COMPETENCE IN COMMUNICATION

User manual

netTAP NT 151-RE-RE

Real-Time Ethernet gateway

Hilscher Gesellschaft für Systemautomation mbH
www.hilscher.com

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Table of contents

1 Introduction

1.1 About this document

1.1.1 Description of the contents

This user manual describes hardware, technical data, installation and commissioning of the Hilscher netTAP gateway device **NT 151-RE-RE** for Real-Time Ethernet networks.
This document also features step-by-step instructions on how to reset the netTAP device to its “factory settings” (a.k.a. “firmware recovery”) and how to use an SD memory card to copy configuration data from one device to another (a.k.a. “cloning” of a spare device).
Technical data of the supported Real-Time Ethernet protocols can also be found in this document.

The configuration of the **NT 151-RE-RE** device is not subject of this document. Configuration and firmware download are described in the operating instruction manual *Configuration of Gateway and Proxy Devices*, DOC081201OIxxEN.
Instructions on how to install the necessary configuration software can be found in the user manual *Software Installation*, DOC100315UMxxEN.

Please note also that for the netTAP **NT 151-CCIES-RE** (gateway for CC-Link IE Field Slave to PROFINET IO Device conversion), there is a separate user manual: *netTAP NT 151-CCIES-RE – CC-Link IE Field Slave to PROFINET IO-Device gateway*, DOC180403UMxxEN.

1.1.2 Obligation to read the manual

Important:
- To avoid personal injury or property damage to your system or to your device, you must read and understand all instructions in this manual and in the documents accompanying your device before installing and operating your device.
- First read the **Safety Instructions** in the chapter *Safety* [page 16].
- Observe all **Safety Messages** in this manual.
- Keep the product DVD providing the product manuals.

1.1.3 List of revisions

Index	Date	Revision
6	2021-03-12	Firmware version 1.4 Protocol conversions added: • POWERLINK Controlled Node / POWERLINK Controlled Node • Open Modbus/TCP / PROFINET IO-Controller • Open Modbus/TCP / EtherCAT Master • Open Modbus/TCP / EtherNet/IP Scanner • Open Modbus/TCP / Sercos Master • Open Modbus/TCP / Open Modbus/TCP Subsection in section *Reference to hardware, firmware, software and drivers* [▷ page 7] updated. Section *Contents of the product DVD* [▷ page 11] updated. Overview table in section *Protocol conversions* [▷ page 22] expanded.
7	2022-06-28	Section *Hardware and firmware* [▷ page 7]: Hardware revision updated to revision 3. Section *Positions of the interfaces and LEDs* [▷ page 27] adapted to device label.
8	2022-07-07	Section *Technical data netTAP NT 151-RE-RE* [▷ page 75]: UKCA added.

Table 1: List of revisions

1.1.4 Conventions in this document

Notes, operation instructions and results of operation steps are marked as follows:

Notes

Important:
<important note>

Note:
<simple note>

<note, where to find further information>

Operation instructions

1. <operational step>
   - ➢ <instruction>
   - ➢ <instruction>
2. <operational step>
   - ➢ <instruction>
   - ➢ <instruction>

Results

 <intermediate result>

 <final result>

For a description of the labeling of **Safety Messages**, see section *Labeling of safety messages* [page 18].

1.1.5 Reference to hardware, firmware, software and drivers

1.1.5.1 Hardware and firmware

This document relates to the following versions of hardware and firmware of the netTAP **NT 151-RE-RE**:

Hardware revision	Protocol of primary network (X2)	Protocol of secondary network (X3)	Article no.	Firmware file	Firmware version (starting from this version and higher)
3	PROFINET IO-Device	PROFINET IO-Device	1722.122/PNS/PNS	T120D0D0.NXF	1.x
		PROFINET IO-Controller	1722.122/PNS/PNM	T120D0C0.NXF	1.x
		EtherCAT Master	1722.122/PNS/ECM	T120D0E0.NXF	1.x
		Sercos Master	1722.122/PNS/S3M	T120D0I0.NXF	1.x
		EtherNet/IP Scanner	1722.122/PNS/EIM	T120D0G0.NXF	1.x
		Open Modbus/TCP	1722.122/PNS/OMB	T120D0L0.NXF	1.x
	EtherCAT Slave	PROFINET IO-Device	1722.122/ECS/PNS	T120F0D0.NXF	1.x
		PROFINET IO-Controller	1722.122/ECS/PNM	T120F0C0.NXF	1.x
		EtherCAT Slave	1722.122/ECS/ECS	T120F0F0.NXF	1.x
		EtherCAT Master	1722.122/ECS/ECM	T120F0E0.NXF	1.x
		Sercos Master	1722.122/ECS/S3M	T120F0I0.NXF	1.x
		EtherNet/IP Adapter	1722.122/ECS/EIS	T120F0H0.NXF	1.x
		EtherNet/IP Scanner	1722.122/ECS/EIM	T120F0G0.NXF	1.x
		Open Modbus/TCP	1722.122/ECS/OMB	T120F0L0.NXF	1.x
	Sercos Slave	PROFINET IO-Device	1722.122/S3S/PNS	T120J0D0.NXF	1.x
		PROFINET IO-Controller	1722.122/S3S/PNM	T120J0C0.NXF	1.x
		EtherCAT Slave	1722.122/S3S/ECS	T120J0F0.NXF	1.x
		EtherCAT Master	1722.122/S3S/ECM	T120J0E0.NXF	1.x
		Sercos Slave	1722.122/S3S/S3S	T120J0J0.NXF	1.x
		Sercos Master	1722.122/S3S/S3M	T120J0I0.NXF	1.x
		EtherNet/IP Adapter	1722.122/S3S/EIS	T120J0H0.NXF	1.x
		EtherNet/IP Scanner	1722.122/S3S/EIM	T120J0G0.NXF	1.x
		Open Modbus/TCP	1722.122/S3S/OMB	T120J0L0.NXF	1.x
	EtherNet/IP Adapter	PROFINET IO-Device	1722.122/EIS/PNS	T120H0D0.NXF	1.x
		PROFINET IO-Controller	1722.122/EIS/PNM	T120H0C0.NXF	1.x
		EtherCAT Master	1722.122/EIS/ECM	T120H0E0.NXF	1.x
		Sercos Master	1722.122/EIS/S3M	T120H0I0.NXF	1.x
		EtherNet/IP Adapter	1722.122/EIS/EIS	T120H0H0.NXF	1.x
		EtherNet/IP Scanner	1722.122/EIS/EIM	T120H0G0.NXF	1.x
		Open Modbus/TCP	1722.122/EIS/OMB	T120H0L0.NXF	1.x
	POWERLINK Controlled Node	PROFINET IO-Device	1722.122/PLS/PNS	T120K0D0.NXF	1.x
		PROFINET IO-Controller	1722.122/PLS/PNM	T120K0C0.NXF	1.x
		EtherCAT Slave	1722.122/PLS/ECS	T120K0F0.NXF	1.x
		EtherCAT Master	1722.122/PLS/ECM	T120K0E0.NXF	1.x
		EtherNet/IP Adapter	1722.122/PLS/EIS	T120K0H0.NXF	1.x
		EtherNet/IP Scanner	1722.122/PLS/EIM	T120K0G0.NXF	1.x
		Sercos Slave	1722.122/PLS/S3S	T120K0J0.NXF	1.x
		Sercos Master	1722.122/PLS/S3M	T120K0I0.NXF	1.x
		Open Modbus/TCP	1722.122/PLS/OMB	T120K0L0.NXF	1.x
		POWERLINK Controlled Node	1722.122/PLS/PLS	T120K0K0.NXF	1.4

Hardware revision	Protocol of primary network (X2)	Protocol of secondary network (X3)	Article no.	Firmware file	Firmware version (starting from this version and higher)
3	Open Modbus/TCP	PROFINET IO-Controller	1722.122/OMB/PNM	T120L0C0.NXF	1.4
		EtherCAT Master	1722.122/OMB/ECM	T120L0E0.NXF	1.4
		EtherNet/IP Scanner	1722.122/OMB/EIM	T120L0G0.NXF	1.4
		Sercos Master	1722.122/OMB/S3M	T120L0I0.NXF	1.4
		Open Modbus/TCP	1722.122/OMB/OMB	T120L0L0.NXF	1.4

Table 2: Reference to firmware

1.1.5.2 Software

This document relates to the following software versions:

Software	Version	File name	Path on Gateway Solutions DVD
SYCON.net	1.500.x.x	SYCONnet netX setup.exe	Software_&_Tools\ Configuration_Software\ SYCON.net\

Table 3: Reference to software

1.1.5.3 Device description files

This document relates to the following device description files:

If used as	Devices	File name	Path on Gateway Solutions DVD
PROFINET IO Device	1722.122/PNS/PNS 1722.122/PNS/PNM 1722.122/PNS/ECM 1722.122/PNS/S3M 1722.122/PNS/EIM 1722.122/ECS/PNS 1722.122/S3S/PNS 1722.122/EIS/PNS	GSDML-V2.31-HILSCHER-NT 151-RE-RE PNS-20151021.xml **Note**: You cannot use this GSDML file if you use the **Auto Mapping** function for mapping signals when configuring your netTAP in SYCON.net. In this case you must generate a new file by using the **Export GSDML** function.	Firmware, EDS, Examples, Webpages \Firmware & EDS\ netTAP 151\ DeviceDescription\PNS
EtherCAT Slave	1722.122/ECS/PNS 1722.122/ECS/PNM 1722.122/ECS/ECS 1722.122/ECS/ECM 1722.122/ECS/S3M 1722.122/ECS/EIS 1722.122/ECS/EIM 1722.122/S3S/ECS 1722.122/EIS/ECS	Hilscher NT 151XX ECS V4.2.X.xml	Firmware, EDS, Examples, Webpages \Firmware & EDS\ netTAP 151\ DeviceDescription\ECS
Sercos Slave	1722.122/S3S/PNS 1722.122/S3S/PNM 1722.122/S3S/ECS 1722.122/S3S/ECM 1722.122/S3S/S3S 1722.122/S3S/S3M 1722.122/S3S/EIS 1722.122/S3S/EIM	SDDML#v3.0#Hilscher#NT_151-RE_RE_S3S_FIXCFG#2017-07-25.xml for 2 byte input and 2 byte output data. **Note:** Create with SYCON.net a device description file matching the used configuration by using the **Export SDDML** function.	Firmware, EDS, Examples, Webpages \Firmware & EDS\ netTAP 151\ DeviceDescription\S3S
EtherNet/IP Adapter	1722.122/EIS/PNS 1722.122/EIS/PNM 1722.122/EIS/ECM 1722.122/EIS/S3M 1722.122/EIS/EIS 1722.122/EIS/EIM	HILSCHER NT 151-RE-RE EIS V1.1.EDS	Firmware, EDS, Examples, Webpages \Firmware & EDS\ netTAP 151\ DeviceDescription\EIS
POWERLINK Controlled Node	1722.122/PLS/PNS 1722.122/PLS/PNM 1722.122/PLS/ECS 1722.122/PLS/ECM 1722.122/PLS/S3S 1722.122/PLS/S3M 1722.122/PLS/EIS 1722.122/PLS/EIM 1722.122/PLS/PLS 1722.122/PLS/OMB	00000044_NT151PLS-64O_64I.xdd for 64 byte input and 64 byte output data. 00000044_NT151PLS-512O_512I.xdd for 512 byte input and 512 byte output data.	Firmware, EDS, Examples, Webpages \Firmware & EDS\ netTAP 151\ DeviceDescription\PLS

Table 4: Reference on device description files

1.1.5.4 Drivers

This document relates to the following driver:

Driver	File name	Path on Gateway Solutions DVD
Installation program for Windows USB drivers	`setup.exe`	`Driver & Toolkit\ Device Driver\USB Driver`

Table 5: Reference to drivers

1.2 Contents of the product DVD

The **Gateway Solutions** product DVD contains:

- SYCON.net configuration and diagnostic program for Windows
- USB drivers for Windows
- PDF documentation
- Firmware
- Device description files
- Tools

Directory of the DVD:

Folder			Contents
Documentation			
	1. Software		Operating instruction manuals for device configuration (PDF)
		Ethernet Device Setup Utility	
		SYCON.net Configuration Software	
	2. Hardware		User manuals of the gateway devices (PDF)
		netLINK PROXY, Model NL 51N-DPL	
		netTAP 50, Model NT 50-xx-yy	
		netTAP 100, Model NT 100-xx-yy	
		netTAP 151, Model NT 151-CCIES-RE	
		netTAP 151, Model NT 151-RE-RE	
	3. For Programmers		Documentation for developers (PDF)
		Error Codes Compilation	
		IO Data Flow Control of 3964R protocol	
		IO Data Flow Control of ASCII protocol	
		Modbus RTU Specification	
		Modbus TCP Specification	
		netSCRIPT Scripting Language	
	4. PLC Application Notes		
		CCLINK IE - PROFINET coupler specification	
		Controllogix PLCs - EthernetIP Integration	
		SIMATIC PLCs - Consistent Data PROFIBUS,PROFINET	
		SIMATIC PLCs - Migration from PROFIBUS to PROFINET	
		Simple TCPIP connectivity through Modbus TCP	
	5. Installation Instructions		Wiring and software installation instructions for standard users (PDF)

Folder	Contents
Firmware, EDS, Examples, Webpages	Loadable firmware files and device description files
Firmware & EDS	
netLINK PROXY	
netTAP 50	
netTAP 100	
netTAP 151	Loadable firmware files for NT 151
DeviceDescription	Device description files for NT 151
ECS	EtherCAT Slave
EIS	EtherNet/IP Adapter
PLS	POWERLINK Controlled Node
PNS	PROFINET IO-Device
S3S	Sercos Slave
Driver & Toolkit	
Device Driver	USB Driver
Driver Toolkit	Driver Toolkit
Supplements & Examples	
Device Factory Reset	Tools for resetting the devices to their “factory settings”
netTAP 100 Factory Settings	
netTAP 151 CCLINK IE Factory Settings	
netTAP 151 Factory Settings	
NL 51N-DPL Factory Settings	
Modbus RTU,TCP Technical Resources	
Source Code from www.freemodbus.org (Freeware)	
Test Tools from www.modbustools.com (Shareware)	
netSCRIPT Source Codes	
RSLogix5000 Projects	
Siemens STEP7 Projects	Example project acyclic communication PROFINET IO-Device to Ethernet IP Scanner
SYCON.net Projects	SYCON.net example projects
UnityProXL Projects	

Table 6: Directory of Gateway Solutions DVD

1.3 Documentation overview

This section lists documents that are relevant to the user of the netTAP **NT 151-RE-RE** device.

Basic documents

Title	Contents	Document ID	Path on the Gateway Solutions DVD
User Manual *netTAP NT 151-RE-RE – Real-Time Ethernet Gateway* **(this document)**	Installation, commissioning and hardware description of the NT 151 device and other technical data	DOC150802UMxxEN	`Documentation\english\2.Hardware \netTAP 151, Model NT 151-RE-RE\netTAP NT 151-RE-RE UM xx EN.pdf`
Operating Instruction Manual *Configuration of Gateway and Proxy Devices*,	Configuring, testing, diagnosing and updating firmware of the NT 151 device	DOC081201OIxxEN	Documentation\english\1.Software\SYCON.net Configuration Software\Configuration of Gateway and Proxy Devices OI xx EN.pdf
User Manual *Software Installation Gateway Solutions*	Instructions for installing the configuration software	DOC100315UMxxEN	Documentation\english\5.Installation Instructions\ Software Installation - Gateway Solutions UM xx EN.pdf

Table 7: Basic documentation for NT 151-RE-RE

NT 151-RE-RE as PROFINET IO Controller

You also need the following documents if you are using the device as PROFINET IO Controller:

Title	Contents	Document ID	Path on the Gateway Solutions DVD
Operating Instruction Manual DTM for Hilscher-PROFINET IO-Controller Devices	Description of the device type manager for PROFINET IO Controller devices	DOC060302OIxxEN	Documentation\english\1.Software\SYCON.net Configuration Software\Master Configuration \PROFINET IO Controller\PROFINET IO Controller DTM OI xx EN.pdf
Operating Instruction Manual Generic DTM for PROFINET IO Devices	Description of the device type manager for generic PROFINET IO devices	DOC060305OIxxEN	Documentation\english\1.Software\SYCON.net Configuration Software\Master Configuration \PROFINET IO Controller \IO Device Configuration \PROFINET IO Generic Device DTM OI xx EN.pdf

Table 8: Additional documentation for NT 151-RE-RE as PROFINET IO Controller

NT 151-RE-RE as PROFINET IO Device

You also need the following document if you are using the device as PROFINET IO Device:

Title	Contents	Document ID	Path on the Gateway Solutions DVD
Operating Instruction Manual Generic DTM for PROFINET IO Devices	Description of the device type manager for generic PROFINET IO devices	DOC060305OIxxEN	Documentation\english\1.Software\SYCON.net Configuration Software\Master Configuration \PROFINET IO Controller \IO Device Configuration \PROFINET IO Generic Device DTM OI xx EN.pdf

Table 9: Additional documentation for NT 151-RE-RE as PROFINET IO Device

NT 151-RE-RE as EtherCAT Master

You also need the following documents if you are using the device as EtherCAT Master:

Title	Contents	Document ID	Path on the Gateway Solutions DVD
Operating Instruction Manual *DTM for Hilscher EtherCAT Master Device*	Description of the device type manager for EtherCAT Master devices	DOC080404OIxxEN	Documentation\english\1.Software\SYCON.net Configuration Software\Master Configuration \EtherCAT Master\EtherCAT Master DTM OI xx EN.pdf
Operating Instruction Manual *Generic Slave DTM for EtherCAT Slave Devices*	Description of the device type manager for generic EtherCAT slave devices	DOC071202OIxxEN	Documentation\english\1.Software\SYCON.net Configuration Software\Master Configuration \EtherCAT Master\Slave Configuration\EtherCAT Generic Slave DTM OI xx EN.pdf
User Manual *Wiring Instructions EtherCAT*	Wiring instructions for EtherCAT networks	DOC121104UMxxEN	Documentation\english\5.Installation Instructions\ Wiring Instructions UM xx EN.pdf

Table 10: Additional documentation for NT 151-RE-RE as EtherCAT Master

NT 151-RE-RE as EtherCAT Slave

You also need the following document if you are using the device as EtherCAT Slave:

Title	Contents	Document ID	Path on the Gateway Solutions DVD
User Manual *Wiring Instructions EtherCAT*	Wiring instructions for EtherCAT networks	DOC121104UMxxEN	Documentation\english\5.Installation Instructions\ Wiring Instructions UM xx EN.pdf

Table 11: Additional documentation for NT 151-RE-RE as EtherCAT Slave

NT 151-RE-RE as EtherNet/IP Scanner

You also need the following documents if you are using the device as EtherNet/IP Scanner:

Title	Contents	Document ID	Path on the Gateway Solutions DVD
Operating Instruction Manual *DTM for EtherNet/IP Scanner Devices*	Description of the device type manager for EtherNet/IP Scanner devices	DOC061201OIxxEN	Documentation\english\1.Software\SYCON.net Configuration Software\Master Configuration \EtherNetIP Scanner\EtherNetIP Scanner DTM OI xx EN.pdf
Operating Instruction Manual *Generic, Modular Generic DTM from EDS File for non-modular and modular EtherNet/IP Adapter Devices*	Description of the generic, modular generic device type manager from EDS file for non-modular EtherNet/IP Adapter devices and modular EtherNet/IP Adapter devices	DOC100221OIxxEN	Documentation\english\1.Software\SYCON.net Configuration Software\Master Configuration \EtherNetIP Scanner\Adapter Configuration \EtherNetIP Generic Adapter DTM EDS OI xx EN.pdf
Operating Instruction Manual *Generic DTM for EtherNet/IP Adapter Devices and Modular Generic DTM for modular EtherNet/IP Adapter Devices*	Description of the generic device type manager for EtherNet/IP Adapter devices and modular EtherNet/IP Adapter devices	DOC070203OIxxEN	Documentation\english\1.Software\SYCON.net Configuration Software\Master Configuration \EtherNetIP Scanner\Adapter Configuration \EtherNetIP Generic Adapter DTM OI xx EN.pdf

Table 12: Additional documentation for NT 151-RE-RE as EtherNet/IP Scanner

NT 151-RE-RE as Sercos Master

You also need the following documents if you are using the device as Sercos Master:

Title	Contents	Document ID	Path on the Gateway Solutions DVD
Operating Instruction Manual *DTM for Hilscher sercos Master Devices*	Description of the device type manager for sercos master devices	DOC090301OIxxEN	Documentation\english\1.Software\SYCON.net Configuration Software\Master Configuration\sercos Master\sercos Master DTM OI xx EN.pdf
Operating Instruction Manual *Generic Slave DTM for sercos Slave Devices*	Description of the device type manager for generic sercos slave devices	DOC090302UMxxEN	Documentation\english\1.Software\SYCON.net Configuration Software\Master Configuration\sercos Master\Slave Configuration\sercos Generic Slave DTM OI xx EN.pdf

Table 13: Additional documentation for NT 151-RE-RE as Sercos Master

2 Safety

2.1 General note

The user manual, the accompanying texts and the documentation are written for the use of the products by educated personnel. When using the products, all safety instructions and all valid legal regulations have to be obeyed. Technical knowledge is presumed. The user has to assure that all legal regulations are obeyed.

2.2 Intended use

The netTAP **NT 151-RE-RE** device described in this manual is a communication device connecting two separate Real-Time Ethernet networks with each other. The device thus serves as a “gateway” between the two networks.

The netTAP **NT 151-RE-RE** device is equipped with a compact housing and is intended for DIN rail mounting according to DIN EN 60715.

2.3 Personnel qualification

The netTAP must be installed, configured and removed only by qualified personnel. Job-specific technical skills for people professionally working with electricity must be present concerning the following topics:

- Safety and health at work
- Mounting and connecting of electrical equipment
- Measurement and Analysis of electrical functions and systems
- Evaluation of the safety of electrical systems and equipment
- Installing and Configuring IT systems

2.4 Safety standards

[S1] American National Standards Institute, Inc.: American National Standard, Product Safety Information in Product Manuals, Instructions, and Other Collateral Materials, ANSI Z535.6-2016, English, 2016.

[S2] DIN Deutsches Institut für Normung e. v. and VDE Verband der Elektrotechnik Elektronik Informationstechnik e. V.: German standard, Equipment for audio/video, information and communication technology - Part 1: Safety requirements, (IEC 62368-1:2014, modified + Cor.:2015); English version EN 62368-1:2014 + AC:2015, English, 2016-05.

[S3] DIN Deutsches Institut für Normung e. v. and VDE Verband der Elektrotechnik Elektronik Informationstechnik e. V.: German standard, Electrostatics - Part 5-1: Protection of electronic components against electrostatic phenomena, General requirements, (IEC 61340-5-1:2016); English version EN 61340-5-1:2016, English, 2017-07.

DIN Deutsches Institut für Normung e. v. und VDE Verband der Elektrotechnik Elektronik Informationstechnik e. V.: German standard, Electrostatics - Part 5-2: Protection of electronic components against electrostatic phenomena, User manual, (IEC TR 61340-5-2:2018), DIN IEC/TR 61340-5-2 (VDE V 0300-5-2), English, 2019-04.

2.5 Safety instructions to avoid personal injury

To ensure your own personal safety and to avoid personal injury, you must read, understand and follow the safety instructions and all safety messages in this manual about danger that might cause personal injury, before you install and operate your netTAP device.

2.5.1 Danger of unsafe system operation

To prevent personal injury, make sure that the removal of the netTAP device from your plant during operation will not affect the safe operation of the plant.

2.6 Safety instructions to avoid property damage

To avoid property damage to your system or to the netTAP device, you must read, understand and follow the safety instructions and all safety messages in this manual about danger that might cause property damage, before you install and operate your device.

2.6.1 Device destruction by exceeding allowed supply voltage

Observe the following notes concerning the supply voltage:

- The netTAP device may only be operated with the specified supply voltage. Make sure that the limits of the allowed range for the supply voltage are not exceeded.
- A supply voltage above the upper limit can cause severe damage to the device!
- A supply voltage below the lower limit can cause malfunction of the device.

The allowed range for the supply voltage of the netTAP device is specified in section *Technical data netTAP NT 151-RE-RE* [▷ page 75].

2.6.2 Danger of unsafe system operation

To prevent property damage, make sure that the removal of the netTAP device from your plant during operation will not affect safe operation of the plant.

2.6.3 Device destruction due to overheating

The air ventilation slots of the netTAP device must not be covered by any objects, otherwise the device might overheat!

Maximum environmental temperature is +60 °C.
If the environmental temperature exceeds +50 °C, you must allow for a minimum of 17.5 mm distance between the netTAP and neighboring devices.

2.6.4 Exceeding the maximum number of permitted write and delete accesses

This device uses a serial flash chip to store remanent data such as firmware storage, configuration storage, etc. This device allows a maximum of 100,000 write/delete accesses that are sufficient for standard operation of the device. However, writing/deleting the chip excessively (e.g. changing the configuration or changing the name of station) leads to the maximum number of permitted write/delete accesses being exceeded and to device damage. For example, if the configuration is changed once an hour, the maximum number is reached after 11.5 years. If the configuration is changed even more frequently, for example once a minute, the maximum number is reached after approx. 69 days.

Avoid exceeding the maximum permitted write/delete accesses by writing too often.

2.7 Labeling of safety messages

In this document the safety instructions and property damage messages are designed according both to the internationally used safety conventions as well as to the **ANSI Z535** standard.

- The **Section Safety Messages** at the beginning of a chapter are pinpointed particularly and highlighted by a signal word according to the degree of endangerment. The kind of danger is specified exactly by the safety message text and optionally by a specific safety sign.
- The **Integrated Safety Messages** embedded in operating instructions are highlighted by a signal word according to the degree of endangerment. In the safety message, the nature of the hazard is indicated.

Signal words and safety signs in safety messages on personal injury

Signal word	Meaning
DANGER	Indicates a direct hazard with high risk, which will have as consequence death or grievous bodily harm if it is not avoided.
WARNING	Indicates a possible hazard with medium risk, which will have as consequence death or (grievous) bodily harm if it is not avoided.
CAUTION	Indicates a minor hazard with medium risk, which could have as consequence personal injury if it is not avoided.

Table 14: Signal words in safety messages on personal injury

Safety sign	Sort of warning or principle
	Warning of lethal electrical shock
	Principle: Disconnect the power plug

Table 15: Safety signs in messages on personal injury

Signal words and safety signs in safety messages on property damage

Signal word	Meaning
NOTICE	Indicates a property damage message

Table 16: Signal words in safety messages on property damage

Safety sign	Sort of warning or principle
	Warning of property damage by electrostatic discharge

Table 17: Safety signs in safety messages on property damage

3 Description

3.1 Functionality

The netTAP **NT 151-RE-RE** device is a communication gateway connecting two separate Real-Time Ethernet networks. The two networks can be either using the same (e. g. PROFINET IO to PROFINET IO) or two different RTE network systems protocols (e. g. EtherNet/IP to PROFINET IO).

The **NT 151-RE-RE** always acts as slave device in the primary network (which is connected at gateway interface X2); in the secondary network however (which is connected at gateway interface X3), it can act either as slave or as master device.

For processing the communication, each of the device's two network interfaces has its own netX controller: the primary network interface (X2) is controlled by the netX 51, the secondary network interface (X3) by the more powerful netX 100.

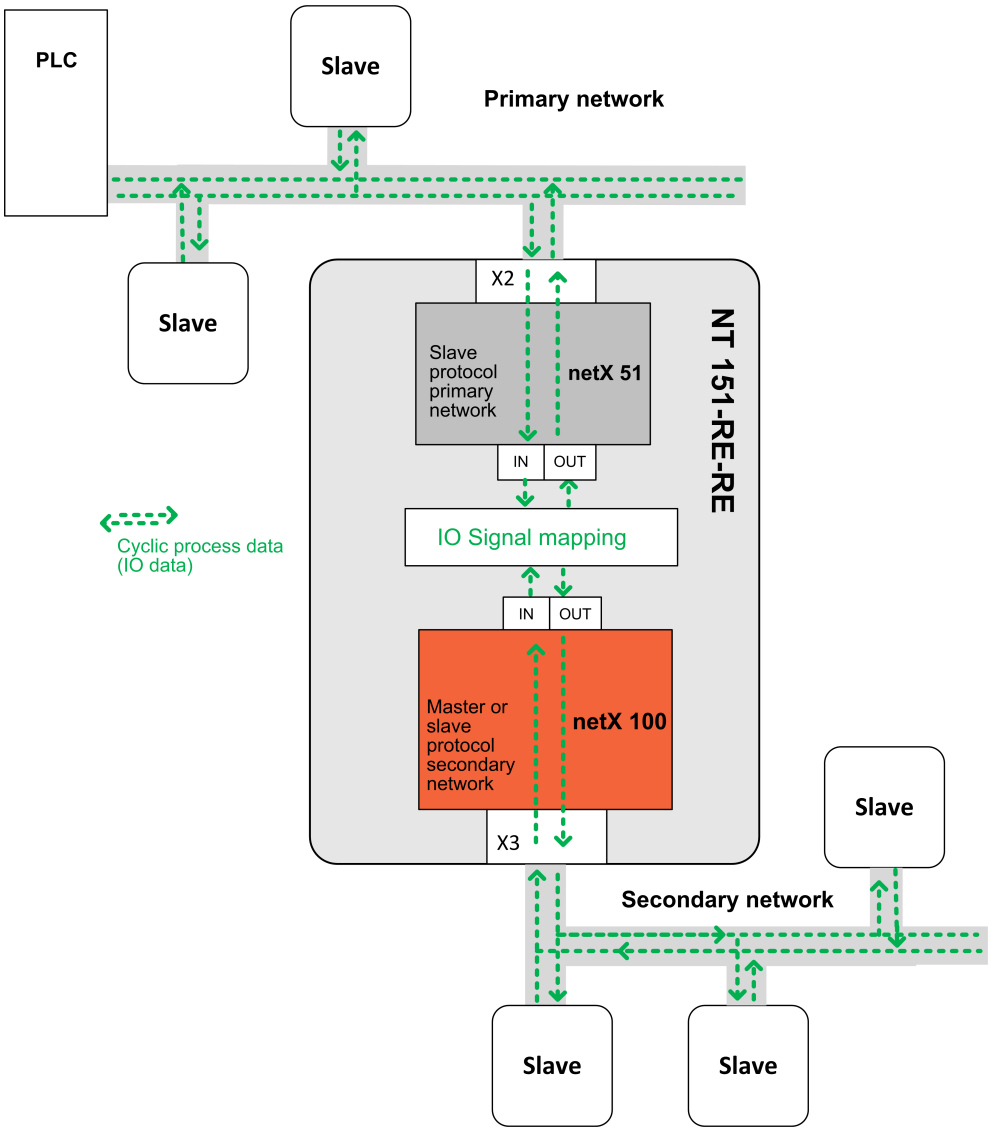


Figure 1: Data flow netTAP NT 151-RE-RE

The protocol conversion (e. g. PROFINET IO Device to EtherNet/IP Scanner) is determined by the firmware installed in the device.
The communication parameters are to be configured by the user himself by means of the **SYCON.net** configuration and diagnosis software, which is included in the scope of delivery.

The netTAP **NT 151-RE-RE** device is equipped with a compact housing and is suitable for DIN rail mounting according to DIN EN 60715.

3.2 Protocol conversions

The protocol conversion of the **NT 151-RE-RE** is determined by the firmware installed in the device. By customer's choice, the device can be ordered with or without pre-installed firmware. Devices shipped without pre-installed firmware are only equipped with a "base firmware" which enables customers to perform a firmware download by using the **SYCON.net** configuration software on a PC connected to the device via USB. The loadable firmware files and SYCON.net are provided on the **Gateway Solutions DVD**. Instructions for downloading firmware to the device with SYCON.net can be found in the operating instruction manual *Configuration of Gateway and Proxy Devices*, DOC081201OIxxEN.
netTAPs acting as master in the secondary network also require a master license in the device. If stated accordingly on ordering, devices intended for being used as masters (devices with or without preloaded firmware alike) will be delivered with pre-installed master licenses.

The following table shows the article numbers and the firmware names (NXF) of the protocol conversions that are currently available for the netTAP NT 151-RE-RE device:

		Primary network (X2)					
		PROFINET IO Device	EtherCAT Slave	Sercos Slave	EtherNet/IP Adapter	POWERLINK Controlled Node	Open Modbus/ TCP
Secondary network (X3)							
PROFINET IO	Device	1722.122 /PNS/PNS T120D0D0 .NXF	1722.122 /ECS/PNS T120F0D0 .NXF	1722.122 /S3S/PNS T120J0D0 .NXF	1722.122 /EIS/PNS T120H0D0 .NXF	1722.122 /PLS/PNS T120K0D0 .NXF	-
	Controller	1722.122 /PNS/PNM T120D0C0 .NXF	1722.122 /ECS/PNM T120F0C0 .NXF	1722.122 /S3S/PNM T120J0C0 .NXF	1722.122 /EIS/PNM T120H0C0 .NXF	1722.122 /PLS/PNM T120K0C0 .NXF	1722.122 /OMB/PNM T120L0C0 .NXF
EtherCAT	Slave	-	1722.122 /ECS/ECS T120F0F0 .NXF	1722.122 /S3S/ECS T120J0F0 .NXF	-	1722.122 /PLS/ECS T120K0F0 .NXF	
	Master	1722.122 /PNS/ECM T120D0E0 .NXF	1722.122 /ECS/ECM T120F0E0 .NXF	1722.122 /S3S/ECM T120J0E0 .NXF	1722.122 /EIS/ECM T120H0E0 .NXF	1722.122 /PLS/ECM T120K0E0 .NXF	1722.122 /OMB/ECM T120L0E0 .NXF
Sercos	Slave	-	-	1722.122 /S3S/S3S T120J0J0 .NXF	-	1722.122 /PLS/S3S T120K0J0 .NXF	-
	Master	1722.122 /PNS/S3M T120D0I0 .NXF	1722.122 /ECS/S3M T120F0I0 .NXF	1722.122 /S3S/S3M T120J0I0 .NXF	1722.122 /EIS/S3M T120H0I0 .NXF	1722.122 /PLS/S3M T120K0I0 .NXF	1722.122 /OMB/S3M T120L0I0 .NXF
EtherNet/IP	Adapter	-	1722.122 /ECS/EIS T120F0H0 .NXF	1722.122 /S3S/EIS T120J0H0 .NXF	1722.122 /EIS/EIS T120H0H0 .NXF	1722.122 /PLS/EIS T120K0H0 .NXF	-
	Scanner	1722.122 /PNS/EIM T120D0G0 .NXF	1722.122 /ECS/EIM T120F0G0 .NXF	1722.122 /S3S/EIM T120J0G0 .NXF	1722.122 /EIS/EIM T120H0G0 .NXF	1722.122 /PLS/EIM T120K0G0 .NXF	1722.122 /OMB/EIM T120L0G0 .NXF
POWERLINK	Controlled Node	-	-	-	-	1722.122 /PLS/PLS T120K0K0 .NXF	-
Open Modbus/ TCP	Server Client	1722.122 /PNS/OMB T120D0L0 .NXF	1722.122 /ECS/OMB T120F0L0 .NXF	1722.122 /S3S/OMB T120J0L0 .NXF	1722.122 /EIS/OMB T120H0L0 .NXF	1722.122 /PLS/OMB T120K0L0 .NXF	1722.122 /OMB/OMB T120L0L0 .NXF

Table 18: Available protocol conversions with article numbers and firmware names

Note:
For the conversion of CC-Link IE Field Slave to PROFINET IO Device, Hilscher offers a separate netTAP with special hardware, i.e. the **NT 151-CCIES-RE**. For more information about this device, see user manual *netTAP NT 151-CCIES-RE – CC-Link IE Field Slave to PROFINET IO-Device gateway*, DOC180403UMxxEN.

3.3 Interfaces

The Ethernet interface for the primary network (X2), consisting of two RJ45 jacks, is located on the upper side of the **NT 151-RE-RE** device, the Ethernet interface for the secondary network (X3), also consisting of two RJ45 jacks, is located on the bottom side of the device. The configuration interfaces (Mini USB socket and SD memory card slot) are easily accessible at the front of the device.

4 Requirements

Technical requirements

- The netTAP **NT 151-RE-RE** device is to be mounted on a DIN rail according to DIN EN 60715.
- A suitable external 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 190 mA at 24 V.

NOTICE

Device Destruction by Exceeding Allowed Supply Voltage!

The voltage must not exceed 30 V, 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. For the allowed temperature, see section *Technical data netTAP NT 151-RE-RE* [page 75].

Requirements for using the SYCON.net configuration software

For installing and operating the SYCON.net configuration software on your PC, you need the following:

- PC with 1 GHz processor or higher
- Windows® 7 (32 bit) SP1, Windows® 7 (64 bit) SP1, Windows® 8 (32 bit) or Windows® 8 (64 bit), Windows® 10 (32 bit) or Windows® 10 (64 bit)
- Administrator privilege required for installation
- Internet Explorer 5.5 or higher
- Free disk space: min. 400 MByte
- DVD ROM drive
- RAM: min. 512 MByte, recommended 1024 MByte
- Graphic resolution: min. 1024 x 768 pixel
- Keyboard and Mouse
- USB interface

5 Device drawings and connectors

5.1 Dimensioned drawings

Outer dimensions of the netTAP **NT 151**:

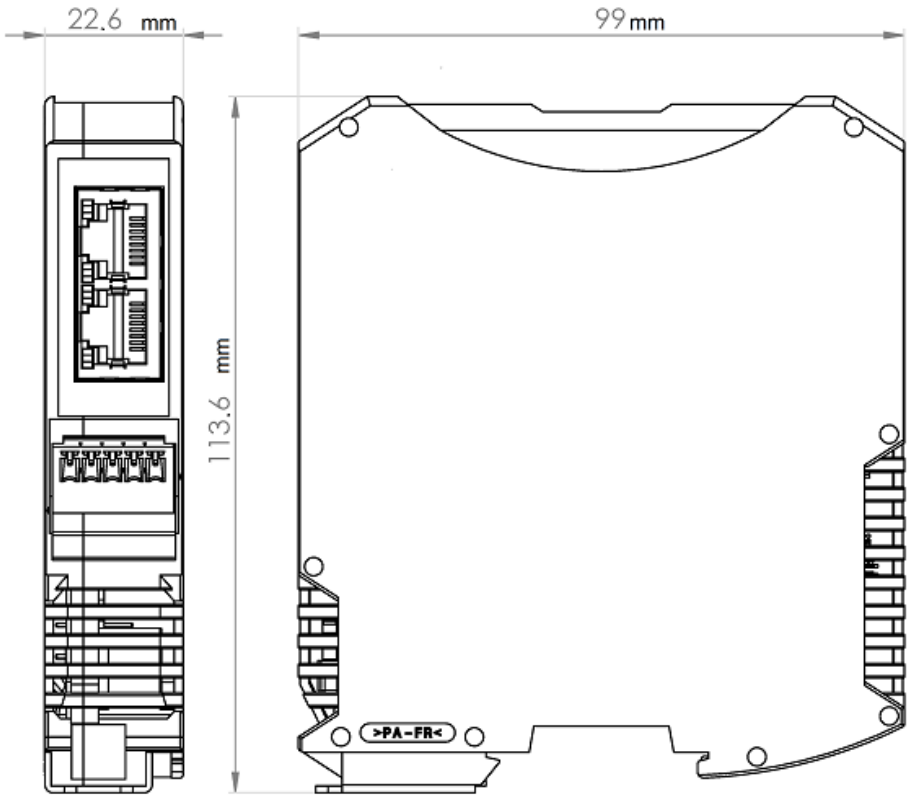


Figure 2: Outer dimensions of NT 151

Dimensions of the power supply plug:

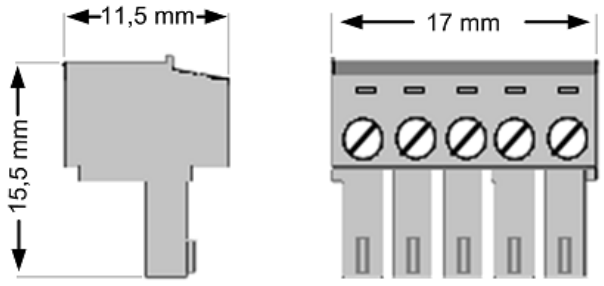
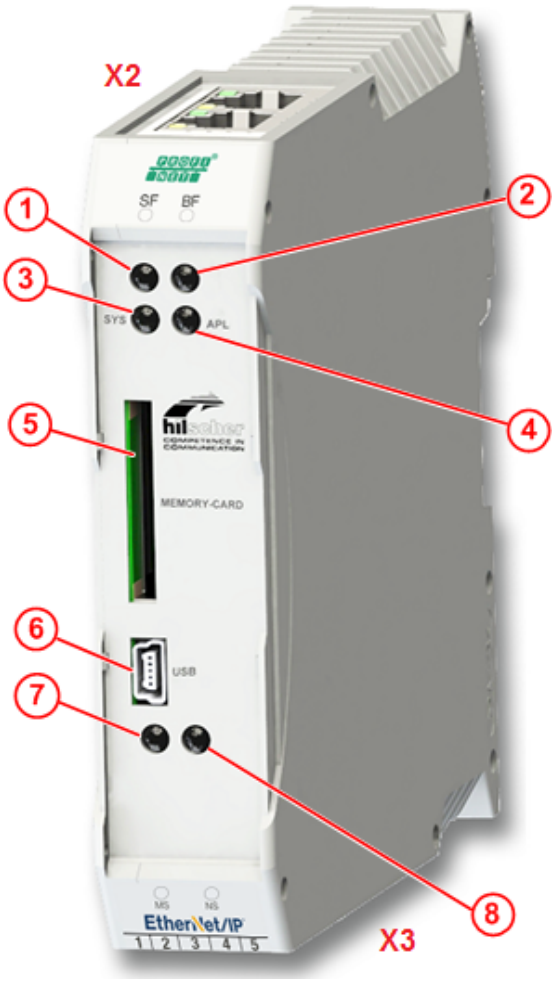


Figure 3: Dimensions of Mini COMBICON power supply plug

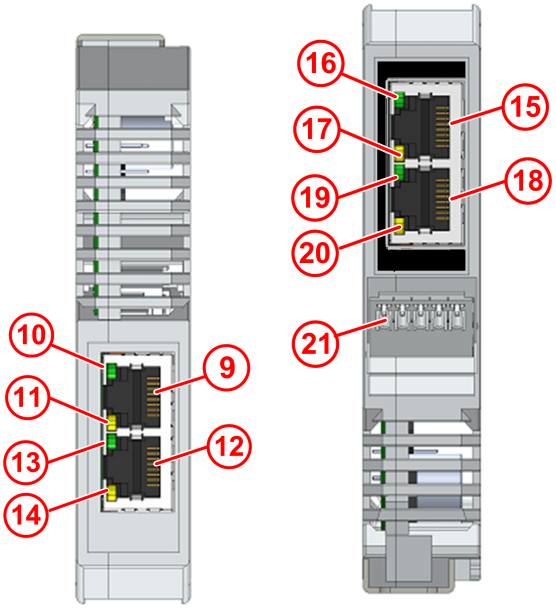
Important:
When planning the installation of the netTAP device, reserve sufficient room above and below the device to allow for convenient plugging or unplugging of the network and power supply cables.

5.2 Positions of the interfaces and LEDs



NT 151-RE-RE front view

(1) Protocol specific LED (COM2) at X2
(2) Protocol specific LED (COM3) at X2
(3) SYS LED (system status)
(4) APL LED (application status)
(5) Slot for SD memory card
(part number of card 1719.003)
(6) Mini-USB interface
(7) Protocol specific LED (COM0) at X3
(8) Protocol specific LED (COM1) at X3
(9) Real-Time Ethernet interface X2 channel 0
(RJ45 socket)
(10) LINK LED for Real-Time Ethernet interface X2 channel 0
(11) ACT LED for Real-Time Ethernet interface X2 channel 0
(activity)
(12) Real-Time Ethernet interface X2 channel 1
(RJ45 socket)
(13) LINK LED for Real-Time Ethernet interface X2 channel 1
(14) ACT LED for Real-Time Ethernet interface X2 channel 1
(activity)
(15) Real-Time Ethernet interface X3 channel 0
(RJ45 socket)
(16) LINK LED for Real-Time Ethernet interface X3 channel 0
(17) ACT LED for Real-Time Ethernet X3 interface channel 0
(activity)
(18) Real-Time Ethernet interface X3 channel 1
(RJ45 socket)
(19) LINK LED for Real-Time Ethernet X3 interface channel 1
(20) ACT LED for Real-Time Ethernet X3 interface channel 1
(activity)
(21) Connector for supply voltage (X1)

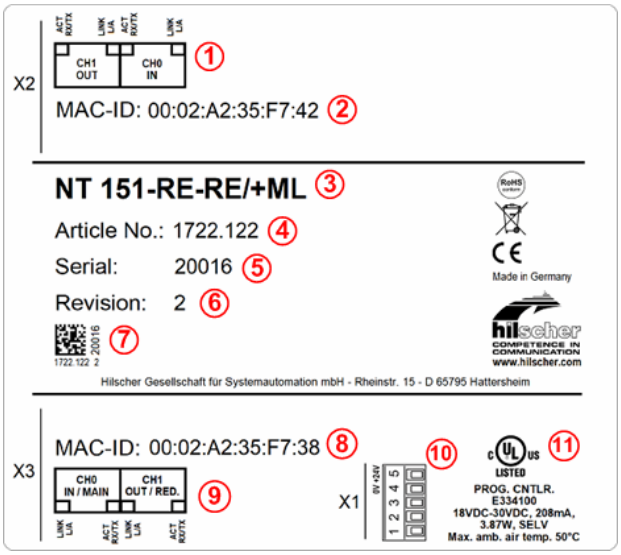


Top view (X2) Bottom view (X3)

Table 19: LEDs and interfaces NT 151-RE-RE

5.3 Device label

Each netTAP **NT 151-RE-RE** carries a device type label providing the following information:



(1) Labelling of channels and LEDs of the connectors of the primary network at X2

(2) MAC address at X2 *

(3) Device type ID
In case the device has a master license, it is followed by **+ML**

(4) Article number

(5) Serial number of device

(6) Hardware revision number

(7) Matrix label

(8) MAC address at X3 *

(9) Labelling of channels and LEDs of the connectors of the secondary network at X3

(10) Labelling of supply voltage connector (X1)

(11) UL label

* three additional MAC addresses are reserved for each network interface

If your netTAP has been delivered with pre-loaded firmware, you will also find on the device type label an indication of the protocol loaded at **X2** respectively **X3**.

Abbreviation	Protocol
PNM	PROFINET IO Controller
PNS	PROFINET IO Device
ECM	EtherCAT Master
ECS	EtherCAT Slave
S3M	Sercos Master
S3S	Sercos Slave
EIM	EtherNet/IP Scanner
EIS	EtherNet/IP Adapter
PLS	POWERLINK Controlled Node
OMB	OpenModbus/TCP

Table 20: Protocol abbreviations

5.4 Protocol logo and LED label sticker

Each netTAP with preloaded firmware is delivered with the appropriate protocol logos and LED labels already attached to the device. Devices without preloaded firmware (for which the appropriate firmware has to be loaded into the device by the customer) are shipped with a separate sheet of sticker labels for all supported protocols. The customer can attach the stickers to the device in order to mark the network interfaces and their protocol-specific LEDs.

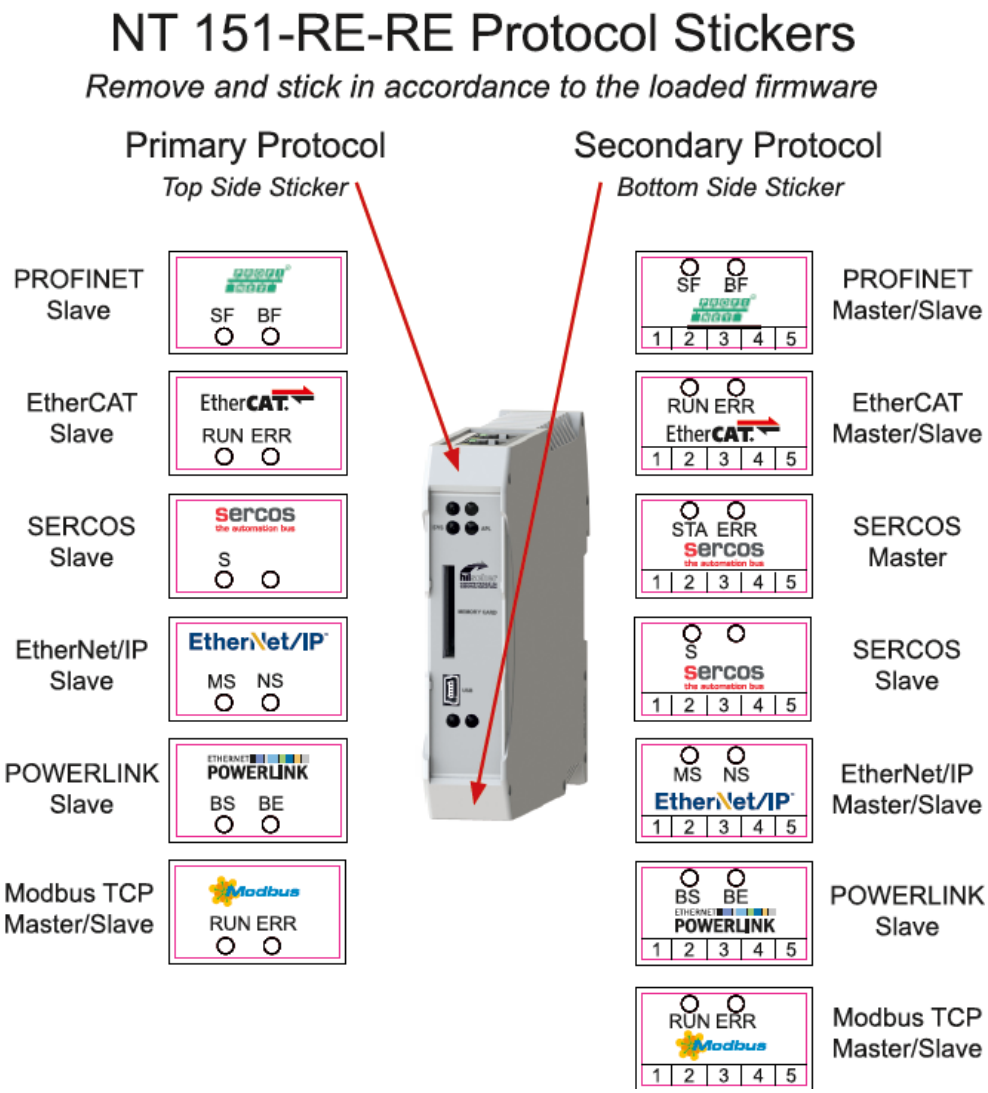


Figure 4: Protocol stickers

5.5 Power supply connector

The power supply of the netTAP NT 151-RE-RE has to be connected to pins 4 and 5 of the five-pole MINI COMBICON connector **X1** (for identification, see position (21) in section *Positions of the interfaces and LEDs* [page 27]) The power supply voltage must be 24 V DC ± 6 V DC.

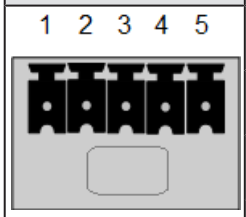
Connector	Pin	Signal	Description
	1	ISO_GND	Ground of isolated I/Os (reserved for future use)
	2	ISO_IN	Isolated input (reserved for future use)
	3	ISO_OUT	Isolated output (reserved for future use)
	4	0 V / GND	Ground of supply voltage
	5	+24 V	+24 V supply voltage

Table 21: Pin assignment of 5-pole power supply socket

Use a five-pole MINI COMBICON plug (included in the delivery) for connecting the voltage supply:

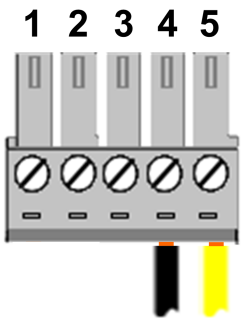
Supply voltage	Pin	Signal	Description
 Mini Combicon	1	-	Reserved for future use
	2	-	Reserved for future use
	3	-	Reserved for future use
	4	0 V / GND	Ground of supply voltage
	5	24 V	+24 V supply voltage

Table 22: Pin assignment Mini Combicon plug 5-pole

5.6 Ethernet connectors

The Real-Time Ethernet interfaces are equipped with RJ45 sockets (see positions (9), (12), (15) and (18) in section *Positions of the interfaces and LEDs* [page 27]). Use twisted pair cables of category 5 (CAT5) or higher, consisting of four twisted pairs. The maximum baud rate is 100 MBit/s (CAT5).

Note:
The device supports Auto Crossover function. Due to this fact, RX and TX can be switched.

The following figure shows the RJ45 standard pinning:

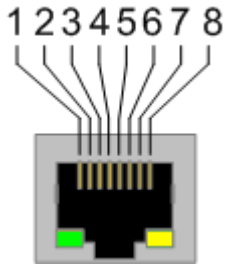
Ethernet	Pin	Signal	Description
 RJ45 Buchse	1	TX+	Transmit data +
	2	TX–	Transmit data –
	3	RX+	Receive data +
	4	-	Connected to FE via RC combination*
	5	-	
	6	RX–	Receive data –
	7	-	Connected to FE via RC combination*
	8	-	
	Shield		Capacitive to FE
			* Bob Smith Termination

Table 23: Ethernet RJ45 pin assignment

If you are using the netTAP with **EtherCAT**, please observe also the user manual *Wiring Instructions EtherCAT*, DOC121104UMxxEN, stored on the Gateway Solutions DVD in the `Documentation\english\5.Installation Instructions` directory.

5.7 USB interface (Mini-B USB)

The USB interface (see position (6) in section *Positions of the interfaces and LEDs* [page 27]) is used for configuring the netTAP **NT 151-RE-RE** with SYCON.net (see operating instruction manual *Configuration of Gateway and Proxy Devices*, DOC081201OIxxEN) and for recovering the firmware (see section *Using USB to recover firmware* [page 41]).

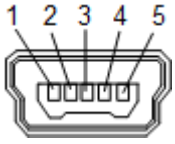
USB socket	Pin	Signal	Description
	1	-	-
	2	D-	Data -
	3	D+	Data +
	4	-	-
	5	GND	Ground
	Shield		Capacitive to GND

Table 24: Pin assignment Mini-B USB connector (5-pin)

5.8 Galvanic isolation

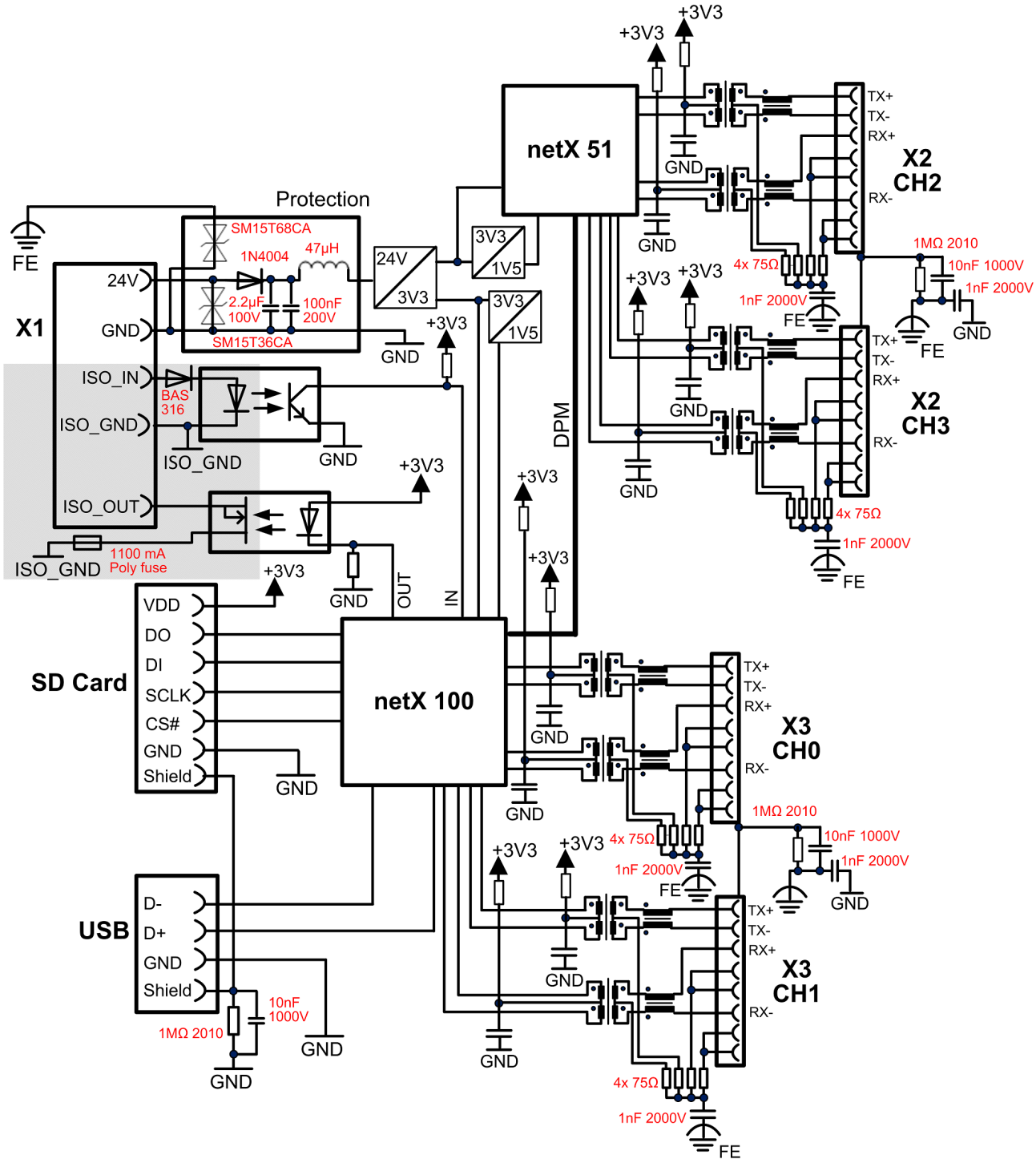


Figure 5: Galvanic isolation of NT 151-RE-RE

Note:
The isolated area is the gray area in the picture above.
Functional earth is connected via back plane bus of the DIN top hat rail.

6 Mounting of device

6.1 Safety messages

Please observe the following safety messages:

NOTICE

Device destruction due to compensating currents !

Please pay attention to the grounding and shielding concept of your plant. The concept should prevent the flowing of compensating currents via signal and power supply lines between the used devices. Otherwise device destruction of the netTAP is possible.

NOTICE

Device destruction due to overheating !

The air ventilation slots of the netTAP device must not be covered by any objects. Otherwise the device might overheat.

Maximum allowed environmental temperature is + 60 °C.
If the environmental temperature exceeds + 50 °C, you must allow a minimum distance of 17.5 mm between the netTAP and neighboring devices.

6.2 Mounting device onto Top Hat Rail

- The netTAP device is to be mounted onto a horizontally attached top hat rail according to DIN EN 60715.
- The rail has to be connected with the potential equalization conductor (FE).

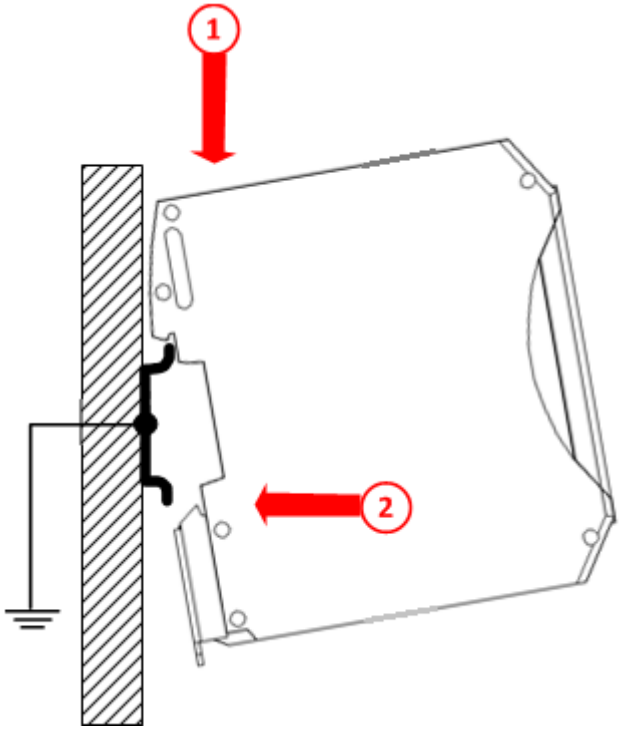


Figure 6: Mounting the netTAP device onto Top Hat Rail

- Push the device onto the top hat rail from above (1).
- Then press the device against the rail until the bolt of the lower hook engages (2).
- After mounting, connect the 24 V supply voltage to the device.

NOTICE

Device Destruction by Exceeding the Allowed Supply Voltage!

The supply voltage must not exceed 30 V, otherwise the netTAP device will be damaged.

Note:

Grounding is done via a grounding contact located at the backside of the device, connecting it electrically to the DIN top hat rail.

6.3 Removing device from Top Hat Rail

➢ Before dismounting the netTAP from the top hat rail, first remove the power supply cable and all data cables from the device.

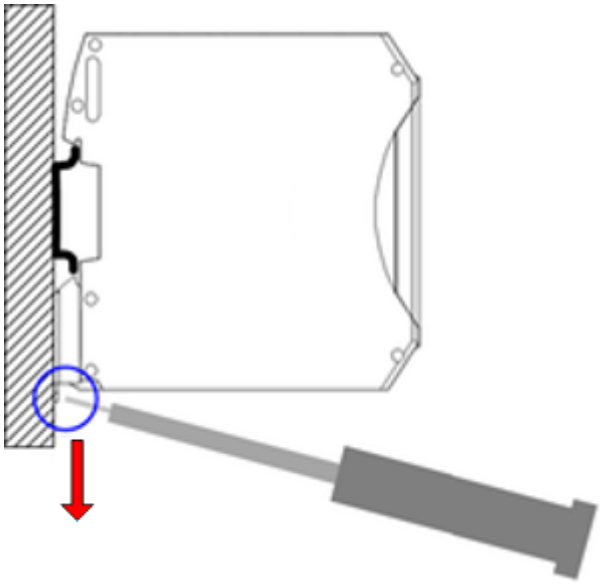


Figure 7: Removing the netTAP device from Top Hat Rail

➢ Put a screw driver into the slot of the latch at the bottom of the device.

➢ To disengage the lock of the hook, pull down the latch with the screw driver.

➢ Take the device off the top hat rail.

7 Commissioning

Firmware

netTAPs with pre-loaded firmware can be instantly installed, configured and commissioned. If you are commissioning a netTAP delivered without pre-loaded firmware, you have to perform a firmware download before you can download the configuration. Information on this can be found in the operating instruction manual *Configuration of Gateway and Proxy Devices*, DOC081201OIxxEN.

Configuration

The netTAP needs to be configured with the Windows configuration software **SYCON.net** via the USB interface of the device (see position (6) in section *Positions of the interfaces and LEDs* [page 27]).
SYCON.net allows you to create a configuration “offline”, without an actual connection to the target device (i. e. the netTAP). Only for the subsequent download of the configuration into the device, you need a physical USB connection.

The device stores this data remanently, i. e. the data is being kept after power off or device reset.

Detailed information about configuration with SYCON.net can be found in the operating instruction manual *Configuration of Gateway and Proxy Devices*, DOC081201OIxxEN on the Gateway Solutions DVD in the `Documentation\english\1.Software \SYCON.net Configuration Software\Configuration of Gateway and Proxy Devices OI xx EN.pdf` directory.

Starting-up with inserted SD memory card

In case an SD memory card containing a valid configuration is inserted into the netTAP **NT 151-RE-RE** while a power-on cycle is being performed, all data stored on the card will be copied to the internal load memory of the device. (For the position of the memory card slot, see (5) in section *Positions of the interfaces and LEDs* [page 27].)
This data can be:

- firmware
- configuration files

Any old data stored in the load memory will be erased by this.

With this procedure, you can reset the device to its factory settings or load a desired configuration without having to establish a USB connection to the SYCON.net configuration software. SYCON.net offers the function to copy the data of the internal load memory of an already configured netTAP onto an inserted empty SD memory card. Thus, you can easily “clone” a configuration and transfer it into another device, e. g. into a spare device in case of a defective primary device.

Note that the SD card must be FAT formatted, otherwise it will not be recognized by the device. Detailed instructions on how to transfer configuration data into another netTAP device by SD memory card can be found in chapter *Using SD memory card to copy configuration data into spare netTAP devices* [page 49].

Resetting the netTAP to its factory settings by using an SD memory card (e. g. in case of a defective firmware) is described in the subsequent chapter.

8 Firmware recovery

8.1 Overview

If after power-on the **SYS** LED (see position (3) in section *Positions of the interfaces and LEDs* [page 27]) is flashing yellow and green at a rate of 1 Hz, the device is in boot mode. The firmware file of the netTAP **NT 151-RE-RE** is missing or defective. In this state, the device cannot be operated and the firmware needs to be recovered either by SD memory card or via USB.

Using SD memory card to reset the device to its factory settings

When using the SD memory card, the file system inside the device will be reformatted and all existing firmware, configuration or IP address files will automatically be deleted. The device will thus be reset to its “factory settings”. Note that by this method, only a so-called “base firmware” is copied from the SD memory card to the device, enabling the subsequent downloading of the “regular” full firmware by SYCON.net via USB connection. This means that after using the SD card, you will have to establish a USB connection between the netTAP and your configuration PC in order to download the regular firmware and a new configuration to the device with SYCON.net.

Using USB and ComProX2 to reset the device to its factory settings/ recover the firmware

On the other hand, if you are using the Hilscher **ComProX2** tool via USB, you can directly access the file system of the netTAP and overwrite the old defective firmware file with a fresh firmware file. Here, you can directly download the “regular” firmware to the netTAP without first having to use the “base firmware” – as it is the case when using the SD card.
Since **ComProX2** allows you to format the whole file system or to erase or download only individual files, you can decide for yourself whether you want to reset the device to its factory settings (erase all files and then download firmware) or whether you want to preserve old configuration files inside the device and only erase the old defective firmware file by downloading new firmware file, thus performing only a “firmware recovery” instead of a “factory reset”. Note, however, that a defective firmware most likely causes corruption also of the file system, thus making a re-formatting of the file system strongly advisable before downloading the new firmware file. Therefore it is recommended to completely reset the device to its factory settings instead of just exchanging/recovering the firmware.

8.2 Using an SD memory card to reset the netTAP to its “factory settings”

The netTAP **NT 151-RE-RE** can be reset to its factory settings by using the load memory image on an SD memory card. You will find the load memory image on the Gateway Solutions DVD in the `Supplements & Examples \Device Factory Reset\netTAP 151 Factory Settings \Recovery via Memory Card` directory. From there, you can copy the image to the SD memory card, and then use the card to copy it to the netTAP device.
All existing old data (including the configuration) in the internal load memory of the netTAP will thereby be deleted and a “base firmware” will be loaded to the device. After recovery by SD card, you therefore must download the full “regular” firmware and a new configuration to the device with SYCON.net.

Note:
The SD memory card is not included in the delivery of the **NT 151-RE-RE** device, but can be obtained from Hilscher. The part number of the card is 1719.003.

Prerequisites

- Empty SD memory card (FAT formatted)
- PC with SD card reader device
- Gateway Solutions DVD
- The netTAP device is supplied with voltage

Step-by-step instructions

1. Copy load memory image from DVD to SD card.
   - ➢ If applicable: remove write protection on your SD memory card.
   - ➢ Insert the empty SD memory card into the SD card reader device of your PC.
   - ➢ On the Gateway Solutions DVD, open `Supplements & Examples \Device Factory Reset\netTAP 151 Factory Settings \Recovery via Memory Card` directory.
   - ➢ Copy the `STARTUP.INI` file and the `BACKUP` folder (with all its subfolders) to the root directory of the SD memory card.
   - ➢ Remove the SD memory card from the SD card reader device.

2. Copy load memory image to netTAP device.
   - ➢ Disconnect the voltage supply from your netTAP device.
   - ➢ Insert the SD card into the card slot of the netTAP device until it engages (metal contacts of the card must be facing left).

Figure 8: Insert SD card

   - ➢ Reconnect the voltage supply of your netTAP device.
   - ↬ The device then loads the memory image. While loading the image, the **SYS** LED quickly alternates between green and yellow for approximately eight seconds, then shows steady yellow for approximately ten seconds, then is switched off for a short while before it finally shows steady green light. The device automatically starts the loaded firmware.
   - ➢ Remove the SD memory card from device.
   - ⇨ The netTAP device has been reset to its factory settings.
     The device now needs a firmware download and a new configuration with SYCON.net via USB connection. Instructions for this can be found in the operating instruction manual *Configuration of Gateway and Proxy Devices*, DOC081201OIxxEN.

8.3 Using USB to recover firmware

Via USB, you can reset the netTAP device to its factory settings by re-formatting its file system and downloading a new firmware file to the device.

For this, you need a USB cable with a Mini USB connector and the Hilscher **ComProX2** tool, which is stored on the Gateway Solutions DVD in the `Supplements & Examples\Device Factory Reset\netTAP 151 Factory Settings\Recovery via USB` directory. **ComProX2** can be executed directly from DVD, it does not need to be installed on your configuration PC.
Note that for recovery via USB, you need to install the USB driver for the Hilscher netTAP on your configuration PC. This driver allows you to communicate with the netTAP via USB, even if the old firmware within the device is defective or missing altogether.
It is recommended to install the USB driver *before* you connect the netTAP device via USB cable. Use the **setup.exe** driver installation program for this, which is stored on the Gateway Solutions DVD in the `Setups & Drivers\USB Driver` directory.

The installation of the USB driver is described in the user manual *Software Installation Gateway Solutions*, DOC100315UMxxEN, which is stored on the Gateway Solutions DVD in the `Documentation\english\5.Installation Instructions` directory.

Note:
As an alternative, you can just perform a so-called “firmware recovery” by downloading a new firmware file to the device without having re-formatted the file system beforehand, thus preserving all existing configuration files within the device. Note, however, that a defective firmware most likely causes corruption also of the file system, therefore you are strongly advised to re-format the file system before downloading a new firmware file.

Prerequisites

- The USB driver for Hilscher netTAP has been installed on the configuration PC (the driver is included in the USB driver installation program stored on the Gateway Solutions DVD).
- The configuration PC has been connected to the netTAP device via USB cable.
- You have access to the Gateway Solutions DVD.
- The netTAP device is supplied with voltage.
- Disconnect all other Hilscher devices (apart from the **NT 151-RE-RE)** that may happen to be also connected to the configuration PC via USB.
- If applicable, close **SYCON.net** on your configuration PC.

Step-by-step instructions

1. Open ComProX2.

   ➢ On the Gateway Solutions DVD, open `Supplements & Examples\Device Factory Reset\netTAP 151 Factory Settings\Recovery via USB` directory.

   ➢ Double-click **comproX2.exe** file.

   ↬ The **ComProX2** tool opens:

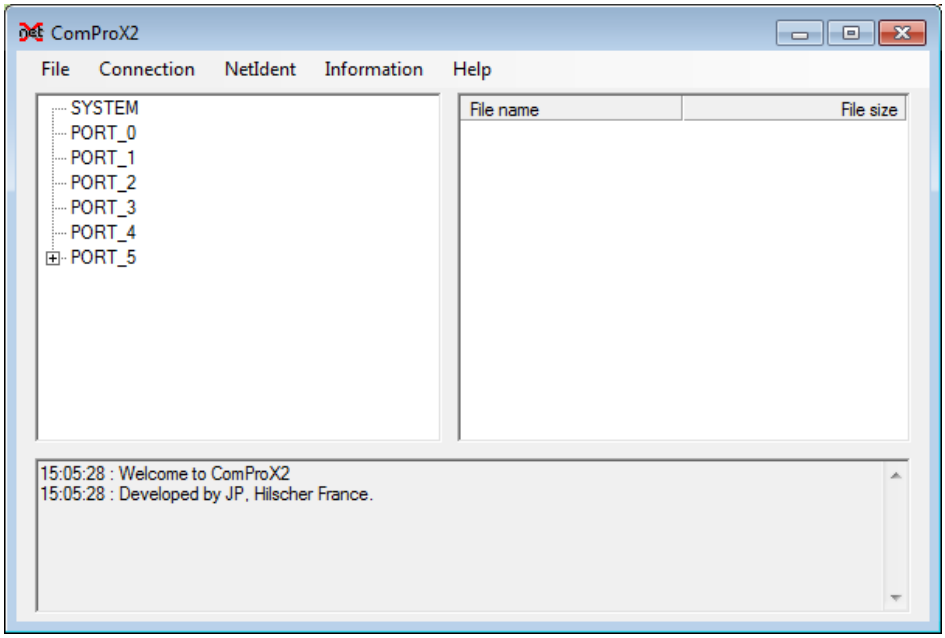


Figure 9: ComProX start window

2. Activate Auto-Refresh function.

   ➢ Open **Connection** menu and make sure that the **File Explorer auto refresh** option is checked.

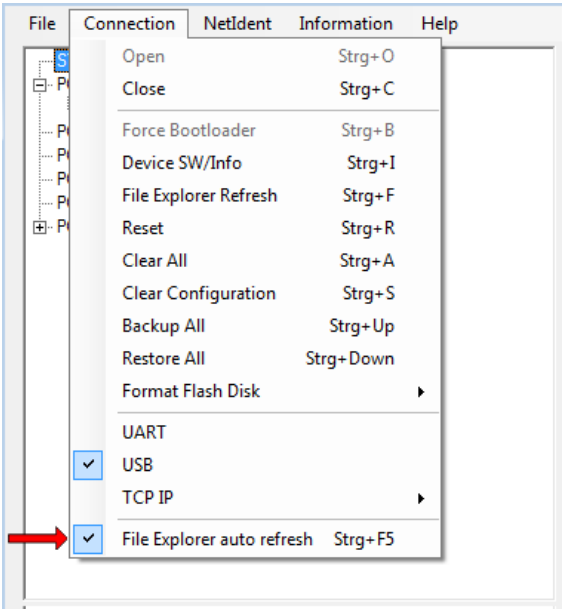


Figure 10: Activate auto refresh function

3. Connect to netTAP device.

   ➢ In the menu, choose **Connection** > **Open**.

   ↬ After the Windows USB/COM ports on the configuration PC have been scanned, the **Open USB Port** dialog window opens. The netTAP is displayed in the drop-down list as `2nd Stage Loader (netX100/500)` behind the connecting USB COM of the PC (in this example `COM18`):

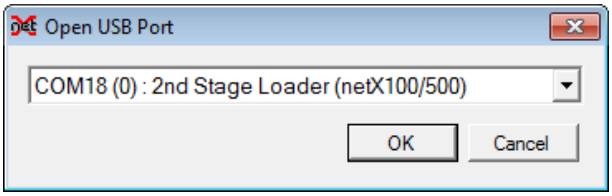


Figure 11: ComProX Open USB Port dialog window

Note:
The so-called “Second Stage Bootloader” (`2nd Stage Loader`) is a software module inside the netTAP complementing the regular firmware. If the firmware is defective or missing, the Second Stage Bootloader takes over, enabling communication between the device and **ComProX2** via USB.
A netTAP device running with proper functional firmware connected via USB would answer at the COM port with a `netTAP 151` entry, followed by the abbreviation of the protocol conversion implemented in the firmware (e. g. `PNS/PNS`).

   ➢ Click **OK** button.

➪ The **Open USB Port** dialog window closes. The **File Explorer** (left window) shows the files currently stored in the various ports of the netTAP. (The ports within the netTAP are not to be confused with the USB COM ports of the configuration PC.)

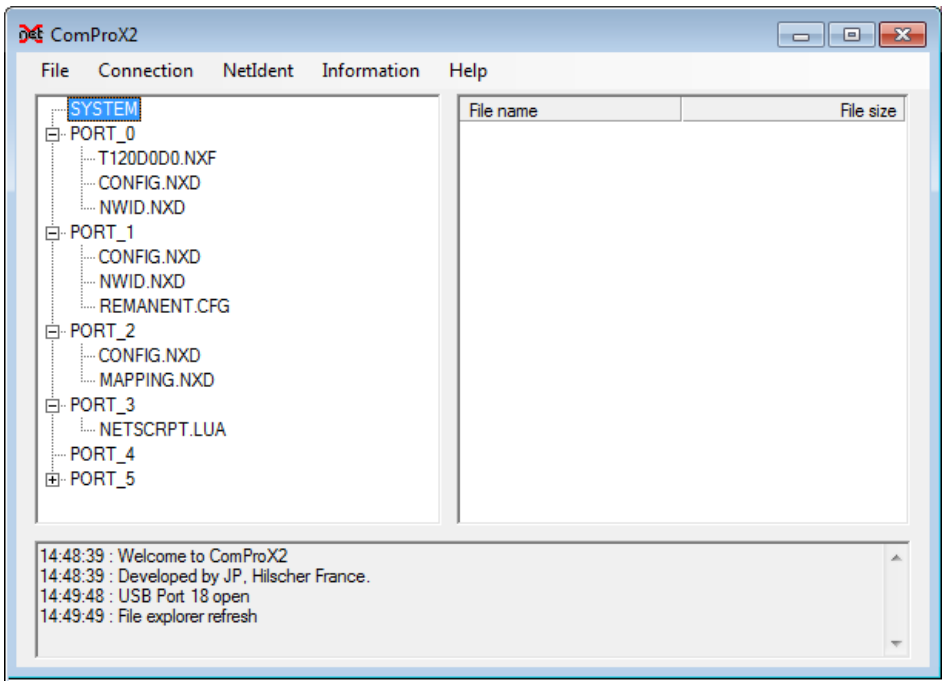


Figure 12: Contents of the netTAP ports displayed in ComProX

4. Re-format file system (delete old files in flash memory of netTAP).

   ➢ Before you proceed to re-format the file system, thus deleting all existing files, you should note or write-down the exact name of the firmware file stored in **PORT_0**. You can recognize the firmware file by its `NXF` file extension. In this example, it is the `T120D0D0.NXF` file (protocol conversion PROFINET IO Device to PROFINET IO Device). Noting the file name makes it easier for you to identify the file later on the **Gateway Solutions** DVD for download.

➢ In the menu, choose **Connection** > **Format Flash Disk** > **Quick Format**.

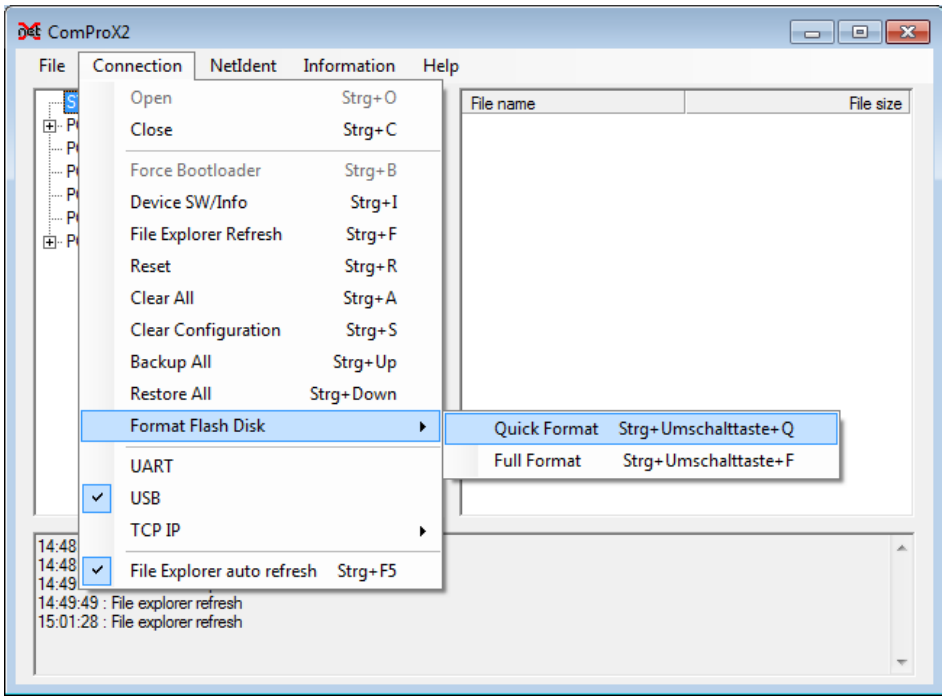


Figure 13: Format flash memory

➢ In the **Information** window, click **OK** button.

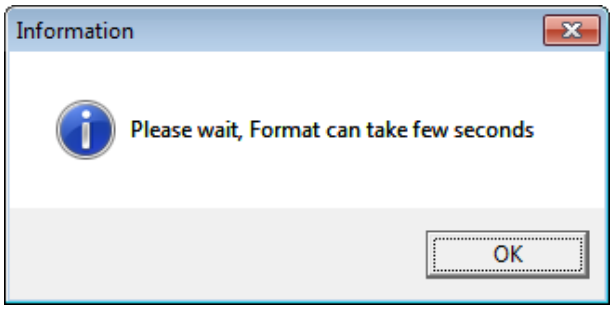


Figure 14: Acknowledge formatting dialog

➢ The file system is being formatted and all files in the ports are deleted.

➢ Acknowledge the **Quick Format is finished** message by clicking the **OK** button.

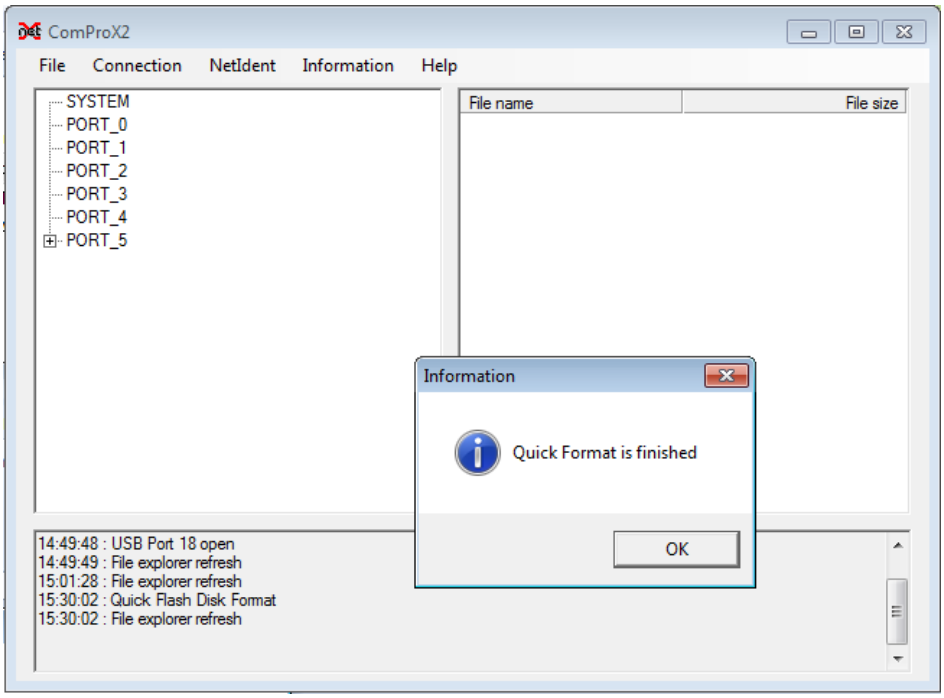


Figure 15: Formatting finished message

5. Download firmware file.

➢ In the **File Explorer** (left window) select **PORT_0** entry.

➢ Use the right mouse button to open the context menu and select **Download**.

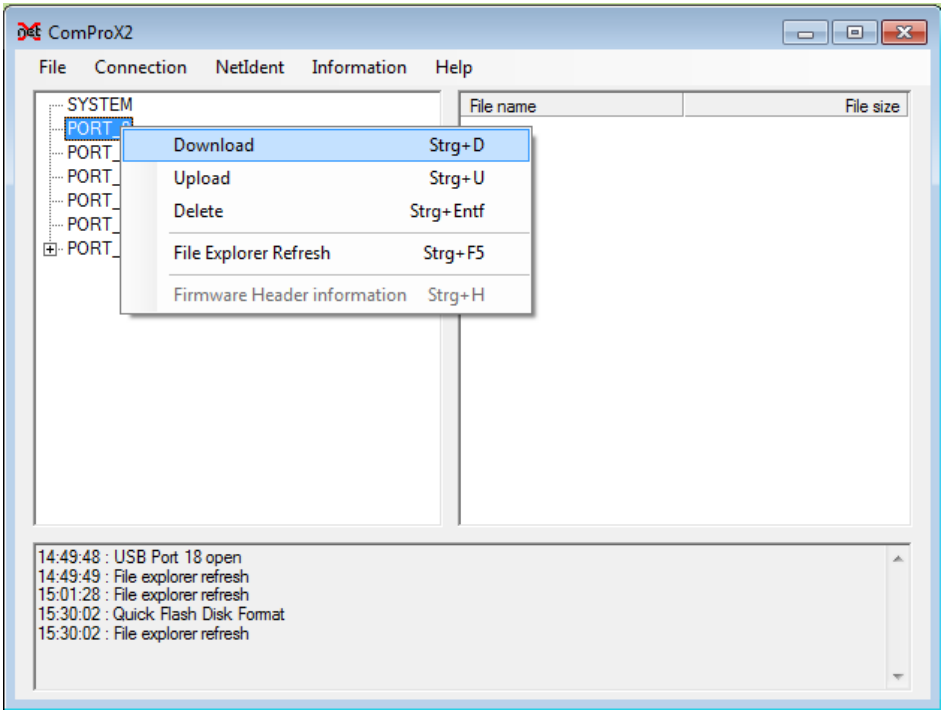


Figure 16: Download menu

The **Open file to download** dialog window opens:

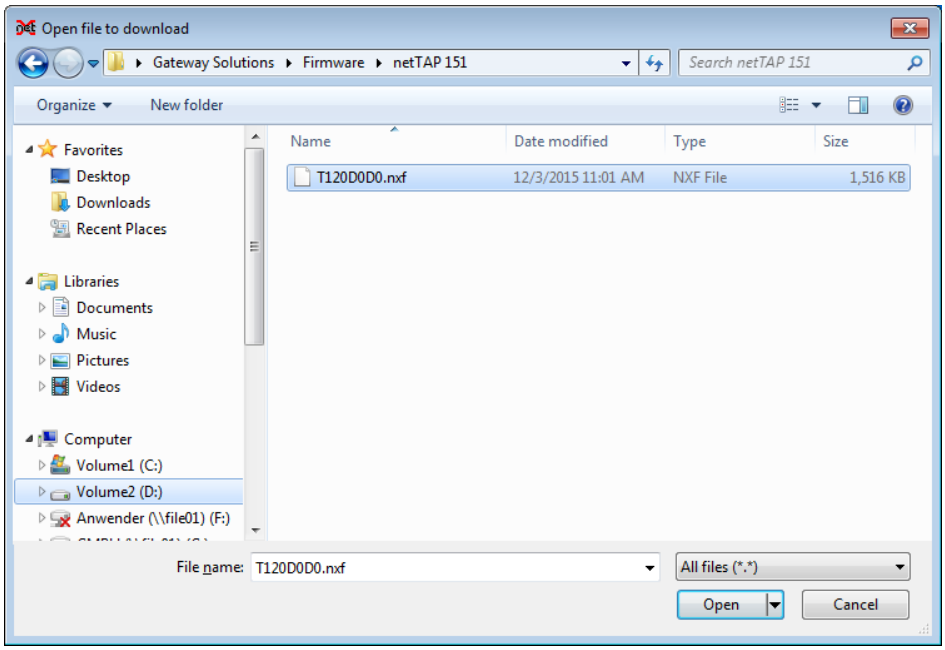


Figure 17: Open File Dialog

➢ On the **Gateway Solutions** DVD, open `Firmware\netTAP 151` folder. Search the list for the name of the firmware file which you had noted/written down before you formatted the file system/flash disk. In this example, it is the `T120D0D0.NXF` file (protocol conversion PROFINET IO Device to PROFINET IO Device).

Note:
You can also consult the table in the *Hardware and firmware* [▸ page 7] section in order to find out the name of the right firmware file for your protocol conversion.

➢ Select the firmware file you want to download, then click **Open** button.

The file is being downloaded:

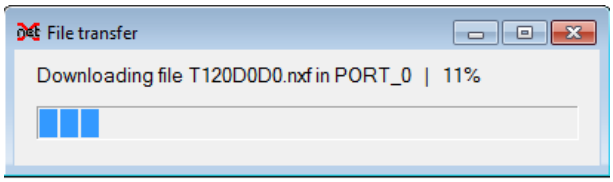


Figure 18: Download status

➢ Acknowledge the **File successfully downloaded** message by clicking the **OK** button.

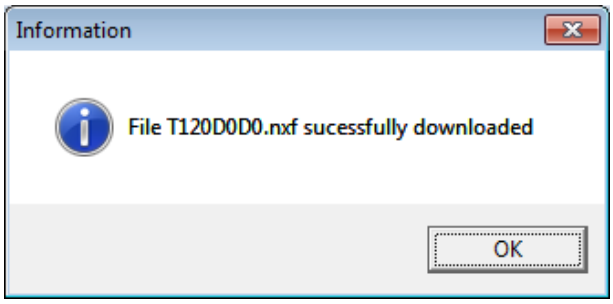


Figure 19: Download finished message

➢ The downloaded firmware file should now be displayed under **PORT_0**:

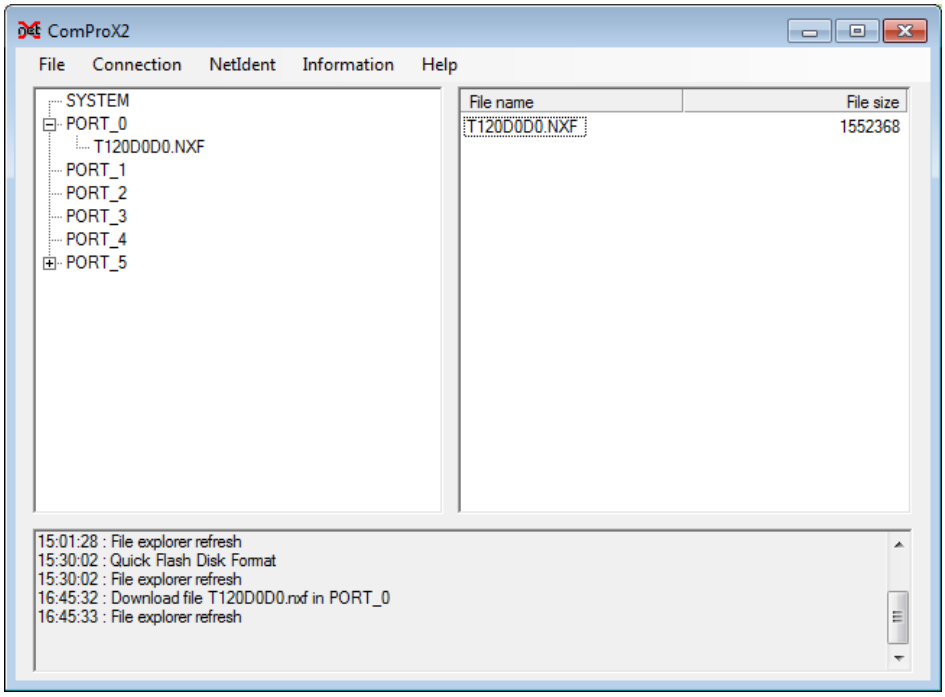


Figure 20: Firmware in PORT_0

➢ In the menu, choose **Connection** > **Close** to close the connection to the netTAP, then choose **File** > **Exit** to close ComProX.

6. Restart netTAP device.

➢ Disconnect the voltage supply from the device, then reconnect it.

➢ After restart, the **SYS** LED shows steady green light (indicating firmware is running) and the **APL** LED shows steady red light (indicating missing configuration).

⇨ You have reset the netTAP device to its factory settings. The device now needs a new configuration with SYCON.net via USB connection. Instructions for this can be found in the operating instruction manual *Configuration of Gateway and Proxy Devices*, DOC081201OIxxEN.

9 Using SD memory card to copy configuration data into spare netTAP devices

9.1 Overview

With the **Memory Card Management** function of the netTAP DTM in SYCON.net, you can copy an already downloaded configuration together with the firmware and the IP address from the internal load memory of the netTAP device onto an SD memory card, which has been inserted into the device. Thus, you can “backup” this data to an external storage medium. Afterwards, you can remove the SD memory card from the netTAP device, insert it into other devices and thus copy the data into their internal load memory.
By this method, you can easily bring several devices to an identical state of configuration (i. e. “clone” a primary device) without having each time to establish an online connection between the configuration PC (respectively SYCON.net) and the individual devices.
This can be useful, e. g., if you want to prepare an identical “spare” device.

9.2 Prerequisites

- SD memory card, FAT formatted.

Note:
The SD memory card is not included in the delivery of the netTAP device, but can be obtained from Hilscher, part number 1719.003.

- A configuration has been downloaded to the netTAP device.
- The Windows PC/Notebook with SYCON.net and the netTAP device are connected via USB.
- The netTAP is connected to a voltage supply.

9.3 Step-by-step instructions

1. Start **SYCON.net** configuration software.
   - ➢ In the Windows Start menu, select **All Programs** > **SYCON.net System Configurator** > **SYCON.net**.
   - ➪ A login dialog appears:

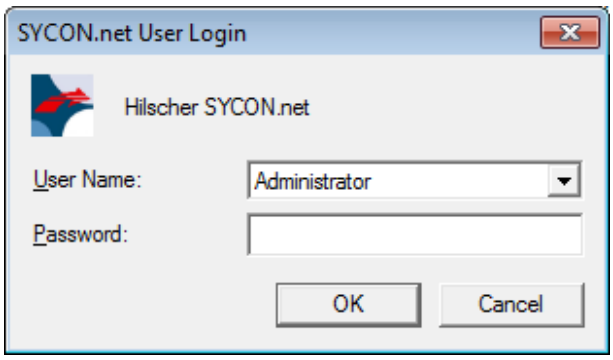


Figure 21: Login SYCON.net

   - ➢ Enter your password, then click **OK**.
   - ➪ SYCON.net opens with a new empty project:

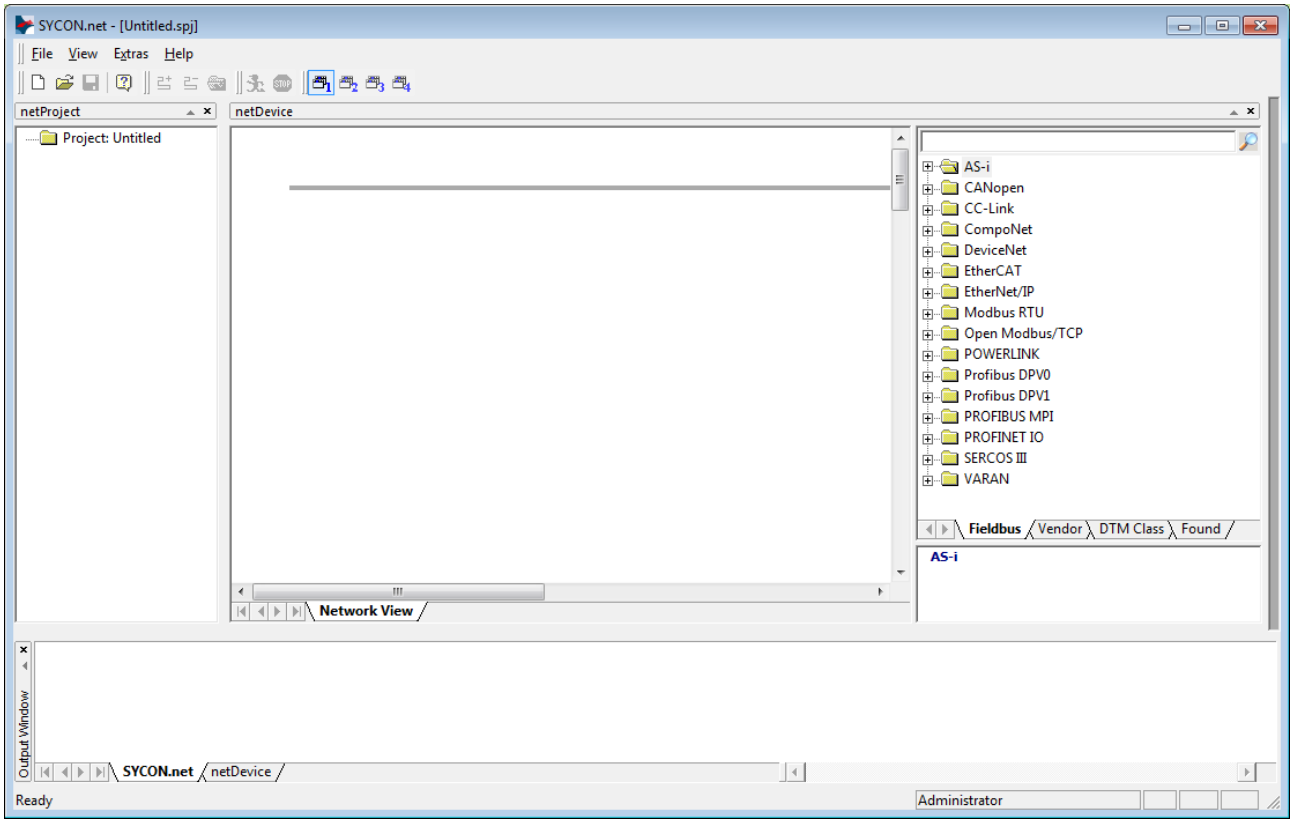


Figure 22: Empty project in SYCON.net

2. Open existing netTAP project or create a new project.

Note:
You can use your already existing configuration project to establish a USB connection between SYCON.net and the netTAP device, and to open the **Memory Card Management** dialog. If you don't have access to the old configuration project file, you can create a provisional new project, consisting only of the netTAP symbol, and use this makeshift project to establish the USB connection.

➢ In the menu, choose **File** > **Open…**to open an existing netTAP project.

OR

➢ In the **Vendor** tab of the **Device Catalog** (right window), open folder **Hilscher GmbH** > **Gateway Stand-Alone Slave**. Then select the NT 151-RE-RE device and drag & drop it onto the bus configuration line in the middle window.

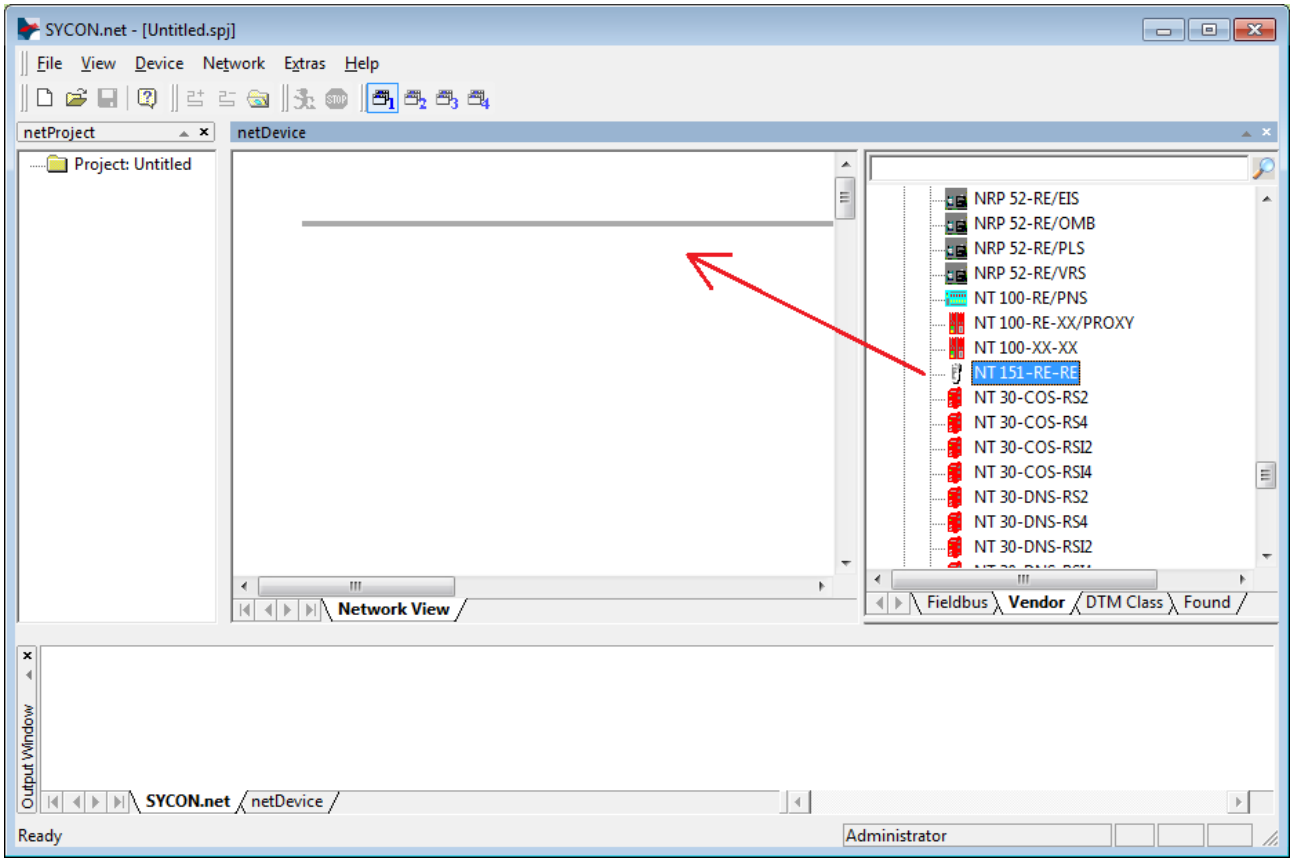


Figure 23: Add netTAP in SYCON.net

3. Open the netTAP configuration window (i.e. the netTAP DTM).

➢ Double-click the netTAP symbol in the bus configuration line, or select the netTAP symbol and choose **Configuration** > **Gateway** from the context menu (to open context menu, right-click on the netTAP symbol).

If you are using an existing netTAP project, for which the configuration of the driver and the device assignment had already taken place, the netTAP DTM now opens with the **Settings** dialog window. In this case, you can directly proceed with *step 5*.

OR

If you have just now created a new project, the netTAP DTM opens with the **Device Assignment** dialog window and immediately starts scanning for connected devices.

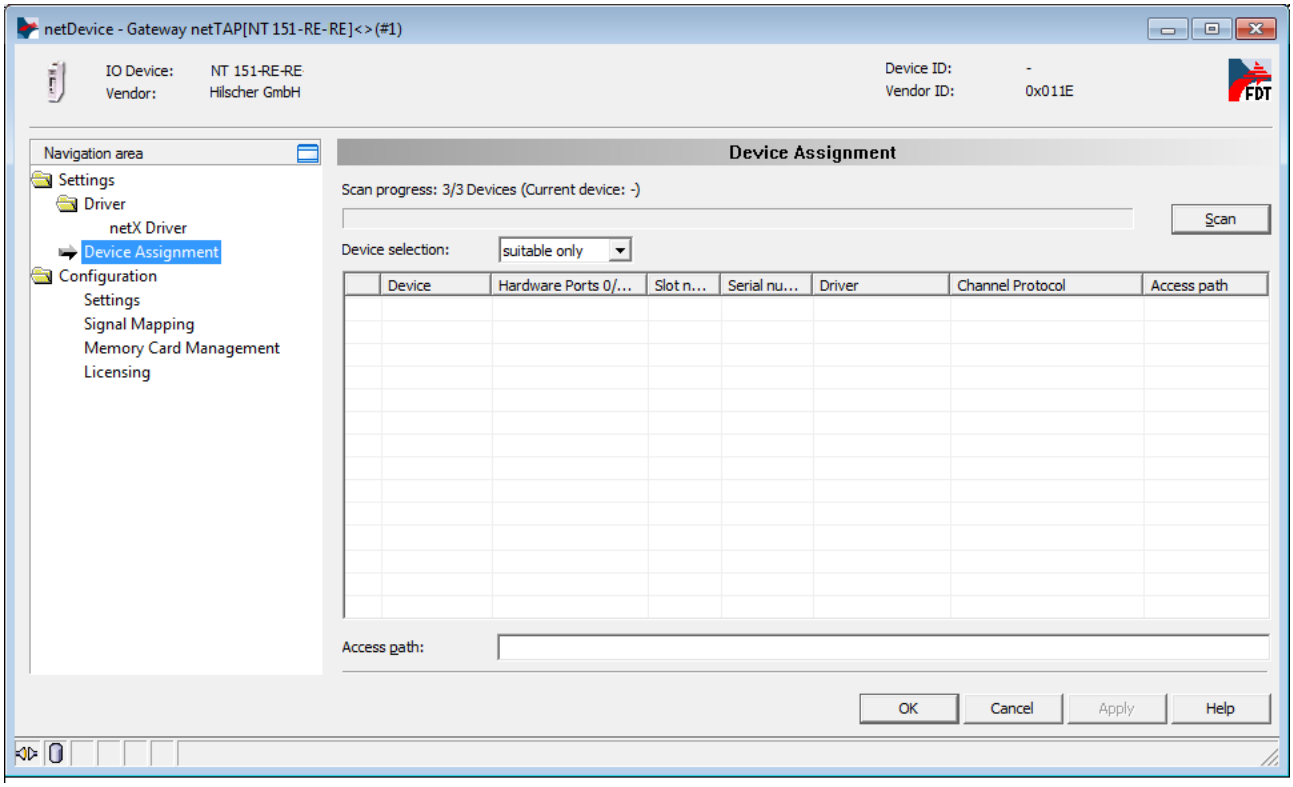


Figure 24: Device assignment 1

➢ Wait a moment until the connected device has been found:

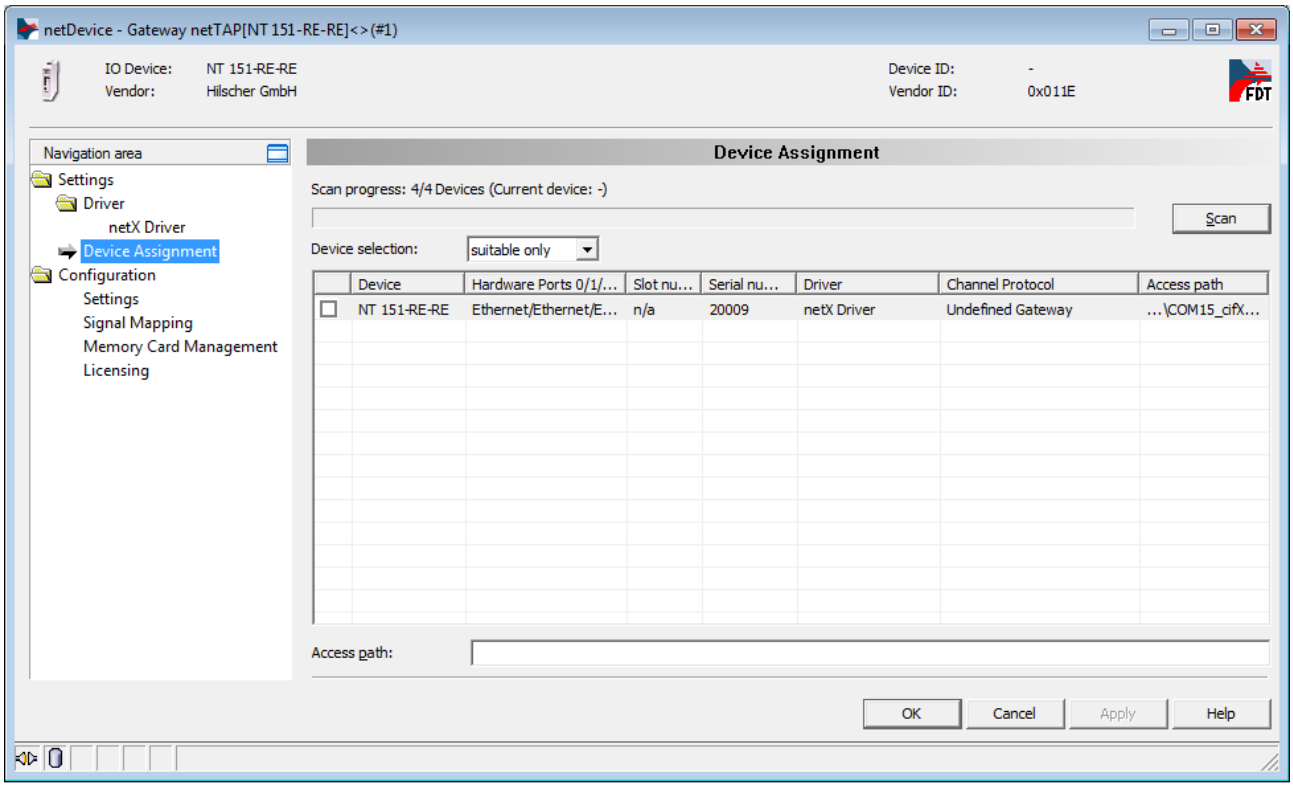


Figure 25: Device assignment 2

4. Assign netTAP device.

➢ Select the found NT 151-RE-RE by checking the box in front of the device entry.

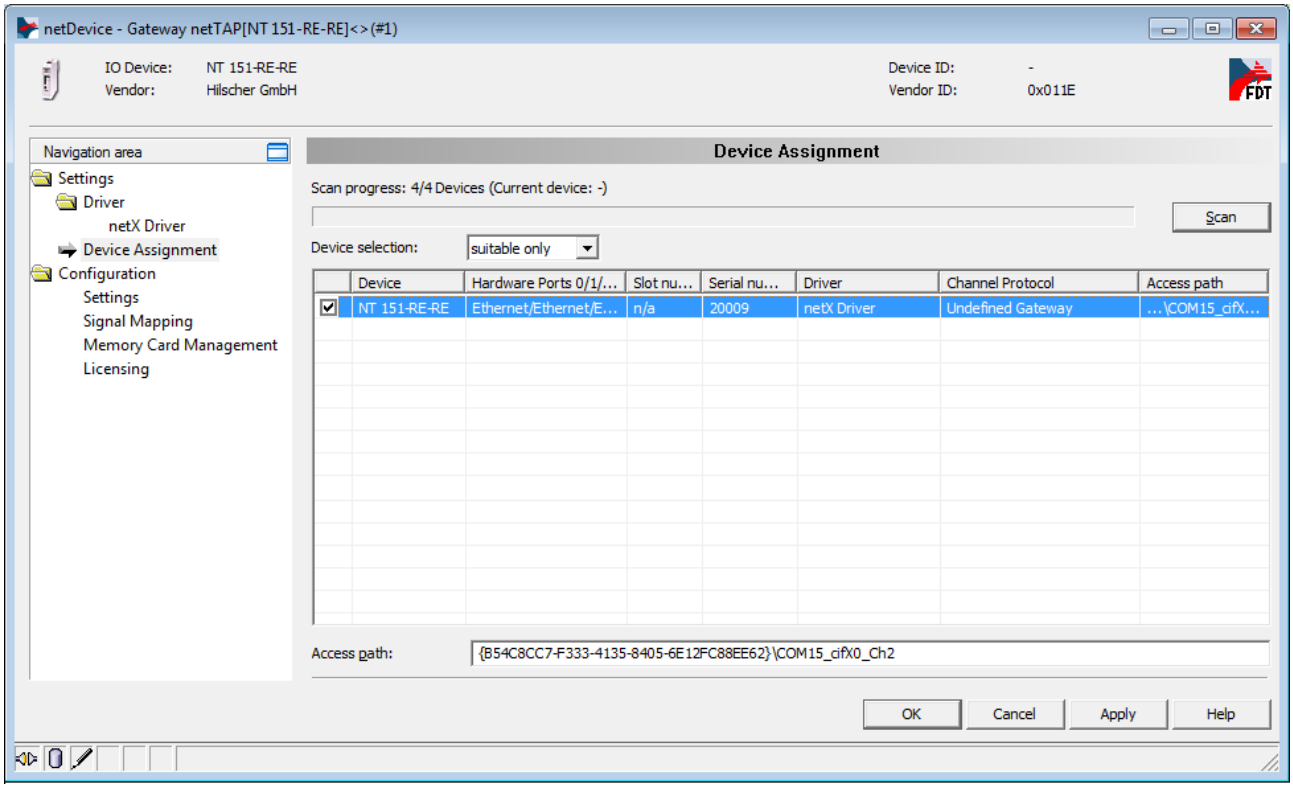


Figure 26: Device assignment 3

➢ Click **Apply** button.

5. Copy configuration data from netTAP device to SD memory card.

➢ In the **Navigation Area**, select **Configuration** > **Memory Card Management**.

↬ The **Memory Card Management** dialog window opens. The **Folder** field in the **Directory** area of the dialog window displays the file system of the internal load memory of the netTAP device:

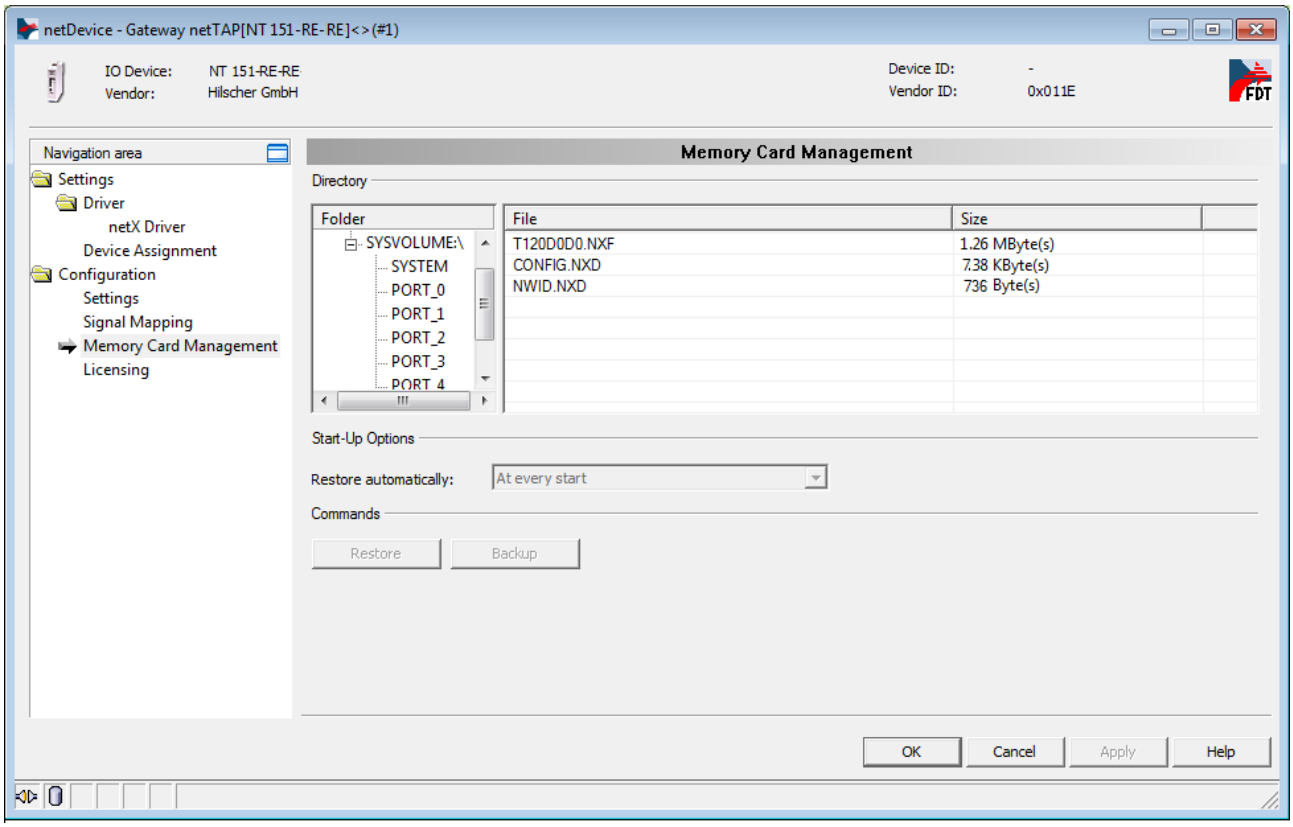


Figure 27: Memory Card Management of the netTAP DTM

➢ Remove the write protection of your SD memory card and insert it into the netTAP device until it engages (metal contacts of card must be facing left).

Figure 28: Insert SD card

➢ In order to refresh the display: close the **Memory Card Management** dialog window (e.g. by clicking on **Licensing** entry in the **Navigation area**), then open it again.

➢ In the **Folder** field of the **Directory** area, the file system of the SD memory card is now displayed below the directory of the internal load memory of the netTAP device (scroll down in the **Folder** window). Furthermore, the **Backup** button is now active and can be used:

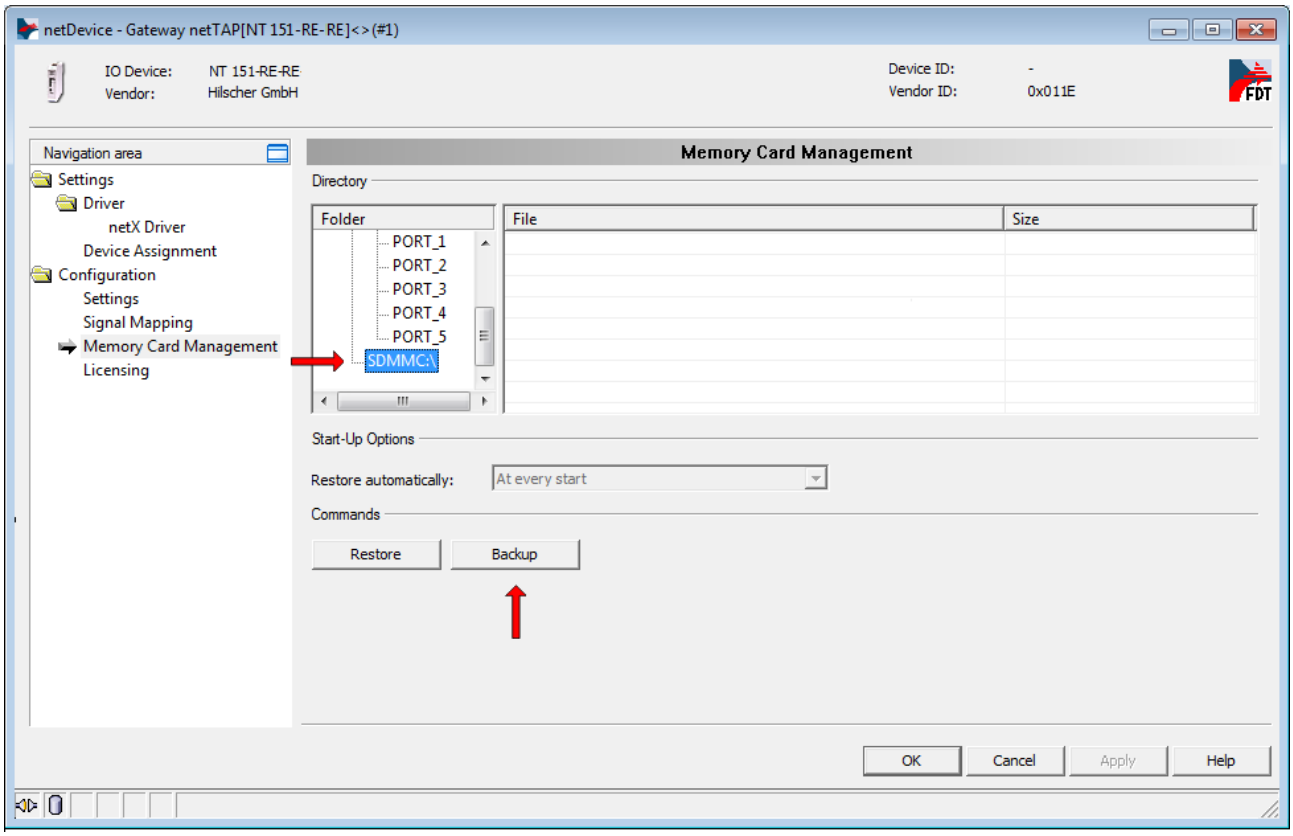


Figure 29: Memory Card Management after inserting SD memory card

➢ Click **Backup** to copy the data stored in the internal load memory of the netTAP to the SD memory card.

⇨ On the SD memory card, a “Backup” folder is being created and the data is copied from the netTAP into this folder. This can take a short while (observe the clock symbol Backup in the footer of the dialog window). After copying has been finished, you can inspect the data by selecting a folder in the **SDMMC:\Backup** directory in the **Folder** window:

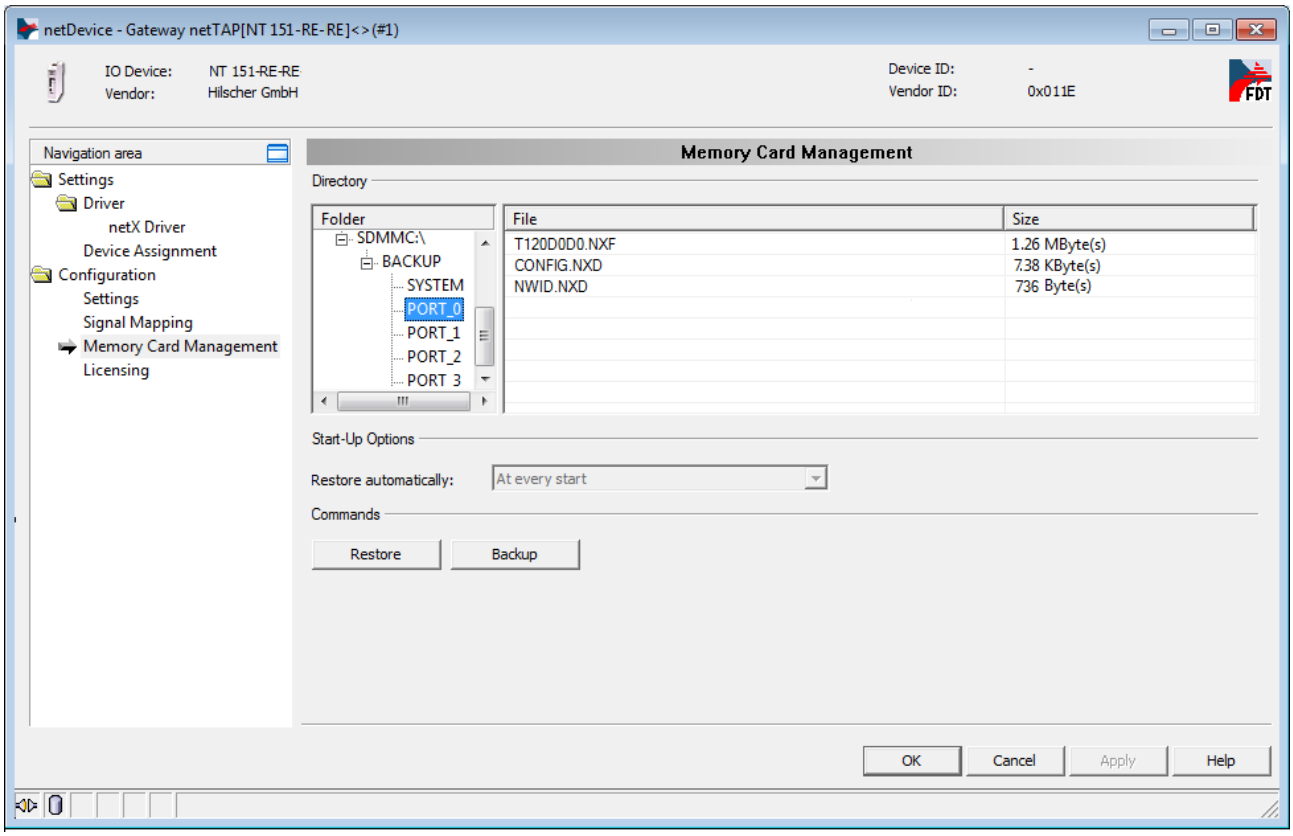


Figure 30: Memory Card Management after backup to SD memory card

➢ Click **OK** to close the netTAP DTM.

➢ Exit SYCON.net

6. Copy data from SD memory card into spare netTAP device.

➢ Remove the SD memory card from the original netTAP device.

➢ Insert the SD memory card into the spare device.

➢ Connect spare device to voltage supply or briefly disconnect voltage supply (in case the device had already been connected to voltage supply).

⇨ The spare netTAP device then loads the data from the SD memory card into its own internal load memory. While loading, the SYS LED quickly alternates between green and yellow for approximately eight seconds, then shows steady yellow for approximately ten seconds, then is switched off for a short while before it finally shows steady green light. The device automatically starts the loaded firmware and the configuration.

➢ Remove the SD memory card from the netTAP device.

10 LEDs

10.1 Overview

This chapter describes the meaning of the LEDs of the netTAP **NT 151-RE-RE** device.
For identification of the LEDs on the device, please refer to section *Positions of the interfaces and LEDs* [page 27].

10.2 SYS LED

This LED indicates basic operating states which are independent of the configuration of the netTAP.

LED	Color	State	Meaning
SYS Position in the device drawing: (3)	**Duo LED yellow/green**		
	(green)	On	Operating System running. For further diagnosis, see **APL** LED.
	(yellow)	On	The hardware of the device is defective and needs replacement.
	(yellow)	Flashing	The device could not be initialized. No boot loader was found in the load memory. The load memory of the device might be defective or a USB cable, which has pin 4 connected with ground, might be attached to the device. This prevents the device from starting.
	(yellow/ green)	Flashing yellow/green 1 Hz	**Error state!** Boot loader active. Firmware file is missing or defective. The device needs to be recovered by SD memory card or via USB. See chapter *Firmware recovery* [page 38].
	(yellow/ green)	Flashing yellow/green 16 Hz	Data is being copied from the SD memory card into the internal load memory.
	(off)	Off	Power supply for the device is missing or hardware is defective.

Table 25: System LED

10.3 APL LED

The APL LED indicates the communication state of the primary (X2) and the secondary Real-Time Ethernet network (X3) as well as the configuration state of the device.

LED	Color	State	Meaning
APL Position in the device drawing: (4)	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 initialization: • Missing configuration • Error in configuration • Internal error

Table 26: APL LED

10.4 LEDs of the Real-Time Ethernet systems

10.4.1 LEDs PROFINET IO Controller

The subsequent table describes the meaning of the PROFINET IO Controller LEDs.

LED	Color	State	Meaning
SF (System Failure) Position in the device drawing: (7)	**Duo LED red/green**		
	(off)	Off	**No error**
	(red)	Flashing (1 Hz, 3 s)	**DCP signal service** is initiated via the bus.
	(red)	Flashing (2 Hz)	**System error:** Invalid configuration, Watchdog error or internal error
	(red)	On (*together with SF "red ON"*)	**No valid Master license**
BF (Bus Failure) Position in the device drawing: (8)	**Duo LED red/green**		
	(off)	Off	**No error**
	(red)	Flashing (2 Hz)	**Configuration fault:** Not all configured IO-Devices are connected.
	(red)	On (*together with SF "red ON"*)	**No valid Master license**
	(red)	On (*together with SF "red ON"*)	**No Connection:** No Link.
LINK CH0: (16), CH1: (19)	**LED green**		
	(green)	On	The device is linked to the Ethernet.
	(off)	Off	The device has no link to the Ethernet.
RX/TX CH0: (17), CH1: (20)	**LED yellow**		
	(yellow)	Flickering (load dependent)	The device sends/receives Ethernet frames.
	(off)	Off	The device does not send/receive Ethernet frames.

Table 27: LED states for the PROFINET IO-Controller protocol

LED state	Definition
Flashing (1 Hz, 3 s)	The indicator turns on and off for 3 seconds with a frequency of 1 Hz: “on” for 500 ms, followed by “off” for 500 ms.
Flashing (2 Hz)	The indicator turns on and off with a frequency of 2 Hz: “on” for 250 ms, followed by “off” for 250 ms.
Flickering (load dependant)	The indicator turns on and off with a frequency of approximately 10 Hz to indicate high Ethernet activity: "on" for approximately 50 ms, followed by "off" for 50 ms. The indicator turns on and off in irregular intervals to indicate low Ethernet activity.

Table 28: LED state definitions for the PROFINET IO-Controller protocol

10.4.2 LEDs PROFINET IO Device

The subsequent table describes the meaning of the PROFINET IO-Device LEDs.

LED	Color	State	Description
SF (System Failure) Position in the device drawing for protocol at X2: (1) Position in the device drawing for protocol at X3: (7)	**Duo LED red/green**		
	(off)	Off	No error
	(red)	Flashing (1 Hz, 3 s)	DCP signal service is initiated via the bus.
	(red)	On	Watchdog timeout; channel, generic or extended diagnosis present; system error
BF (Bus Failure) Position in the device drawing for protocol at X2: (2) Position in the device drawing for protocol at X3: (8)	**Duo LED red/green**		
	(off)	Off	No error
	(red)	Flashing (2 Hz)	No data exchange
	(red)	On	No configuration; or low speed physical link; or no physical link
LINK CH0: (16) , CH1: (19) CH2: (10) , CH3: (13)	**LED green**		
	(green)	On	The device is linked to the Ethernet.
	(off)	Off	The device has no link to the Ethernet.
RX/TX CH0: (17) , CH1: (20) CH2: (11) , CH3: (14)	**LED yellow**		
	(yellow)	Flickering (load dependent)	The device sends/receives Ethernet frames.
	(off)	Off	The device does not send/receive Ethernet frames.

Table 29: LED states for the PROFINET IO-Device protocol

LED state	Definition
Flashing (1 Hz, 3 s)	The LED turns on and off for 3 seconds with a frequency of 1 Hz: “On” for 500 ms, followed by “Off” for 500 ms.
Flashing (2 Hz)	The LED turns on and off with a frequency of 2 Hz: “On” for 250 ms, followed by “Off” for 250 ms.
Flickering (load dependent)	The LED turns on and off with a frequency of approximately 10 Hz to indicate high Ethernet activity: "On" for approximately 50 ms, followed by "Off" for 50 ms. The LED turns on and off in irregular intervals to indicate low Ethernet activity.

Table 30: LED state definitions for the PROFINET IO-Device protocol

10.4.3 LEDs EtherCAT Master

The subsequent table describes the meaning of the EtherCAT Master LEDs.

LED	Color	State	Description
RUN Position in the device drawing: (7)	**Duo LED red/green**		
	(off)	Off	**INIT:** The device is in INIT state.
	(green)	Blinking (2.5 Hz)	**PRE-OPERATIONAL:** The device is in PRE-OPERATIONAL state.
	(green)	Flickering (10 Hz)	The device is not configured.
	(green)	Single flash	**SAFE-OPERATIONAL:** The device is in SAFE-OPERATIONAL state.
	(green)	On	**OPERATIONAL:**The device is in the OPERATIONAL state.
ERR Position in the device drawing: (8)	**Duo LED red/green**		
	(off)	Off	Master has no errors
	(red)	Single flash	Bus Sync error threshold
	(red)	Double flash	Internal Stop of the bus cycle
	(red)	Triple Flash	DPM watchdog has expired.
	(red)	Quadruple Flash	No Master license present in the device.
	(red)	Blinking (2.5 Hz)	Error in the configuration database.
	(red)	Single Flickering	Channel Init was executed at the Master. Transient state that may not be visible.
	(red)	Double Flickering	Slave is missing Unconfigured slave No matching mandatory slave list No bus connected
	(red)	Flickering (10 Hz)	Boot-up was stopped due to an error.
LINK CH0: (16)	**LED green**		
	(green)	On	**Link:** The device is linked to the Ethernet, but does not send/ receive Ethernet frames.
	(green)	Flickering (load dependent)	**Activity:** The device is linked to the Ethernet and sends/receives Ethernet frames.
	(off)	Off	The device has no link to the Ethernet.
ACT CH0: (17)	**LED yellow**		
	(off)	Off	This LED is not used.

Table 31: LED states for the EtherCAT Master (V4) protocol

LED state	Definition
Single flash	The LED shows one short flash (200 ms) followed by a long “Off“ phase (1,000 ms).
Double flash	The LED 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 LED 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).
Quadruple Flash	The LED shows a sequence of four 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).
Blinking (2.5 Hz)	The LED turns on and off with a frequency of 2.5 Hz: “On” for 200 ms, followed by “Off” for 200 ms.
Single Flickering	The LED is switched on and off once: "On" for 50 ms, followed by "Off" for 500 ms.
Double Flickering	The LED is switched on and off and on once: "On" / "Off" / "On" each for approximately 50 ms, followed by "Off" for 500 ms.
Flickering (10 Hz)	The LED turns on and off with a frequency of 10 Hz: “On” for 50 ms, followed by “Off” for 50 ms.
Flickering (load dependent)	The LED turns on and off with a frequency of approximately 10 Hz to indicate high Ethernet activity: "On" for approximately 50 ms, followed by "Off" for 50 ms. The LED turns on and off in irregular intervals to indicate low Ethernet activity.

Table 32: LED state definitions for the EtherCAT Master (V4) protocol

10.4.4 LEDs EtherCAT Slave

The subsequent table describes the meaning of the EtherCAT Slave LEDs.

LED	Color	State	Description
RUN Position in the device drawing for protocol at X2: (1) Position in the device drawing for protocol at X3: (7)	**Duo LED red/green**		
	(off)	Off	**INIT:** The device is in INIT state.
	(green)	Blinking (2.5 Hz)	**PRE-OPERATIONAL:** The device is in PRE-OPERATIONAL state.
	(green)	Single flash	**SAFE-OPERATIONAL:** The device is in SAFE-OPERATIONAL state.
	(green)	On	**OPERATIONAL:** The device is in the OPERATIONAL state.
ERR Position in the device drawing for protocol at X2: (2) Position in the device drawing for protocol at X3: (8)	**Duo LED red/green**		
	(off)	Off	**No error:** The EtherCAT communication of the device is in working condition.
	(red)	Blinking (2.5 Hz)	**Invalid configuration:** General Configuration Error Possible reason: State change commanded by master is impossible due to register or object settings.
	(red)	Single flash	**Local error:** Slave device application has changed the EtherCAT state autonomously. Possible reason 1: A host watchdog timeout has occurred. Possible reason 2: Synchronization Error, device enters Safe-Operational automatically.
	(red)	Double flash	**Application watchdog timeout:** An application watchdog timeout has occurred. Possible reason: Sync Manager Watchdog timeout.
L/A IN, **L/A OUT** CH0: (16) , CH1: (19) CH2: (10) , CH3: (13)	**LED green**		
	(green)	On	**Link:** The device is linked to the Ethernet, but does not send/ receive Ethernet frames.
	(green)	Flickering (load dependent)	**Activity:** The device is linked to the Ethernet and sends/receives Ethernet frames.
	(off)	Off	The device has no link to the Ethernet.
	LED yellow		
	(off)	Off	This LED is not used.

Table 33: LED states for the EtherCAT Slave protocol

LED state	Definition
Blinking (2.5 Hz)	The LED turns on and off with a frequency of 2.5 Hz: “On” for 200 ms, followed by “Off” for 200 ms.
Single flash	The LED shows one short flash (200 ms) followed by a long “Off“ phase (1,000 ms).
Double flash	The LED 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).
Flickering (load dependent)	The LED turns on and off with a frequency of approximately 10 Hz to indicate high Ethernet activity: "On" for approximately 50 ms, followed by "Off" for 50 ms. The LED turns on and off in irregular intervals to indicate low Ethernet activity.

Table 34: LED state definitions for the EtherCAT Slave protocol

10.4.5 LEDs EtherNet/IP Scanner

The subsequent table describes the meaning of the EtherNet/IP Scanner LEDs.

LED	Color	State	Description
MS (module status) Position in the device drawing: (7)	**Duo LED red/green**		
	(green)	On	**Device operational:** The device is operating correctly.
	(green)	Flashing (1 Hz)	**Standby:** The device has not been configured.
	(green/red/ green)	Flashing green/red/ green	**Self-test**: The device performs a self-test after power-on. The following sequence is displayed during the self-test: • NS-LED off. • MS LED turns green for approximately 250 ms, turns red for approximately 250 ms, and again turns green (and holds that state until the power-up test has completed). • NS LED turns green for approximately 250 ms, turns red for approximately 250 ms, and then turns off (and holds that state until the power-up test has completed).
	(red)	Flashing (1 Hz)	**Major recoverable fault:** The device has detected a major recoverable fault. E.g., an incorrect or inconsistent configuration can be considered a major recoverable fault.
	(red)	On	**Major unrecoverable fault:** The device has detected a major unrecoverable fault.
	(off)	(Off)	**No power:** The device is powered off.
NS (Network status) Position in the device drawing: (8)	**Duo LED red/green**		
	(green)	On	**Connected:** An IP address is configured, at least one CIP connection (any transport class) is established, and an Exclusive Owner connection has not timed out.
	(green)	Flashing (1 Hz)	**No connections:** An IP address is configured, but no CIP connections are established, and an Exclusive Owner connection has not timed out.
	(green/red/off)	Flashing green/red/off	**Self-test:** The device performs a self-test after power-on. Refer to the description of the MS LED in the self-test status.
	(red)	Flashing (1 Hz)	**Connection timeout:** An IP address is configured, and an Exclusive Owner connection for which this device is the target has timed out. The NS LED returns to steady green only when all timed out Exclusive Owner connections are reestablished.
	(red)	On	**Duplicate IP:** The device has detected that its IP address is already in use.
	(off)	Off	**Not powered, no IP address:** The device does not have an IP address (or is powered off).
LINK CH0: (16) , CH1: (19)	**LED green**		
	(green)	On	The device is linked to the Ethernet.
	(off)	Off	The device has no link to the Ethernet.
ACT CH0: (17) , CH1: (20)	**LED yellow**		
	(yellow)	Flickering (load dependent)	The device sends/receives Ethernet frames.
	(off)	Off	The device does not send/receive Ethernet frames.

Table 35: LED states for the EtherNet/IP Scanner protocol

LED state	Definition
Flashing (1 Hz)	The LED turns on and off with a frequency of 1 Hz: “On” for 500 ms, followed by “Off” for 500 ms.
Flashing fast green/red/ green	The MS LED or NS LED turns on green "On" for 250 ms, then red "On" for 250 ms, then green "On" (until the test is completed).
Flickering (load dependent)	The LED turns on and off with a frequency of approximately 10 Hz to indicate high Ethernet activity: "On" for approximately 50 ms, followed by "Off" for 50 ms. The LED turns on and off in irregular intervals to indicate low Ethernet activity

Table 36: LED state definitions for the EtherNet/IP Scanner protocol

10.4.6 LEDs EtherNet/IP Adapter

The subsequent table describes the meaning of the EtherNet/IP Adapter LEDs.

LED	Color	State	Description
MS (module status) Position in the device drawing for protocol at X2: (1) Position in the device drawing for protocol at X3: (7)	**Duo LED red/green**		
	(green)	On	**Device operational:** The device is operating correctly.
	(green)	Flashing (1 Hz)	**Standby:** The device has not been configured.
	(green/red/ green)	Flashing fast green/red/ green	**Self-test**: The device performs a self-test after power-on. The following sequence is displayed during the self-test: • NS-LED off. • MS LED turns green for approximately 250 ms, turns red for approximately 250 ms, and again turns green (and holds that state until the power-up test has completed). • NS LED turns green for approximately 250 ms, turns red for approximately 250 ms, and then turns off (and holds that state until the power-up test has completed).
	(red)	Flashing (1 Hz)	**Major recoverable fault:** The device has detected a major recoverable fault. E.g., an incorrect or inconsistent configuration can be considered a major recoverable fault.
	(red)	On	**Major unrecoverable fault:** The device has detected a major unrecoverable fault.
	(off)	Off	**No power:** The device is powered off.
NS (Network status) Position in the device drawing for protocol at X2: (2) Position in the device drawing for protocol at X3: (8)	**Duo-LED red/green**		
	(green)	On	**Connected:** An IP address is configured, at least one CIP connection (any transport class) is established, and an Exclusive Owner connection has not timed out.
	(green)	Flashing (1 Hz)	**No connections:** An IP address is configured, but no CIP connections are established, and an Exclusive Owner connection has not timed out.
	(green/red/off)	Flashing fast green/red/off	**Self-test:** The device performs a self-test after power-on. Refer to the description of the MS LED in the self-test status.
	(red)	Flashing (1 Hz)	**Connection timeout:** An IP address is configured, and an Exclusive Owner connection for which this device is the target has timed out. The NS LED returns to steady green only when all timed out Exclusive Owner connections are reestablished.
	(red)	On	**Duplicate IP:** The device has detected that its IP address is already in use.
	(off)	(Off)	**Not powered, no IP address:** The device does not have an IP address (or is powered off).
LINK CH0: (16) , CH1: (19) CH2: (10) , CH3: (13)	**LED green**		
	(green)	On	The device is linked to the Ethernet.
	(off)	Off	The device has no link to the Ethernet.
ACT CH0: (17) , CH1: (20) CH2: (11) , CH3: (14)	**LED yellow**		
	(yellow)	Flickering (load dependent)	The device sends/receives Ethernet frames.
	(off)	Off	The device does not send/receive Ethernet frames.

Table 37: LED states for the EtherNet/IP Adapter protocol

LED state	Definition
Flashing (1 Hz)	The LED turns on and off with a frequency of 1 Hz: “On” for 500 ms, followed by “Off” for 500 ms.
Flashing fast green/red/ green	The MS LED or NS LED turns on green "On" for 250 ms, then red "On" for 250 ms, then green "On" (until the test is completed).
Flickering (load dependent)	The LED turns on and off with a frequency of approximately 10 Hz to indicate high Ethernet activity: "On" for approximately 50 ms, followed by "Off" for 50 ms. The LED turns on and off in irregular intervals to indicate low Ethernet activity

Table 38: LED state definitions for the EtherNet/IP Adapter protocol

10.4.7 LEDs Sercos Master

The subsequent table describes the meaning of the Sercos Master LEDs.

LED	Color	State	Description
STA Position in the device drawing: (7)	**Duo LED red/green**		
	(green)	On	**CP4:** Communication phase **4**
	(green)	Triple Flash	**CP3: Communication phase 3**
	(green)	Double flash	**CP2: Communication phase 2**
	(green)	Single flash	**CP1: Communication phase 1**
	(green)	Blinking (2.5 Hz)	**CP0: Communication phase 0**
	(green)	Flickering (10 Hz)	**Master is not configured and is in NRT.** After a status change this isn't indicated again
	(off)	Off	**NRT:** Non Real-Time Mode
ERR Position in the device drawing: (8)	**Duo LED red/green**		
	(red)	Single flash	Bus Sync error threshold
	(red)	Double flash	Internal Stop of the bus cycle
	(red)	Triple Flash	DPM watchdog has expired.
	(red)	Quadruple Flash	No Master license present in the device.
	(red)	Blinking (2.5 Hz)	Error in the configuration database.
	(red)	Single Flickering	Channel Init was executed at the Master. Transient state that may not visible at all.
	(red)	Double Flickering	Slave is missing. Unconfigured slave No matching mandatory slave list No bus connected Duplicate Sercos address Invalid Sercos address
	(red)	Flickering (10 Hz)	Boot-up was stopped due to an error.
	(off)	Off	No error
L/A CH0: (16) , CH1: (19)	**LED green**		
	(green)	On	**Link:** The device is linked to the Ethernet, but does not send/ receive Ethernet frames.
	(green)	Flickering (load dependent)	**Activity:** The device is linked to the Ethernet and sends/receives Ethernet frames.
	(off)	Off	The device has no link to the Ethernet.
	LED yellow		
	(off)	Off	This LED is not used.

Table 39: LED states for the Sercos Master protocol

LED state	Definition
Single flash	The LED shows one short flash (200 ms) followed by a long “Off“ phase (1,000 ms).
Double flash	The LED 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 LED 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).
Quadruple flash	The LED shows a sequence of four 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).
Blinking (2.5 Hz)	The LED turns on and off with a frequency of 2.5 Hz: “On” for 200 ms, followed by “Off” for 200 ms.
Single Flickering	The LED is switched on and off once: "On" for 50 ms, followed by "Off" for 500 ms.
Double Flickering	The LED is switched on and off and on once: "On" / "Off" / "On" each for approximately 50 ms, followed by "Off" for 500 ms.
Flickering (10 Hz)	The LED turns on and off with a frequency of 10 Hz: “On” for 50 ms, followed by “Off” for 50 ms.
Flickering (load dependent)	The LED turns on and off with a frequency of approximately 10 Hz to indicate high Ethernet activity: "On" for approximately 50 ms, followed by "Off" for 50 ms. The LED turns on and off in irregular intervals to indicate low Ethernet activity.

Table 40: LED state definitions for the Sercos Master protocol

10.4.8 LED Sercos Slave

The subsequent table describes the meaning of the Sercos Slave LED.

LED	Color	State	Description
S Position in the device drawing for protocol at X2: (1) Position in the device drawing for protocol at X3: (7)	**Duo-LED red/green** (orange = red/green simultaneously)		
	(green)	On	**CP4:** Communication phase **4:** Normal operation, no error
	(green)	Flashing (2 Hz)	**Loopback:** The network state has changed from „fast-forward“ to „loopback“.
	(green/ orange)	Flashing (1 x green/3s)	**CP3: Communication phase 3**
		(2 x green/3s)	**CP2: Communication phase 2**
		(1 x green/3s)	**CP1: Communication phase 1**
	(orange)	On	**CP2: Communication phase 0**
	(orange/ green)	Flashing (2 Hz)	**HP0:** Hot-plug mode
		(1 x orange/3s)	**HP1:** Hot-plug mode
		(2 x orange/3s)	**HP2:** Hot-plug mode
	(orange)	Flashing (2 Hz)	**Identification:** Invoked by (C-DEV.Bit15 in the Device Control) Or SIP Identification Request
	(green/red)	Flashing (2 Hz, min. 2s)	**MST losses ≥ (S-0-1003/2):** The communication warning (S-DEV.Bit 15) is present in the device status.
	(red/orange)	Flashing (2 Hz)	**Application error (C1D):** See GDP & FSP Status codes class error.
	(red)	Flashing (2 Hz)	**Watchdog error:** Application is not running.
	(red)	On	**Communication Error (C1D):** Error detected according to Sercos third generation Class 1 Diagnosis, see SCP Status codes class error.
	(off)	Off	**NRT-Mode:** (Non Real-Time Mode) No Sercos Communication
	Duo LED red/green		
	(off)	Off	This LED is not used.
L/A CH0: (16) , CH1: (19) CH2: (10) , CH3: (13)	**LED green**		
	(green)	On	**Link:** The device is linked to the Ethernet, but does not send/ receive Ethernet frames.
	(green)	Flickering (load dependent)	**Activity:** The device is linked to the Ethernet and sends/ receives Ethernet frames.
	(off)	Off	The device has no link to the Ethernet.
	LED yellow		
	(off)	Off	This LED is not used.

Table 41: LED states for the Sercos Slave protocol

LED state	Definition
Flashing (2 Hz)	The LED turns on and off with a frequency of 2 Hz: *one color*: "On" for appr. 250 ms, followed by "Off" for appr. 250 ms. *two colors*: First color for appr. 250 ms, followed by the second color for appr. 250 ms.
Flashing (1 x green/3s)	Flashing green for 250 ms, then orange on for 2 second and 750 ms.
Flashing (2 x green/3s)	Flashing green / orange / green, each for 250 ms, then orange on for 2 seconds and 250 ms.
Flashing (3 x green/3s)	Flashing green / orange / green / orange / green, each for 250 ms, then orange on for 1 second and 750 ms.
Flashing (1 x orange /3s)	Flashing orange for 250 ms, then green on for 2 second an 750 ms.
Flashing (2 x orange /3s)	Flashing orange / green / orange, each for 250 ms, then green on for 2 seconds and 250 ms.
Flickering (load dependent)	The LED turns on and off with a frequency of approximately 10 Hz to indicate high Ethernet activity: "On" for approximately 50 ms, followed by "Off" for 50 ms. The LED turns on and off in irregular intervals to indicate low Ethernet activity.

Table 42: LED state definitions for the Sercos Slave protocol

10.4.9 LEDs POWERLINK Controlled Node

The subsequent table describes the meaning of the POWERLINK Controlled Node LEDs.

LED	Color	State	Description
BS (Bus status) Position in the device drawing for protocol at X2: (1) Position in the device drawing for protocol at X3: (7)	**Duo LED red/green**		
	● (green)	On	Slave is in **'Operational'** state.
	✺ (green)	Triple flash	Slave is in **'ReadyToOperate'** state.
	✺ (green)	Double flash	Slave is in **'Pre-Operational 2'** state.
	✺ (green)	Single flash	Slave is in **'Pre-Operational 1'** state.
	✺ (green)	Flickering (10 Hz)	Slave is in **'Basic Ethernet'** state
	✺ (green)	Blinking (2.5 Hz)	Slave is in **'Stopped'** state.
	● (off)	Off	Slave initializing
BE (Bus Error) Position in the device drawing for protocol at X2: (2) Position in the device drawing for protocol at X3: (8)	**Duo LED red/green**		
	● (off)	Off	Slave has no error
	● (red)	On	Slave has detected an error
L/A CH0: (16) , CH1: (19) CH2: (10) , CH3: (13)	**LED green**		
	● (green)	On	**Link:** The device is linked to the Ethernet, but does not send/ receive Ethernet frames.
	✺ (green)	Flickering (load dependent)	**Activity:** The device is linked to the Ethernet and sends/receives Ethernet frames.
	● (off)	Off	The device has no link to the Ethernet.
	LED yellow		
	● (off)	Off	This LED is not used.

Table 43: LED states for the POWERLINK Controlled Node protocol

LED state	Definition
Triple flash	The LED 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).
Double flash	The LED 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).
Single flash	The LED shows one short flash (200 ms) followed by a long "Off" phase (1,000 ms).
Flickering (10 Hz)	The LED turns on and off with a frequency of 10 Hz: "On" for 50 ms, followed by "Off" for 50 ms. The red LED and the green LED are switched on alternately.
Blinking (2.5 Hz)	The LED turns on and off phase with a frequency of 2,5 Hz: "On" for 200 ms followed by "Off" for 200 ms. The red LED and the green LED are switched on alternately.
Flickering (load dependant)	The LED turns on and off with a frequency of approximately 10 Hz to indicate high Ethernet activity: "On" for approximately 50 ms, followed by "Off" for 50 ms. The LED turns on and off in irregular intervals to indicate low Ethernet activity.

Table 44: LED state definitions for the POWERLINK Controlled Node protocol

10.4.10 LEDs OpenModbus/TCP (Client and Server)

The subsequent table describes the meaning of the OpenModbus/TCP LEDs (for Client and Server).

LED	Color	State	Description
RUN Position in the device drawing for protocol at X2: (1) Position in the device drawing for protocol at X3: (7)	**Duo LED red/green**		
	(green)	On	**Connected:** OMB task has communication. At least one TCP connection is established.
	(green)	Flashing (1 Hz)	**Ready, not configured yet:** OMB task is ready and not yet configured.
	(green)	Flashing (5 Hz)	**Waiting for Communication:** OMB task is configured.
	(off)	Off	**Not Ready:** OMB task is not ready.
ERR Position in the device drawing for protocol at X2: (2) Position in the device drawing for protocol at X3: (8)	**Duo LED red/green**		
	(off)	Off	No communication error
	(red)	Flashing (2 Hz, 25% on)	System error
	(red)	On	Communication error active
LINK CH0: (16) , CH1: (19) CH2: (10) , CH3: (19)	**LED green**		
	(green)	On	The device is linked to the Ethernet.
	(off)	Off	The device has no link to the Ethernet.
ACT CH0: (17) , CH1: (20) CH2: (11) , CH3: (14)	**LED yellow**		
	(yellow)	Flickering (load dependent)	The device sends/receives Ethernet frames.
	(off)	Off	The device does not send/receive Ethernet frames.

Table 45: LED states for the OpenModbusTCP protocol

LED state	Definition
Flashing (1 Hz)	The LED turns on and off with a frequency of 1 Hz: "On" for 500 ms, followed by "Off" for 500 ms.
Flashing (2 Hz, 25% on)	The LED turns on and off with a frequency of 2 Hz: “On” for 125 ms, followed by “Off” for 375 ms.
Blinking (5 Hz)	The LED turns on and off with a frequency of 5 Hz: “On” for 100 ms, followed by “Off” for 100 ms.
Flickering (load dependent)	The LED turns on and off with a frequency of approximately 10 Hz to indicate high Ethernet activity: "On" for approximately 50 ms, followed by "Off" for 50 ms. The LED turns on and off in irregular intervals to indicate low Ethernet activity.

Table 46: LED state definitions for the OpenModbusTCP protocol

11 Troubleshooting

There are two steps of error diagnosis:

- the initial approximate diagnosis by checking the LEDs of the device,
- the comprehensive diagnosis with the SYCON.net configuration and diagnosis software via USB connection.

The following overview describes the error conditions that may be detected by checking the LEDs (for identification of the LEDs, please refer to section *Positions of the interfaces and LEDs* [page 27]).

For information on diagnosis with SYCON.net, see operating instruction manual *Configuration of Gateway and Proxy Devices*, DOC081201OIxxEN on the Gateway Solutions DVD in the `Documentation\english\1.Software\SYCON.net Configuration Software\Configuration of Gateway and Proxy Devices OI xx DE.pdf` directory.

LED	LED state	Cause/remedy
All	No LED is on	The device is not powered or the device is defective and needs replacement.
SYS Position in device drawing: (3)	**SYS** LED flashes yellow/green at 1 Hz	After a power cycle the device has not found a valid firmware and remains in boot loader mode. The firmware of the device has to be “recovered”. See chapter *Firmware recovery* [page 38]. If recovery fails, the load memory of the device might be defective.
SYS Position in device drawing: (3)	**SYS** LED flashes yellow	The device could not be initialized. No boot loader was found in the load memory. The load memory of the device might be defective or a USB cable, which has pin 4 connected with ground, might be attached to the device. This prevents the device from starting.
SYS Position in device drawing: (3)	**SYS** LED shows static yellow	The hardware of the device is defective and needs replacement.
SYS Position in device drawing: (3) **APL** Position in device drawing: (4)	**SYS** LED shows static green and **APL** LED flashes red or shows static red.	The device is well initialized. Further diagnosis is possible with the **APL** LED. See section *APL LED* [page 58].
APL Position in device drawing: (4)	**APL** LED flashes green.	The communication at port X2 or/and port X3 is not in data exchange mode. See also section *APL LED* [page 58].

Table 47: netTAP NT 151-RE-RE troubleshooting by LED

For protocol-specific error diagnostics by LED, see section *LEDs of the Real-Time Ethernet systems* [page 59].

12 Technical data

12.1 Technical data netTAP NT 151-RE-RE

Category	Parameter	Value
Valid for	Hardware revision	3
Communication controller	Primary network X2	netX 51
	Secondary network X3	netX 100
Memory	RAM	netX 51: 8 MB SDRAM netX 100: 8 MB SDRAM
	FLASH	netX 51: 4 MB serial Flash netX 100: 4 MB serial Flash
	SD memory card (optional)	max. 2 GByte Do not use SDHC or SDXC card types
USB Interface	USB Socket	Mini-USB, 5-pin
Display	LEDs	**SYS** system status **APL** application status 4 x **LINK** Link (RJ45) 4 x **ACT** Activity (RJ45) 4 x Protocol specific LEDs: **COM0** **COM1** **COM2** **COM3**
Power supply	Voltage	24 V ± 6 V DC with reverse voltage protection
	Current at 24 V (typically)	190 mA
	Power consumption	4.78 W
	Connector	MINI COMBICON, 5-pin
Environmental conditions	Ambient temperature range for operation	If distance to neighboring devices is minimum 17.5 mm: - 20 … + 60 °C If housing has contact to neighboring device (and if surface temperature of neighboring device does not exceed + 70 °C): - 20 … + 50 °C
	Humidity	10 ... 95 %
Device	Dimensions (L x W x H)	113.6 x 22.6 x 99 mm (without connector)
	Weight	121 g
	Mounting	Top hat rail (DIN rail EN 60715)
	Protection class	IP 20
	RoHS	Yes

Category	Parameter	Value
Conformance with EMC directives	CE sign	Yes
	UKCA sign	Yes
	ESD air discharge (DIN EN 61131-2 / BS EN 61131-2)	8 kV (criterion A)
	ESD contact discharge (DIN EN 61131-2 / BS EN 61131-2)	6 kV (criterion A)
	Burst (DIN EN 61131-2 / BS EN 61131-2)	2.2 kV (criterion B)
	Surge (DIN EN 61131-2 / BS EN 61131-2)	1 kV (criterion A)
	Immunity: radiated, HF field (DIN EN 61000-4-3 / BS EN 61000-4-3) 80 MHz ... 3 GHz	10 V/m (criterion A)
	Immunity: conducted (DIN EN 61000-4-6 / BS EN 61000-4-6) 150 kHz ... 80 MHz	10 V/m (criterion A)
	Radio interference emission (DIN EN 55016-2-3 / BS EN 55016-2-3)	30 ... 2000 MHz (criterion A)
	Radio interference voltage (DIN EN 55016-2-1 / BS EN 55016-2-1)	0.01 ... 30 MHz (criterion A)
Configuration	Software	SYCON.net
Ethernet Interfaces	Transmission rate	100 MBit/s 10 MBit/s
	Interface type	100 BASE-TX, isolated
	Half duplex/Full duplex	supported (at 100 MBit/s)
	Auto-Negotiation	supported
	Auto-Crossover	supported
	Connector	X2 (primary network): 2 x RJ45 X3 (secondary network): 2 x RJ45

Table 48: Technical data netTAP NT 151-RE-RE

12.2 Technical data of the protocols

12.2.1 PROFINET IO Controller

Parameter	Description
Maximum number of PROFINET IO Devices	128
Maximum number of total cyclic input data	5712 bytes (including IOxS status bytes)
Maximum number of total cyclic output data	5760 bytes (including IOxS status bytes)
Maximum number of cyclic input data	1440 bytes per device (= IOCR data length including IOxS status bytes)
Maximum number of cyclic output data	1440 bytes per device (= IOCR data length including IOxS status bytes)
Supported protocols	RTC – Real Time Cyclic Protocol, Class 1 RTA – Real Time Acyclic Protocol DCP – Discovery and configuration Protocol CL-RPC – Connectionless Remote Procedure Call
Context management by CL-RPC	Supported
Minimum cycle time	1 ms Different IO Devices can be configured with different cycle times
Functions	Fast Startup of PROFINET IO Devices supported
Baud rate	100 MBit/s Full-Duplex mode
Data transport layer	Ethernet II, IEEE 802.3
Configuration file	Maximum 1 MByte
Limitations	Read/Write Record not supported No Alarm processing RT over UDP not supported Multicast communication not supported DHCP is not supported Only one IOCR per IO Device NameOfStation of IO Controller CANNOT be set using the DCP SET NameOfStation service but only at start-up while configuring the IO Controller The buffer for IO-Device diagnosis data will be overwritten in case of multiple diagnostic events. Only one (the last) event is stored at the same time. If a single event produces more than 200 bytes of diagnosis data, only the first 200 bytes will be taken care of. The usable (minimum) cycle time depends on the number of used IO Devices, the number of used input and output data. The cycle-time, the number of configured IO Devices and the amount of IO data depend on each other. For example it is not possible due to performance reasons to have 128 IO Devices communication with cycle-time 1ms. The size of the bus configuration file is limited by the size of the RAM Disk (1 MByte) Only one API (API = 0) is supported WriteMultiple-Record service is not supported
Reference to stack version	PROFINET IO Controller 2.7.x.x

Table 49: Technical data PROFINET IO Controller protocol

12.2.2 PROFINET IO Device

Parameter	Description
Maximum number of cyclic input data	1440 Bytes
Maximum number of cyclic output data	1440 Bytes
Maximum number of submodules	255 submodules per Application Relation at the same time, 1000 submodules can be configured
Multiple Application Relations (AR)	The Stack can handle up to 2 IO-ARs, one Supervisor AR and one Supervisor-DA AR at the same time.
Supported protocols	RTC – Real Time Cyclic Protocol, Class 1 (unsynchronized), Class 3 (synchronized) RTA – Real Time Acyclic Protocol DCP – Discovery and configuration Protocol CL-RPC – Connectionless Remote Procedure Call LLDP – Link Layer Discovery Protocol SNMP – Simple Network Management Protocol MRP – MRP Client
Topology recognition	LLDP, SNMP V1, MIB2, physical device
Identification & Maintenance	Read and write of I&M1-4
Minimum cycle time	1 ms for RT_CLASS_1
IRT Support	RT_CLASS_3
Media redundancy	MRP client is supported
Additional features	DCP, VLAN- and priority-tagging, Shared Device
Baud rate	100 MBit/s
Data transport layer	Ethernet II, IEEE 802.3
PROFINET IO specification	V2.2 (legacy startup) and V2.3 (but advanced startup only for RT) are supported.

Parameter	Description
Limitations	No acyclic user data transfer. RT over UDP not supported. Multicast communication not supported. DHCP is not supported. FastStartUp is not supported. The amount of configured IO-data influences the minimum cycle time that can be reached. Only 1 Input-CR and 1 Output-CR are supported. Media Redundancy is not supported. System Redundancy (SR-AR) and Configuration-in-Run (CiR) are not supported. Max. 255 submodules can be used simultaneously within one specific Application Relation. RT Class 2 synchronized (IRT “flex”) is not supported. Access to the submodule granular status bytes (IOCS) is not supported. SharedInput is not supported. MRPD is not supported. DFP and other HighPerformance-profile related features are not supported. PDEV functionality is only supported for submodules located in slot 0. Submodules cannot be configured or used by an AR in subslot 0. DAP and PDEV submodules only supported in slot 0. NT 151-RE-RE can be used in a PROFINET IRT network, however cannot be used with IRT communication due to the internal gateway structure and internal cycle times of the device.
Reference to stack version	V3.9

Table 50: Technical data PROFINET IO RT IRT Device Protocol

12.2.3 EtherNet/IP Scanner

Parameter	Description
Maximum number of EtherNet/IP connections	64 connections for implicit and explicit
Maximum number of total cyclic input data	5712 bytes
Maximum number of total cyclic output data	5760 bytes
Maximum number of cyclic input data	504 bytes per slave per telegram
Maximum number of cyclic output data	504 bytes per slave per telegram
IO Connection type	Cyclic, minimum 1 ms (depending on used number of connections and used number of input and output data)
UCMM, Class 3	Supported
Quick connect	Supported
Predefined standard objects	Identity Object Message Route Object Assembly Object Connection Manager Ethernet Link Object TCP/IP Object DLR Object QoS Object
Topology	Tree, Line, Ring
DLR (Device Level Ring)	Beacon based ’Ring Node’
ACD (Address Conflict Detection)	Supported
DHCP	Supported
BOOTP	Supported
Baud rate	10 and 100 MBit/s
Data transport layer	Ethernet II, IEEE 802.3
Switch function	Integrated
Limitations	No acyclic user data transfer. CIP Sync Services are not implemented TAGs are not supported
Reference to stack version	V2.8

Table 51: Technical data EtherNet/IP Scanner (Master) protocol

12.2.4 EtherNet/IP Adapter

Parameter	Description
Maximum number of cyclic input data	504 bytes
Maximum number of cyclic output data	504 bytes
IO Connection (implicit)	1 exclusive owner, up to 2 listen only
IO Connection type	Cyclic, minimum 1 ms
UCMM	Supported
Predefined standard objects	Identity Object Message Route Object Assembly Object Connection Manager Ethernet Link Object TCP/IP Object
Topology	Tree, Line, Ring
DLR (Device Level Ring)	Beacon based ’Ring Node’
ACD (Address Conflict Detection)	Supported
DHCP	Supported
BOOTP	Supported
Baud rate	10 and 100 MBit/s
Data transport layer	Ethernet II, IEEE 802.3
Integrated switch	Supported
Limitations	No acyclic user data transfer. CIP Sync Services are not implemented TAGs are not supported
Reference to stack version	V2.10

Table 52: Technical data EtherNet/IP Adapter (slave) protocol

12.2.5 EtherCAT Master

Parameter	Description
Maximum number of EtherCAT slaves	Maximum 200 Slaves. The number of usable slaves depends on the available memory for the configuration file. See ‘configuration file’ below.
Maximum number of cyclic input data	4600 bytes
Maximum number of cyclic output data	4600 bytes
Minimum bus cycle time	205 µs, depending on the used number of slaves and the used number of cyclic input data and output data. Recommended is a cycle time of 1 ms and higher.
Bus Scan	Supported
Redundancy	Not supported
Distributed Clocks	Supported
Topology	Line
Baud rate	100 MBit/s
Data transport layer	Ethernet II, IEEE 802.3
Configuration File (ethercat.xml or config.nxd)	Maximum 1 MByte
Limitations	No acyclic user data transfer The size of the bus configuration file is limited by the size of the FLASH disk (1 Mbyte).
Reference to stack version	V4.2.x.x

Table 53: Technical data EtherCAT Master protocol

12.2.6 EtherCAT Slave

Parameter	Description
Maximum number of cyclic input data	256 bytes
Maximum number of cyclic output data	256 bytes
Type	Complex Slave
FMMUs	3
SYNC Manager	4
Baud rate	100 MBit/s
Data transport layer	Ethernet II, IEEE 802.3
Limitations	No acyclic user data transfer LRW not supported
Reference to stack version	V4.4.x.x

Table 54: Technical data EtherCAT slave protocol

12.2.7 Sercos Master

Parameter	Description
Maximum number of cyclic input data	5760 bytes (including Connection Control per Connection)
Maximum number of cyclic output data	5760 bytes (including Connection Control per Connection)
Maximum number of configured slave devices	511
Minimum cycle time	250 µs
Acyclic communication	Service channel: Read/Write/Commands
Functions	Bus Scan
Communication phases	NRT, CP0, CP1, CP2, CP3, CP4
Topology	Line and double ring
Redundancy	Supported
NRT channel	Supported
Baud rate	100 MBit/s, full duplex
Data transport layer	Ethernet II, IEEE 802.3
Auto crossover	Supported
Supported Sercos version	Communication Specification Version 1.3
TCP/IP Stack	Integrated
Limitations	No acyclic user data transfer. NRT channel not used Hot-Plug not supported Cross Communication not supported
Reference to stack version	V2.1

Table 55: Technical daten sercos master protocol

12.2.8 Sercos Slave

Parameter	Description
Maximum number of cyclic input data (Tx)	120 bytes (including Connection Control and IO Status)
Maximum number of cyclic output data (Rx)	120 bytes (including Connection Control and IO Control)
Maximum number of slave devices	1
Maximum number of applicable sercos addresses	1 … 511
Minimum cycle time	250 µs
Topology	Line and ring
Communication phases	NRT, CP0, CP1, CP2, CP3, CP4
Baud rate	100 MBit/s
Data transport layer	Ethernet II, IEEE 802.3
Supported Sercos version	Sercos in the third generation Communication Specification Version 1.3.0
Supported Sercos Communication Profiles	SCP_FixCFG Version 1.1.1 SCP_VarCFG Version 1.1.1 SCP_VarCFG Version 1.1.3
Supported FSP profiles	FSP_IO
SCP_NRTPC support	Yes
S/IP support	Yes
Identification LED feature supported	Yes
Limitations	Max. 2 connections: 1 for consumer and 1 for producer No acyclic user data transfer Modifications of the Service-Channel Object Dictionary will be volatile after reset, if it resides on device Hot plug is not supported Cross communication not supported NRT Channel only forwarding and S/IP
Reference to stack version	V3.3.x.x

Table 56: Technical data Sercos slave protocol

12.2.9 POWERLINK Controlled Node

Parameter	Description
Maximum number of cyclic input data	1490 bytes
Maximum number of cyclic output data	1490 bytes
Baud rate	100 MBit/s, half-duplex
Data transport layer	Ethernet II, IEEE 802.3
Ethernet POWERLINK version	V 2
Limitations	No acyclic user data transfer No slave-to-slave communication
Reference to stack version	V3.1

Table 57: Technical data POWERLINK Controlled Node (slave) protocol

12.2.10 Open Modbus/TCP

Parameter	Description
Maximum number of input data	2880 Registers
Maximum number of output data	2880 Registers
Maximum number of connections	16
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 16) 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 (Function code 23 in server mode only)
Protocol Mode	Client (with command table) or Server
Baud rate	10 and 100 MBit/s
Data transport layer	Ethernet II, IEEE 802.3
Reference to stack version	V2.6

Table 58: Technical data OpenModbus/TCP protocol

13 Decommissioning/Disposal

13.1 Putting the device out of operation

NOTICE

Danger of Unsafe System Operation !

To prevent personal injury or property damage, make sure that the removal of the device from your plant during operation will not affect the safe operation of the plant.

- ➢ Disconnect all communication cables from the device.
- ➢ Disconnect the power supply plug.
- ➢ Remove the device from the DIN rail as described in section *Removing device from Top Hat Rail* [page 35].

13.2 Disposal of waste electronic equipment

Important notes from the European Directive 2012/19/EU “Waste Electrical and Electronic Equipment (WEEE)”

Waste electronic equipment

This product must not be treated as household waste.

This product must be disposed of at a designated waste electronic equipment collecting point.

Waste electronic equipment may not be disposed of as household waste. As a consumer, you are legally obliged to dispose of all waste electronic equipment according to national and local regulations.

14 Appendix

14.1 Legal notes

Copyright

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