SERCOS III

A communication system for industrial Ethernet designed and developed by Bosch-Rexroth and supported by SERCOS International.

Warmstart

A part of the initialization process of netX-controlled communication systems. During warmstart the netX-controlled system is adjusted to the

intended parameters of operation. These parameters are supplied by a special message, the warmstart message which is transferred to the netX within the warmstart packet.

Watchdog Timer

A watchdog timer provides an internal supervision mechanism of a communication system. It supervises that an important event happens within a given timeframe (the watchdog time which can be adjusted accordingly, for instance by a parameter in the warmstart message) and causes an alarm otherwise (usually this is accomplished by changing the operational state of the communication system to a more safe state).

XDD file

A special kind of Device Description file used by Ethernet Powerlink.

XML

XML stands for Extended Markup Language. It is a symbolic language for structuring data systematically. XML is standard maintained by the W3C (World-wide web consortium). Device Description Files often use XML-based formats for storing the device-related data appropriately.

16 Contacts

Headquarter

Germany
Hilscher Gesellschaft für
Systemautomation mbH
Rheinstrasse 15
65795 Hattersheim
Phone: +49 (0) 6190 9907-0
Fax: +49 (0) 6190 9907-50
E-Mail: info@hilscher.com

Support
Phone: +49 (0) 6190 9907-99
E-Mail: de.support@hilscher.com

Subsidiaries

China
Hilscher Ges.f.Systemaut. mbH
Shanghai Representative Office
200010 Shanghai
Phone: +86 (0) 21-6355-5161
E-Mail: info@hilscher.cn

Support
Phone: +86 (0) 21-6355-5161
E-Mail: cn.support@hilscher.com

France
Hilscher France S.a.r.l.
69500 Bron
Phone: +33 (0) 4 72 37 98 40
E-Mail: info@hilscher.fr

Support
Phone: +33 (0) 4 72 37 98 40
E-Mail: fr.support@hilscher.com

India
Hilscher India Pvt. Ltd.
New Delhi - 110 025
Phone: +91 9810269248
E-Mail: info@hilscher.in

Italy
Hilscher Italia srl
20090 Vimodrone (MI)
Phone: +39 02 25007068
E-Mail: info@hilscher.it

Support
Phone: +39 / 02 25007068
E-Mail: it.support@hilscher.com

Japan
Hilscher Japan KK
Tokyo, 160-0022
Phone: +81 (0) 3-5362-0521
E-Mail: info@hilscher.jp

Support
Phone: +81 (0) 3-5362-0521
E-Mail: jp.support@hilscher.com

Switzerland
Hilscher Swiss GmbH
4500 Solothurn
Phone: +41 (0) 32 623 6633
E-Mail: info@hilscher.ch

Support
Phone: +49 (0) 6190 9907-99
E-Mail: ch.support@hilscher.com

USA
Hilscher North America, Inc.
Lisle, IL 60532
Phone: +1 630-505-5301
E-Mail: info@hilscher.us

Support
Phone: +1 630-505-5301
E-Mail: us.support@hilscher.com