



User Manual

netJACK Communication Module Installation, Operation and Hardware Description



Hilscher Gesellschaft für Systemautomation mbH
www.hilscher.com

DOC110504UM06EN | Revision 6 | English | 2017-08 | Released | Public

Table of Contents

1	Introduction	5
1.1	About this manual	5
1.1.1	Description of the contents	5
1.1.2	List of revisions	6
1.1.3	Conventions in this document.....	8
1.2	Versions of devices, firmware, software tools and drivers	9
1.2.1	Overview	9
1.2.2	Important changes	9
1.2.3	Devices and firmware	15
1.2.4	Software tools	17
1.2.5	Drivers.....	17
1.3	Contents of the product DVD	17
1.3.1	Overview	17
1.3.2	Device description files	18
1.3.3	Documentation	19
1.4	Ensuring access security	19
1.5	Legal notes.....	20
1.6	Registered trademarks	24
2	Safety	25
2.1	General note	25
2.2	Intended use	25
2.3	Personnel qualification	27
2.4	References safety	27
2.5	Safety instructions to avoid personal injury	27
2.5.1	Electrical shock hazard	27
2.6	Safety instructions to avoid property damage	28
2.6.1	Device destruction by exceeding allowed supply voltage	28
2.6.2	Device destruction by exceeding allowed signaling voltage	28
2.6.3	Electrostatic sensitive devices	29
2.6.4	Exceeding the maximum number of allowed write/delete accesses	29
2.6.5	Drop of supply voltage during write and delete accesses in the file system ...	29
2.7	Labeling of safety messages.....	30
3	Device description	31
3.1	Overview	31
3.2	Firmware, drivers and configuration software	33
3.3	netJACK as embedded system.....	33
4	Prerequisites for operation	35
4.1	Hardware host system	35
4.2	Firmware and drivers	35
4.3	System requirements SYCON.net	36
4.4	Communication partner in the network	36
5	Getting started	37
5.1	Overview	37

5.2	Notes on configuring master devices	41
5.3	Device names in SYCON.net.....	42
6	Software overview	44
6.1	Software for downloading firmware.....	44
6.2	Software for configuration and diagnosis	45
7	Mounting/removing netJACK	46
7.1	Safety messages.....	46
7.2	Mounting principle netJACK.....	47
7.3	Mounting netJACK	48
7.4	Removing netJACK.....	50
8	Using the Evaluation Board	51
8.1	Overview	51
8.1.1	Required Hardware	51
8.1.2	Required Software	51
8.2	Safety messages.....	52
8.3	Mounting netJACK onto Evaluation Board.....	53
8.4	Connecting Evaluation Board to PC	55
8.4.1	Evaluation Board NJEB-E (PCI Express)	55
8.4.2	Evaluation Board NJEB-D (Dual-Port Memory)	56
9	Updating firmware	58
9.1	Ways to update firmware	58
9.1.1	Updating firmware of mounted netJACKs.....	61
9.1.2	Updating firmware of netJACK via Evaluation Board.....	64
9.2	Instructions for updating firmware with SYCON.net.....	68
9.2.1	Prerequisites	68
9.2.2	Overview	68
9.2.3	Step-by-step instructions for updating firmware.....	69
9.2.4	Troubleshooting firmware update	74
10	Device pictures, connectors and LEDs	78
10.1	Device pictures.....	78
10.2	Device type label.....	79
10.3	Positions of the LEDs and control elements	81
10.3.1	netJACK for Real-Time Ethernet systems	81
10.3.2	netJACK for fieldbus systems	86
10.4	Descriptions of the LEDs.....	88
10.4.1	System LED	88
10.4.2	LEDs Real-Time Ethernet systems.....	89
10.4.3	LEDs fieldbus systems.....	106
10.5	Pinning	112
10.5.1	Pinning Real-Time Ethernet interface	112
10.5.2	Pinning CANopen interface.....	113
10.5.3	Pinning CC-Link interface	113
10.5.4	Pinning DeviceNet interface.....	114
10.5.5	Pinning PROFIBUS DP interface.....	114
11	Troubleshooting.....	115

12 Technical data	116
12.1 Technical Data of the netJACK Communication Modules	116
12.1.1 NJ 10D-COS	117
12.1.2 NJ 10D-CCS	118
12.1.3 NJ 10D-DNS	119
12.1.4 NJ 10D-DPS	120
12.1.5 NJ 51D-RE (preliminary)	121
12.1.6 NJ 100EN-RE	123
12.1.7 NJ 100EN-CO	124
12.1.8 NJ 100EN-DN	125
12.1.9 NJ 100EN-DP	126
12.1.10 NJ 100DN-RE	127
12.1.11 NJ 100DN-CO	129
12.1.12 NJ 100DN-DN	130
12.1.13 NJ 100DN-DP	131
12.2 Technical Data of the Real-Time Ethernet Systems	132
12.2.1 EtherCAT Master V3	132
12.2.2 EtherCAT Master V4	133
12.2.3 EtherCAT Slave V2.5 and V4.6	135
12.2.4 EtherNet/IP-Scanner	136
12.2.5 EtherNet/IP-Adapter	137
12.2.6 Open Modbus/TCP	138
12.2.7 POWERLINK Controlled Node V2	139
12.2.8 POWERLINK Controlled Node V3	139
12.2.9 PROFINET IO Controller V2	140
12.2.10 PROFINET IO Controller V3	141
12.2.11 PROFINET IO Device V3.4	143
12.2.12 PROFINET IO Device V3.10	144
12.2.13 Sercos Master	146
12.2.14 Sercos Slave	147
12.2.15 VARAN Client	149
12.3 Technical Data of the Fieldbus Systems	150
12.3.1 CANopen Master	150
12.3.2 CANopen Slave	151
12.3.3 CC-Link Slave	152
12.3.4 DeviceNet Master	153
12.3.5 DeviceNet Slave	154
12.3.6 PROFIBUS DP Master	155
12.3.7 PROFIBUS DP Slave	156
12.4 PCI IDs netJACK on the PCI Bus	157
12.5 EtherNet/IP Adapter/Slave – Instance ID of I/O Data	157
List of Figures	158
List of Tables	159
Contacts	162

1 Introduction

1.1 About this manual

1.1.1 Description of the contents

This manual describes the Hilscher netJACK communication modules for Real-Time Ethernet and Fieldbus networks.

Here you will find information on how to install, configure and operate the netJACK modules.

The netJACK communication modules are designed to be part of an “embedded system”, which means that they are to be mounted and integrated into other electronic devices or systems. In this document, the hosting electronic device, into which the netJACK is to be mounted, is referred to as “host system” of the netJACK.

The physical design of the embedded system is not described in this document. The physical design is discussed in full detail in a separate document, the *netJack Design Guide*.

A list of further documents which are relevant for the user of the netJACK is provided in the Installation Guide *Software Installation and Documentation Overview Communication Solutions* in chapter *Communication Modules netJACK, Software and Documentation*. You will find the Installation Guide on the Communication Solutions DVD in the `Documentation\0. Installation and Overview` directory.



Important:

- To avoid personal injuries or damage to electrical devices, please read this manual carefully before installing and using the netJACK communication modules.
 - Please first read the Safety chapter.
-

1.1.2 List of revisions

Index	Date	Revision
4	2013-12-19	Instructions for installing software were taken out of this document. Instructions for installing software can now be found in separate User manual <i>Software Installation comX and netJACK</i> , DOC130405UMxxEN.
		Section <i>Important changes</i> [► page 9] with information about new firmware versions added.
		New devices added: NJ 10D-COS NJ 10D-CCS NJ 10D-DNS NJ 10D-DPS NJ 51D-RE NJ 100DN-RE NJ 100DN-CO NJ 100DN-DN
		LED Descriptions for the following protocols in section <i>Descriptions of the LEDs</i> [► page 88] updated: DeviceNet Master DeviceNet Slave Sercos Master Sercos Slave
		Section <i>Technical Data of the netJACK Communication Modules</i> [► page 116] updated.
		Technical data of the following protocols in section <i>Technical Data of the Real-Time Ethernet Systems</i> [► page 132] updated: EtherCAT Slave EtherNet/IP Scanner EtherNet/IP Adapter PROFINET IO Device (V3.5) Sercos Master Sercos Slave
		Technical data of the following protocols in section <i>Technical Data of the Fieldbus Systems</i> [► page 150] updated: CANopen Slave CC-Link Slave PROFIBUS DP Master

Index	Date	Revision
5	2017-03-30	Structure and layout of document revised.
		Versions of firmware, device description files, software tools and drivers updated.
		NJ 50D-RE removed from document.
		NJ 51D-RE for POWERLINK Controlled Node added.
		Information about new firmware versions for PROFINET IO Controller and EtherCAT Master in section <i>Important changes</i> [▶ page 9] added.
		Section <i>Contents of the product DVD</i> [▶ page 17] updated.
		Section <i>Descriptions of the LEDs</i> [▶ page 88] revised.
		Warning against implementing a separate voltage switch for netJACKs with PCI express added in section <i>Safety messages</i> [▶ page 46].
		Section <i>System requirements SYCON.net</i> [▶ page 36] revised.
		Warnung vor <i>Exceeding the maximum number of allowed write/delete accesses</i> [▶ page 29] added.
		Warnung vor <i>Drop of supply voltage during write and delete accesses in the file system</i> [▶ page 29] added.
		Technical data of devices NJ 51D-RE, NJ 100DN-RE, NJ 100DN-CO and NJ 100DN-DN updated.
		Technical data of the following protocols in section <i>Technical Data of the Real-Time Ethernet Systems</i> [▶ page 132] updated: PROFINET IO Controller V3 EtherCAT Master V4 POWERLINK Controlled Node V3 PROFINET IO Device V3.10 Sercos Slave EtherNet/IP Scanner EtherNet/IP Adapter Open Modbus/TCP
		Identification of input/output channels of VARAN Client in section <i>Front view of netJACK with VARAN Client</i> [▶ page 85] added.
6	2017-08-30	Information about new firmware version for POWERLINK Controlled Node in section <i>New firmware version V3 for POWERLINK Controlled Node</i> [▶ page 13] added.

Table 1: List of revisions

1.1.3 Conventions in this document

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

Notes



Note:
<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 30].

1.2 Versions of devices, firmware, software tools and drivers

1.2.1 Overview

The hardware revisions and the versions of the firmware, the drivers and the configuration software functionally belong together. This means that certain revisions of netJACK hardware need certain versions of firmware, software and drivers in order to function properly.

This section lists the hardware revisions and the versions of the firmware, the configuration software and the drivers which functionally belong together and to which all instructions in this manual refer.

1.2.2 Important changes

1.2.2.1 New firmware version V3 for PROFINET IO Controller

The PROFINET IO-Controller firmware has been revised and completed and is available in version V3 since the first quarter of 2017.

Upgrading the PROFINET IO-Controller firmware from V2 to V3 is recommended. Use the PROFINET IO-Controller firmware V3 for a new installation when creating or developing your application program for the first time.

The development of the PROFINET IO-Controller firmware V2 will not be continued, but this firmware version is still maintained and will still be delivered in future.

The PROFINET IO-Controller V3 implements several new features, which are not available in the PROFINET IO-Controller V2:

- IRT operating mode
- Optimized process data performance
- Automatic name assignment
- Automatic alarm acknowledgement
- MRP Client and Manager for media redundancy
- Requirements PROFINET Specification 2.3: e. g. Advanced Startup, MultipleInterfaceMode, network load requirements.

The process data handling in PROFINET IO-Controller V3 (process data image structure and process data timing) was reworked to achieve the required performance improvement and to support synchronized applications.

Removed features and incompatibilities:

- PROFINET IO-Controller V3 does neither support swapping of IO data nor automatic IOPS handling.
- The configuration parameters have been extended to meet the IRT configuration requirements. The structure of the configuration database has been changed. Therefore, the PROFINET IO-Controller V3 can not be configured with a configuration database of the PROFINET IO-Controller V2 and vice versa.
- The configuration API of PROFINET IO-Controller V2 are not supported by PROFINET IO-Controller V3. The new configuration API of PROFINET IO-Controller V3 is to be used.
- The PROFINET IO-Controller V3 does not support process data in little endian format. This feature was rarely used and has been removed for better performance.

If you want to change in an existing system from the PROFINET IO-Controller firmware V2 to V3, note the following guidelines:

1. Customize your application program according to the Migration Guide *PROFINET IO Controller Migrating from version 2 to 3*.



If you want to change to V4.2, please check in the Migration Guide *PROFINET IO Controller Migrating from version 2 to 3* in order to note which changes are necessary in the application program for using version 4.2.

2. If you upgrade to the PROFINET IO-Controller firmware V3, you cannot reuse the existing SYCON.net project of the PROFINET IO-Controller firmware V2. Create a new configuration. For the PROFINET IO-Controller firmware V3, you need SYCON.net from version 1.400 for configuration, which contains new configuration dialogs (PROFINET IO IRT-Controller DTM).
3. Update the PROFINET IO controller firmware in your device to Version 3.

On the Communication Solutions DVD, files and manuals referring to firmware V2 and V3, are available as follows:

	PROFINET IO-Controller V2 Directory on the DVD \ file:	PROFINET IO-Controller V3 Directory on the DVD \ file:
Firmware	<i>Firmware\NETJACK\Outdated versions\PNM V2\J020C000.nxf</i>	<i>Firmware\NETJACK\ J020C000.nxf</i>
Header	<i>Examples and API\0. Header\Firmware\PROFINET IO Controller V2</i>	<i>Examples and API\0. Header\Firmware \PROFINET Controller V3</i>
Protocol API	<i>Documentation\7. Programming Manuals\EN\3. Protocol API\PROFINET IO Controller\ PROFINET IO Controller Protocol API 19 EN.pdf, Ethernet Protocol API.pdf, TCP IP - Packet Interface API 12 EN.pdf</i>	<i>Documentation\7. Programming Manuals\EN\3. Protocol API\PROFINET IO Controller V3\ PROFINET IO Controller V3 Protocol API 05 EN.pdf, PROFINET IO Controller - Migrating from version 2 to 3 MG 01 EN.pdf</i>

Table 2: PROFINET IO-Controller firmware V2 and V3 on the product DVD

1.2.2.2 New firmware version V4 for EtherCAT Master

The EtherCAT Master firmware has been revised and completed and is available in version V4 since the first quarter of 2017.

Upgrading the EtherCAT Master firmware from V3 to V4 is recommended. Use the EtherCAT Master firmware V4 for a new installation when creating or developing your application program for the first time, as well as in existing systems.

The reasons for upgrading are as follows:

- The development of the EtherCAT Master firmware V3 will not be continued (although this firmware version will still be delivered in future).
- Due to the software design, the EtherCAT Master firmware V3 has considerable performance limitations on Hilscher products.
- Compared to the EtherCAT Master firmware V3, the EtherCAT Master firmware V4 has major improvements, while keeping the backward compatibility to the firmware V3 as much as possible. Due to the improvements, there are advantages in device certification.

Performance improvement and new functions with EtherCAT Master firmware V4:

- General performance improvement up to five times
- Improvements in network and individual Slave control, Slave diagnostics
- Support of CoE, SoE, EoE, FoE, ExtSync
- Support of redundancy in different, even complex topologies, including DC and DC resynchronization and hot-connect.
- Troubleshooting improvement.

If you want to change in an existing system from the EtherCAT Master firmware V3 to V4, you need to upgrade the EtherCAT Master firmware in your device to V4.

With SYCON.net, you can configure both the EtherCAT Master firmware V3 as well as the EtherCAT Master firmware V4. When you upgrade to the EtherCAT Master firmware V4, you can continue to use the existing SYCON.net project.

On the Communication Solutions DVD, files and manuals referring to firmware V3 and V4, are available as follows:

	EtherCAT-Master V3 Directory on the DVD \ file:	EtherCAT-Master V4 Directory on the DVD \ file:
Firmware	<i>Firmware\NETJACK\Outdated versions\ECM V3\J020E000.nxf</i>	<i>Firmware\NETJACK\J020E000.nxf</i>
Header	<i>Examples and API\0. Header\Firmware\EtherCAT Master V3</i>	<i>Examples and API\0. Header\Firmware\EtherCAT Master V4</i>
Protocol API	<i>Documentation\7. Programming Manuals\EN\3. Protocol API\EtherCAT Master V3\EtherCAT Master V3 Protocol API 05 EN.pdf</i>	<i>Documentation\7. Programming Manuals\EN\3. Protocol API\EtherCAT Master V4\EtherCAT Master V4 Protocol API 05 EN.pdf</i>

Table 3: EtherCAT Master firmware V3 and V4 on the product DVD

1.2.2.3 New firmware version 4.6 for EtherCAT Slaves

The EtherCAT Slave firmware was revised and completed and is available in version 4.6 since the first quarter of 2017.

Use the EtherCAT Slave firmware in version 4.6 for a new installation, when you create or develop your application program for the first time.

If you want to change from EtherCAT Slave firmware version 2.5 to version 4.6 in an existing system, please note the following guidelines:

1. Customize your application program according to the Migration Guide **EtherCAT Slave, Migration from V2.5 to V4.2**.



If you want to change to V4.6, please check in the Migration Guide **EtherCAT Slave, Migration from V2.5 to V4.2** which changes are necessary in the application program in order to use version 4.6.

2. Adjust the configuration of your EtherCAT Master device. Use the new XML files in the configuration software of the EtherCAT Master for this:
 - *Hilscher NJ 51XX RE ECS V4.6.X.xml*
 - *Hilscher NJ 100XX RE ECS V4.6.X.xml*.

3. Update the EtherCAT Slave firmware in your device to version 4.6.

Note also:

- SYCON.net V1.0400.x.x can configure the EtherCAT Slave firmware V2.5 as well as V4.6.
- The netX Configuration Tool V1.0900.x.x can configure the EtherCAT Slave firmware V2.5 as well as V4.6.
- The development of the EtherCAT Slave firmware V2.5 will not be continued, but this old version will nevertheless still be included in future deliveries.

On the Communication Solutions DVD, software and manuals relating to both firmware versions V2.5 and V4.6 are available:

	EtherCAT-Slave V2.5 Directory on the DVD \ File:	EtherCAT-Slave V4.6 Directory on the DVD \ File:
Firmware	-	<i>Firmware\NETJACK\J060F000.nxf</i>
	<i>Firmware\NETJACK\Outdated versions J020F000.nxf</i>	<i>Firmware\NETJACK\J020F000.nxf</i>
Header	<i>Examples and API\0. Header\Firmware \EtherCAT Slave V2</i>	<i>Examples and API\0. Header\Firmware\EtherCAT Slave V4</i>
XML	-	<i>EDS\EtherCAT\Slave\V4\Hilscher NJ 51XX RE ECS V4.6.X.xml</i>
	<i>EDS\EtherCAT\Slave\V2\Hilscher NJ 100XX RE ECS V2.5.X.xml</i>	<i>EDS\EtherCAT\Slave\V4\Hilscher NJ 100XX RE ECS V4.6.X.xml</i>
Protocol API	<i>Documentation\7. Programming Manuals\EN\3. Protocol API\EtherCAT Slave V2\EtherCAT Slave Protocol API 21 EN.pdf</i>	<i>Documentation\7. Programming Manuals\EN\3. Protocol API\EtherCAT Slave V4\EtherCAT Slave V4 Protocol API 08 EN.pdf</i> <i>EtherCAT Slave - Migration from Version 2.5 to 4.2 MG 02 EN.pdf</i> <i>Object Dictionary V3 03 API EN.pdf</i>

Table 4: EtherCAT Slave firmware version 2.5 and 4.6, Header, XML and Protocol API Manual

1.2.2.4 New firmware version V3 for POWERLINK Controlled Node

The POWERLINK Controlled Node firmware has been revised and completed and is available for NJ 51D-RE in version V3 since the first quarter of 2017 as well as for NJ 100DN-RE und NJ 100EN-RE in version V3 since the third quarter of 2017.

Do not use the POWERLINK Controlled Node V2.x for new applications. For a new installation when creating or developing your application program for the first time, use the POWERLINK Controlled Node firmware V3. Already existing applications based on V2.x do not need to be upgraded.

The reasons for upgrading are as follows:

- The development of the POWERLINK Controlled Node firmware V2 will not be continued.
- Performance improvements
- IPV4 support according to EPSG specification
- Multiple ASnd

POWERLINK Controlled Node V3 is developed to fulfill the following requirements:

- Support of netX 51-based and netX 100-based products. netX50 based products are not supported.
- Optimization of the internal stack structure to improve performance and less memory space requirement.
- POWERLINK Controlled Node V3 uses the object dictionary V3 component, to achieve a common base with other Hilscher stacks.
- Applications, which used configuration database (inibatch.nxd) or configuration API of POWERLINK Controlled Node V2, can be easily migrated to V3 because these configuration mechanisms are supported also for V3.

If you want to change in an existing system from the POWERLINK Controlled Node firmware V2 to V3, note the following guidelines:

1. Using the same configuration project, SYCON.net V1.400 can configure the POWERLINK Controlled Node firmware V2 as well as V3.
2. If the application program uses the API for object dictionary V2, the application program must be adapted and the API for object dictionary V3 must be used. The API of the object dictionary was changed incompatible from V2 to V3 and may require additional effort if these services are used.
3. Adjust the configuration of your POWERLINK Managing Node device. Use the new updated XDD file in the configuration software of the POWERLINK Managing Node for this: 00000044_NJ 51XX RE PLS.xdd or 00000044_NJ 100XX RE PLS.xdd.
4. Update the POWERLINK Controlled Node firmware in your device to V3.

On the Communication Solutions DVD, files and manuals referring to firmware V2 and V3, are available as follows:

	POWERLINK Controlled Node V2 Directory on the DVD \ File:	POWERLINK Controlled Node V3 Directory on the DVD \ File:
Firmware	<i>Firmware\NETJACK\Outdated versions\PLS V2\ - J020K000.nxf</i>	<i>Firmware\NETJACK\ J060K000.nxf (NJ 51D-RE) J020K000.nxf (NJ 100XX-RE)</i>
Header	<i>Examples and API\0. Header\Firmware\ POWERLINK Controlled Node V2</i>	<i>Examples and API\0. Header\Firmware\ POWERLINK Controlled Node V3</i>
XDD	<i>EDS\POWERLINK\Slave\V2\ - 00000044_NJ 100XX RE PLS.xdd</i>	<i>EDS\POWERLINK\Slave\V3\ 00000044_NJ 51XX RE PLS.xdd 00000044_NJ 100XX RE PLS.xdd</i>
Protocol API	<i>Documentation\7. Programming Manuals\EN\ 3. Protocol API\POWERLINK Controlled Node V2\ Powerlink Controlled Node Protocol API 12 EN.pdf</i>	<i>Documentation\7. Programming Manuals\EN\ 3. Protocol API\POWERLINK Controlled Node V3\ POWERLINK Controlled Node V3 Protocol API 05 EN.pdf</i>

Table 5: POWERLINK Controlled Node Firmware V2 and V3 on the product DVD

1.2.3 Devices and firmware

This manual refers to the following hardware revisions and firmware versions:

netJACK device type name	Host interface	Protocol	Part number	Hardware revision	Firmware	Firmware version
NJ 10D-COS	Dual-Port Memory 60 Pin	CANopen Slave	1652.540/COS	1	J0505000.nxf	3.7.x.x
NJ 10D-CCS	Dual-Port Memory 60 Pin	CC-Link Slave	1652.740/CCS	1	J0509000.nxf	2.11.x.x
NJ 10D-DNS	Dual-Port Memory 60 Pin	DeviceNet Slave	1652.520/DNS	1	J0507000.nxf	2.5.x.x
NJ 10D-DPS	Dual-Port Memory 60 Pin	PROFIBUS DP Slave	1652.420/DPS	1	J0502000.nxf	2.9.x.x
NJ 51D-RE	Dual-Port Memory 60 Pin	EtherCAT Slave	1662.100/ECS	1	J060F000.nxf	4.6.x.x
		EtherNet/IP Adapter	1662.100/EIS	1	J060H000.nxf	2.11.x.x
		Open Modbus/TCP	1662.100/OMB	1	J060L000.nxf	2.6.x.x
		POWERLINK Controlled Node	1662.100/PLS	1	J060K000.nxf	3.2.x.x
		PROFINET IO Device	1662.100/PNS	1	J060D000.nxf	3.10.x.x
		Sercos Slave	1662.100/S3S	1	J060J000.nxf	3.4.x.x
NJ 100DN-RE	Dual-Port Memory 80 Pin	EtherCAT Master	1623.100/ECM	1	J020E000.nxf	4.3.x.x
		EtherCAT Slave	1623.100/ECS	1	J020F000.nxf	2.5.x.x (outdated) 4.6.x.x
		EtherNet/IP Scanner	1623.100/EIM	1	J020G000.nxf	2.9.x.x
		EtherNet/IP Adapter	1623.100/EIS	1	J020H000.nxf	2.11.x.x
		Open Modbus/TCP	1623.100/OMB	1	J020L000.nxf	2.6.x.x
		POWERLINK Controlled Node	1623.100/PLS	1	J020K000.nxf	2.1.x.x
		PROFINET IO Controller	1623.100/PNM	1	J020C000.nxf	3.2.x.x
		PROFINET IO Device	1623.100/PNS	1	J020D000.nxf	3.4.x.x (outdated) 3.10.x.x
		Sercos Master	1623.100/S3M	1	J020I000.nxf	2.1.x.x
		Sercos Slave	1623.100/S3S	1	J020J000.nxf	3.4.x.x
		VARAN Client	1623.100/VRS	1	J020T000.nxf	1.1.x.x
NJ 100DN-CO	Dual-Port Memory 80 Pin	CANopen Master	1623.500/COM	1	J0204000.nxf	2.14.x.x
		CANopen Slave	1623.500/COS	1	J0205000.nxf	3.7.x.x
NJ 100DN-DN	Dual-Port Memory 80 Pin	DeviceNet Master	1623.510/DNM	1	J0206000.nxf	2.4.x.x
		DeviceNet Slave	1623.510/DNS	1	J0207000.nxf	2.5.x.x
NJ 100DN-DP	Dual-Port Memory 80 Pin	PROFIBUS DP Master	1623.400/DPM	1	J0201000.nxf	2.7.x.x
		PROFIBUS DP Slave	1623.400/DPS	1	J0202000.nxf	2.9.x.x

netJACK device type name	Host interface	Protocol	Part number	Hardware revision	Firmware	Firmware version
NJ 100EN-RE	PCI Express 40 Pin	EtherCAT Master	1625.100/ECM	1	J020E000.nxf	4.3.x.x
		EtherCAT Slave	1625.100/ECS	1	J020F000.nxf	2.5.x.x (outdated) 4.6.x.x
		EtherNet/IP Scanner	1625.100/EIM	1	J020G000.nxf	2.9.x.x
		EtherNet/IP Adapter	1625.100/EIS	1	J020H000.nxf	2.11.x.x
		Open Modbus/TCP	1625.100/OMB	1	J020L000.nxf	2.6.x.x
		POWERLINK Controlled Node	1625.100/PLS	1	J020K000.nxf	2.1.x.x
		PROFINET IO Controller	1625.100/PNM	1	J020C000.nxf	3.2.x.x
		PROFINET IO Device	1625.100/PNS	1	J020D000.nxf	3.4.x.x (outdated) 3.10.x.x
		Sercos Master	1625.100/S3M	1	J020I000.nxf	2.1.x.x
		Sercos Slave	1625.100/S3S	1	J020J000.nxf	3.4.x.x
		VARAN Client	1625.100/VRS	1	J020T000.nxf	1.1.x.x
NJ 100EN-CO	PCI Express 40 Pin	CANopen Master	1625.500/COM	1	J0204000.nxf	2.14.x.x
		CANopen Slave	1625.500/COS	1	J0205000.nxf	3.7.x.x
NJ 100EN-DN	PCI Express 40 Pin	DeviceNet Master	1625.510/DNM	1	J0206000.nxf	2.4.x.x
		DeviceNet Slave	1625.510/DNS	1	J0207000.nxf	2.5.x.x
NJ 100EN-DP	PCI Express 40 Pin	PROFIBUS DP Master	1625.400/DPM	1	J0201000.nxf	2.7.x.x
		PROFIBUS DP Slave	1625.400/DPS	1	J0202000.nxf	2.9.x.x

Table 6: Reference to hardware and firmware

1.2.4 Software tools

This manual refers to the following software versions:

Software	File name	Version
SYCON.net	SYCONnet netX setup.exe	1.0400.x.x or higher
netX Configuration Tool	netXConfigurationUtility_Setup.exe	1.0900.x.x or higher

Table 7: Reference to software tools

1.2.5 Drivers

This manual refers to the following driver versions:

Driver	File name	Version
cifX Device Driver	cifX Device Driver Setup.exe	1.3.x.x
USB Driver Windows	Setup.exe	-

Table 8: Reference to Drivers

1.3 Contents of the product DVD

1.3.1 Overview

The **Communication Solutions DVD** contains the necessary software and documentation that you need for your netJACK communication module:

- Installation programs for SYCON.net and slave configuration tools
- Firmware
- Drivers
- Device description files (GSD, GSDML, EDS, XML, XDD, CSP)
- Documentation

You can download the DVD as ZIP file from our website

<http://www.hilscher.com> on the netJACK product page under “Downloads”.

A detailed description of the contents of the DVD is provided in the *What is on the Communication Solutions DVD?* section in the *Installation Guide Software Installation and Documentation Overview Communication Solutions*. You will find the Installation Guide on the DVD in the `Documentation\0. Installation and Overview` directory.

1.3.2 Device description files

In the EDS directory of the DVD, you will find device description files for the following types of slave devices:

netJACK serving as Real-Time Ethernet slave

Real-Time Ethernet protocol	Name of device description file	Required to configure
EtherCAT Slave V2.5	Hilscher NJ 100XX RE ECS V2.5.X.xml	EtherCAT Master
EtherCAT Slave V4.6	Hilscher NJ 51XX RE ECS V4.6.X.xml Hilscher NJ 100XX RE ECS V4.6.X.xml	
EtherNet/IP Adapter (Slave)	HILSCHER NJ 51XX-RE EIS V1.1.EDS HILSCHER NJ 100XX-RE EIS V1.1.EDS	EtherNet/IP Scanner
POWERLINK Controlled Node / Slave	00000044_NJ 51XX RE PLS.xdd 00000044_NJ 100XX RE PLS.xdd	POWERLINK Managing Node
PROFINET IO Device V3.4 (Slave)	GSDML-V2.3-HILSCHER-NJ 100XX-RE PNS-20130806.xml	PROFINET IO Controller (Master)
PROFINET IO Device V3.10 (Slave)	GSDML-V2.32-HILSCHER-NJ 51X-RE PNS-20160502.xml GSDML-V2.32-HILSCHER-NJ 100XX-RE PNS-20160502.xml	
Sercos Slave (V3)	SDDML#v3.0#Hilscher#NJ_51X_RE-FIXCFG_FSPIO#2014-01-08.xml SDDML#v3.0#Hilscher#NJ_100XX_RE-FIXCFG_FSPIO#2014-01-08.xml Note: If you use a Sercos Master which is using SDDML files for configuration, and one of the defaults for vendor code, device ID, input data size or output data size was changed, then you have to export a new updated SDDML file from SYCON.net and import this SDDML file into the configuration software for the Sercos Master.	Sercos Master

Table 9: Device description files for netJACK serving as Real-Time Ethernet slave



Note:

The Real-Time Ethernet systems Open Modbus/TCP and VARAN do not use device description files.

netJACK serving as fieldbus slave

Fieldbus protocol	Name of device description file	Required to configure
CANopen Slave	NJ 10X-COS COS.eds	CANopen Master
	NJ 100XX-CO COS.eds	
PROFIBUS DP Slave	HIL_0D81.GSD (NJ 10x)	PROFIBUS DP Master
	HIL_0D83.GSD (NJ 100xx)	
DeviceNet Slave	NJ_10X-DNS_DNS.EDS	DeviceNet Master
	NJ_100XX-DN_DNS.EDS	

Table 10: Device description files for netJACK serving as fieldbus slave

netJACK Serving as Real-Time Ethernet master

In the `EDS` directory of the DVD you will also find device description files for the following Real-Time Ethernet master devices:

Real-Time Ethernet	Name of device description file
EtherNet/IP Scanner (Master)	HILSCHER_NJ_100XX-RE_EIM_V1.0.eds

Table 11: Device description files for netJACK serving as Real-Time Ethernet master

**Note:**

The device description file for the EtherNet/IP Master device is needed when an additional EtherNet/IP Master device is to communicate with a Hilscher EtherNet/IP Master device via EtherNet/IP.

1.3.3 Documentation

A list of all documents which are relevant for the user of the netJACK is provided in the Installation Guide *Software Installation and Documentation Overview Communication Solutions* in chapter *Communication Modules netJACK, Software and Documentation*. The Installation Guide is stored in the `Documentation\0. Installation and Overview` directory of the Communication Solutions DVD. All documents listed in the Installation Guide are stored as PDF files in the corresponding subfolders of the `Documentation` directory on the DVD.

1.4 Ensuring access security

The firmware of the protocols

- EtherNet/IP Scanner
- EtherNet/IP Adapter
- Open Modbus/TCP
- PROFINET IO Device
- Sercos Slave

include an integrated web server. The access to the device by the integrated web server via Internet and Intranet brings with it the danger of misuse. You should therefore always protect the access to the device with passwords. Beyond this also restrict access to your network with suitable security mechanisms.

**Important:**

In any case change the default password, otherwise you allow everyone the right to execute functions without authorization.

To protect the device from unauthorized access, you can restrict access to authorized users. How you set up an own user authentication is described in the Application Note *Functions of the Integrated WebServer* in the *User Authentication* chapter.

1.5 Legal notes

Copyright

© Hilscher Gesellschaft für Systemautomation mbH

All rights reserved.

The images, photographs and texts in the accompanying materials (in the form of a user's manual, operator's manual, Statement of Work document and all other document types, support texts, documentation, etc.) are protected by German and international copyright and by international trade and protective provisions. Without the prior written consent, you do not have permission to duplicate them either in full or in part using technical or mechanical methods (print, photocopy or any other method), to edit them using electronic systems or to transfer them. You are not permitted to make changes to copyright notices, markings, trademarks or ownership declarations. Illustrations are provided without taking the patent situation into account. Any company names and product designations provided in this document may be brands or trademarks by the corresponding owner and may be protected under trademark, brand or patent law. Any form of further use shall require the express consent from the relevant owner of the rights.

Important notes

Utmost care was/is given in the preparation of the documentation at hand consisting of a user's manual, operating manual and any other document type and accompanying texts. However, errors cannot be ruled out. Therefore, we cannot assume any guarantee or legal responsibility for erroneous information or liability of any kind. You are hereby made aware that descriptions found in the user's manual, the accompanying texts and the documentation neither represent a guarantee nor any indication on proper use as stipulated in the agreement or a promised attribute. It cannot be ruled out that the user's manual, the accompanying texts and the documentation do not completely match the described attributes, standards or any other data for the delivered product. A warranty or guarantee with respect to the correctness or accuracy of the information is not assumed.

We reserve the right to modify our products and the specifications for such as well as the corresponding documentation in the form of a user's manual, operating manual and/or any other document types and accompanying texts at any time and without notice without being required to notify of said modification. Changes shall be taken into account in future manuals and do not represent an obligation of any kind, in particular there shall be no right to have delivered documents revised. The manual delivered with the product shall apply.

Under no circumstances shall Hilscher Gesellschaft für Systemautomation mbH be liable for direct, indirect, ancillary or subsequent damage, or for any loss of income, which may arise after use of the information contained herein.

Liability disclaimer

The hardware and/or software was created and tested by Hilscher Gesellschaft für Systemautomation mbH with utmost care and is made available as is. No warranty can be assumed for the performance or flawlessness of the hardware and/or software under all application conditions and scenarios and the work results achieved by the user when using the hardware and/or software. Liability for any damage that may have occurred as a result of using the hardware and/or software or the corresponding documents shall be limited to an event involving willful intent or a grossly negligent violation of a fundamental contractual obligation. However, the right to assert damages due to a violation of a fundamental contractual obligation shall be limited to contract-typical foreseeable damage.

It is hereby expressly agreed upon in particular that any use or utilization of the hardware and/or software in connection with

- Flight control systems in aviation and aerospace;
- Nuclear fusion processes in nuclear power plants;
- Medical devices used for life support and
- Vehicle control systems used in passenger transport

shall be excluded. Use of the hardware and/or software in any of the following areas is strictly prohibited:

- For military purposes or in weaponry;
- For designing, engineering, maintaining or operating nuclear systems;
- In flight safety systems, aviation and flight telecommunications systems;
- In life-support systems;
- In systems in which any malfunction in the hardware and/or software may result in physical injuries or fatalities.

You are hereby made aware that the hardware and/or software was not created for use in hazardous environments, which require fail-safe control mechanisms. Use of the hardware and/or software in this kind of environment shall be at your own risk; any liability for damage or loss due to impermissible use shall be excluded.

Warranty

Hilscher Gesellschaft für Systemautomation mbH hereby guarantees that the software shall run without errors in accordance with the requirements listed in the specifications and that there were no defects on the date of acceptance. The warranty period shall be 12 months commencing as of the date of acceptance or purchase (with express declaration or implied, by customer's conclusive behavior, e.g. putting into operation permanently).

The warranty obligation for equipment (hardware) we produce is 36 months, calculated as of the date of delivery ex works. The aforementioned provisions shall not apply if longer warranty periods are mandatory by law pursuant to Section 438 (1.2) BGB, Section 479 (1) BGB and Section 634a (1) BGB [Bürgerliches Gesetzbuch; German Civil Code] If, despite of all due care taken, the delivered product should have a defect, which already existed at the time of the transfer of risk, it shall be at our discretion to either repair the product or to deliver a replacement product, subject to timely notification of defect.

The warranty obligation shall not apply if the notification of defect is not asserted promptly, if the purchaser or third party has tampered with the products, if the defect is the result of natural wear, was caused by unfavorable operating conditions or is due to violations against our operating regulations or against rules of good electrical engineering practice, or if our request to return the defective object is not promptly complied with.

Costs of support, maintenance, customization and product care

Please be advised that any subsequent improvement shall only be free of charge if a defect is found. Any form of technical support, maintenance and customization is not a warranty service, but instead shall be charged extra.

Additional guarantees

Although the hardware and software was developed and tested in-depth with greatest care, Hilscher Gesellschaft für Systemautomation mbH shall not assume any guarantee for the suitability thereof for any purpose that was not confirmed in writing. No guarantee can be granted whereby the hardware and software satisfies your requirements, or the use of the hardware and/or software is uninterrupted or the hardware and/or software is fault-free.

It cannot be guaranteed that patents and/or ownership privileges have not been infringed upon or violated or that the products are free from third-party influence. No additional guarantees or promises shall be made as to whether the product is market current, free from deficiency in title, or can be integrated or is usable for specific purposes, unless such guarantees or promises are required under existing law and cannot be restricted.

Confidentiality

The customer hereby expressly acknowledges that this document contains trade secrets, information protected by copyright and other patent and ownership privileges as well as any related rights of Hilscher Gesellschaft für Systemautomation mbH. The customer agrees to treat as confidential all of the information made available to customer by Hilscher Gesellschaft für Systemautomation mbH and rights, which were disclosed by Hilscher Gesellschaft für Systemautomation mbH and that were made accessible as well as the terms and conditions of this agreement itself.

The parties hereby agree to one another that the information that each party receives from the other party respectively is and shall remain the intellectual property of said other party, unless provided for otherwise in a contractual agreement.

The customer must not allow any third party to become knowledgeable of this expertise and shall only provide knowledge thereof to authorized users as appropriate and necessary. Companies associated with the customer shall not be deemed third parties. The customer must obligate authorized users to confidentiality. The customer should only use the confidential information in connection with the performances specified in this agreement.

The customer must not use this confidential information to his own advantage or for his own purposes or rather to the advantage or for the purpose of a third party, nor must it be used for commercial purposes and this confidential information must only be used to the extent provided for in this agreement or otherwise to the extent as expressly authorized by the disclosing party in written form. The customer has the right, subject to the obligation to confidentiality, to disclose the terms and conditions of this agreement directly to his legal and financial consultants as would be required for the customer's normal business operation.

Export provisions

The delivered product (including technical data) is subject to the legal export and/or import laws as well as any associated regulations of various countries, especially such laws applicable in Germany and in the United States. The products / hardware / software must not be exported into such countries for which export is prohibited under US American export control laws and its supplementary provisions. You hereby agree to strictly follow the regulations and to yourself be responsible for observing them. You are hereby made aware that you may be required to obtain governmental approval to export, reexport or import the product.

1.6 Registered trademarks

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

CANopen® is a registered trademark of CAN in AUTOMATION - International Users and Manufacturers Group e.V. (CiA), Nürnberg.

CC-Link is a registered trademark of Mitsubishi Electric Corporation, Tokyo, Japan.

DeviceNet™ and EtherNet/IP™ are trademarks of ODVA (Open DeviceNet Vendor Association, Inc.)

EtherCAT® is a registered trademark and a patented technology of Beckhoff Automation GmbH, Verl, Germany, formerly Elektro Beckhoff GmbH.

Modbus is a registered trademark of Schneider Electric.

PCI™, PCI Express® and PCIe® or MINI PCI™ are trademarks or registered trademarks of the Peripheral Component Interconnect Special Interest Group (PCI-SIG).

POWERLINK is a registered trademark of B&R, Bernecker + Rainer Industrie-Elektronik Ges.m.b.H, Eggelsberg, Austria.

PROFIBUS® and PROFINET® are registered trademarks of PROFIBUS International, Karlsruhe.

Sercos and Sercos interface are registered trademarks of Sercos International e. V., Suessen, Germany.

Windows® XP, Windows® 7, Windows® 8 and Windows® 10 are registered trademarks of Microsoft Corporation.

All other mentioned trademarks are property of their respective legal owners.

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, property damage messages 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 netJACK communication module described in this user manual serves as an interface between a host system, into which the netJACK is integrated, and a network system.

The netJACK communication module may only be operated as part of a communication system to create connections in one of the following networks:

netJACK device type name	Part number	Network/Protocol / device functioning as	Host interface
NJ 10D-COS	1652.540/COS	CANopen Slave	Dual-Port-Memory (60 Pin)
NJ 10D-CCS	1652.740/CCS	CC-Link Slave	
NJ 10D-DNS	1652.520/DNS	DeviceNet Slave	
NJ 10D-DPS	1652.420/DPS	PROFIBUS DP Slave	
NJ 51D-RE	1662.100/ECS	EtherCAT Slave	
	1662.100/EIS	EtherNet/IP Adapter	
	1662.100/OMB	Open Modbus/TCP	
	1662.100/PLS	POWERLINK Controlled Node	
	1662.100/PNS	PROFINET IO Device	
	1662.100/S3S	Sercos Slave	
NJ 100DN-RE	1623.100/ECM	EtherCAT Master	Dual-Port-Memory (80 Pin)
	1623.100/ECS	EtherCAT Slave	
	1623.100/EIM	EtherNet/IP Scanner	
	1623.100/EIS	EtherNet/IP Adapter	
	1623.100/OMB	Open Modbus/TCP	
	1623.100/PLS	POWERLINK Controlled Node	
	1623.100/PNM	PROFINET IO Controller	
	1623.100/PNS	PROFINET IO Device	
	1623.100/S3M	Sercos Master	
	1623.100/S3S	Sercos Slave	
	1623.100/VRS	VARAN Client	
NJ 100DN-CO	1623.500/COM	CANopen Master	
	1623.500/COS	CANopen Slave	
NJ 100DN-DN	1623.510/DNM	DeviceNet Master	
	1623.510/DNS	DeviceNet Slave	
NJ 100DN-DP	1623.400/DPM	PROFIBUS DP Master	
	1623.400/DPS	PROFIBUS DP Slave	

netJACK device type name	Part number	Network/Protocol / device functioning as	Host interface
NJ 100EN-RE	1625.100/ECM	EtherCAT Master	PCI-Express (40 Pin)
	1625.100/ECS	EtherCAT Slave	
	1625.100/EIM	EtherNet/IP Scanner	
	1625.100/EIS	Ethernet/IP Adapter	
	1625.100/OMB	Open Modbus/TCP	
	1625.100/PLS	POWERLINK Controlled Node	
	1625.100/PNM	PROFINET IO Controller	
	1625.100/PNS	PROFINET IO Device	
	1625.100/S3M	Sercos Master	
	1625.100/S3S	Sercos Slave	
	1625.100/VRS	VARAN Client	
NJ 100EN-CO	1625.500/COM	CANopen Master	
	1625.500/COS	CANopen Slave	
NJ 100EN-DN	1625.510/DNM	DeviceNet Master	
	1625.510/DNS	DeviceNet Slave	
NJ 100EN-DP	1625.400/DPM	PROFIBUS DP Master	
	1625.400/DPS	PROFIBUS DP Slave	

Table 12: Which netJACK can be used for which protocol and host interface?

The netJACK communication module may only be installed and operated in a host system which has been constructed according to the specifications given in the netJACK Design Guide.

2.3 Personnel qualification

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

- 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 References safety

- [S1] ANSI Z535.6-2006 American National Standard for Product Safety Information in Product Manuals, Instructions, and Other Collateral Materials
- [S2] IEC 60950-1, Information technology equipment - Safety - Part 1: General requirements, (IEC 60950-1:2005, modified); German Edition EN 60950-1:2006
- [S3] EN 61340-5-1 and EN 61340-5-2 as well as IEC 61340-5-1 and IEC 61340-5-2

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 following safety instructions in this manual and all warning messages about danger causing personal injury, before you install and operate the netJACK communication module.

2.5.1 Electrical shock hazard

The danger of a lethal electrical shock caused by parts with more than 50V may occur if you work at the host system or open the housing of the host system.

- Hazardous voltage may be present inside the host device, into which the netJACK communication module is to be integrated. Therefore read and follow the safety instructions of the manufacturer of the host device.
- First disconnect the power plug of the host device, before you mount or remove the netJACK communication module.
- Make sure, that the power supply is off at the host device.
- Mount or remove the netJACK communication module only after disconnecting the power at the host system.

An electrical shock is the result of a current flowing through the human body. The resulting effect depends on the intensity and duration of the current and on its path through the body. Currents in the range of approximately ½ mA can cause effects in persons with good health, and indirectly cause injuries resulting from startle responses. Higher currents can cause more direct effects, such as burns, muscle spasms, or ventricular fibrillation.

In dry conditions permanent voltages up to approximately 42.4 V peak or 60 V DC are not considered as dangerous, if the contact area is equivalent to a human hand.

Reference Safety [S2]

2.6 Safety instructions to avoid property damage

To avoid damage to your netJACK communication module or to your host system, you must read, understand and follow the following safety instructions and all safety instructions and warnings in this manual concerning property damage, before you install and operate your netJACK communication module.

2.6.1 Device destruction by exceeding allowed supply voltage

The netJACK communication module 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 netJACK!
- A supply voltage below the lower limit can cause malfunction of the netJACK!

The allowed range for the supply voltage is indicated in section *Technical Data of the netJACK Communication Modules* [► page 116].

2.6.2 Device destruction by exceeding allowed signaling voltage

To avoid damage to your netJACK communication module due to high signaling voltage, you must observe the following instructions:

- All I/O signal pins of the netJACK tolerate only a specified signaling voltage!
- Operation with a signaling voltage other than the specified signaling voltage may lead to severe damage to the netJACK!

The allowed range for the signaling voltage is indicated in section *Technical Data of the netJACK Communication Modules* [► page 116].

2.6.3 Electrostatic sensitive devices

The netJACK communication module is sensitive to electrostatic discharge, which can cause internal damage and affect its normal operation. Therefore adhere to the necessary safety precautions for components that are vulnerable with electrostatic discharge when you install or replace the netJACK. Follow the guidelines listed hereafter when you handle the netJACK:

- Touch a grounded object to discharge potential static before you handle the netJACK.
- Wear an approved grounding wriststrap.
- Do not touch the connector pins located on the underside of the netJACK.
- If possible, use a static-safe workstation.
- When not in use, store the equipment in appropriate static-safe packaging.

Reference Safety [S3]

2.6.4 Exceeding the maximum number of allowed write/delete accesses

This device uses a serial Flash chip for storing remanent data, such as firmware, configuration, etc. This chip allows a maximum of 100 000 write/delete accesses which is sufficient for a standard device operation. Writing/deleting the chip excessively (e.g. in order to change configuration or name of station) will exceed the maximum number of allowed write/delete accesses and, thus, result in damage to the device. If, e.g., the configuration is changed every hour, the maximum number will be reached after 11.5 years. If, e.g., it is changed every minute, the maximum number will already be reached after approx. 69 days.

Avoid exceeding the maximum number of allowed write/delete accesses by excessive writing.

2.6.5 Drop of supply voltage during write and delete accesses in the file system

The FAT file system in the netX firmware is subject to certain limitations in its operation. Write and delete accesses in the file system (firmware update, configuration download etc.) can destroy the FAT (File Allocation Table) if the accesses cannot be completed if the supply voltage drops. Without a proper FAT, a firmware may not be found and cannot be started.

Make sure, that the supply voltage of the device does not drop during write and delete accesses in the file system (firmware update, configuration download etc.).

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 standard.

- The **Section Safety Messages** at the beginning of a chapter are pinpointed particularly. They are highlighted by a specific safety symbol and a signal word according to the degree of endangerment. In the safety message, the nature of the hazard is indicated.
- The **Integrated Safety Messages** embedded in operating instructions are highlighted by a signal word according to the degree of endangerment and possibly by a safety symbol. In the safety message, the nature of the hazard is indicated.





Safety symbol	Safety symbol USA	Sort of warning or principle
		Warning of lethal electrical shock
		Warning of damages by electrostatic discharge
		Principle: Disconnect the power plug

Table 13: Safety symbols and sort of warning or principle

Signal word	Meaning	Meaning USA
DANGER	Indicates a direct hazard with high risk, which will have as consequence death or grievous bodily harm if it is not avoided.	Indicates a hazardous situation which, if not avoided, will result in death or serious injury.
WARNING	Indicates a possible hazard with medium risk, which will have as consequence death or (grievous) bodily harm if it is not avoided.	Indicates a hazardous situation which, if not avoided, could result in death or serious injury.
CAUTION	Indicates a minor hazard with medium risk, which could have as consequence personal injury, if it is not avoided.	Indicates a hazardous situation which, if not avoided, may result in minor or moderate injury.
NOTICE	Indicates a property damage message.	Indicates a property damage message.

Table 14: Signal words

3 Device description

3.1 Overview

The products of the netJACK family are communication modules for automation devices in Real-Time Ethernet or Fieldbus networks.

Being part of an embedded system, the netJACK communication modules are integrated into a host device or host system in order to provide I/O data via Dual-Port Memory or PCI Express interface.

netJACKs are based on netX technology and are endowed with physically complete bus interfaces for all leading Fieldbus or Real-Time Ethernet protocols.

The following table shows, which netJACK communication module is currently available for which network protocol/system and host interface.

netJACK device type name	Part number	Network/Protocol	Host interface
NJ 10D-COS	1652.540/COS	CANopen Slave	Dual-Port-Memory (60 Pin)
NJ 10D-CCS	1652.740/CCS	CC-Link Slave	
NJ 10D-DNS	1652.520/DNS	DeviceNet Slave	
NJ 10D-DPS	1652.420/DPS	PROFIBUS DP Slave	
NJ 51D-RE	1662.100/ECS	EtherCAT Slave	
	1662.100/EIS	EtherNet/IP Adapter	
	1662.100/OMB	Open Modbus/TCP	
	1662.100/PLS	POWERLINK Controlled Node	
	1662.100/PNS	PROFINET IO Device	
	1662.100/S3S	Sercos Slave	
NJ 100DN-RE	1623.100/ECM	EtherCAT Master	Dual-Port-Memory (80 Pin)
	1623.100/ECS	EtherCAT Slave	
	1623.100/EIM	EtherNet/IP Scanner	
	1623.100/EIS	EtherNet/IP Adapter	
	1623.100/OMB	Open Modbus/TCP	
	1623.100/PLS	POWERLINK Controlled Node	
	1623.100/PNM	PROFINET IO Controller	
	1623.100/PNS	PROFINET IO Device	
	1623.100/S3M	Sercos Master	
	1623.100/S3S	Sercos Slave	
	1623.100/VRS	VARAN Client	
NJ 100DN-CO	1623.500/COM	CANopen Master	
	1623.500/COS	CANopen Slave	
NJ 100DN-DN	1623.510/DNM	DeviceNet Master	
	1623.510/DNS	DeviceNet Slave	
NJ 100DN-DP	1623.400/DPM	PROFIBUS DP Master	
	1623.400/DPS	PROFIBUS DP Slave	

netJACK device type name	Part number	Network/Protocol	Host interface
NJ 100EN-RE	1625.100/ECM	EtherCAT Master	PCI-Express (40 Pin)
	1625.100/ECS	EtherCAT Slave	
	1625.100/EIM	EtherNet/IP Scanner	
	1625.100/EIS	Ethernet/IP Adapter	
	1625.100/OMB	Open Modbus/TCP	
	1625.100/PLS	POWERLINK Controlled Node	
	1625.100/PNM	PROFINET IO Controller	
	1625.100/PNS	PROFINET IO Device	
	1625.100/S3M	Sercos Master	
	1625.100/S3S	Sercos Slave	
	1625.100/VRS	VARAN Client	
NJ 100EN-CO	1625.500/COM	CANopen Master	
	1625.500/COS	CANopen Slave	
NJ 100EN-DN	1625.510/DNM	DeviceNet Master	
	1625.510/DNS	DeviceNet Slave	
NJ 100EN-DP	1625.400/DPM	PROFIBUS DP Master	
	1625.400/DPS	PROFIBUS DP Slave	

Table 15: Which netJACK for Which Protocol and Host Interface?

3.2 Firmware, drivers and configuration software

The firmware of the netJACK supports both Dual-Port Memory and PCI Express-based host Interfaces.

For communication between netJACK and host system, you can use the Hilscher standard cifX Device Driver or a cifX Toolkit-based driver.

You can use the SYCON.net configuration software to configure master and slaves. To configure slaves, you can also use the netX Configuration Tool as an alternative to SYCON.net.

If a USB interface has been implemented on the carrier board of the netJACK or if you are using an Evaluation Board, you can access the netJACK from a Windows PC via USB cable. For this purpose, USB drivers are provided by Hilscher.



Note:

Firmware, drivers, configuration software and cifX Toolkit are provided on the Communication Solutions DVD. Instructions for installing the drivers and the configuration software can be found in the User Manual *Software Installation comX and netJACK*, DOC130405UMxxEN, which is also provided on the Communication Solutions DVD.

3.3 netJACK as embedded system

netJACK communication modules are part of an embedded system, i. e. they are mounted on a carrier board which is provided by the OEM as part of the host system.

Note therefore, that certain functions of the netJACK communication modules – like the USB diagnostic interface and the serial diagnostic interface for netJACK with Dual-Port Memory – are only available, if the necessary hardware components (connectors, wiring) have been implemented on the carrier board by the OEM.

On the other hand, there is no need for the OEM to implement LEDs on the carrier board, since the status LEDs have already been integrated into the casing of the netJACK by Hilscher.

The compact casings of the netJACK communication modules all share the same dimensions, regardless of what network system or host interface they are intended to be used with. Only the connecting parts and electrical components differ according to network and interface.

Due to their uniform design, the netJACK communication modules can be mounted just-in-time before being put into operation at customer site. Changing network systems is made easy, because the netJACK can be mounted or dismounted quickly without having to use any tools, since the netJACK is frontloaded and then fixed to the host system by brackets and a sliding latch. Specially designed guiding rails on the netJACK and cut-outs on the carrier board prevent mounting a netJACK that is not compatible with the interface of the host system.

When constructing the carrier board of the host system, the manufacturer must take into account, that at least one of the two diagnostic interfaces suited for firmware update must be implemented according to the specifications given in the netJACK Design Guide. This diagnostic interface should be accessible from the outside of the host system.

A host system with PCI Express interface has a USB interface for diagnostic interface, a host system with Dual-Port Memory interface has a USB or a serial interface for diagnostic interface.

These interfaces do not only make updating the firmware easier, they also provide extensive diagnosis possibilities via the System Configurator SYCON.net (see sections „*Diagnosis*“ and „*Extended Diagnosis*“ of the SYCON.net DTM manuals), which is a sophisticated and powerful diagnostic tool, or via the cifX test application, which is an easy to use lean and compact tool. For configuring, diagnosing and updating slave devices, you can also use the netX Configuration Tool.

If neither the serial interface nor the USB interface have been implemented on the carrier board of the host system, the netJACK firmware can only be updated by removing the netJACK from the host system and connecting it to an external PC via Hilscher Evaluation Board (for Dual-Port Memory: NJEB-D, Hilscher part number 1600.000; for PCI Express: NJEB-E, Hilscher part number 1600.010).

For details on firmware update, please refer to chapter *Updating Firmware* [► page 58].

4 Prerequisites for operation

The following prerequisites must be fulfilled to operate netJACK communication modules:

4.1 Hardware host system

- Mechanical connection: For proper mounting of the netJACK, all necessary cut-outs in the front panel of the housing and on the carrier board of the host system must be implemented according to the specifications given in the netJACK Design Guide.
- Power supply: The netJACK needs a power supply via the pins of the SAMTEC connector according to the specifications given in the netJACK Design Guide. The voltage must always be in the range of $3.3 \text{ V} \pm 5 \%$
- Electrical connection: The netJACK is electrically connected to the carrier board of the host system via SAMTEC connector. The pins of the connector on the carrier board must be implemented and wired according to the specifications given in the netJACK Design Guide and according to the host interface which is being used (PCI Express or Dual-Port Memory).
- Diagnostic interface: For using the USB diagnostic interface or the serial diagnostic interface (only netJACK with Dual-Port Memory), the necessary hardware components (connectors, wiring) must be implemented on the carrier board of the host system according to the specifications given in the netJACK Design Guide.

4.2 Firmware and drivers

- The netJACK communication module must be loaded with the appropriate firmware for the used network protocol. You will find a mapping of the netJACK devices to the appropriate firmware for the concerned protocol in section *Devices and firmware* [► page 15].
- For communication between a netJACK communication module and a host system not running under Microsoft Windows®, a cifX Toolkit-based driver must be installed on the host system. If the host system runs under Windows or if the netJACK is to be connected to a PC via Hilscher Evaluation Board, the cifX Device Driver must be installed.
- The netJACK communication module must be properly configured as master or slave. You can use the SYCON.net configuration software for this purpose. Slaves can also be configured by using the netX Configuration Tool.
- If you want to access the netJACK from a Windows PC via USB interface, you first have to install the USB drivers on the PC.

4.3 System requirements SYCON.net

You need internet access in order to download the product DVD.

- PC with 1 GHz processor or higher
- Windows® XP SP3,
Windows® Vista (32 bit) SP2,
Windows® 7 (32 bit and 64 bit) SP1,
Windows® 8 (32 bit and 64 bit),
Windows® 8.1 (32 bit and 64 bit),
Windows® 10 (32 bit and 64 bit)
- Administrator privilege required for installation
- Microsoft .NET Framework 4.0
- Internet Explorer 5.5 or higher
- Free disk space: ca. 400 MByte
- RAM: min. 512 MByte, 1024 MByte recommended
- Graphic resolution: min. 1024 x 768 pixel
- Keyboard and mouse
- USB, serial or Ethernet interface
- Restriction: Touch screens are not supported



Note:

If the project file is used on another PC,

- the other PC must also comply to the above listed system requirements,
 - the device description files of the devices used in the project must be imported to the configuration software SYCON.net on the other PC,
 - respectively the DTMs of the devices used in the project must be installed on the other PC.
-

4.4 Communication partner in the network

- If you use the netJACK communication module as slave device, a corresponding master device must be present in the network.
- If you use the netJACK communication module as master device, a corresponding slave device must be present in the network.

5 Getting started

5.1 Overview

The following table provides an overview of the necessary steps for installing drivers, software and hardware, and for configuring the netJACK communication module (as master or slave) for typical use cases.



Note:

netJACK communication modules are shipped with their firmware already loaded.

For information on how to update netJACK firmware, please refer to chapter *Updating Firmware* [▶ page 58].

#	Step	Description	For details see
1	Installing Drivers and Software		
1.1	Installing drivers	You need to install drivers for the host interface and the diagnostic interface on the host system:	
1.1.1	Installing driver for the host interface	<p>If a Windows® operating system runs on the host system or if you want to install the netJACK for testing or diagnostic purposes via Evaluation Board in a PC running under Windows®, you need to install the cifX Device Driver.</p> <p>If no Windows® operating system runs on the host system, a custom driver created by the cifX Driver Toolkit has to be installed on the host system.</p>	<p>User Manual <i>Software Installation comX and netJACK</i></p> <p>Toolkit Manual <i>cifX/netX Toolkit DPM</i></p>
1.1.2	Installing driver for the diagnostic interface	<p>If the host system provides a USB interface for the netJACK communication module, and you want to use this USB interface for diagnosing, configuring or updating the firmware of the netJACK, you need to install the USB Driver.</p> <p>Note: A netJACK with Dual-Port Memory can also be diagnosed, configured or have its firmware updated by using a serial interface, if the serial interface is provided by the host system. For the serial interface, no driver needs to be installed.</p>	User Manual <i>Software Installation comX and netJACK</i>
1.2	Installing configuration software	If no suitable configuration software has yet been installed on the host system, you need to install a configuration software in order to be able to configure the netJACK as master or slave device:	
1.2.1	Installing configuration software for netJACK as master device	<p>If a Windows® operating system runs on the host system or if you want to install the netJACK for testing or diagnostic purposes via Evaluation Board in a PC running under Windows®, you need to install the SYCON.net configuration software on the host system, respectively on the PC.</p> <p>If no Windows® operating system runs on the host system and/or you want to use an external PC to configure the netJACK via USB or serial interface (serial interface is only available for netJACKs with Dual-Port Memory), you need to install SYCON.net on the external PC.</p>	User Manual <i>Software Installation comX and netJACK</i>
1.2.2	Installing configuration software for netJACK as slave device	<p>If a Windows® operating system runs on the host system or if you want to install the netJACK for testing or diagnostic purposes via Evaluation Board in a PC running under Windows®, you need to install the SYCON.net configuration software or the netX Configuration Tool on the host system, respectively on the PC.</p> <p>If no Windows® operating system runs on the host system and/or you want to use an external PC to configure the netJACK via USB or serial interface (serial interface is only available for netJACKs with Dual-Port Memory), you need to install SYCON.net or the netX Configuration Tool on the external PC.</p>	User Manual <i>Software Installation comX and netJACK</i>

#	Step	Description	For details see
2	Installing Hardware		
2.1	Preparing Hardware Installation		
2.1.1	Take safety precautions	<p>Carefully read the documentation of the host system into which the netJACK is to be mounted. Strictly obey all safety rules given by the manufacturer of the device.</p> <p>⚠ WARNING Lethal Electrical Shock caused by parts with more than 50V!</p> <ul style="list-style-type: none"> ➤ First disconnect the power plug of the host system before mounting the netJACK! ➤ Make sure that the power supply is off at the device! 	Section <i>Electrical Shock Hazard</i> [▶ page 27]
2.1.2	Prepare netJACK for mounting	<p>Remove the cardboard cover from the underside of the netJACK and pull the sliding latch into mounting position.</p> <p>NOTICE Electrostatic Sensitive Device</p> <ul style="list-style-type: none"> ➤ After removing the cover, make sure you do not touch the metal pins of the SAMTEC connector located on the underside of the netJACK communication module. 	Chapter <i>Mounting netJACK</i> [▶ page 48]
2.2	Mounting netJACK	Mount netJACK in host system	
2.2.1	Insert netJACK	Fix netJACK onto the carrier board of the host system.	Chapter <i>Mounting netJACK</i> [▶ page 48]
2.2.2	Lock netJACK in host system	Push the sliding latch into the netJACK.	
2.3	Connect cables and power supply		
2.3.1	Connect cable to the network communication partner (master or slave)	<p>Note: Use the RJ45 socket only for LAN, not for telecommunication circuits.</p> <p>Important: Note for netJACK PROFINET IO Controller (Master): Connect only ports with each other which have different cross-over settings. Otherwise, a connection between the devices can not be established. If the port settings of the netJACK PROFINET IO Controller are not set to AUTO, then Port0 is switched uncrossed and Port1 crossed.</p>	User manual of the corresponding protocol
2.3.2	Reconnect power supply	Connect the host system with the power supply and switch it on.	User manual of the host system
3	Configuring netJACK		
3.1	Configuring netJACK slave	You can use either SYCON.net or the netX Configuration Tool to configure the netJACK as slave device.	
3.1.1a	Configuring slave by using SYCON.net	<ul style="list-style-type: none"> ➤ Start configuration software SYCON.net. ➤ Create new project /Open existing project. ➤ Add slave to configuration. ➤ To open the configuration window, double click device symbol or choose Configuration entry from the context menu. ➤ Select driver and assign device. ➤ If it is necessary to update the firmware, select and download the firmware. ➤ Configure netJACK Slave. 	<p>Operating Instruction Manual for the DTM of the concerned protocol</p> <p>also</p> <p>Section <i>Device Names in SYCON.net</i> [▶ page 42]</p> <p>,</p> <p>also</p> <p>Section <i>Instructions for Updating Firmware with SYCON.net</i> [▶ page 68]</p> <p>,</p>

#	Step	Description	For details see
3.1.1b	OR: Configuring slave by using netX Configuration Tool	<ul style="list-style-type: none"> ➤ Start netX Configuration Tool. ➤ Select language. ➤ If it is necessary to update the firmware, select and download firmware. ➤ Set device parameters. 	Operating Instruction Manual for the DTM of the protocol concerned also Operating Instruction Manual <i>netX Configuration Tool for cifX, comX and netJACK</i>
3.1.2	Downloading Slave configuration	Download the netJACK (Slave) configuration.	
3.2	Configuring netJACK master	You can use SYCON.net to configure the netJACK as master device. Use the corresponding Master DTM in SYCON.net .	
3.2.1	Configuring master by using SYCON.net	<ul style="list-style-type: none"> ➤ Start configuration software SYCON.net. ➤ Create new project /Open existing project. ➤ Add master to configuration. ➤ To open the configuration window, double click device symbol or choose Configuration entry from the context menu. ➤ Select driver and assign device. ➤ If it is necessary to update the firmware, select and download the firmware. ➤ Configure netJACK Master. 	Operating Instruction Manual for the DTM of the protocol concerned also Sections <i>Notes on Configuring Master Devices</i> [▶ page 41] and <i>Device Names in SYCON.net</i> [▶ page 42]
3.2.2	Downloading Master configuration	Download the netJACK (Master) configuration.	
4	Diagnosis		
4.1	Slave diagnosis	You can use either SYCON.net or the netX Configuration Tool for diagnostic purposes with a netJACK slave device	
4.1.1	Slave diagnosis by using SYCON.net	Diagnosis, I/O Data Use the corresponding Slave DTM in the configuration software SYCON.net	
	Diagnosis	<ul style="list-style-type: none"> ➤ Right click on device symbol. ➤ In the context menu, select Diagnosis entry, ➤ Then select Diagnosis > General or Firmware Diagnosis or select Diagnosis > Extended Diagnosis. 	Operating Instruction Manual for the DTM of the protocol concerned
	I/O Monitor	<ul style="list-style-type: none"> ➤ Right click on device symbol. ➤ In the context menu, select Diagnosis entry. ➤ Select Tools > I/O Monitor. ➤ Check the input or output data. 	
4.1.2	OR Slave Diagnosis by using netX Configuration Tool	<ul style="list-style-type: none"> ➤ In the navigation area, select Diagnostic. ➤ In the Diagnostic pane, click Start to start communication with the master device and run the diagnosis. ➤ To run an extended diagnosis, click Extended. 	Operating Instruction Manual <i>netX Configuration Tool for cifX, comX and netJACK</i>
4.2	Master diagnosis	You can use SYCON.net for diagnostic purposes with a netJACK master device.	
4.2.1	Master diagnosis by using SYCON.net	Diagnosis, I/O Data Use the corresponding Master DTM in the configuration software SYCON.net	

#	Step	Description	For details see
	Diagnosis	<ul style="list-style-type: none"> ➤ Right click on device symbol. ➤ In the context menu, select Diagnosis entry. ➤ Select Diagnosis > General or Firmware Diagnosis or Master Diagnosis or select Diagnosis > Extended Diagnosis. 	Operating Instruction Manual for the DTM of the protocol concerned
	I/O Monitor	<ul style="list-style-type: none"> ➤ Right click on device symbol. ➤ In the context menu, select Diagnosis entry. ➤ Select Tools > I/O Monitor. ➤ Check the input or output data. 	

Table 16: Steps for Installing Soft- and Hardware, configuring and Diagnosing a netJACK Communication Module (Master and Slave)

5.2 Notes on configuring master devices

To configure the Master, a device description file of a netJACK slave is required. Please observe the following notes:

Real-Time Ethernet system	Notes
<i>EtherCAT Slave</i>	To configure the Master, an XML file (device description file) is required. The settings in the used Master must comply with the settings in the Slave to establish communication. Important parameters are: Vendor ID, Product Code, Serial Number, Revision Number, Output/Input Data Bytes.
	The loadable firmware supports for the number of cyclic input data and for cyclic output data in total up to 512 bytes. If more than 256 bytes for input data or for output data should be exchanged via EtherCAT, then a customer specific XML file is necessary. Additionally the following formula applies: $(\text{number of input bytes} + 3)/4 + (\text{number of output bytes} + 3)/4$ must be less or equal to 128.
<i>EtherNet/IP-Adapter</i>	To configure the Scanner/Master, an EDS file (device description file) is required. The settings in the used Scanner/Master must comply with the settings in the Adapter/Slave to establish communication. Important parameters are: Input, Output Data Bytes, Vendor ID, Product Type, Product Code, Major Rev, Minor Rev, IP Address and Netmask.
<i>POWERLINK-Controlled-Node/Slave</i>	To configure the Managing Node/Master, an XDD file (device description file) is required. The settings in the used Managing Node/Master must comply with the settings in the Controlled Node/Slave, to establish communication. Important parameters are: Vendor ID, Product Code, Serial Number, Revision Number, Node ID, Output and Input length.
<i>PROFINET IO-Device (Slave)</i>	To configure the Controller, a GSDML file (device description file) is required. The settings in the used Controller must comply with the settings in the Device to establish communication. Important parameters are: Station Name, Vendor ID, Device ID, Input and Output Data Bytes. Under Name of Station , the name must be typed which was also used in the configuration file of the master of this device. If no name chosen freely is used in the configuration file, then the name from the GSDML file is used.
<i>Sercos Slave</i>	The Sercos Master uses the Sercos address to communicate with the slave. Some Masters verify Device ID, Vendor Code, Input Data Size and Output Data Size and do further communication to the slave only if all these values match. Therefore the master reads these parameters from the slave and compares them with the configuration stored in the master. The parameters Device ID, Vendor Code, Input Data Size and Output Data Size are part of the SDDML device description file. If for the configuration of the Sercos Master SDDML files are used and a default value of one of these parameters was changed, then a SDDML file must be created in the configuration software via Export SDDML and then used in the configuration of the SERCOS Master.

Table 17: Notes on configuring RTE master device

Fieldbus system	Notes
<i>PROFIBUS DP Slave</i>	To configure the Master, a GSD file (device description file) is required. The settings in the used Master must comply with the settings in the Slave to establish communication. Important parameters are: Station Address, Ident Number, Baudrate and Config Data (the configuration data for the output and input length).
<i>CANopen Slave</i>	To configure the Master, an EDS file (device description file) is required. The settings in the used Master must comply with the settings in the Slave to establish communication. Important parameters are: Node Address and Baudrate.
<i>DeviceNet Slave</i>	To configure the Master, an EDS file (device description file) is required. The settings in the used Master must comply with the settings in the Slave to establish communication. Important parameters are: MAC ID, Baudrate, Produced Size, Consumed Size, Vendor ID, Product Type, Product Code, Major Rev, Minor Rev.

Table 18: Notes on configuring fieldbus master device



For further information on device description files, see section *Device Description Files* [▶ page 18].

5.3 Device names in SYCON.net

The following table shows the device names which are displayed in the SYCON.net configuration software for the individual netJACK device types and the used protocol.

netJACK device type name	Protocol	DTM specific group	Device name in SYCON.net
NJ 10D-COS	CANopen Slave	Gateway/Stand-Alone Slave	NJ 10X-COS COS (NJ 10X-COS COS.eds)
NJ 10D-CCS	CC-Link Slave	Gateway/Stand-Alone Slave	NJ 10X-CCS/CCS
NJ 10D-DNS	DeviceNet Slave	Gateway/Stand-Alone Slave	NJ 10X-DNS/DNS (NJ_10X-DNS_DNS.EDS)
NJ 10D-DPS	PROFIBUS DP Slave	Gateway/Stand-Alone Slave	NJ 10X-DPS/DPS
NJ 51D-RE	EtherCAT Slave V4.6	Gateway/Stand-Alone Slave	NJ 51X-RE/ECS V4.2
	EtherNet/IP Adapter/Slave	Gateway/Stand-Alone Slave	NJ 51X-RE/EIS v1.1
	Open Modbus/TCP	Gateway/Stand-Alone Slave	NJ 51X-RE/OMB
	POWERLINK Controlled Node	Gateway/Stand-Alone Slave	NJ 51X-RE/PLS
	PROFINET IO Device V3.10 (Slave)	Gateway/Stand-Alone Slave	NJ 51X-RE/PNS V3.5.35 - V3.x
	Sercos Slave	Gateway/Stand-Alone Slave	NJ_51X-RE_S3S_FIXCFG
NJ 100DN-DP	PROFIBUS DP Master	Master	NJ 100XX-DP/DPM
NJ 100EN-DP	PROFIBUS DP Slave	Gateway/Stand-Alone Slave	NJ 100XX-DP/DPS

netJACK device type name	Protocol	DTM specific group	Device name in SYCON.net
NJ 100DN-RE	EtherCAT Master	Master	NJ 100XX-RE/ECM
NJ 100EN-RE	EtherCAT Slave V2.5	Gateway/Stand-Alone Slave	NJ 100XX RE/ECS V2.0
	EtherCAT Slave V4.6	Gateway/Stand-Alone Slave	NJ 100XX RE/ECS V4.2
	EtherNet/IP Scanner/Master	Master	NJ 100XX-RE/EIM
	EtherNet/IP Adapter/Slave	Gateway/Stand-Alone Slave	NJ 100XX-RE/EIS
	Open Modbus/TCP	Gateway/Stand-Alone Slave	NJ 100XX-RE/OMB
	POWERLINK Controlled Node	Gateway/Stand-Alone Slave	NJ 100XX-RE/PLS
	PROFINET IO Controller V2 (Master)	Master	NJ 100XX-RE/PNM
	PROFINET IO Controller V3 (Master)	Master	NJ 100XX-RE/PNM V3
	PROFINET IO Device V3.4 (Slave)	Gateway/Stand-Alone Slave	netJACK 100XX-RE/PNS V3.4.19 - V3.4.x
	PROFINET IO Device V3.10 (Slave)	Gateway/Stand-Alone Slave	NJ 100XX-RE/PNS V3.5.35 - V3.x
	Sercos Master	Master	NJ 100XX-RE/S3M
	Sercos Slave	Gateway/Stand-Alone Slave	NJ_100XX-RE_S3S_FIXCFG
	VARAN Client	Gateway/Stand-Alone Slave	NJ 100XX-RE/VRS
NJ 100DN-CO	CANopen Master	Master	NJ 100XX-CO/COM
NJ 100EN-CO	CANopen Slave	Gateway/Stand-Alone Slave	NJ 100XX-CO/COS (NJ 100XX-CO COS.eds)
NJ 100DN-DN	DeviceNet Master	Master	NJ 100XX-DN/DNM
NJ 100EN-DN	DeviceNet Slave	Gateway/Stand-Alone Slave	NJ 100XX-DN/DNS (NJ_100XX-DN_DNS.EDS)

Table 19: Device names in SYCON.net by communication protocol

6 Software overview

**Note:**

Firmware, drivers and configuration software are provided on the Communication Solutions DVD.
Instructions for installing drivers and software can be found in the User Manual *Software Installation comX and netJACK*, DOC130405UMxxEN, also provided on the Communication Solutions DVD.

The USB interface, the serial interface as well as the cifX Device Driver may only be used exclusively by **one** software, that is

- the SYCON.net configuration software (with integrated ODMV3) or
- the netX Configuration Tool or
- the cifX Test Application or
- the cifX Driver Setup Utility or
- the application program.

Never use the listed software simultaneously, otherwise this will result in communication problems with the device.

If the SYCON.net configuration software was used on the PC, then stop the ODMV3 service before you use one of the other software listed above. Therefore, select **Service > Stop** from the context menu of the ODMV3 system tray icon.

6.1 Software for downloading firmware

netJACK communication modules are shipped with their firmware already loaded. You can update the firmware, if necessary.

In the *Reference to Hardware and Firmware* [► page 15] section, you will find a list of up-to-date firmware files which are stored on the Communication Solutions DVD.

When using a Microsoft Windows® operating system, you need the following software to update your firmware:

- Up-to-date firmware file
- SYCON.net (contains the Online Data Manager ODMV3) or, if you want to update a netJACK slave device, the netX Configuration Tool.
- cifX Device Driver or, if you want to update the netJACK via USB or serial interface (serial interface only available for netJACKs with Dual-Port Memory), the netX Driver or the netX Transport DLL. The netX Driver is included in the SYCON.net setup and does not need to be installed separately. The netX Transport DLL is also included in the SYCON.net setup and in the netX Configuration Tool setup and does not need to be installed separately either.
- If you want to update the netJACK via USB interface, you also need an installed USB driver.

You will find detailed information on the hardware needed for updating firmware and step-by-step instructions on how to update firmware with SYCON.net in chapter *Updating Firmware* [► page 58].

If you are not using a Microsoft Windows® operating system, you need the following software to update your firmware:

- Up-to-date firmware file
- Native application program which is able to download firmware
- Customized driver (based on cifX Toolkit)



Note:

You can not only update the firmware, but also load a different firmware to your netJACK, e. g. if you want to change to another protocol or if you want to switch the netJACK from slave to master device (or vice versa).

6.2 Software for configuration and diagnosis

When using a Microsoft Windows® operating system and a netJACK as **master device**, you need the following software to configure or diagnose your netJACK:

- SYCON.net (contains the Online Data Manager ODMV3)
- cifX Device Driver or, if you want to configure or diagnose the netJACK via USB or serial interface, the netX Driver (serial interface only available for netJACKs with Dual-Port Memory). The netX Driver is included in the SYCON.net installation and does not need to be installed separately.
- If you want to configure or diagnose the netJACK via USB interface, you also need to install the USB driver.

When using a Microsoft Windows® operating system and a netJACK as **slave device**, you need the following software to configure or diagnose your netJACK:

- SYCON.net (contains the Online Data Manager ODMV3) or the netX Configuration Tool
- cifX Device Driver or, if you want to configure or diagnose the netJACK via USB or serial interface (serial interface only available for netJACKs with Dual-Port Memory), the netX Driver or the netX Transport DLL. The netX Driver is included in the SYCON.net setup and does not need to be installed separately. The netX Transport DLL is included in SYCON.net and in the netX Configuration Tool setup and also does not need to be installed separately.
- If you want to configure or diagnose the netJACK via USB interface, you also need to install the USB driver.

If you are not using a Microsoft Windows® operating system, you need the following software to configure or diagnose your netJACK:

- Native application program which is able to configure and diagnose the netJACK
- Customized driver (based on cifX Toolkit)

7 Mounting/removing netJACK

7.1 Safety messages

Please note the following safety messages:



⚠ WARNING**Lethal Electrical Shock caused by parts with more than 50V !**

Hazardous Voltage may be present inside the device, into which the netJACK communication module is integrated. Strictly obey all safety rules provided in the documentation of the host device's manufacturer!

- First disconnect the power plug of the device.
 - Make sure that the power supply is off at the device.
 - Open the housing and install or remove the netJACK communication module only after disconnecting power!
-

NOTICE**Device destruction caused by short-circuit !**

netJACK communication modules, the Evaluation Boards and the Adapter Board are not designed for „hot-plugging“. Therefore, only mount or remove the netJACK if no voltage is applied to the entire system.



NOTICE**Electrostatic Sensitive Device !**

The netJACK communication module is sensitive to electrostatic discharge, which can cause internal damage and affect its normal operation. Therefore adhere to the necessary safety precautions for components that are vulnerable with electrostatic discharge, if you install or replace the netJACK.

- Do not touch the metal pins of the SAMTEC connector on the underside of the netJACK!
 - Touch a grounded object to discharge potential static.
 - Wear an approved grounding wrist strap.
 - If available, use a static-safe workstation.
 - When not in use, store the device in an appropriate static-safe packaging.
-

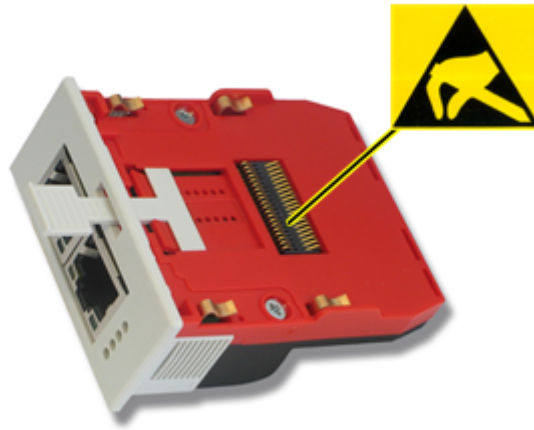


Figure 1: Elektrostatic Sensitive Device



Important:

netJACK communication modules for PCI Express must be powered on/off together with the entire host system. This is to ensure the necessary re-booting of the PCI Express bus when restarting the netJACK. Re-booting of the PCI Express bus is necessary for the netJACK to establish communication with the host. Therefore note that implementing a separate power on/off switch for the netJACK can lead to malfunctioning of the module.

7.2 Mounting principle netJACK

For mounting the netJACK communication modules, no tools are required. Simply insert the netJACK through the cut-out in the front panel of the housing of the host system, engage it to the carrier board, and finally lock it to the carrier board by using the sliding latch.

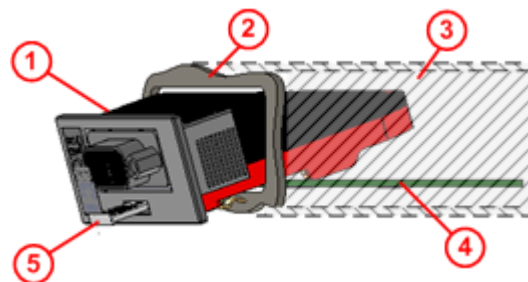


Figure 2: Monting Principle of the netJACK

- ① netJACK communication module
- ② Cut-out at front panel of the host system
- ③ housing of host system
- ④ Carrier board of host system
- ⑤ Sliding latch

7.3 Mounting netJACK

To mount the netJACK communication module into the host system, proceed as follows:

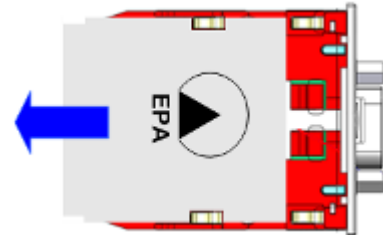


WARNING

Lethal Electrical Shock caused by parts with more than 50V !

- First disconnect the power plug of the host system before mounting the netJACK.
- Make sure that the power supply is off at the device.

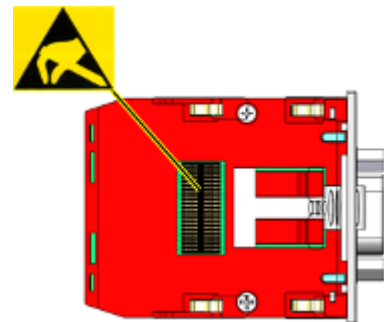
- Remove the cardboard cover which protects the underside of the netJACK, by sliding the cover underneath the brackets to the side.
Be careful not to damage or bend the brackets holding the cardboard cover.



Remove Cover

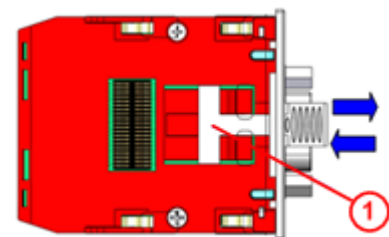
NOTICE Electrostatic Sensitive Device

After removing the cover, make sure you do not touch the metal pins of the SAMTEC connector located on the underside of the netJACK communication module, because this might damage the device.



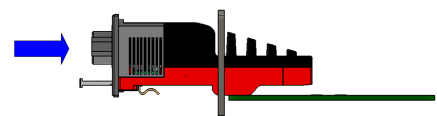
Electrostatic Sensitive Device

- Set the sliding latch located on the underside of the netJACK to mounting position: Pull the handle of the sliding latch half way out of the module.
Mounting position **①** is reached, when the latch is approximately at center position of the guiding rails.



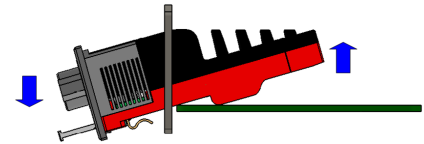
Bring Sliding Latch into Mounting Position

- Insert the netJACK approximately half way into the host system.



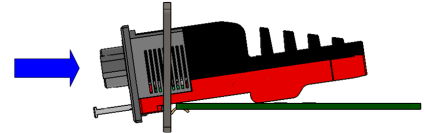
Push netJACK Inside

- Tilt the netJACK slightly downwards at the front, in order to push it further into the housing of the host system.

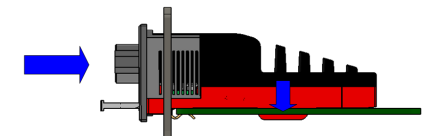


Tilt netJACK

- Push the netJACK further in, until it can be pushed downwards onto the carrier board and vertically engages in the cut-outs of the board.

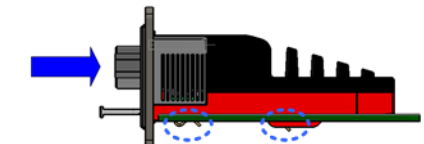


Push netJACK Further in



Engage netJACK Vertically

- Push the netJACK further in, until final position is reached and the module can not be moved in any further. You might have to push a little harder than before, in order to overcome the resistance of the brackets engaging horizontally with the carrier board.

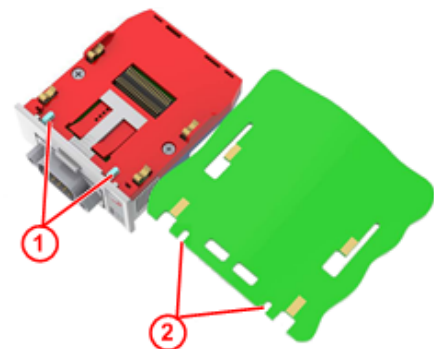


Engage netJACK in Final Position

- ⇒ The brackets now fix the netJACK to the carrier board.

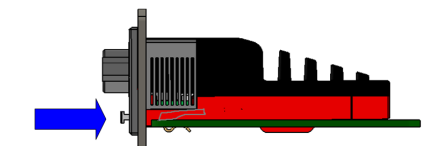
NOTICE Do not use force!

If the netJACK can not be brought into final position by pushing it with moderate strength, please check if you are by mistake trying to install a type of netJACK which is not compatible to the interface of the host system (e. g. netJACK for Dual-Port Memory into a PCI Express host system). The netJACK and the carrier board are endowed with small guides **①** and cut outs **②**, ensuring that only a compatible netJACK can be mounted onto the carrier board.



Protection Against Mounting Wrong netJACK

- To lock the netJACK onto the carrier board, push the handle of the sliding latch fully into the module.



Lock netJACK

- ⇒ You have mounted the netJACK communication module.

7.4 Removing netJACK

To remove the netJACK communication module from the host system, proceed as follows:

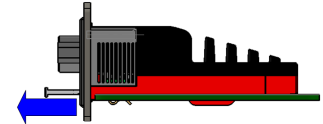


⚠ WARNING

Lethal Electrical Shock caused by parts with more than 50V !

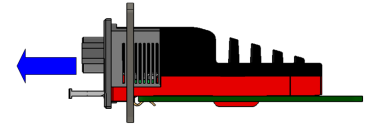
- First disconnect the power plug of the host system before removing the netJACK
- Make sure that the power supply is off at the device.

- To unlock the netJACK, pull the handle of the sliding latch out of the module.



Unlock netJACK

- While holding on to the handle of the sliding latch, pull the netJACK fully out of the housing of the host system. You might have to use a little strength, in order to overcome the resistance of the brackets clinging onto the carrier board.



Pull out netJACK

- ⇒ You have removed the netJACK communication module.

8 Using the Evaluation Board

8.1 Overview

For testing, diagnosing or updating firmware, you can connect the netJACK communication module via Evaluation Board to a PC which runs under Microsoft Windows® and has the cifX Device Driver and a configuration software (SYCON.net or netX Configuration Tool) installed on it.

**Note:**

Before connecting the Evaluation Board, first install all necessary software. Instructions for installing drivers and software can be found in the User Manual *Software Installation comX and netJACK*, DOC130405UMxxEN provided on the Communication Solutions DVD.

No tools are necessary for using the Evaluation Board. First, you need to mount the netJACK onto the Evaluation Board and then connect the Evaluation Board to the PC.

The Evaluation Board NJEB-E for netJACK with PCI Express can simply be plugged into the PCI Express slot of the PC.

When using the Evaluation Board NJEB-D for netJACK with Dual-Port-Memory, you need an NXPCA-PCI Adapterboard and a CAB-NXPCA-PCI cable to connect the Evaluation Board NJEB-D with the PC.

8.1.1 Required Hardware

For a netJACK with PCI Express, you need:

- Evaluation Board NJEB-E (Hilscher part number 1600.010).

For a netJACK with Dual-Port Memory, you need:

- Evaluation Board NJEB-D (Hilscher part number 1600.000)
- Adapterboard NXPCA-PCI (Hilscher part number 7902.100)
- Cable CAB-NXPCA-PCI (Hilscher part number 4400.000)
- Power Adaptor NXAC-POWER (Hilscher part number 7930.000) for power supply (24 Volt) for Evaluation Board NJEB-D

8.1.2 Required Software

For driver, you need to install the cifX Device Driver on the PC.

If you want to download firmware, configure or diagnose a **master device**, you also need to install the SYCON.net configuration software.

If you want to download firmware, configure or diagnose a **slave device**, you can use the netX Configuration Tool as an alternative to SYCON.net.

8.2 Safety messages

Please observe the following safety messages:



WARNING**Lethal Electrical Shock caused by parts with more than 50V !**

Hazardous Voltage may be present inside the PC, into which the Evaluation Board or the Adapterboard are to be installed. Strictly obey all safety rules given in the documentation of the PC manufacturer.

- First disconnect the power plug of the PC.
 - Make sure that the power supply is off at the PC.
 - Open the housing and install or remove the Evaluation Board only after disconnecting the power!
-

NOTICE**Device Destruction caused by short-circuit !**

The netJACK communication module, the Evaluation Board and the adapter board are not designed for „hot-plugging“. Therefore, only install or remove these devices if no voltage is applied to the system.



NOTICE**Electrostatic Sensitive Devices**

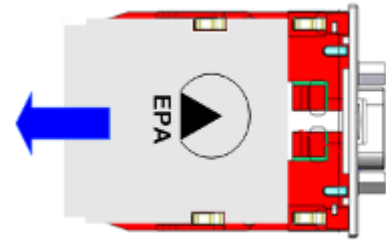
The netJACK communication module, the Evaluation Board and the adapter board are sensitive to electrostatic discharge, which can cause internal damage and affect their normal operations. Therefore adhere to the necessary safety precautions for components that are vulnerable with electrostatic discharge, if you install or replace these devices. Follow the guidelines listed hereafter when you handle these devices:

- Touch a grounded object to discharge potential static.
 - Wear an approved grounding wrist strap.
 - Do not touch unprotected connectors or wirings.
 - If available, use a static-safe workstation.
 - When not in use, store the devices in an appropriate static-safe packaging.
-

8.3 Mounting netJACK onto Evaluation Board

To mount the netJACK communication module onto the Evaluation Board, proceed as follows:

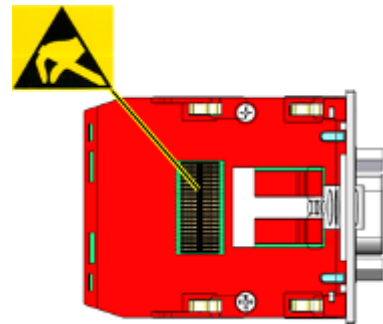
- Remove the cardboard cover which protects the underside of the netJACK by sliding the cover underneath the brackets to the side. Be careful not to damage or bend the brackets holding the cardboard cover.



Remove Cover

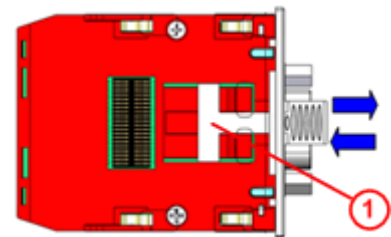
NOTICE Electrostatic Sensitive Device

After removing the cover, make sure you do not touch the metal pins of the SAMTEC connector located on the underside of the netJACK communication module, because this might damage the device.



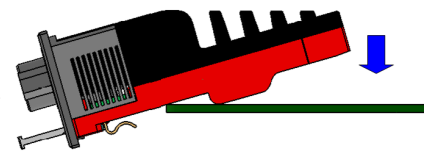
Electrostatic Sensitive Device

- Set the sliding latch located on the underside of the netJACK to mounting position: Pull the handle of the sliding latch half way out of the module. Mounting position ① is reached, when the latch is approximately at center position of the guiding rails.



Bring Sliding Latch into Mounting Position

- Lower the netJACK onto the Evaluation Board, thereby inserting the guiding rails of the netJACK into the cut out slots of the board.



Mount netJACK onto Evaluation Board



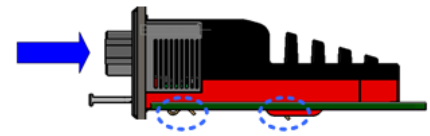
Fit Guiding Rails into Slots

- Push the netJACK horizontally onto the Evaluation Board, until final position is reached and the module can not be pushed in any further. You might have to push with moderate strength, in order to overcome the resistance of the brackets engaging horizontally with the Evaluation Board.
- ⇒ The brackets now fix the netJACK to the Evaluation Board.

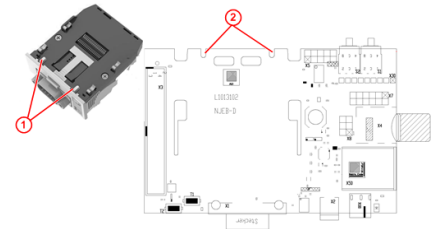
NOTICE Do not use force !

If the netJACK can not be brought into final position by pushing it with moderate strength, please check if you are by mistake trying to install a type of netJACK which is not compatible to the Evaluation Board (e. g. a NJ 100EN-RE with PCI Express and a NJEB-D Board for Dual-Port Memory). The netJACK and the Evaluation Board are endowed with small guides **①** and cut outs **②**, ensuring that only a compatible netJACK can be mounted onto the Evaluation Board.

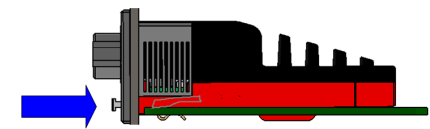
- To lock the netJACK onto the Evaluation Board, push the handle of the sliding latch fully into the module.
- ⇒ You have mounted the netJACK onto the Evaluation Board



Engage netJACK in Final Position



Protection Against Mounting Wrong netJACK



Lock netJACK

8.4 Connecting Evaluation Board to PC

8.4.1 Evaluation Board NJEB-E (PCI Express)

First mount the netJACK communication module onto the Evaluation Board NJEB-E as described in section *Mounting netJACK onto Evaluation Board* [► page 53].

Then install the Evaluation Board with mounted netJACK at the PCI Express interface of the PC.

To do this, proceed as follows:



⚠ WARNING**Lethal Electrical Shock caused by parts with more than 50V !**

- First disconnect the power plug of the PC.
 - Make sure that the power supply is off at the PC.
-
- Open the housing of the PC. Follow the safety instructions of the manufacturer of the PC.
 - Plug the Evaluation Board with mounted netJACK into the PCI Express slot of the PC. When doing this, please follow the rules concerning electrostatic sensitive devices given in section *Safety Messages* [► page 52].
 - Close the housing of the PC according to the instructions of the manufacturer of the PC.
 - Reconnect PC to power supply and switch it on.
- ⇒ If the installation of the Evaluation Board NJEB-E with mounted netJACK has been successful, the entry **CIFx Communication Interface > netJACK 100PCI/PCle Device** is displayed in the Windows Device Manager.

8.4.2 Evaluation Board NJEB-D (Dual-Port Memory)

First mount the netJACK communication module onto the Evaluation Board NJEB-D as described in section *Mounting netJACK onto Evaluation Board* [► page 53].

Then install the Adapterboard NXPCA-PCI at a PCI interface of the PC. Finally connect the Adapterboard via cable CAB-NXPCA-PCI to the Evaluation Board with mounted netJACK.



Important:

Please note, that the Evaluation Board NJEB-D needs an external power supply of 24 Volts (e. g. NXAC-POWER adaptor, Hilscher part number 7930.000), because the Adapterboard NXPCA-PCI does not supply power for the Evaluation Board.

Note also, that in this setup, the Evaluation Board is not protected by a housing, therefore take extra care to observe the notice concerning electrostatic sensitive devices in section *Safety Messages* [► page 52].

To connect the Evaluation Board NJEB-D to a PC, proceed as follows:



⚠ WARNING**Lethal Electrical Shock caused by parts with more than 50V !**

- First disconnect the power plug of the PC.
 - Make sure that the power supply is off at the PC.
-
- Open the housing of the PC and install the Adapterboard NXPCA-PCI at a free PCI interface slot of the PC
 - Connect the CAB-NXPCA-PCI cable to the NXPCA-PCI Adapterboard.
-



For further information, please refer to the manual of the Adapterboard *User Manual NXPCA-PCI*.

- Plug the CAB-NXPCA-PCI cable into the connector of the host interface of the Evaluation Board ①. Then connect the 24 V NXAC-POWER adaptor to the power connector of the Evaluation Board ② and switch it on.

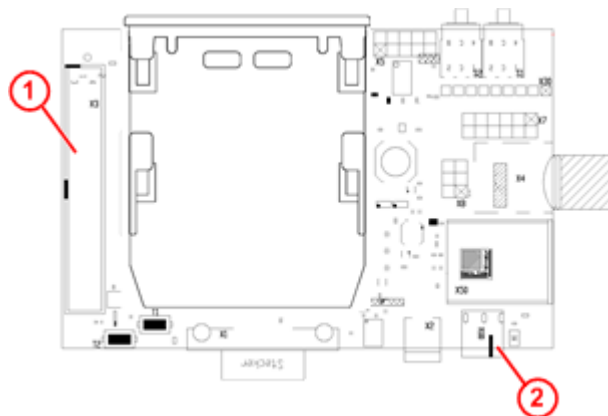


Figure 3: Host Interface and Power Connector on NJEB-D

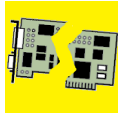
- Reconnect PC to power supply and switch it on.
- ⇒ If the installation has been successful, the entry **CIFx Communication Interface > NX-PCA-PCI** is displayed in the Windows Device Manager.

9 Updating firmware

9.1 Ways to update firmware

This section introduces you to the different possibilities of updating the firmware in the netJACK communication modules.

In the following illustrations, which shall provide an overview of the various update scenarios, the yellow marked elements show the way in which the firmware is being transferred into the netJACK communication module.



NOTICE

Drop of supply voltage during write and delete accesses in the file system

The FAT file system in the netX firmware is subject to certain limitations in its operation. Write and delete accesses in the file system (firmware update, configuration download etc.) can destroy the FAT (File Allocation Table) if the accesses cannot be completed if the supply voltage drops. Without a proper FAT, a firmware may not be found and cannot be started.

- Make sure, that the supply voltage of the device does not drop during write and delete accesses in the file system (firmware update, configuration download etc.).

If your host system (in the subsequent graphics designated as “Embedded System”) runs under a Windows® operating system with the SYCON.net configuration software and the cifX Device Driver installed, you can update the firmware of your netJACK communication module directly on your host system. In this case, you don’t need an external PC. If your netJACK runs as slave device, you can also use the netX Configuration Tool instead of the more powerful SYCON.net.

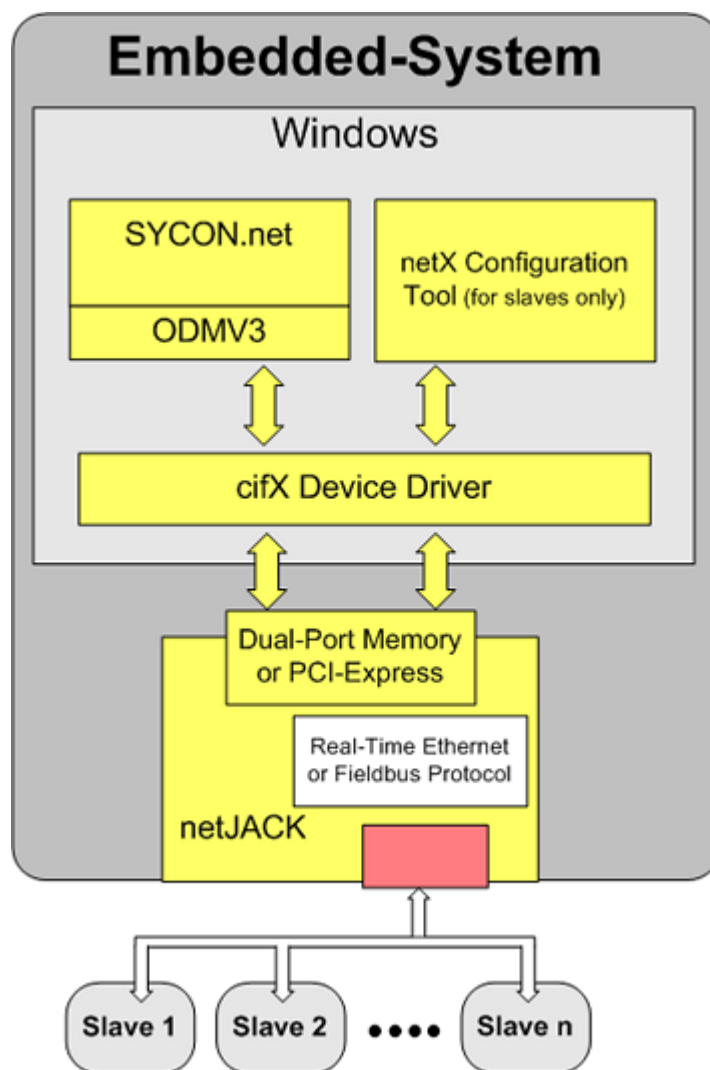


Figure 4: Updating firmware in host system running under Windows

In most cases however – especially if your host system does not run under Windows®, and SYCON.net or the netX Configuration Tool are not installed on your host system – you might want to update the netJACK firmware by using an external PC with SYCON.net or the netX Configuration Tool.

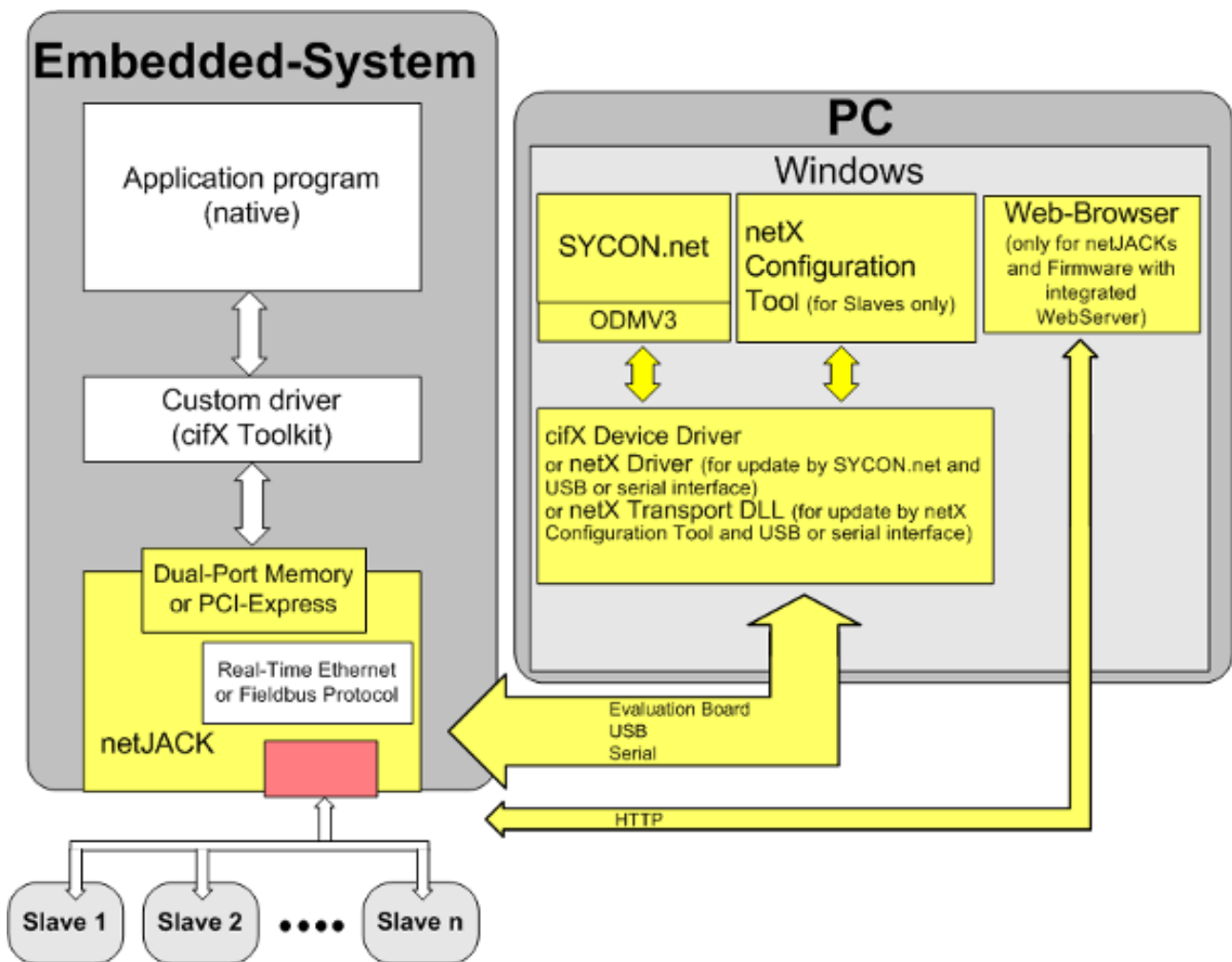


Figure 5: Updating firmware by external PC

Depending on your hardware setup, there are different ways to update firmware by using an external PC. These options are described in the subsequent sections.

You will find instructions on how to use SYCON.net for updating netJACK firmware in section *Instructions for Updating Firmware with SYCON.net* [► page 68].

9.1.1 Updating firmware of mounted netJACKs

For updating firmware of a netJACK communication module which is mounted in its host system, the following ways are possible:

9.1.1.1 Setup A1: Updating firmware with SYCON.net via USB interface

Updating netJACK firmware with SYCON.net or the netX Configuration Tool (only for slave devices) via external PC and USB interface.

To update firmware by USB, you do not need a cifX Device Driver, only the netX Driver, which is included in SYCON.net, respectively the netX Transport DLL, which is included in the netX Configuration Tool.

Prerequisites

- The USB interface of the netJACK communication module must be implemented on the carrier board of the host system according to the specifications given in the netJACK Design Guide and must be accessible from outside the host system.
- USB driver has been installed on the external PC.
- SYCON.net or the netX Configuration Tool (only for slave devices) has been installed on the external PC.

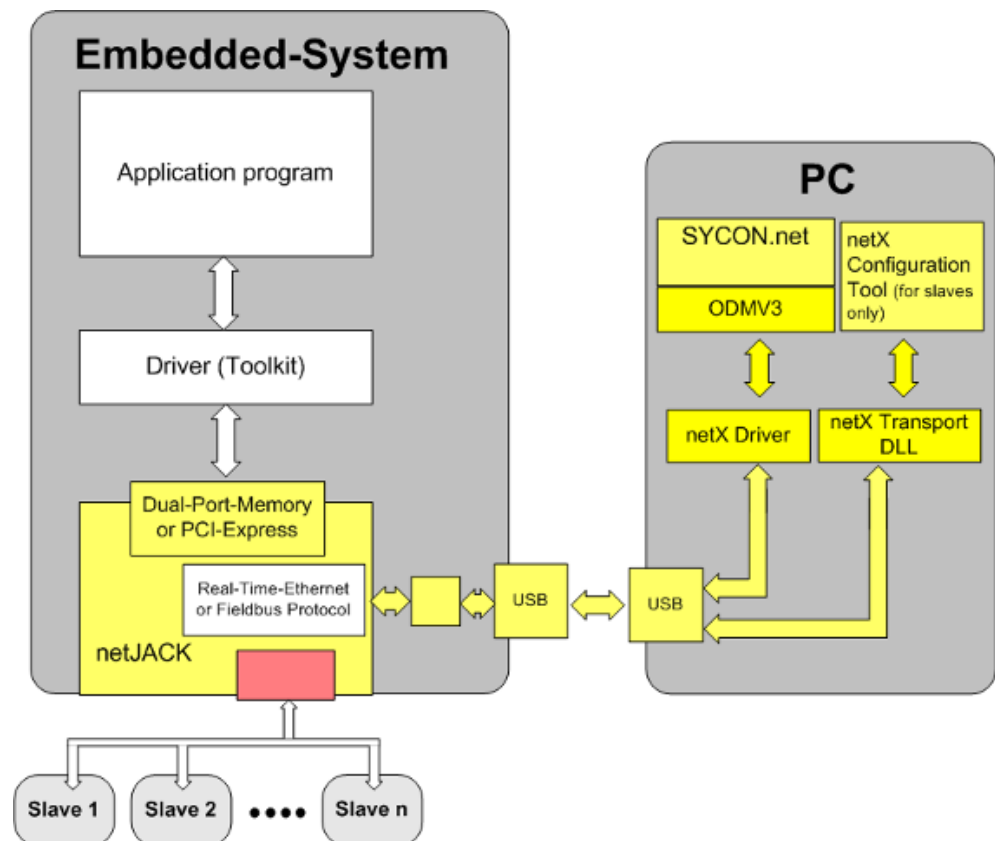


Figure 6: Updating firmware with SYCON.net via USB interface

9.1.1.2 Setup A2: Updating firmware with SYCON.net via serial interface (Dual-Port Memory only)

Updating netJACK firmware with SYCON.net or the netX Configuration Tool (only for slave devices) via external PC and serial interface.
To update firmware by serial interface, you do not need a cifX Device Driver, only the netX Driver, which is included in SYCON.net, respectively the netX Transport DLL, which is included in the netX Configuration Tool.

Prerequisites

- The host interface of the netJACK is Dual-Port Memory.
- The serial interface of the netJACK communication module must be implemented on the carrier board of the host system according to the specifications given in the netJACK Design Guide and must be accessible from outside the host system.
- SYCON.net or the netX Configuration Tool (only for slave devices) has been installed on the external PC.

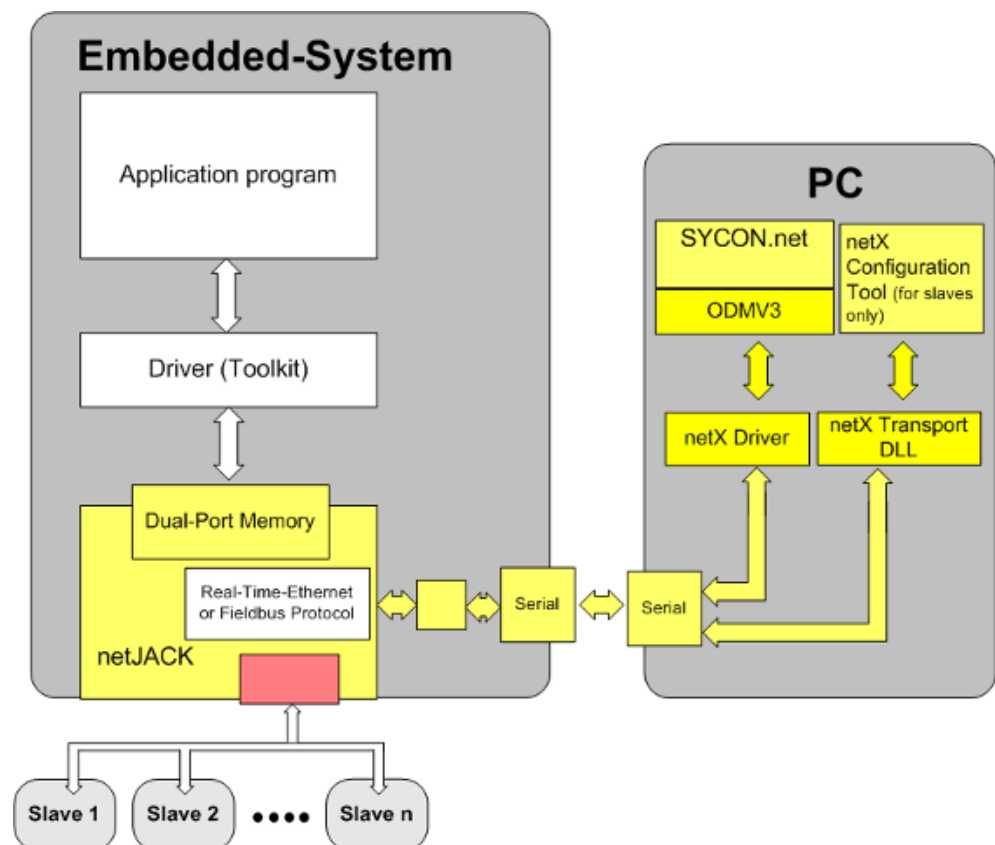


Figure 7: Updating firmware with SYCON.net via serial interface

9.1.1.3 Setup A3: Updating firmware via HTTP and Ethernet interface

This option is only available for netJACK communication modules NJ 51D-RE, NJ 100DN-RE and NJ 100EN-RE for Real-Time-Ethernet running on firmware with integrated WebServer functionality. The firmware of these netJACKs can be updated via their Ethernet interface and HTTP. For this setup, you need a PC with installed standard web browser and a connection to the netJACK via Ethernet network.

Prerequisites

- The netJACK communication module is a device for Real-Time Ethernet (NJ 51D-RE, NJ 100DN-RE and NJ 100EN-RE) running on firmware with integrated WebServer.
- The netJACK is connected to an IP network via its Ethernet interface.
- Your PC has a web browser and is connected to the IP network.
- You know the IP address of the netJACK and the user name and password for the firmware update function of the WebServer.

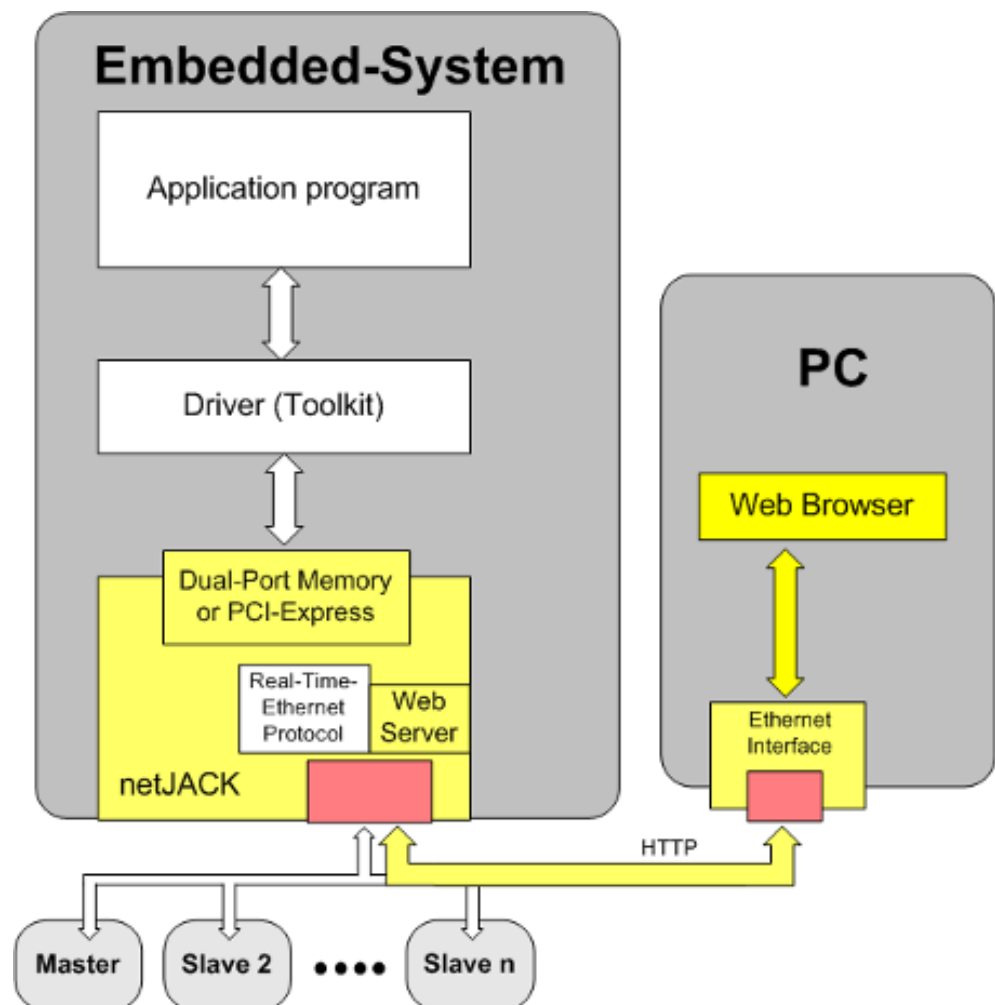


Figure 8: Updating firmware via HTTP and Ethernet interface



For further information on this update method and a list of firmware with integrated WebServer, please refer to the Application Note *Functions of the integrated WebServer*.

9.1.2 Updating firmware of netJACK via Evaluation Board

If you want to update the firmware of the netJACK communication module while there is no serial or USB diagnostic interface available on the carrier board of the host system, you have to remove the netJACK from its host system and connect it via Evaluation Board to an external PC.

There are several ways to do so, depending on whether you use a netJACK communication module with PCI Express or with Dual-Port Memory.

9.1.2.1 Setup B1a: Updating firmware of netJACK with PCI Express via Evaluation Board

To update the firmware of a netJACK communication module with PCI Express host interface, install the netJACK on the NJEB-E Evaluation Board (Hilscher part number 1600.010) and connect the Evaluation Board to the PCI Express interface of a PC. The PC must have SYCON.net or the netX Configuration Tool (only for slave devices) and the cifX Device Driver installed on it.

Prerequisites:

- The netJACK communication module is installed on an NJEB-E Evaluation Board.
- The Evaluation Board is connected to a PCI Express interface of the PC.
- SYCON.net or the netX Configuration Tool (only for slave devices) is installed on the PC.
- cifX Device Driver is installed on the PC.

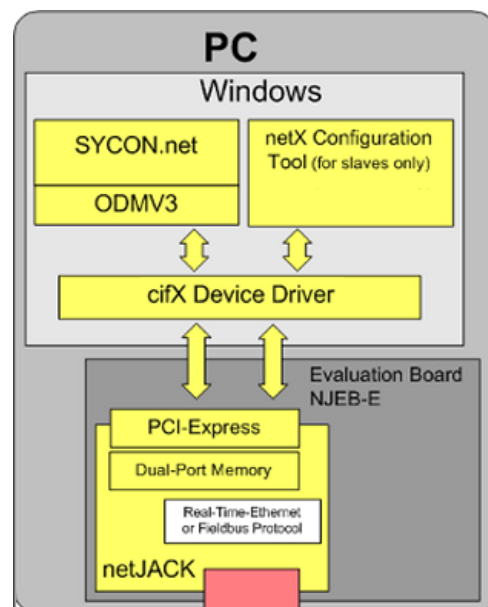


Figure 9: Updating firmware of a netJACK with PCI Express via Evaluation Board

9.1.2.2 Setup B1b: Updating firmware of netJACK with PCI Express via Evaluation Board and USB

As an alternative, you can install the netJACK on the NJEB-E Evaluation Board (Hilscher part number 1600.010), connect the Evaluation Board to the PCI Express interface of a PC, and then connect the Evaluation Board via USB interface to another external PC. The external PC must have SYCON.net or the netX Configuration Tool (only for slave devices) installed on it.

To update firmware by USB, you do not need a cifX Device Driver, only the netX Driver, which is included in SYCON.net, respectively the netX Transport DLL, which is included in the netX Configuration Tool.

Prerequisites:

- The netJACK communication module is installed on an NJEB-E Evaluation Board.
- The Evaluation Board is plugged into a PCI Express slot of a PC.
- The USB interface of the Evaluation Board is connected to a USB interface of the external PC.
- USB driver has been installed on the external PC.
- SYCON.net or the netX Configuration Tool (only for slave devices) is installed on the external PC.

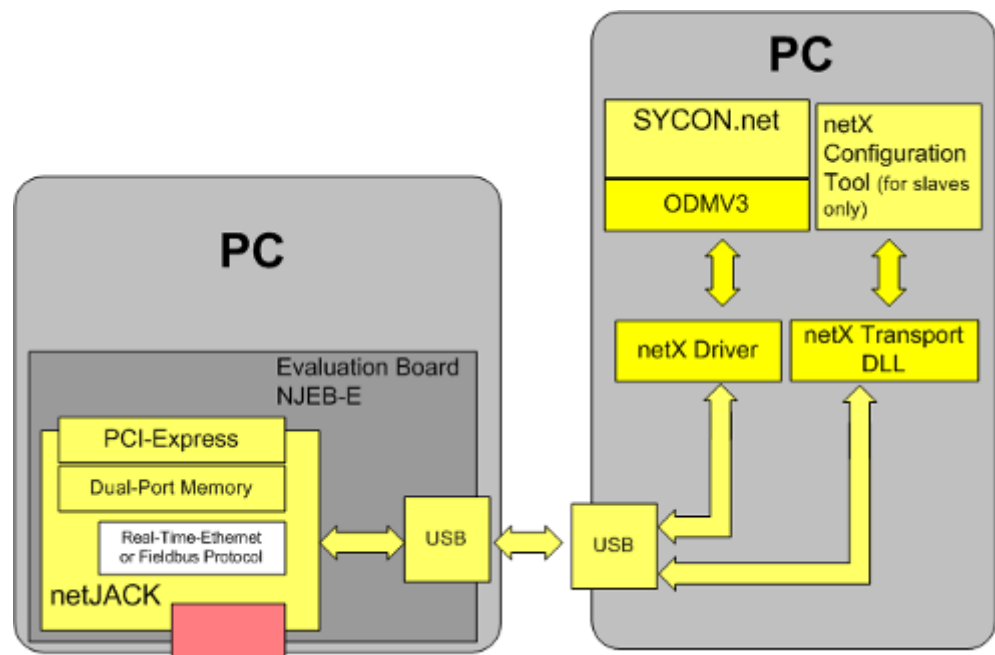


Figure 10: Updating firmware of a netJACK with PCI Express via Evaluation Board

9.1.2.3 Setup B2a: Updating firmware of netJACK with Dual-Port Memory via Evaluation Board

To update the firmware of a netJACK communication module with Dual-Port Memory host interface, you can install the netJACK on the NJEB-D Evaluation Board (Hilscher part number 1600.000) and connect the Evaluation Board via USB or serial interface to a PC. The PC must have SYCON.net or the netX Configuration Tool (only for slave devices) installed on it.

To update firmware by USB or serial interface, you do not need a cifX Device Driver, only the netX Driver, which is included in SYCON.net, respectively the netX Transport DLL, which is included in the netX Configuration Tool.

Note that the Evaluation Board NJEB-D must be connected to 24 V power adaptor (e. g. NXAC-POWER adaptor, Hilscher part number 7930.000).

Prerequisites

- The netJACK communication module is installed on an NJEB-D Evaluation Board.
- The Evaluation Board is connected to a 24 Volt power adaptor.
- The Evaluation Board is connected to the PC via USB or serial interface.
- USB driver has been installed on the external PC (if USB interface is to be used).
- SYCON.net or the netX Configuration Tool (only for slave devices) is installed on the PC.

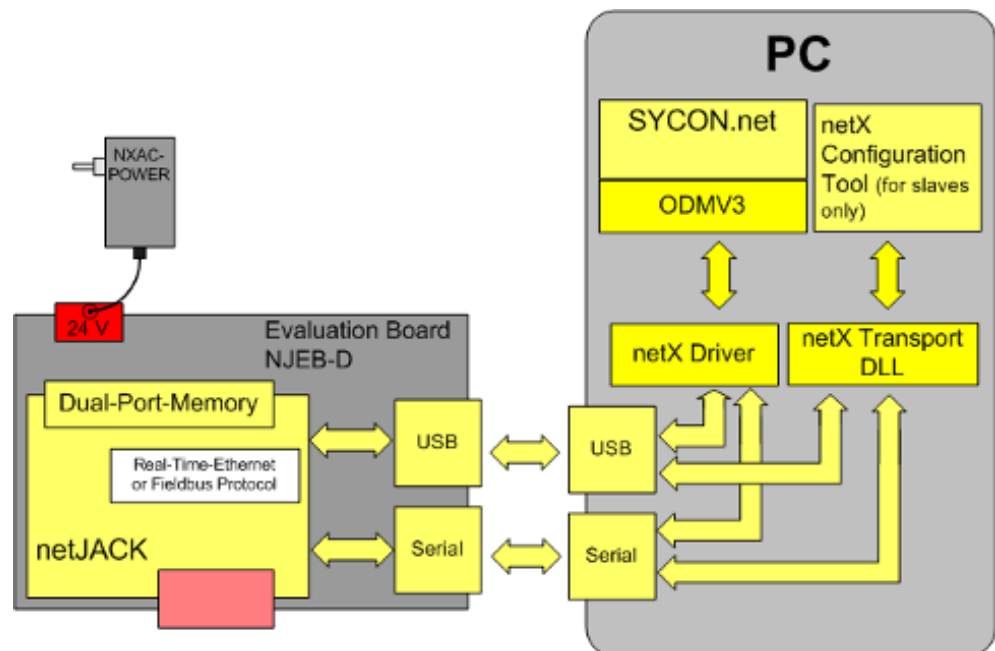


Figure 11: Updating firmware of a netJACK with DPM via Evaluation Board and USB or serial interface

9.1.2.4 Setup B2b: Updating firmware of netJACK with Dual-Port Memory via Evaluation Board and Adapter Board

As an alternative to USB or serial interface, you can also connect the netJACK via host interface of the NJEB-D Evaluation Board to a PC. The PC must have SYCON.net or the netX Configuration Tool (only for slave devices) installed on it. For this setup, you also need the NXPCA-PCI Adapter Board (Hilscher part number 7902.100), which has to be connected to the PCI interface of the PC, and a CAB-NXPCA-PCI cable (Hilscher part number 4400.000), which connects the Adapter Board with the host interface of the Evaluation Board.

Note that the Evaluation Board NJEB-D must be connected to 24 V power adaptor (e. g. NXAC-POWER adaptor, Hilscher part number 7930.000).

Prerequisites

- The netJACK communication module is installed on an NJEB-D Evaluation Board.
- The Evaluation Board is connected to a 24 Volt power adaptor.
- The Evaluation Board is connected via CAB-NXPCA-PCI cable to the NXPCA-PCI Adapter Board.
- The NXPCA-PCI Adapter Board is connected to the PCI interface of the PC.
- SYCON.net or the netX Configuration Tool (only for slave devices) is installed on the PC.

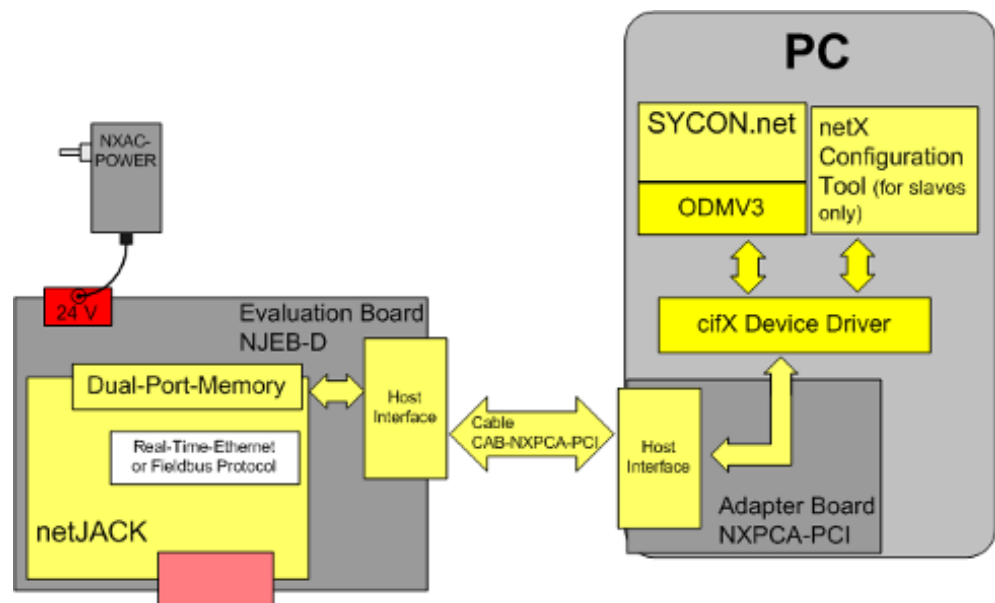


Figure 12: Updating firmware of a netJACK with DPM via Evaluation Board and NXPCA-PCI

9.2 Instructions for updating firmware with SYCON.net

9.2.1 Prerequisites

Make sure, that the netJACK communication module is connected to a PC according to one of the methods described in section *Ways to Update Firmware* [► page 58] and that SYCON.net and the necessary drivers are installed on the PC.

9.2.2 Overview

To update the firmware of the netJACK with SYCON.net, the following tasks have to be performed:

1. Select existing project or create new project
2. Choose driver to establish a connection to the netJACK (depending on hardware setup, see section *Ways to Update Firmware* [► page 58])
3. Choose netJACK to be updated (Device Assignment)
4. Download firmware into the netJACK (Firmware Download)



For a detailed description of the updating process, please refer to the SYCON.net DTM manual of the corresponding Fieldbus or Real-Time Ethernet protocol. You will find a list of relevant manuals in the Installation Guide *Software Installation and Documentation Overview Communication Solutions* in chapter *Communication Modules netJACK, Software and Documentation*.

9.2.3 Step-by-step instructions for updating firmware

1. Start SYCON.net configuration software.
 - In the Windows **Start** menu, select **Programs > SYCON.net System Configurator > SYCON.net**.
 - SYCON.net opens.
 2. Choose an existing project or create a new one.
 - In the menu, select **File > Open...** to open a suitable existing project.
- or
- In the menu, select **File > New** to create a new project and add a master or slave device to the bus configuration line.



For more information on how to create and configure a new project, please refer to the SYCON.net DTM manual of the corresponding Fieldbus or Real-Time Ethernet protocol.

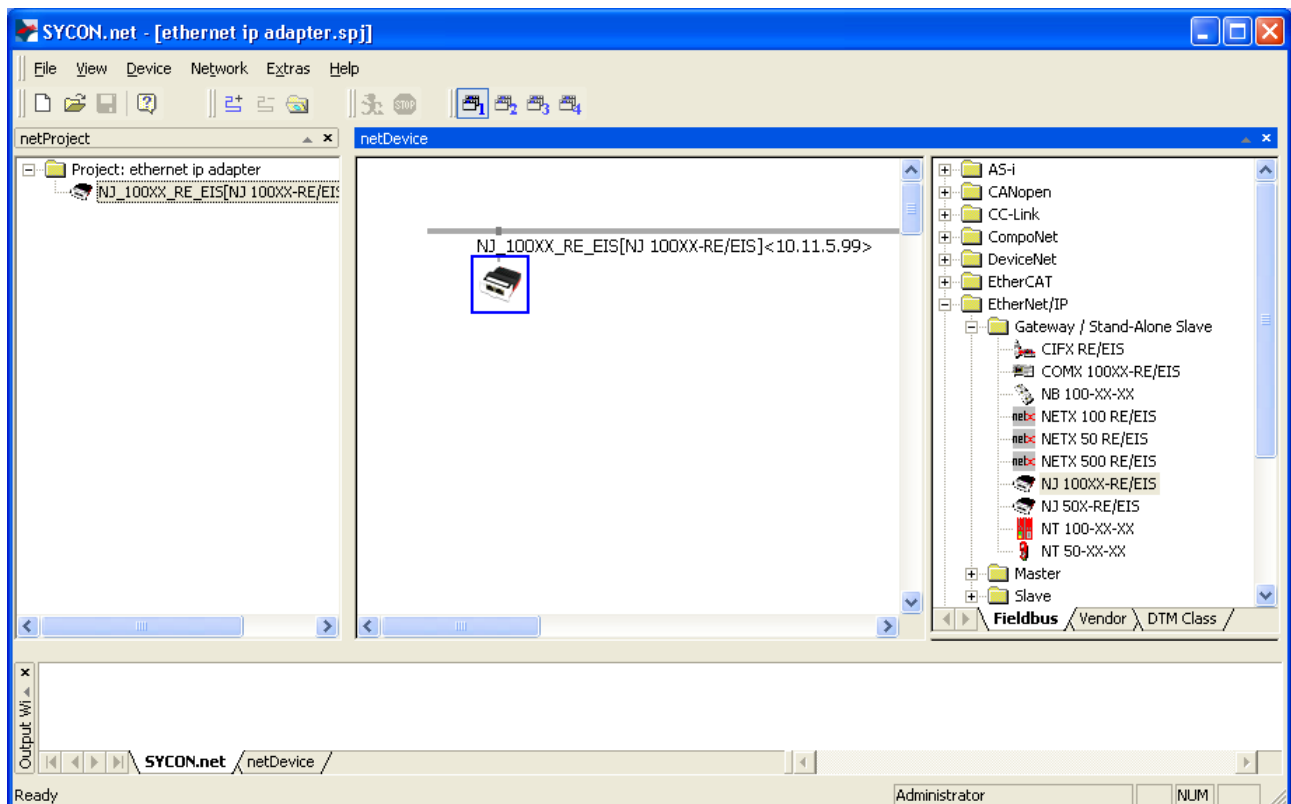


Figure 13: netJACK project in SYCON.net

3. Open configuration window.
 - Double click the device symbol in the bus configuration line or open the context menu and choose **Configuration** entry.
 - The Configuration window opens.

4. Choose adequate driver.

- In the **Navigation Area**, select **Settings > Driver**.
- The **Driver** list opens.

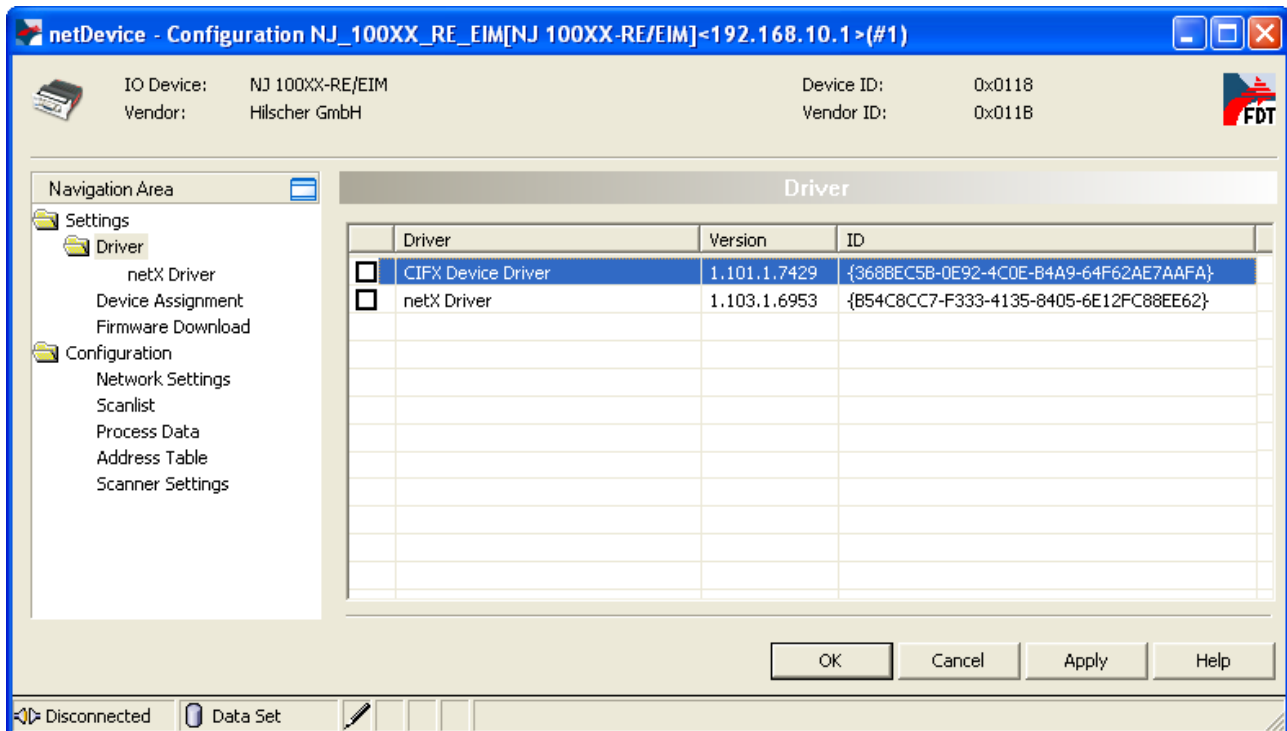


Figure 14: Choosing driver

If a USB or serial interface (serial interface only available for netJACKs with Dual-Port Memory) is used for the firmware update, the **netX Driver** is needed:

- In this case, check the box in front of the **netX Driver** entry and click **Apply** button.

**Note:**

The netX Driver is included in every SYCON.net installation and does not need to be installed separately.

If a no USB or serial interface is used for the firmware update, the cifX Device Driver is needed:

- In this case, check the box in front of the **cifX Device Driver** entry and click **Apply** button.



Please also refer to the *Selecting the Driver* section in the SYCON.net DTM manual for the corresponding Fieldbus or Real-Time Ethernet protocol.

For details on the netX Driver, please refer to the *netX Driver* section in the SYCON.net DTM manual. The necessary adjustment of interfacing parameters is explained in the *Driver parameters for netX Driver - USB/RS232 Connection* section.

For details on the cifX Device Driver, please refer to the *cifX Device Driver* section in the SYCON.net DTM manual.

5. Choose the netJACK, for which you want to update the firmware.
 - In the **Navigation Area**, select **Settings > Driver > Device Assignment**.
 - The **Device Assignment** window opens.
6. Start scanning for connected devices.
 - In the **Device selection** dropdown list, select entry **All** and click **Scan** button.
 - A list displaying all connected devices is opened.
7. Choose the device.
 - Check the box in front of the appropriate device and click **Apply** button.

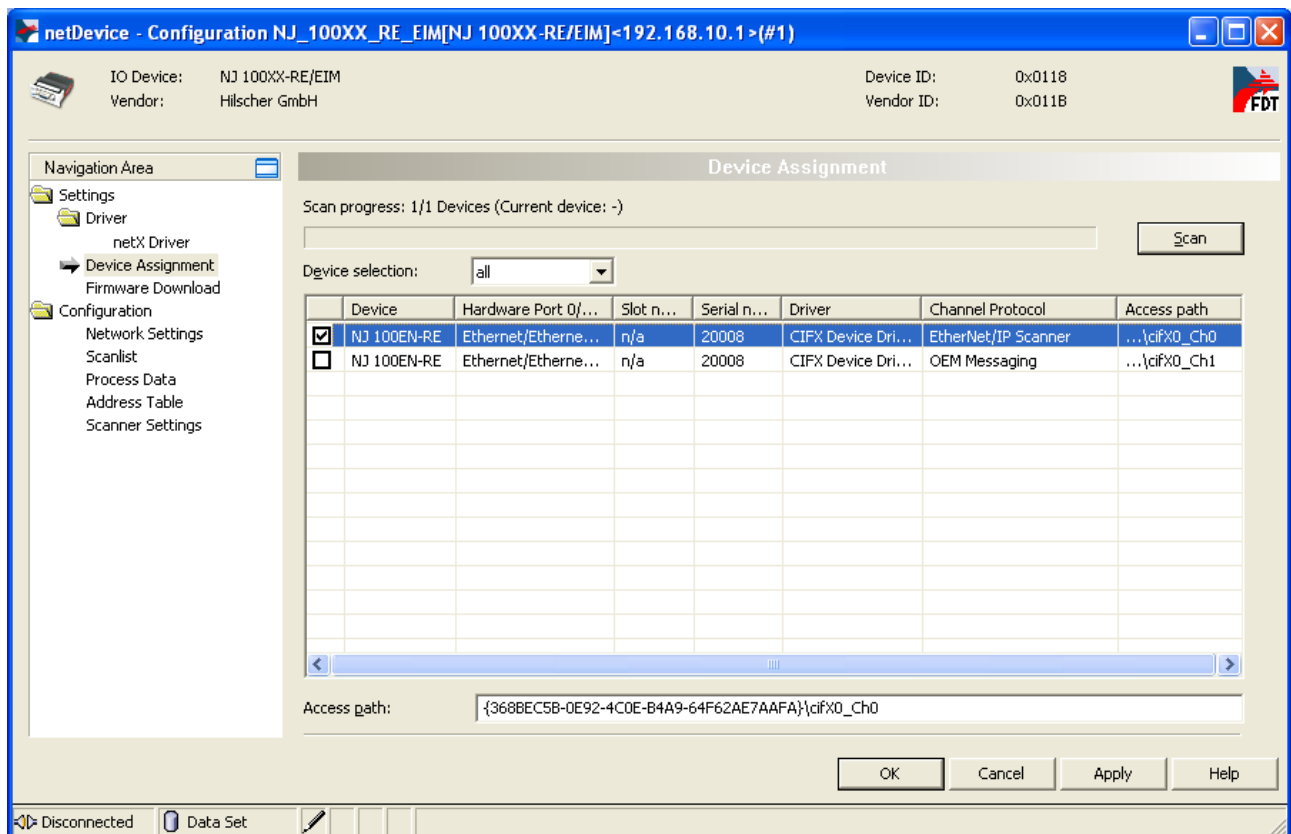


Figure 15: Choosing device



For details, please refer to the *Device Assignment* section in the SYCON.net DTM manual for the corresponding Fieldbus or Real-Time Ethernet protocol.

8. Download the firmware to the netJACK.
 - In the **Navigation Area**, select **Settings > Driver > Firmware-Download**.
 - The **Firmware-Download** window is opens.
9. Choose the firmware which you want to load to the netJACK.
 - Click **Browse...** button.
 - The **Select Firmware File** dialog opens.
 - Navigate to the folder containing the firmware files, select the appropriate file and click **Open** button.

**Note:**

If you choose a firmware that does not fit to the device, an error message will be issued.

For a list of firmware, please refer to section *Devices and firmware* [▶ page 15].

- Name and version of the selected firmware are displayed in the **Firmware-Download** window.
- Check name and version of the firmware.

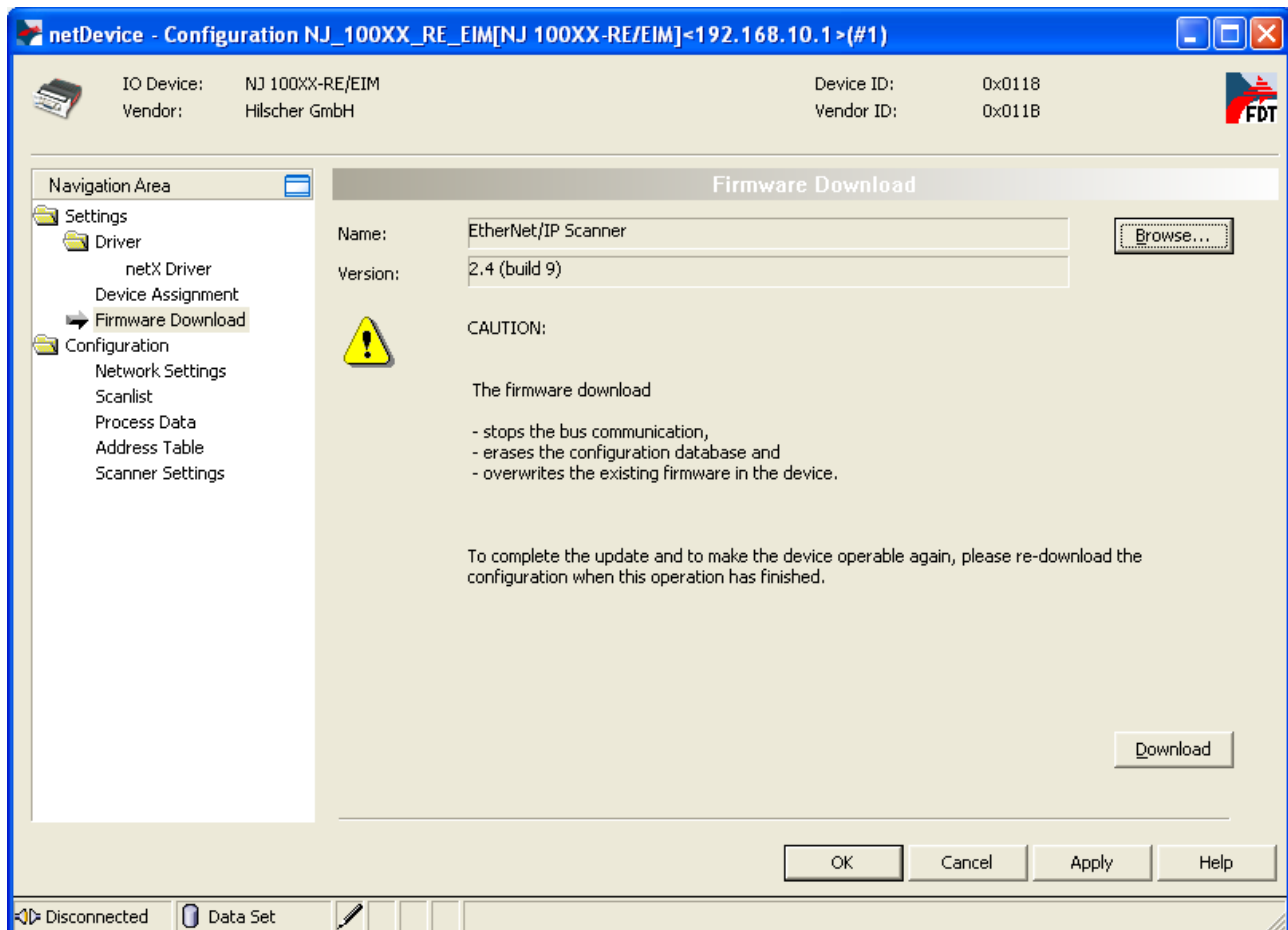
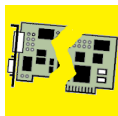


Figure 16: Downloading firmware to the device

**NOTICE**

Drop of supply voltage during write and delete accesses in the file system



The FAT file system in the netX firmware is subject to certain limitations in its operation. Write and delete accesses in the file system (firmware update, configuration download etc.) can destroy the FAT (File Allocation Table) if the accesses cannot be completed if the supply voltage drops. Without a proper FAT, a firmware may not be found and cannot be started.

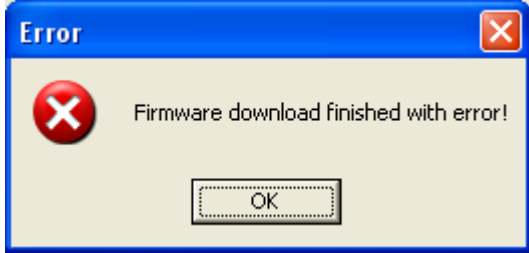


- Make sure, that the supply voltage of the device does not drop during write and delete accesses in the file system (firmware update, configuration download etc.).



10. Start the download.

- Click **Download** button
- ⇒ The firmware is downloaded to the netJACK.
- To close the configuration window, click **OK** button.
- ⇒ You have downloaded the firmware to the netJACK.

9.2.4 Troubleshooting firmware update

Problem	<p>Error message</p>  <p>appears</p>
Cause 1	The loaded file does not contain firmware for any Hilscher device (neither for netJACK nor for any other Hilscher device).
Remedial Action 1	Load a correct firmware file, see section <i>Devices and firmware</i> [► page 15].
Cause 2	When updating the netJACK via Evaluation Board: The netJACK has no sufficient contact with the Evaluation Board.
Remedial Action 2	Check whether the netJACK is mounted correctly.
Cause 3	When updating the netJACK with PCI Express via Evaluation Board: The Evaluation Board has no sufficient contact with the PCI Express interface of the PC.
Remedial Action 3	Check whether the Evaluation Board is mounted correctly.
Cause 4	When updating the netJACK with Dual-Port Memory via Evaluation Board and Adapter Board: The Adapter Board has no sufficient contact with the PCI interface of the PC.
Remedial Action 4	Check whether the Adapter Board is mounted correctly.
Problem	<p>Error message</p>  <p>appears</p>
Cause 1	The connection to the netJACK communication module has been lost due to contact problems.
Remedial Action 1	Check whether the netJACK is mounted correctly. When updating the netJACK with PCI Express via Evaluation Board, check whether the Evaluation Board is mounted correctly.
Cause 2	When updating the netJACK via serial or USB interface: The connection to the netJACK has been lost due to contact problems at the serial or USB connection.
Remedial Action 2	Check whether the serial or USB cable are connected correctly.

Problem	<p>Error message</p>  <p>appears</p>
Cause	When updating the netJACK via serial or USB interface: The firmware download has been finished with an error due to having lost the serial or USB connection to the netJACK during the firmware download.
Remedial Action	Check whether the serial or USB cable are connected correctly.
Problem	<p>Error message</p>  <p>appears.</p>
Cause	The device classes do not match. The selected firmware file contains a Hilscher firmware which is not suited for the netJACK communication module but for another Hilscher product (in this case for instance a cifX card).
Remedial Action	Select adequate firmware file for the netJACK. See section <i>Devices and firmware</i> [► page 15].
Problem	<p>Error message</p>  <p>appears</p>
Cause	The communication classes do not match. Either the firmware file to be loaded is suited for a Master/Scanner/Controller and the installed netJACK communication module requires a Slave/Adapter/Device firmware or the firmware file to be loaded is suited for a Slave/Adapter/Device and the installed netJACK requires a Master/Scanner/Controller firmware.

Remedial Action	If a change from Master to Slave or vice versa is intended and a Master license is present, then click Yes to perform the intended change. In all other cases click No and use a firmware of the correct type for your netJACK, i. e. a Master firmware for a Master module and a Slave firmware for a Slave module.
Problem	<p>Error message</p>  <p>appears.</p>
Cause	The protocol classes do not match. The selected firmware does not support any protocol suited for the selected netJACK communication module. This error mostly occurs in conjunction with the two errors discussed directly above.
Remedial Action	Use a suitable firmware for a protocol that is supported by your netJACK. If a change of the Real-Time Ethernet System is intended and you use a netJACK Real-Time Ethernet Module (NJ 51D-RE, NJ 100EN-RE), click Yes to perform the intended change. In all other cases click No .
Problem	<p>Error message</p>  <p>appears.</p>
Cause	The hardware options do not match, i. e. you either use a Real-Time Ethernet-firmware in conjunction with a Fieldbus communication module, or vice versa, a Fieldbus firmware in conjunction with a Real-Time Ethernet communication module.
Remedial Action	Click No and use a firmware suitable for a protocol that is supported by your netJACK communication module. If you choose Yes , a non-conforming firmware is loaded and the module will not operate correctly.
Problem	The Download button in the Firmware Download screen is grayed out/deactivated.
Cause	There is a (temporary) contact problem.

Remedial Action	Check whether the netJACK communication module and the Evaluation Board (if used) are tightly connected and have good electrical contact. Then, click the Select button and again select the firmware file to be loaded using the subsequent file selection dialog. Afterwards, the Download button should not be grayed out anymore.
-----------------	---

Table 20: Troubleshooting firmware update with SYCON.net

If you have problems while downloading firmware, please also check:

- When using a master firmware: a master license must be present and loaded. If not, a Master license must be purchased from Hilscher and must be loaded.
- Has SYCON.net been installed correctly?
- Is the correct device selected within SYCON.net?

10 Device pictures, connectors and LEDs

10.1 Device pictures

netJACK top view

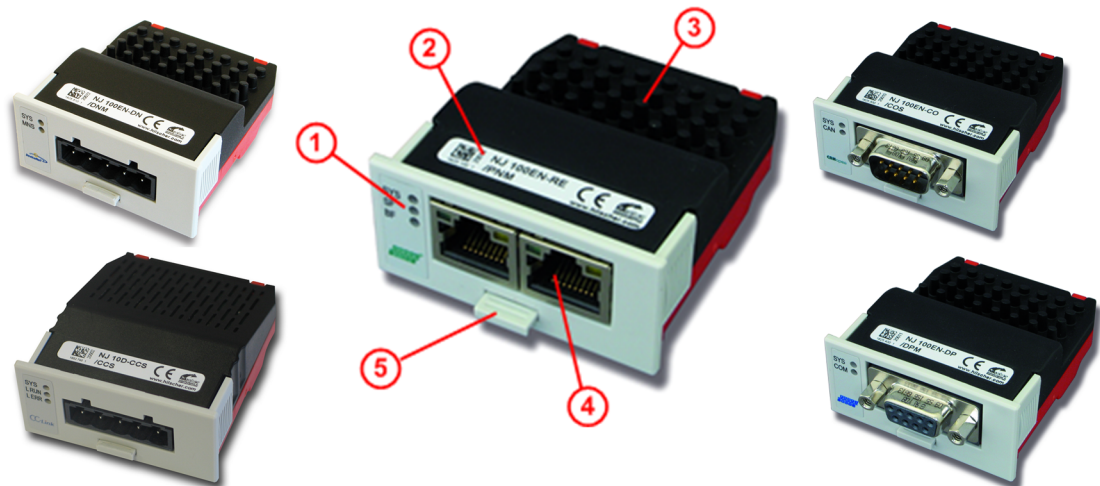
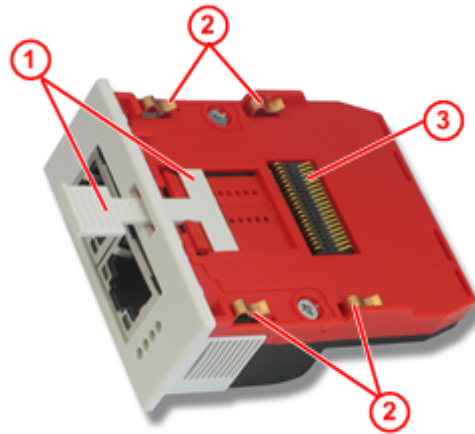


Figure 17: Top view of netJACK devices

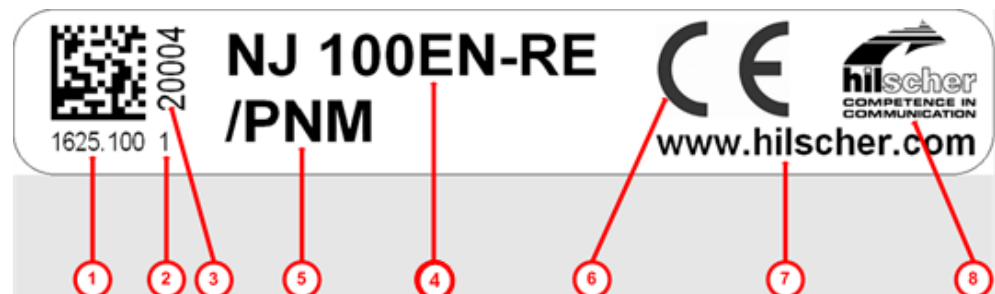
- ① Status LEDs. The arrangement of the LEDs depends on the network protocol. See section *Positions of the LEDs and Control Elements* ► page 79].
- ② Device label
- ③ Ventilation slats
- ④ Network interface. The design depends on the network protocol. See section *Positions of the LEDs and Control Elements* ► page 79].
- ⑤ Sliding latch

netJACK bottom view*Figure 18: Bottom view of netJACK devices*

- ① Sliding latch to lock the netJACK in the host system.
- ② Brackets to fix the netJACK to the carrier board of the host system.
- ③ SAMTEC connector, interface to the host system. Number of Pins depends on the kind of interface (PCI Express or Dual-Port Memory) used by the host system and on the netX chip in the netJACK.

10.2 Device type label

Each netJACK communication module carries a device type label, which provides the following information:

*Figure 19: Device type label netJACK*

- ① Part number
- ② Hardware revision number
- ③ Serial number of individual device
- ④ Device type name
- ⑤ Abbreviation of firmware
- ⑥ CE Sign
- ⑦ Hilscher's web address
- ⑧ Hilscher logo

The netJACK device type name and the abbreviation of the firmware provide the following information:



Figure 20: Device type name netJACK

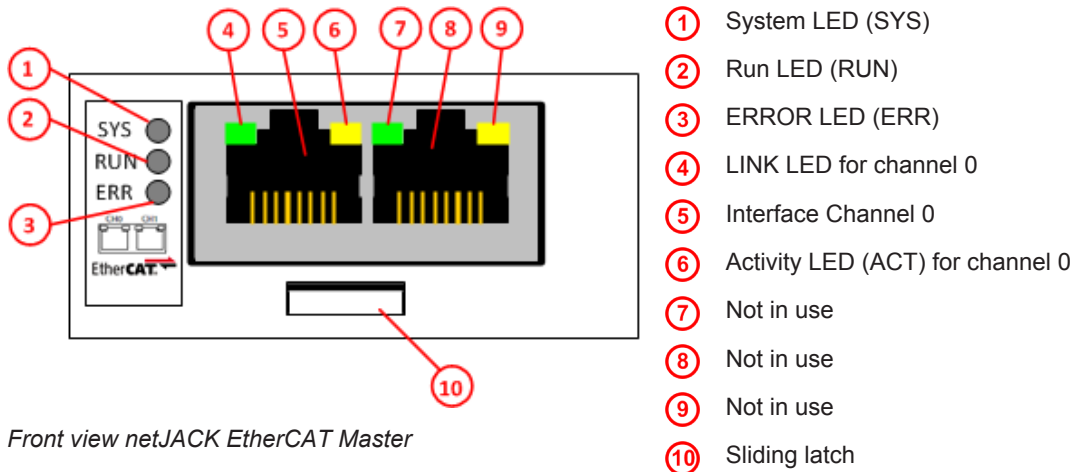
- ① Abbreviation of the Hilscher netJACK product line
- ② Type of built-in netX processor:
10 = netX 10
51 = netX 51
100 = netX 100
- ③ Abbreviation of host interface:
D = Dual-Port Memory
E = PCI Express
- ④ Indicates, whether netJACK provides additional network functionality (**N** = yes)
- ⑤ Abbreviation of the network/protocol type:
CC = CC-Link
CO = CANopen
DN = DeviceNet
DP = Profibus
RE = Real-Time-Ethernet
- ⑥ Abbreviation of the firmware loaded in the netJACK:

CCS = CC-Link Slave	COS = CANopen Slave
COM = CANopen Master	DPS = PROFIBUS DP Slave
DPM = PROFIBUS DP Master	DNS = DeviceNet Slave
DNM = DeviceNet Master	ECS = EtherCAT Slave
ECM = EtherCAT Master	EIS = Ethernet/IP Adapter/Slave
EIM = Ethernet/IP Scanner/Master	
OMB = Open Modbus/TCP	
PLS = POWERLINK Controlled Node	
PNM = PROFINET IO Controller	PNS = PROFINET IO Device
S3M = Sercos Master	S3S = Sercos Slave
VRS = VARAN Client	

10.3 Positions of the LEDs and control elements

10.3.1 netJACK for Real-Time Ethernet systems

10.3.1.1 Front view of netJACK with EtherCAT Master

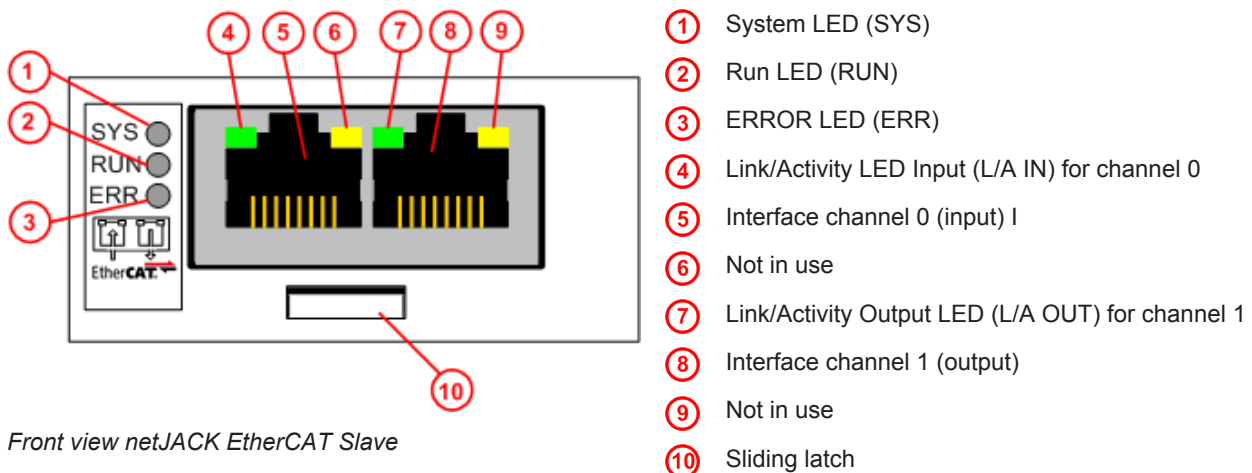


Front view netJACK EtherCAT Master

For a description of the LED signals used by EtherCAT (Master), see section *LEDs EtherCAT Master* [► page 89].

For a description of the pinning of the network interface, see section *Pinning Real-Time Ethernet Interface* [► page 112].

10.3.1.2 Front view of netJACK with EtherCAT Slave

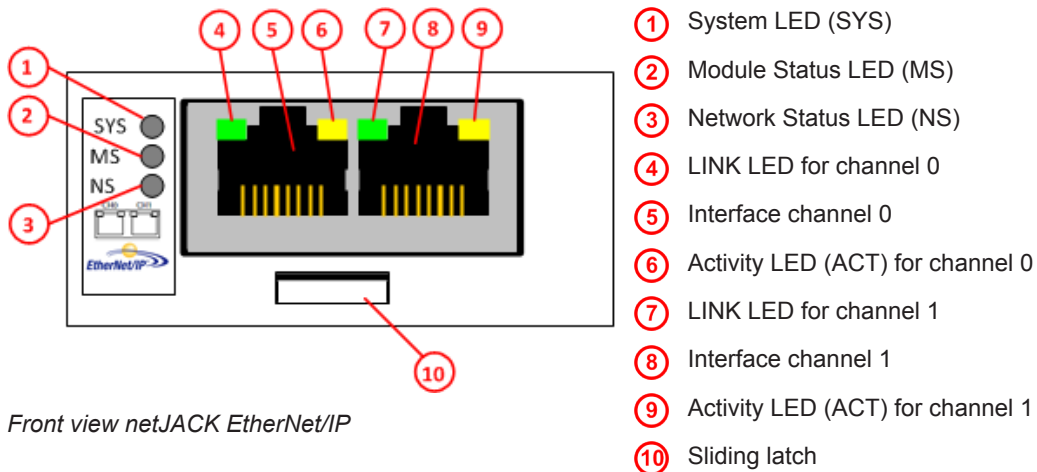


Front view netJACK EtherCAT Slave

For a description of the LED signals used by EtherCAT (Slave), see section *LEDs EtherCAT Slave* [► page 92].

For a description of the pinning of the network interface, see section *Pinning Real-Time Ethernet Interface* [► page 112].

10.3.1.3 Front view of netJACK with EtherNet/IP

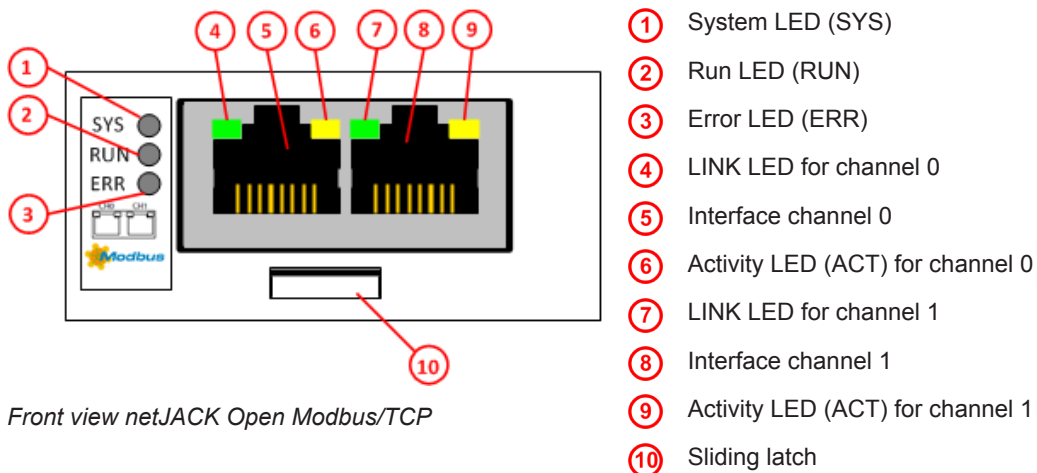


Front view netJACK EtherNet/IP

For a description of the LED signals used by EtherNet/IP, see section *LEDs EtherNet/IP* [► page 93] and section *LEDs EtherNet/IP* [► page 94].

For a description of the pinning of the network interface, see section *Pinning Real-Time Ethernet Interface* [► page 112].

10.3.1.4 Front view of netJACK with Open Modbus/TCP

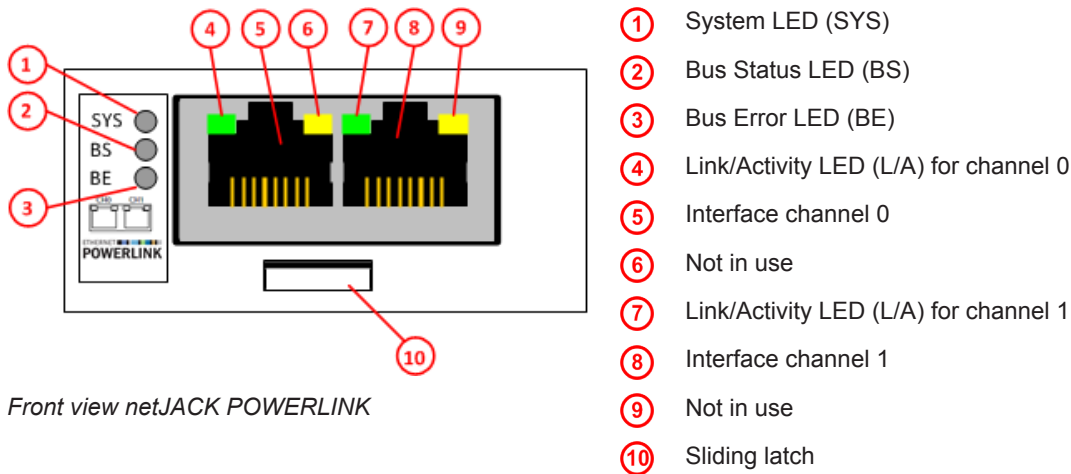


Front view netJACK Open Modbus/TCP

For a description of the LED signals used by Open Modbus/TCP, see section *LEDs Open Modbus/TCP* [► page 95].

For a description of the pinning of the network interface, see section *Pinning Real-Time Ethernet Interface* [► page 112].

10.3.1.5 Front view of netJACK with POWERLINK

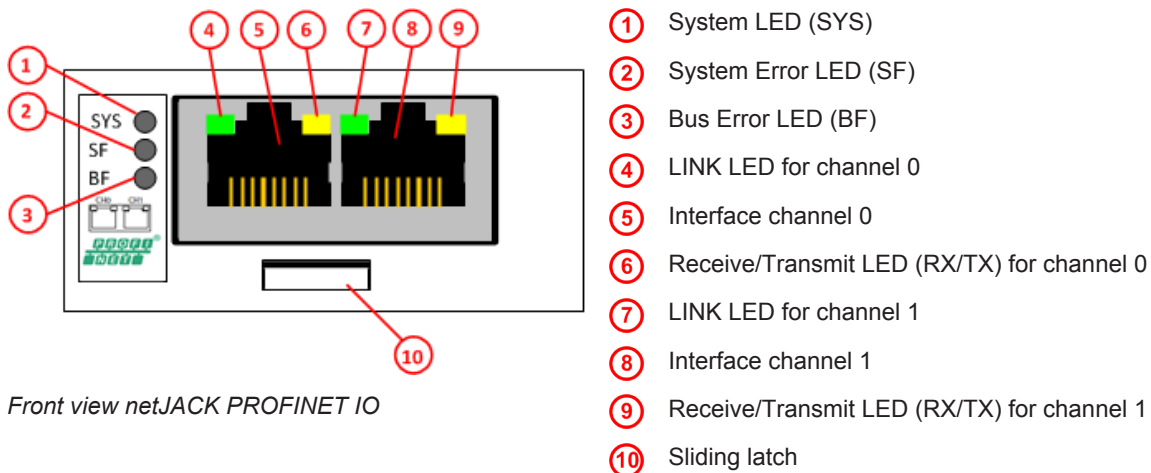


Front view netJACK POWERLINK

For a description of the LED signals used by POWERLINK, see section *LEDs POWERLINK* [► page 96].

For a description of the pinning of the network interface, see section *Pinning Real-Time Ethernet Interface* [► page 112].

10.3.1.6 Front view of netJACK with PROFINET IO

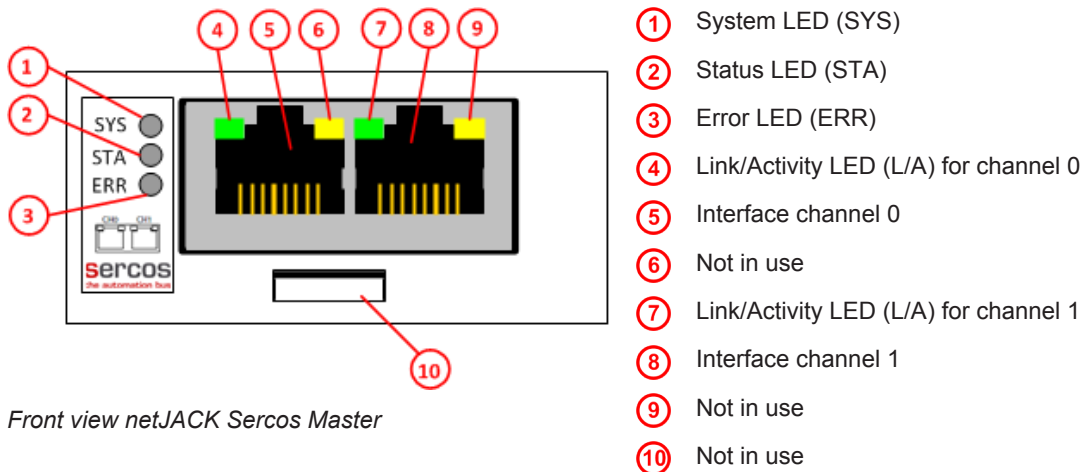


Front view netJACK PROFINET IO

For a description of the LED signals used by PROFINET IO, see section *LEDs PROFINET IO Controller* [► page 97] and section *LEDs PROFINET IO Device* [► page 100].

For a description of the pinning of the network interface, see section *Pinning Real-Time Ethernet Interface* [► page 112].

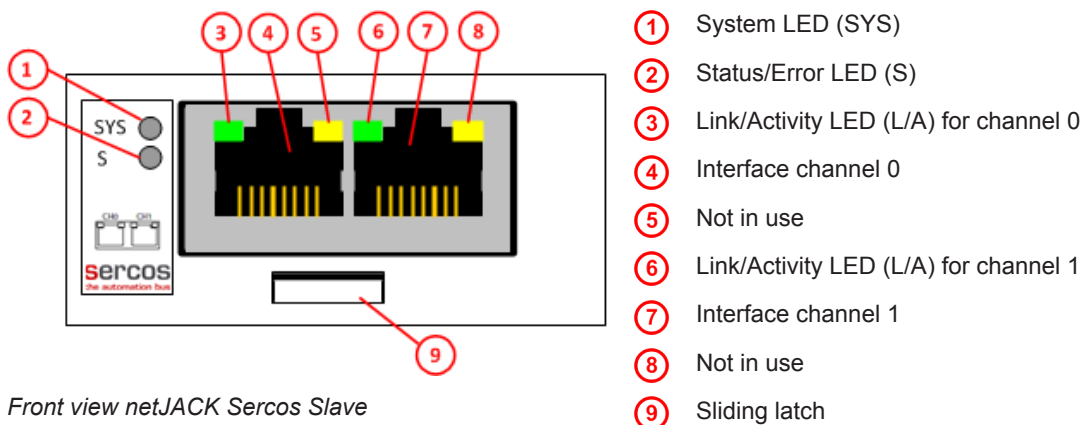
10.3.1.7 Front view of netJACK with Sercos Master



For a description of the LED signals used by Sercos (Master), see section *LEDs Sercos Master* [► page 101].

For a description of the pinning of the network interface, see section *Pinning Real-Time Ethernet Interface* [► page 112].

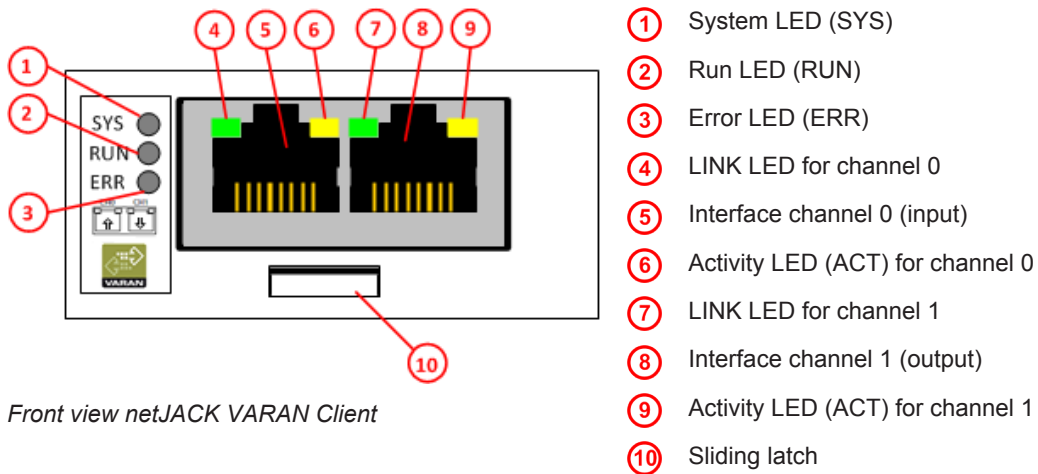
10.3.1.8 Front view of netJACK with Sercos Slave



For a description of the LED signals used by Sercos (Slave), see section *LEDs Sercos Slave* [► page 103].

For a description of the pinning of the network interface, see section *Pinning Real-Time Ethernet Interface* [► page 112].

10.3.1.9 Front view of netJACK with VARAN Client



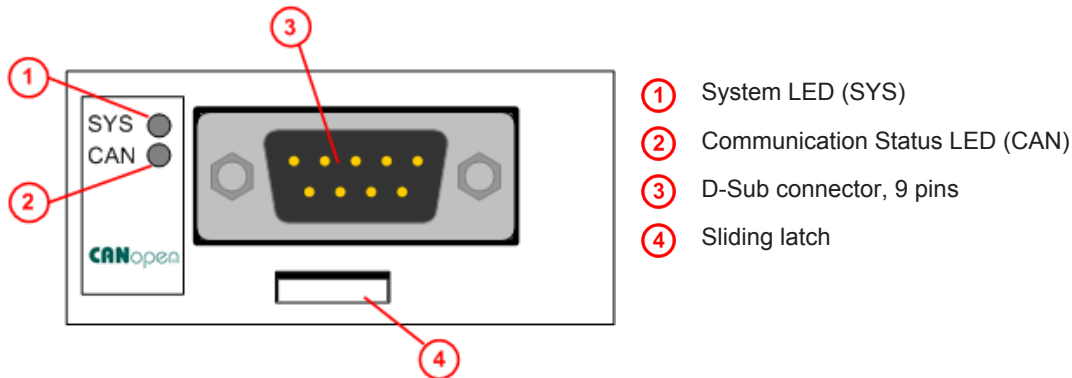
Front view netJACK VARAN Client

For a description of the LED signals used by VARAN (Client), see section *LEDs VARAN Client* [► page 105].

For a description of the pinning of the network interface, see section *Pinning Real-Time Ethernet Interface* [► page 112].

10.3.2 netJACK for fieldbus systems

10.3.2.1 Front view of netJACK with CANopen

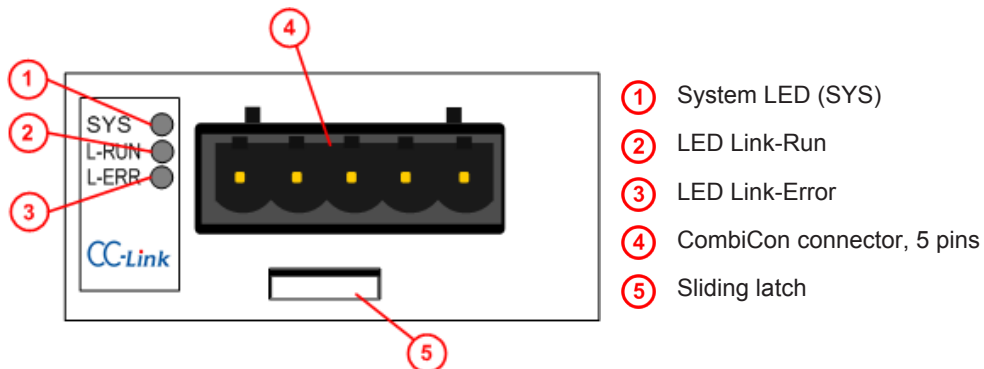


Front view netJACK CANopen

For a description of the LED signals used by CANopen, see section *LEDs CANopen Master* [► page 106] and section *LEDs CANopen Slave* [► page 107].

For a description of the pinning of the network interface, see section *Pinning CANopen Interface* [► page 113].

10.3.2.2 Front view of netJACK with CC-Link

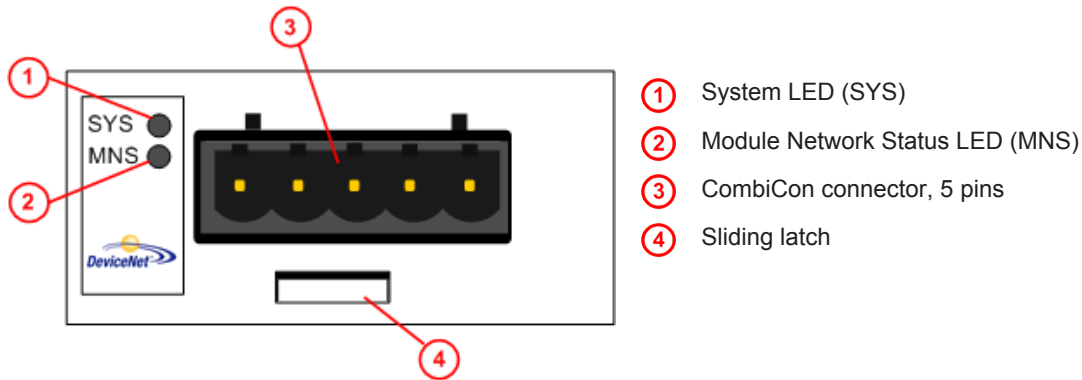


Front view netJACK CC-Link

For a description of the LED signals used by CC-Link, see section *LEDs CC-Link Slave* [► page 108].

For a description of the pinning of the network interface, see section *Pinning CC-Link Interface* [► page 113].

10.3.2.3 Front view of netJACK with DeviceNet

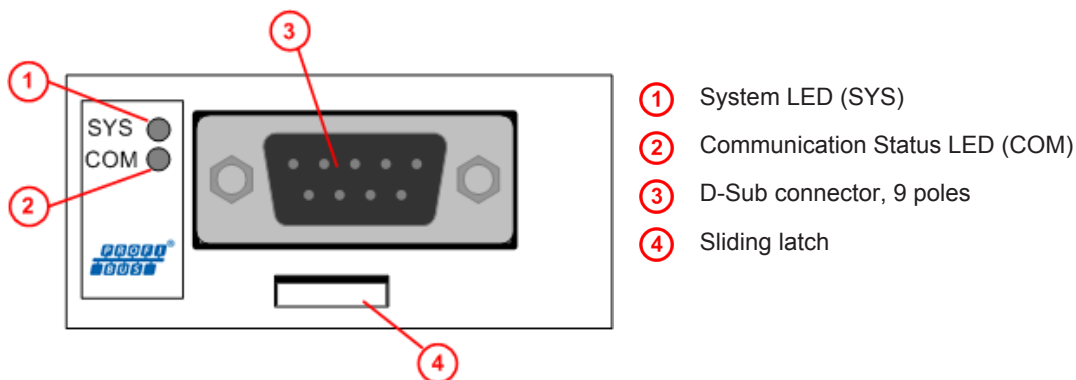


Front view netJACK DeviceNet

For a description of the LED signals used by DeviceNet, see section *LEDs DeviceNet Master* [► page 109] and section *LEDs DeviceNet Slave* [► page 110].

For a description of the pinning of the network interface, see section *Pinning DeviceNet Interface* [► page 114].

10.3.2.4 Front view of netJACK with PROFIBUS DP



Front view netJACK PROFIBUS DP

For a description of the LED signals used by PROFIBUS DP, see section *LEDs PROFIBUS DP Master* [► page 111] and section *LEDs PROFIBUS DP Slave* [► page 111].

For a description of the pinning of the network interface, see section *Pinning PROFIBUS DP Interface* [► page 114].

10.4 Descriptions of the LEDs

10.4.1 System LED

The subsequent table describes the meaning of the **System** LED of the netJACK communication module. The meaning of the **System** LED is the same in all network protocols.

For the position of the System LED on the devices, see position (1) in section *Positions of the LEDs and control elements* [► page 81].





LED	Color	State	Meaning
SYS	Duo LED yellow/green		
	 (green)	On	Operating system is running.
	 (green/ yellow)	Blinking	Second stage bootloader is waiting for firmware.
	 (yellow)	On	Bootloader netX (= romloader) is waiting for second stage bootloader.
	 (off)	Off	Power supply for the device is missing or hardware defect.

Table 21: System status LED states

10.4.2 LEDs Real-Time Ethernet systems

10.4.2.1 LEDs EtherCAT Master V3

LED	Color	State	Meaning
RUN Position in the device drawing: (2)	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)	BOOT: Device is in Boot mode.
	☀ (green)	Single flash	SAFE-OPERATIONAL: The device is in SAFE-OPERATIONAL state.
ERR Position in the device drawing: (3)	● (off)	Off	Master has no errors
	● (red)	On	Master has detected a communication error. The error is indicated in the DPM.
LINK Ch0: (4)	LED green		
	● (green)	On	The device is linked to the Ethernet.
ACT Ch0: (6)	● (off)	Off	The device has no link to the Ethernet.
	LED yellow		
	☀ (yellow)	Flickering (load dependent)	The device sends/receives Ethernet frames.
	● (off)	Off	The device does not send/receive Ethernet frames.

Table 22: LED states for the EtherCAT Master(V3) protocol

LED state	Definition
Blinking (2.5 Hz)	The indicator turns on and off with a frequency of 2.5 Hz: "on" for 200 ms, followed by "off" for 200 ms.
Flickering (10 Hz)	The indicator turns on and off with a frequency of 10 Hz: "on" for 50 ms, followed by "off" for 50 ms.
Single flash	The indicator shows one short flash (200 ms) followed by a long "off" phase (1,000 ms).
Flickering (load dependent)	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 23: LED state definitions for the EtherCAT Master(V3) protocol

The positions of the LEDs are indicated in section *Front view of netJACK with EtherCAT Master* [► page 81].

10.4.2.2 LEDs EtherCAT Master V4

LED	Color	State	Meaning
RUN Position in the device drawing: (2)	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: (3)	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 (4)	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 (6)	LED yellow		
	● (off)	Off	This LED is not used.

Table 24: LED states for the EtherCAT Master(V4) protocol

LED state	Definition
Single flash	The indicator shows one short flash (200 ms) followed by a long "off" phase (1,000 ms).
Double flash	The indicator shows a sequence of two short flashes (each 200 ms), separated by a short off phase (200 ms). The sequence is finished by a long off phase (1,000 ms).
Triple Flash	The indicator shows a sequence of three short flashes (each 200 ms), separated by a short off phase (200 ms). The sequence is finished by a long off phase (1,000 ms).
Quadruple Flash	The indicator 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 indicator turns on and off with a frequency of 2.5 Hz: "on" for 200 ms, followed by "off" for 200 ms.
Single Flickering	The indicator is switched on and off once: "on" for 50 ms, followed by "off" for 500 ms.
Double Flickering	The indicator 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 indicator turns on and off with a frequency of 10 Hz: "on" for 50 ms, followed by "off" for 50 ms.
Flickering (load dependent)	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 25: LED state definitions for the EtherCAT Master(V4) protocol

The positions of the LEDs are indicated in section *Front view of netJACK with EtherCAT Master* [► page 81].

10.4.2.3 LEDs EtherCAT Slave

LED	Color	State	Meaning
RUN Position in the device drawing: (2)	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.
ERR Position in the device drawing: (3)	● (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 (4) , Ch1 (7)	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.
Ch0 (6) , Ch1 (9)	● (off)	Off	The device has no link to the Ethernet.
	LED yellow		
	● (off)	Off	This LED is not used.

Table 26: LED states for the EtherCAT Slave protocol

LED state	Definition
Blinking (2.5 Hz)	The indicator turns on and off with a frequency of 2.5 Hz: "on" for 200 ms, followed by "off" for 200 ms.
Single flash	The indicator shows one short flash (200 ms) followed by a long "off" phase (1,000 ms).
Double flash	The indicator shows a sequence of two short flashes (each 200 ms), separated by a short off phase (200 ms). The sequence is finished by a long off phase (1,000 ms).
Flickering (load dependent)	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 27: LED state definitions for the EtherCAT Slave protocol

The positions of the LEDs are indicated in section *Front view of netJACK with EtherCAT Slave* [► page 81].

10.4.2.4 LEDs EtherNet/IP Scanner















LED	Color	State	Meaning
MS (module status) Position in the device drawing: (2)	Duo LED red/green		
	 (green)	On	Device operational: The device is operating correctly.
	 (green)	Flashing (1 Hz)	Standby: The device has not been configured.
	 (red/green)	Flashing (1 Hz)	Self-test: The device is performing its power up testing.
	 (red)	Flashing (1 Hz)	Minor fault: The device has detected a recoverable minor fault. E. g. an incorrect or inconsistent configuration can be considered as a minor fault.
	 (red)	On	Major fault: The device has detected a non-recoverable major fault.
NS (Network status) Position in the device drawing: (3)	Duo LED red/green		
	 (green)	On	Connected: The device has at least one established connection (even to the Message Router).
	 (green)	Flashing (1 Hz)	No connections: The device has no established connections, but has obtained an IP address.
	 (red/green)	Flashing (1 Hz)	Self-test: The device is performing its power up testing.
	 (red)	Flashing (1 Hz)	Connection timeout: One or more of the connections in which this device is the target have timed out. This status will be finished only if all timed out connections are reestablished or if the device is reset.
	 (red)	On	Duplicate IP: The device has detected that its IP address is already in use.
LINK Ch0 (4) , Ch1 (7)	LED green		
	 (green)	On	The device is linked to the Ethernet.
	 (off)	Off	The device has no link to the Ethernet.
ACT Ch0 (6) , Ch1 (9)	LED yellow		
	 (gelb)	Flickering (load dependent)	The device sends/receives Ethernet frames.
	 (off)	Off	The device does not send/receive Ethernet frames.

Table 28: LED states for the EtherNet/IP Scanner protocol

LED state	Definition
Flashing (1 Hz)	The indicator turns on and off with a frequency of 1 Hz: "on" for 500 ms, followed by "off" for 500 ms.
Flickering (load dependent)	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 29: LED state definitions for the EtherNet/IP Scanner protocol

The positions of the LEDs are indicated in section *Front view of netJACK with EtherNet/IP* ► page 82].

10.4.2.5 LEDs EtherNet/IP Adapter

















LED	Color	State	Meaning
MS (module status) Position in the device drawing: (2)	Duo LED red/green		
	 (green)	On	Device operational: The device is operating correctly.
	 (green)	Flashing (1 Hz)	Standby: The device has not been configured.
	 (red/green)	Flashing (1 Hz)	Self-test: The device is performing its power up testing.
	 (red)	Flashing (1 Hz)	Minor fault: The device has detected a recoverable minor fault. E. g. an incorrect or inconsistent configuration can be considered as a minor fault.
	 (red)	On	Major fault: The device has detected a non-recoverable major fault.
	 (off)	Off	No power: The power supply to the device is missing.
NS (Network status) Position in the device drawing: (3)	Duo LED red/green		
	 (green)	On	Connected: The device has at least one established connection (even to the Message Router).
	 (green)	Flashing (1 Hz)	No connections: The device has no established connections, but has obtained an IP address.
	 (red/green)	Flashing (1 Hz)	Self-test: The device is performing its power up testing.
	 (red)	Flashing (1 Hz)	Connection timeout: One or more of the connections in which this device is the target have timed out. This status will be finished only if all timed out connections are reestablished or if the device is reset.
	 (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 (4) , Ch1 (7)	LED green		
	 (green)	On	The device is linked to the Ethernet.
	 (off)	Off	The device has no link to the Ethernet.
ACT Ch0 (6) , Ch1 (9)	LED yellow		
	 (yellow)	Flickering (load dependent)	The device sends/receives Ethernet frames.
	 (off)	Off	The device does not send/receive Ethernet frames.

Table 30: LED states for the EtherNet/IP Adapter protocol

LED state	Definition
Flashing (1 Hz)	The indicator turns on and off with a frequency of 1 Hz: "on" for 500 ms, followed by "off" for 500 ms.
Flickering (load dependent)	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 31: LED state definitions for the EtherNet/IP Adapter protocol

The positions of the LEDs are indicated in section *Front view of netJACK with EtherNet/IP* [► page 82].

10.4.2.6 LEDs Open Modbus/TCP

LED	Color	State	Meaning
RUN Position in the device drawing: (2)	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.
ERR Position in the device drawing: (3)	● (off)	Off	No communication error
	⦿ (red)	Flashing (2 Hz, 25% on)	System error
	● (red)	On	Communication error active
LINK Ch0 (4) , Ch1 (9)	LED green		
	● (green)	On	The device is linked to the Ethernet.
ACT Ch0 (6) , Ch1 (9)	● (off)	Off	The device has no link to the Ethernet.
	LED yellow		
	⦿ (yellow)	Flickering (load dependent)	The device sends/receives Ethernet frames.
	● (off)	Off	The device does not send/receive Ethernet frames.

Table 32: LED states for the OpenModbusTCP protocol

LED state	Definition
Flashing (1 Hz)	The indicator 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 indicator turns on and off with a frequency of 2 Hz: "on" for 125 ms, followed by "off" for 375 ms.
Flashing (5 Hz)	The indicator turns on and off with a frequency of 5 Hz: "on" for 100 ms, followed by "off" for 100 ms.
Flickering (load dependent)	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 33: LED state definitions for the OpenModbusTCP protocol

The positions of the LEDs are indicated in section *Front view of netJACK with Open Modbus/TCP* [► page 82].

10.4.2.7 LEDs POWERLINK Controlled Node V2 and V3

LED	Color	State	Meaning
BS (Bus status) Position in the device drawing: (2)	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.
BE (Bus Error) Position in the device drawing: (3)	● (off)	Off	Slave has no error
	● (red)	On	Slave has detected an error
L/A Ch0 (4) , Ch1 (7)	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.
Ch0 (6) , Ch1 (9)	● (off)	Off	The device has no link to the Ethernet.
	LED yellow		
	● (off)	Off	This LED is not used.

Table 34: LED states for the POWERLINK Controlled Node protocol

LED state	Definition
Triple Flash	The indicator shows a sequence of three short flashes (each 200 ms), separated by a short off phase (200 ms). The sequence is finished by a long off phase (1,000 ms).
Double flash	The indicator shows a sequence of two short flashes (each 200 ms), separated by a short off phase (200 ms). The sequence is finished by a long off phase (1,000 ms).
Single flash	The indicator shows one short flash (200 ms) followed by a long "off" phase (1,000 ms).
Flickering (10 Hz)	The indicator turns on and off with a frequency of approximately 10 Hz: On for approximately 50 ms, followed by off for 50 ms.
Blinking (2.5 Hz)	The indicator turns on and off with a frequency of approximately 2.5 Hz: On for approximately 200 ms, followed by off for 200 ms.
Flickering (load dependent)	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 35: LED state definitions for the POWERLINK Controlled Node protocol

The positions of the LEDs are indicated in section *Front view of netJACK with POWERLINK* [► page 83].

10.4.2.8 LEDs PROFINET IO Controller V2

LED	Color	State	Meaning
SF (System Failure) Position in the device drawing: (2)	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 (<i>together with SF "red ON"</i>)	No valid Master license
BF (Bus Failure) Position in the device drawing: (3)	Duo LED red/green		
	● (off)	Off	No error
	☀ (red)	Flashing (2 Hz)	Configuration fault: Not all configured IO-Devices are connected.
	● (red)	On (<i>together with SF "red ON"</i>)	No valid Master license
	● (red)	On (<i>together with SF "red ON"</i>)	No Connection: No Link.
LINK Ch0 (4) , Ch1 (7)	LED green		
	● (green)	On	The device is linked to the Ethernet.
	● (off)	Off	The device has no link to the Ethernet.
RX/TX Ch0 (6) , Ch1 (9)	LED yellow		
	☀ (yellow)	Flickering (load dependent)	The device sends/receives Ethernet frames.
	● (off)	Off	The device does not send/receive Ethernet frames.

Table 36: 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 dependent)	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 37: LED state definitions for the PROFINET IO-Controller protocol

The positions of the LEDs are indicated in section *Front view of netJACK with PROFINET IO* ► page 83].

10.4.2.9 LEDs PROFINET IO Controller V3







SYS	SF	BF	Meaning
System Status	System Failure Position in the device drawing: (2)	Bus Failure Position in the device drawing: (3)	LED name name
Yellow/green	Red/green	Red/green	Colours of the Duo LEDs SYS, SF or BF
Firmware and Configuration			
● Off	● Off	● Off	Power supply for the device is missing or hardware defect.
● On, yellow	● Off	● Off	No second stage bootloader found in Flash memory.
 Flashing, green/ yellow, cyclic	● Off	● Off	No firmware file found in Flash file system.
● On, green	● On, red	● Off	PROFINET IO Controller is not configured.
● On, green	● Off	● On, red	No Ethernet port has a link. E. g., no cable connected to any of the Ethernet ports.
● On, green	● Off	 Flashing, red, 2 Hz	PROFINET IO Controller is not online (Bus is switched to Off).
PROFINET communication			
● On, green	● Off or ● On, red	 Flashing, red, 1 Hz	Not all configured devices are in data exchange.
● On, green	● On, red	-	One IO Device connected to the PROFINET IO Controller reports a problem.
● On, green	● Off	● Off	All devices are in data exchange and no problem has been reported by any device.
PROFINET IO Controller operation			
● On, green	 Flashing, red, 1 Hz, 3 s	● Off	A PROFINET DCP Set Signal has been received.
● On, green	 Flashing, red, 2 Hz	 Flashing, red, 2 Hz	The PROFINET IO Controller has detected an address conflict. Another device in the network is using the same Name of Station or IP address as the PROFINET IO Controller. Or Watchdog error
● On, green	● On, red	● On, red	No valid Master license

Table 38: PROFINET IO Controller, SYS, COM0 and COM1 LEDs states





LED	Color	State	Meaning
LINK Ch0 (4) , Ch1 (7)	LED green		
	 (green)	On	The device is linked to the Ethernet.
	 (off)	Off	The device has no link to the Ethernet.
RX/TX Ch0 (6) , Ch1 (9)	LED yellow		
	 (yellow)	Flickering (load dependent)	The device sends/receives Ethernet frames.
	 (off)	Off	The device does not send/receive Ethernet frames.

Table 39: PROFINET IO Controller, Ethernet LEDs states

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 (1 Hz)	The indicator turns on and off 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 dependent)	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 40: PROFINET IO Controller, LEDs states definitions

The positions of the LEDs are indicated in section *Front view of netJACK with PROFINET IO* [► page 83].

10.4.2.10 LEDs PROFINET IO Device

LED	Color	State	Meaning
SF (System Failure) Position in the device drawing: (2)	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: (3)	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 (4) , Ch1 (7)	LED green		
	● (green)	On	The device is linked to the Ethernet.
	● (off)	Off	The device has no link to the Ethernet.
RX/TX Ch0 (6) , Ch1 (9)	LED yellow		
	☀ (yellow)	Flickering (load dependent)	The device sends/receives Ethernet frames.
	● (off)	Off	The device does not send/receive Ethernet frames.

Table 41: LED states for the PROFINET IO-Device 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 dependent)	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 42: LED state definitions for the PROFINET IO-Device protocol

The positions of the LEDs are indicated in section *Front view of netJACK with PROFINET IO* [► page 83].

10.4.2.11 LEDs Sercos Master





















LED	Color	State	Meaning
STA Position in the device drawing: (2)	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: (3)	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 (4) , Ch1 (7)	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.
Ch0 (6) , Ch1 (9)	LED yellow		
	 (off)	Off	This LED is not used.

Table 43: LED states for the Sercos Master protocol

LED state	Definition
Single flash	The indicator shows one short flash (200 ms) followed by a long "off" phase (1,000 ms).
Double flash	The indicator shows a sequence of two short flashes (each 200 ms), separated by a short off phase (200 ms). The sequence is finished by a long off phase (1,000 ms).
Triple Flash	The indicator shows a sequence of three short flashes (each 200 ms), separated by a short off phase (200 ms). The sequence is finished by a long off phase (1,000 ms).
Quadruple Flash	The indicator 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 indicator turns on and off with a frequency of 2.5 Hz: "on" for 200 ms, followed by "off" for 200 ms.
Single Flickering	The indicator is switched on and off once: 'on' for 50 ms, followed by 'off' for 500 ms.
Double Flickering	The indicator 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 indicator turns on and off with a frequency of 10 Hz: 'on' for 50 ms, followed by 'off' for 50 ms.
Flickering (load dependent)	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 44: LED state definitions for the Sercos Master protocol

The positions of the LEDs are indicated in section *Front view of netJACK with Sercos Master* [► page 84].

10.4.2.12 LEDs Sercos Slave
















LED	Color	State	Meaning
S Position in the device drawing: (2)	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 (3 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	CP0: 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 \geq (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
L/A Ch0: (3) Ch1: (6)	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 connection to the Ethernet.
	LED yellow		
	 (off)	Off	This LED is not used.

Table 45: LED states for the Sercos Slave protocol

LED state	Definition
Flashing (2 Hz)	The indicator turns on and off with a frequency of 2 Hz: <i>one color</i> : On for appr. 250 ms, followed by off for appr. 250 ms. <i>two colors</i> : 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.
(2 x green/3s)	Flashing orange / green / orange, each for 250 ms, then green on for 2 seconds and 250 ms.
(3 x green/3s)	Flashing green / orange / green / orange / green, each for 250 ms, then orange on for 1 second and 750 ms.
(1 x orange/3s)	Flashing orange for 250 ms, then green on for 2 second an 750 ms.
(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 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 46: LED state definitions for the Sercos Slave protocol

The positions of the LEDs are indicated in section *Front view of netJACK with Sercos Slave* [► page 84].

10.4.2.13 LEDs VARAN Client

LED	Color	State	Meaning
RUN Position in the device drawing: (2)	Duo LED red/green		
	● (green)	On	Configured and communication is active.
	☼ (green)	Blinking (5 Hz)	Configured and communication is inactive.
	● (off)	Off	Not configured.
ERR Position in the device drawing: (3)	Duo LED red/green		
	● (off)	Off	Configured.
	☼ (red)	Blinking (5 Hz)	Not configured.
	● (red)	On	Communication error occurred.
LINK IN Ch0 (4) LINK OUT Ch1 (7)	LED green		
	● (green)	On	The device is linked to the Ethernet.
	● (off)	Off	The device has no link to the Ethernet.
ACT IN Ch0 (6) ACT OUT Ch1 (9)	LED yellow		
	☼ (yellow)	Flickering (load dependent)	The device sends/receives Ethernet frames.
	● (off)	Off	The device does not send/receive Ethernet frames.

Table 47: LED states for the VARAN Client protocol

LED state	Definition
Blinking (5 Hz)	The indicator turns on and off with a frequency of 5 Hz: "on" for 100 ms, followed by "off" for 100 ms.
Flickering (load dependent)	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 48: LED state definitions for the VARAN Client protocol

The positions of the LEDs are indicated in section *Front view of netJACK with VARAN Client* [► page 85].

10.4.3 LEDs fieldbus systems

10.4.3.1 LEDs CANopen Master








LED	Color	State	Meaning
CAN Position in the device drawing: (2)	Duo LED red/green		
	 (green)	On	OPERATIONAL: The device is in the OPERATIONAL state.
	 (green)	Blinking (2.5 Hz)	PREOPERATIONAL: The device is in the PREOPERATIONAL state.
	 (green)	Single flash	STOPPED: The device is in STOPPED state.
	 (red)	Single flash	Warning limit reached: At least one of the error counters of the CAN controller has reached or exceeded the warning level (too many error frames).
	 (red)	Double flash	Error control event: A guard event (NMT Slave or NMT Master) or a heartbeat event (Heartbeat consumer) has occurred.
	 (red)	On	Bus off: The CAN controller is in bus OFF state.
	 (off)	Off	RESET: The device is executing a reset or the device has no configuration.

Table 49: LED states for the CANopen Master protocol

LED state	Definition
Blinking (2.5 Hz)	The indicator turns on and off with a frequency of 2.5 Hz: "on" for 200 ms, followed by "off" for 200 ms.
Single flash	The indicator shows one short flash (200 ms) followed by a long "off" phase (1,000 ms).
Double flash	The indicator shows a sequence of two short flashes (each 200 ms), separated by a short "off" phase (200 ms). The sequence is finished by a long "off" phase (1,000 ms).

Table 50: LED state definitions for the CANopen Master protocol

The position of the LED is indicated in section *Front view of netJACK with CANopen* [► page 86].

10.4.3.2 LEDs CANopen Slave










LED	Color	State	Meaning
CAN Position in the device drawing: (2)	Duo LED red/green		
	 (green)	On	OPERATIONAL: The device is in the OPERATIONAL state.
	 (green)	Blinking (2.5 Hz)	PREOPERATIONAL: The device is in the PREOPERATIONAL state.
	 (green)	Single flash	STOPPED: The device is in STOPPED state.
	  (red/green)	Flickering (10 Hz)	Auto baud rate detection active: The Device is in the auto baud rate detection mode.
	 (red)	Single flash	Warning limit reached: At least one of the error counters of the CAN controller has reached or exceeded the warning level (too many error frames).
	 (red)	Double flash	Error control event: A guard event (NMT Slave or NMT Master) or a heartbeat event (Heartbeat consumer) has occurred.
	 (red)	On	Bus off: The CAN controller is in bus OFF state.
	 (off)	Off	RESET: The device is executing a reset or the device has no configuration.

Table 51: States of the CAN LED for the CANopen Slave protocol

LED state	Definition
Flickering (10 Hz)	The indicator turns on and off with a frequency of 10 Hz: "on" for 50 ms, followed by "off" for 50 ms.
Blinking (2.5 Hz)	The indicator turns on and off with a frequency of 2.5 Hz: "on" for 200 ms, followed by "off" for 200 ms.
Single flash	The indicator shows one short flash (200 ms) followed by a long "off" phase (1,000 ms).
Double flash	The indicator shows a sequence of two short flashes (each 200 ms), separated by a short off phase (200 ms). The sequence is finished by a long off phase (1,000 ms).

Table 52: LED state definitions for the CANopen Slave protocol

The position of the LED is indicated in section *Front view of netJACK with CANopen* [► page 86].

10.4.3.3 LEDs CC-Link Slave






LED	Color	State	Meaning
L RUN Position in the device drawing: (2)	LED green		
	 (green)	On	After participating in the network, the device receives both refresh and polling signals or just the refresh signal normally.
	 (off)	Off	1. Before participating in the network 2. Unable to detect carrier 3. Timeout 4. Resetting hardware
L ERR Position in the device drawing: (3)	LED red		
	 (red)	Blinking	The switch setting has been changed from the setting at the reset cancellation (blinks for 0.4 sec.).
	 (red)	On	1. CRC error 2. Address parameter error (0.65 or greater is set including the number of occupied stations) 3. Baud rate switch setting error during cancellation of reset (5 or greater)
	 (off)	Off	1. Normal communication 2. Resetting hardware

Table 53: LED states for the CC-Link Slave protocol

The positions of the LEDs are indicated in section *Front view of netJACK with CC-Link* [► page 86].

10.4.3.4 LEDs DeviceNet Master







LED	Color	State	Meaning
MNS Position in the device drawing: (2)	Duo LED red/green		
	 (green)	On	Device operational AND on-line, connected Device is online and has established all connections with all Slaves.
	 (green)	Flashing (1 Hz)	Device operational AND on-line Device is online and has established no connection in the established state. - Configuration missing, incomplete or incorrect.
	 (green/red/off)	Flashing (2 Hz) Green/Red/Off	Self-test after power on
	 (red)	Flashing (1 Hz)	Minor fault and/or connection time-out Device is online and has established one or more connections in the established state. It has data exchange with at least one of the configured Slaves. Minor or recoverable fault: No data exchange with one of the configured Slaves. One or more Slaves are not connected. Connection timeout. No network power present.
	 (red)	On	Critical fault or critical link failure Critical connection failure; device has detected a network error: duplicate MAC-ID or severe error in CAN network (CAN-bus off).
	 (off)	Off	Device is not powered - The device may not be powered. Device is not on-line and/or no network power - The device has not yet completed the Dup_MAC_ID test. - The device is powered, but the network power is missing.

Table 54: LED states for the DeviceNet Master protocol

LED state	Definition
Flashing (1 Hz)	The indicator turns on and off with a frequency of 1 Hz: "on" for 500 ms, followed by "off" for 500 ms.
Flashing (2 Hz) green/red/off	The indicator turns on green on for 250 ms, then red on for 250 ms, then off.

Table 55: LED state definitions for the DeviceNet Master protocol

10.4.3.5 LEDs DeviceNet Slave







LED	Color	State	Meaning
MNS Position in the device drawing: (2)	Duo LED red/green		
	 (green)	On	Device operational AND on-line, connected Device is online and has established all connections with all Slaves.
	 (green)	Flashing (1 Hz)	Device operational AND on-line Device is online and has established no connection in the established state. - Configuration missing, incomplete or incorrect.
	 (green/red/off)	Flashing (2 Hz) green/red/off	Self-test after power on
	 (red)	Flashing (1 Hz)	Minor fault and/or connection time-out Device has no connection to the Master. Minor or recoverable fault: No data exchange with the Master. Connection timeout. No network power present.
	 (red)	On	Critical fault or critical link failure Critical connection failure; device has detected a network error: duplicate MAC-ID or severe error in CAN network (CAN-bus off).
	 (off)	Off	Device is not powered - The device may not be powered. Device is not on-line and/or no network power - The device has not yet completed the Dup_MAC_ID test. - The device is powered, but the network power is missing.

Table 56: LED states for the DeviceNet Slave protocol

LED state	Definition
Flashing (1 Hz)	The indicator turns on and off with a frequency of 1 Hz: "on" for 500 ms, followed by "off" for 500 ms.
Flashing (2 Hz) green/red/off	The indicator turns on green on for 250 ms, then red on for 250 ms, then off.

Table 57: LED state definitions for the DeviceNet Slave protocol

The positions of the LEDs are indicated in section *Front view of netJACK with DeviceNet* [► page 87].

10.4.3.6 LEDs PROFIBUS DP Master







LED	Color	State	Meaning
COM Position in the device drawing: (2)	Duo LED red/green		
	 (green)	On	Communication to all Slaves is established.
	 (green)	Blinking (5 Hz)	PROFIBUS is configured, but the bus communication is not yet released from the application.
	 (green)	Flashing, acyclic	No configuration or faulty configuration
	 (red)	Blinking (5 Hz)	Communication to at least one Slave is disconnected.
	 (red)	On	Communication to all Slaves is disconnected or another serious error has occurred. Redundant Mode: The active Master was not found.
	 (off)	Off	Device is not switched on or supply voltage is missing.

Table 58: LED states for the PROFIBUS DP Master protocol

LEDs states	Definition
Blinking (5 Hz)	The indicator turns on and off with a frequency of 5 Hz: "on" for 100 ms, followed by "off" for 100 ms.
Flashing, acyclic	The indicator turns on and off in irregular intervals.

Table 59: LED state definitions for the PROFIBUS DP Master protocol

10.4.3.7 LEDs PROFIBUS DP Slave







LED	Color	State	Meaning
COM Position in the device drawing: (2)	Duo LED red/green		
	 (green)	On	Communication to all Slaves is established.
	 (green)	Blinking (5 Hz)	PROFIBUS is configured, but the bus communication is not yet released from the application.
	 (green)	Flashing, acyclic	No configuration or faulty configuration
	 (red)	Blinking (5 Hz)	Communication to at least one Slave is disconnected.
	 (red)	On	Communication to all Slaves is disconnected or another serious error has occurred. Redundant Mode: The active Master was not found.
	 (off)	Off	Device is not switched on or supply voltage is missing.

Table 60: LED states for the PROFIBUS DP Master protocol

LEDs states	Definition
Blinking (5 Hz)	The indicator turns on and off with a frequency of 5 Hz: "on" for 100 ms, followed by "off" for 100 ms.
Flashing, acyclic	The indicator turns on and off in irregular intervals.

Table 61: LED state definitions for the PROFIBUS DP Master protocol

The position of the LED is indicated in section *Front view of netJACK with PROFIBUS DP* [► page 87].

10.5 Pinning

10.5.1 Pinning Real-Time Ethernet interface

The following picture shows the pinning of the Real-Time Ethernet interface of the netJACK communication module:

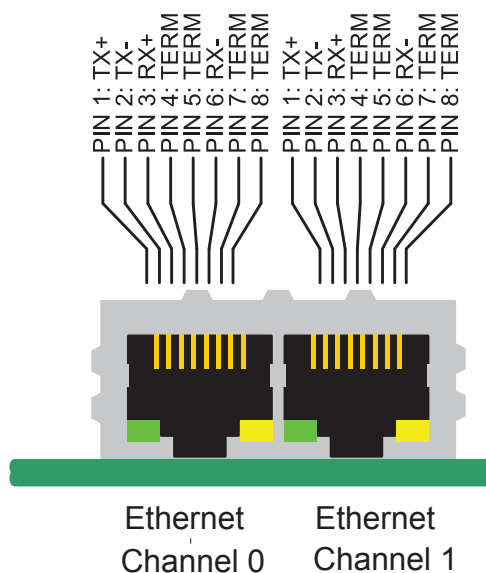


Figure 21: Pinning of Ethernet connectors

Pin	Signal	Description
1	TX +	Transmit Data +
2	TX –	Transmit Data –
3	RX +	Receive Data +
4	TERM	Bob Smith Termination
5	TERM	
6	RX –	Receive Data –
7	TERM	Bob Smith Termination
8	TERM	

Table 62: Ethernet interface channel 0 and channel 1 pin assignments



Note:

Auto-crossover function is supported by the netJACK modules.

10.5.2 Pinning CANopen interface

The following picture shows the pinning of the CANopen interface of the netJACK communication module:

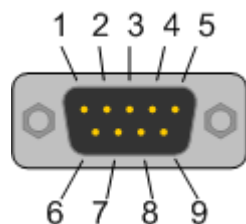


Figure 22: Pinning CANopen interface (D-Sub-Plug, 9-poles)

Pin	Signal	Description
2	CAN_L	CAN-Low bus line
3	CAN_GND	CAN reference potential
7	CAN_H	CAN-High bus line

Table 63: Pinning CANopen interface

10.5.3 Pinning CC-Link interface

The following picture shows the pinning of the CC-Link interface of the netJACK communication module:

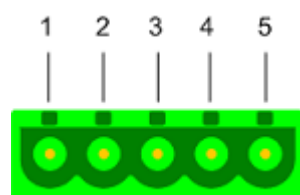


Figure 23: Pinning CC-Link interface (CombiCon connector, 5-pole)

Pin	Signal	Description
1	DA	Data positive
2	DB	Data negative
3	DG	Data ground
4	SLD	Shield, internally connected to common ground
5	FG	Field ground, internally connected to common ground

Table 64: Pinning CC-Link

10.5.4 Pinning DeviceNet interface

The following picture shows the pinning of the DeviceNet interface of the netJACK communication module:

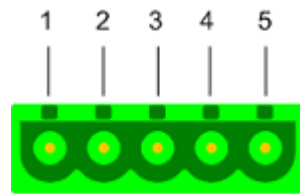


Figure 24: Pinning DeviceNet interface (CombiCon connector, 5-pole)

Connection with CombiCon plug	Signal	Color	Description
1	V-	Black	Data reference potential of the DeviceNet power supply
2	CAN_L	Blue	CAN Low signal
3	Drain		Shield
4	CAN_H	White	CAN High signal
5	V+	Red	+24 V DeviceNet supply voltage

Table 65: Pinning DeviceNet interface

10.5.5 Pinning PROFIBUS DP interface

The following picture shows the pinning of the PROFIBUS interface of the netJACK communication module:

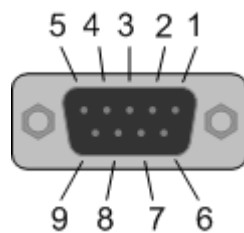


Figure 25: Pinning PROFIBUS DP interface (D-Sub-female connector, 9-pole)

Pin	Signal	Description
3	RxD/TxD-P	Receive-/Send data-P (Line B at plug)
5	DGND	Data reference potential
6	VP	Power supply (positive)
8	RxD/TxD-N	Receive-/Send data--N (Line A at plug)

Table 66: Pinning PROFIBUS DP interface



Note:

The PROFIBUS interface is a potential free RS-485 interface according to PROFIBUS Standard EN 50170.

11 Troubleshooting

In case of error, please follow the hints given below:

General

- Check, if the requirements for operating the netJACK are fulfilled (see *Prerequisites for Operation* [▶ page 35] section).



Important:

If you are using a Windows operating system and a **cifX Device Driver**, make sure you have upgraded the **cifX Device Driver** to the version indicated in the *Reference to Drivers* [▶ page 17] table.

LINK-LEDs

If you are using Real-Time Ethernet:

- Check the LINK LEDs status, to see if a connection to the Ethernet is established.

For further information on this, please refer to the corresponding protocol in the section *Descriptions of the LEDs* [▶ page 88].

Cable

- Check, if the pinning of the used cable is correct.

Configuration

- Check, if master and slave configuration match.

Diagnosing with SYCON.net

In the SYCON.net configuration software, use the **Online > Diagnosis** menu to display diagnostic information about the device.



Note:

You will find more information about device diagnosis functions in the operating manual of the corresponding protocol.

Diagnosing with netX Configuration Tool

In the netX Configuration Tool, use the **netX Configuration Tool > Diagnostics** menu to display diagnostic information about the device.

12 Technical data

12.1 Technical Data of the netJACK Communication Modules

See the following pages for the technical data of the netJACK Communication Modules.

12.1.1 NJ 10D-COS

NJ 10D-COS	Parameter	Value
Device identification	Part number	1652.540
Communication controller	Type	netX 10 processor
Integrated memory	RAM	8 MB SDRAM
	FLASH	4 MB serial Flash EPROM
Host interface	Type	Parallel or serial Dual-Port Memory
	Dual-port memory size	64 KB (16 address lines), where 8 KB used by firmware (13 address lines, lowest 8 KB)
	Data width (parallel)	8 or 16 bit
	Serial dual-port memory interface	SPI, mode 3 (CPOL = 1, CPHA = 1)
	Serial transmission rate	Max. 50 MHz
	Connector Type	60-Pin connector (SAMTEC FSI-130-03-G-D-AB)
CANopen communication	Supported firmware	CANopen Slave
CANopen interface	Transmission rate	10 kBits/s to 1 MBit/s
	Interface type	ISO 11898, potential free
Diagnostic Interface	USB or UART	Signal at host interface Available only if integrated in host system
Display	LEDs	SYS System Status
		CAN Communication Status
Power supply	Voltage	+3.3 V \pm 5 % DC
	Current at 3.3 V (typically)	250 mA
	Current at 3.3 V (maximum)	300 mA
Signal lines	Voltage of IO signal lines	+3.3 V \pm 5 %
Environmental conditions	Ambient temperature range for operation	-20 ... +70°C
Dimensions (L x W x H)	Length	68.2 mm / 60 mm (with / without DSUB connector)
	Width	53.4 mm (at front panel) / 50.4 mm (at body)
	Height	25.2 mm (at front panel) / 19.2 mm (at body)
Weight	Weight	< 80 g
Device	Housing	Closed module
	Protection class	IP40
	Width / distance of pins	0.55 mm / 0.45 mm
	Mounting	Via milled footprint holes in the carrier board and retaining brackets. No mounting accessories required.
	Mounting/pulling cycles	max. 10
	Hot plugging	No
Certification	CE Sign	Yes
	RoHS	Yes
	Reach	Yes
	UL Certification	Yes, cURus
	UL File No.	E334100
Applied Tests	Emission	CISPR 11; Class A
	Immunity	according to EN 61131-2:2003
	Shock and vibration	EN60068-2-6 Fc / EN60068-2-27 Ea

Table 67: Technical Data NJ 10D-COS

12.1.2 NJ 10D-CCS

NJ 10D-CSS	Parameter	Value
Device identification	Part number	1652.740
Communication controller	Type	netX 10 processor
Integrated memory	RAM	8 MB SDRAM
	FLASH	4 MB serial Flash EPROM
Host interface	Type	Parallel or serial Dual-Port Memory
	Dual-port memory size	64 KB (16 address lines), where 8 KB used by firmware (13 address lines, lowest 8 KB)
	Data width (parallel)	8 or 16 bit
	Serial dual-port memory interface	SPI, mode 3 (CPOL = 1, CPHA = 1)
	Serial transmission rate	Max. 50 MHz
	Connector Type	60 pin connector (SAMTEC FSI-130-03-G-D-AB)
CC-Link communication	Supported firmware	CC-Link Slave
CC-Link interface	Transmission rate	156 kBits/s to 10 MBit/s
	Interface type	RS-485, potential free
	Connector	CombiCon connector, 5-pin
Diagnostic Interface	USB or UART	Signal at host interface Available only if integrated in host system
Display	LEDs	SYS System Status
		L RUN/L ERR Communication Status
Power supply	Voltage	+3.3 V \pm 5 % DC
	Current at 3.3 V (typically)	250 mA
	Current at 3.3 V (maximum)	300 mA
Signal lines	Voltage of IO signal lines	+3.3 V \pm 5 %
Environmental conditions	Ambient temperature range for operation	0 ... +55 °C
Dimensions (L x W x H)	Length	68.2 (with CombiCon connector) / 60 mm (without connector)
	Width	53.4 mm (at front panel) / 50.4 mm (body)
	Height	25.2 mm (at front panel) / 19.2 mm (body)
Weight	Weight	< 80 g
Device	Housing	Closed module
	Protection class	IP40
	Width / distance of pins	0.55 mm / 0.45 mm
	Mounting	Via milled footprint holes in the carrier board and retaining brackets. No mounting accessories required.
	Mounting/pulling cycles	max. 10
	Hot plugging	No
Certification	CE Sign	Yes
	RoHS	Yes
	Reach	Yes
	UL Certification	Yes, cURus
	UL File No.	E334100
Applied tests	Emission	CISPR 11; Class A
	Immunity	according to EN 61131-2:2003
	Shock and vibration	EN60068-2-6 Fc / EN60068-2-27 Ea

Table 68: Technical Data NJ 10D-CSS

12.1.3 NJ 10D-DNS

NJ 10D-DNS	Parameter	Value
Device identification	Part number	1652.520
Communication controller	Type	netX 10 processor
Integrated memory	RAM	8 MB SDRAM
	FLASH	4 MB serial Flash EPROM
Host interface	Type	Parallel or serial Dual-Port Memory
	Dual-port memory size	64 KB (16 address lines), where 8 KB used by firmware (13 address lines, lowest 8 KB)
	Data width (parallel)	8 or 16 bit
	Serial dual-port memory interface	SPI, mode 3 (CPOL = 1, CPHA = 1)
	Serial transmission rate	Max. 50 MHz
	Connector Type	60 pin connector (SAMTEC FSI-130-03-G-D-AB)
DeviceNet communication	Supported firmware	DeviceNet Slave
DeviceNet interface	Transmission rate	125 kBits/s, 250 kBits/s, 500 kBits/s
	Interface type	ISO 11898, potential free
	Connector	CombiCon connector, 5-pin
Diagnostic Interface	USB or UART	Signal at host interface Available only if integrated in host system
Display	LEDs	SYS System Status
		MNS Module Network Status
Power supply	Voltage	+3.3 V \pm 5 % DC
	Current at 3.3 V (typically)	250 mA
	Current at 3.3 V (maximum)	300 mA
Signal lines	Voltage of IO signal lines	+3.3 V \pm 5 % DC
Environmental conditions	Ambient temperature range for operation	-20 ... +70 °C
Dimensions (L x W x H)	Length	60 mm
	Width	53.4 mm (at front panel) / 50.4 mm (body)
	Height	25.2 mm (at front panel) / 19.2 mm (body)
Weight	Weight	< 80 g
Device	Housing	Closed module
	Protection class	IP40
	Width / distance of pins	0.55 mm / 0.45 mm
	Mounting	Via milled footprint holes in the carrier board and retaining brackets. No mounting accessories required.
	Mounting/pulling cycles	max. 10
	Hot plugging	No
Certification	CE Sign	Yes
	RoHS	Yes
	Reach	Yes
	UL Certification	Yes, cURus
	UL File No.	E334100
Applied tests	Emission	CISPR 11; Class A
	Immunity	according to EN 61131-2:2003
	Shock and vibration	EN60068-2-6 Fc / EN60068-2-27 Ea

Table 69: Technical Data NJ 10D-DNS

12.1.4 NJ 10D-DPS

NJ 10D-DPS	Parameter	Value
Device identification	Part number	1652.420
Communication controller	Type	netX 10 processor
Integrated memory	RAM	8 MB SDRAM
	FLASH	4 MB serial Flash EPROM
Host interface	Type	Parallel or serial Dual-Port Memory
	Dual-port memory size	64 KB (16 address lines), where 8 KB used by firmware (13 address lines, lowest 8 KB)
	Data width (parallel)	8 or 16 bit
	Serial dual-port memory interface	SPI, mode 3 (CPOL = 1, CPHA = 1)
	Serial transmission rate	Max. 50 MHz
	Connector Type	60-Pin connector (SAMTEC FSI-130-03-G-D-AB)
PROFIBUS communication	Supported firmware	PROFIBUS DP Slave
PROFIBUS interface	Transmission rate	Fixed values ranging from 9.6 kBits/s to 12 MBit/s
	Interface type	RS-485, potential-free
Diagnostic Interface	USB or UART	Signal at host interface Available only if integrated in host system
Display	LEDs	SYS System Status
		COM Communication Status
Power supply	Voltage	+3.3 V \pm 5 % DC
	Current at 3.3 V (typically)	310 mA
	Current at 3.3 V (maximum)	850 mA
Signal lines	Voltage of IO signal lines	+3.3 V \pm 5 %
Environmental conditions	Ambient temperature range for operation	-20 ... +70 °C
Dimensions (L x W x H)	Length	68.2 mm / 60 mm (with / without DSUB connector)
	Width	53.4 mm (at front panel) / 50.4 mm (at body)
	Height	25.2 mm (at front panel) / 19.2 mm (at body)
Weight	Weight	approx. 68 g
Device	Housing	Closed module
	Protection class	IP40
	Width / distance of pins	0.55 mm / 0.45 mm
	Mounting	Via milled footprint holes in the carrier board and retaining brackets. No mounting accessories required.
	Mounting/pulling cycles	max. 10
	Hot plugging	No
Certification	CE Sign	Yes
	RoHS	Yes
	Reach	Yes
	UL Certification	Yes, cURus
	UL File No.	E334100
Applied tests	Emission	CISPR 11; Class A
	Immunity	according to EN 61131-2:2003
	Shock and vibration	EN60068-2-6 Fc / EN60068-2-27 Ea

Table 70: Technical Data NJ 10D-DPS

12.1.5 NJ 51D-RE (preliminary)

NJ 51D-RE	Parameter	Value
Device ID	Part number	1662.100
Communication controller	Type	netX 51 processor
Integrated memory	RAM	8 MB SDRAM
	FLASH	4 MB serial Flash EPROM
Host interface	Type	Parallel or serial Dual-Port Memory
	Dual-port memory size	64 KB (16 address lines), where 16 KB used by firmware (14 address lines, lowest 16 KB)
	Data width (parallel)	8 or 16 bit
	Serial dual-port memory interface	SPI, mode 3 (CPOL = 1, CPHA = 1)
	Serial transmission rate	Max. 50 MHz
	Connector type	60 pin connector, SAMTEC FSI-130-03-G-D-AB
Ethernet communication	Supported firmware	EtherCAT Slave, EtherNet/IP Adapter/Slave, Open Modbus/TCP, PROFINET IO Device (Slave), Sercos Slave
Ethernet interface	Transmission rate	100 MBit/s or 10 MBit/s (depending on loaded firmware)
	Interface type	100 BASE-TX, isolated or 10 BASE-T (depending on loaded firmware)
	Half duplex/Full duplex	supported (at 100 MBit/s)
	Auto-Negotiation	depending on loaded firmware
	Auto-Crossover	depending on loaded firmware
Diagnostic Interface	USB or UART	Signal at host interface Available only if interpreted in host system
Display	LEDs	SYS System Status
		COM0/1 Communication status
		Link0/1; Activity0/1
Power supply	Voltage	+3.3 V \pm 5 % DC
	Current at 3.3 V (typically)	570 mA
	Current at 3.3 V (maximum)	not measured yet
	Power consumption	1.94 W
Signal lines	Voltage of IO signal lines	+3,3 V \pm 5 %
Environmental conditions	Ambient temperature range for operation	-20 ... +65°C
Dimensions (L x W x H)	Length	62 mm (with RJ45 connector), 60 mm (without RJ45 connector)
	Width	53.4 mm (at front panel), 50.4 mm (at body)
	Height	25.2 mm (at front panel), 19.2 mm (at body)
Weight	Weight	approx. 60 g
Device	Housing / Protection class	Closed module / IP40
	Width / distance of pins	0.55 mm / 0.45 mm
	Mounting	Via milled footprint holes in the carrier board and retaining brackets. No mounting accessories required.
	Mounting/pulling cycles	max. 10
	Hot plugging	No
Zertifizierung	CE Sign	Yes
	RoHS	Yes
	Reach	Yes
	UL Certification	Yes, cURus
	UL File No.	E334100

NJ 51D-RE	Parameter	Value
Applied tests	Emission	CISPR 11; Class A
	Immunity	according to EN 61131-2:2003
	Shock and vibration	EN60068-2-6 Fc / EN60068-2-27 Ea

Table 71: Technical Data NJ 51D-RE

12.1.6 NJ 100EN-RE

NJ 100EN-RE	Parameter	Value
Device identification	Part number	1625.100
Communication controller	Type	netX 100 processor
Integrated memory	RAM	8 MB SDRAM
	FLASH	4 MB serial Flash EPROM
Host interface	Type	PCI Express
	Port type	One-Lane-Port
	Frequency	1.5 GHz
	Connector Type	40 pin connector, SAMTEC FSI-120-03-G-D-AB
Ethernet communication	Supported firmware	EtherCAT Master, EtherCAT Slave, EtherNet/IP Scanner/Master, EtherNet/IP Adapter/Slave, Open Modbus/TCP, POWERLINK Controlled Node/Slave, PROFINET IO Controller (Master), PROFINET IO Device (Slave), Sercos Master, Sercos Slave, TCP/IP, VARAN Client
Ethernet interface	Transmission rate	100 MBit/s or 10 MBit/s (depending on loaded firmware)
	Interface type	100 BASE-TX, isolated or 10 BASE-T (depending on loaded firmware)
	Half duplex/Full duplex	supported (at 100 MBit/s)
	Auto-Negotiation	depending on firmware
	Auto-Crossover	depending on firmware
Diagnostic Interface	USB	Signal at host interface Available only if integrated in host system
Display	LEDs	SYS System Status, COM0/1 Communication status, Link, Activity
Power supply	Voltage	+3.3 V \pm 5 % DC
	Current at 3.3 V (typically)	746 mA
	Power Consumption	2.5 W
Signal lines	Voltage of IO signal lines	+3.3 V \pm 5 %
Environmental conditions	Ambient temperature range for operation	-20 ... +65°C
Dimensions (L x W x H)	Length	62 mm / 60 mm (with / without RJ45 connector)
	Width	53.4 mm (at front panel) / 50.4 mm (at body)
	Height	25.2 mm (at front panel) / 19.2 mm (at body)
Weight	Weight	approx. 60 g
Device	Housing	Closed module
	Protection class	IP40
	Number of pins	40
	Width / distance of pins	0.55 mm / 0.45 mm
	Mounting	Via milled footprint holes in the carrier board and retaining brackets. No mounting accessories required.
	Mounting/pulling cycles	max. 10
	Hot plugging	No
Certification	CE Sign	Yes
	RoHS	Yes
	Reach	Yes
	UL Certification	Yes, cURus
	UL File No.	E334100
Applied tests	Emission	CISPR 11; Class A
	Immunity	according to EN 61131-2:2003
	Shock and vibration	EN60068-2-6 Fc / EN60068-2-27 Ea

Table 72: Technical Data NJ 100EN-RE

12.1.7 NJ 100EN-CO

NJ 100EN-CO	Parameter	Value
Device identification	Part number	1625.500
Communication controller	Type	netX 100 processor
Integrated memory	RAM	8 MB SDRAM
	FLASH	4 MB serial Flash EPROM
Host interface	Type	PCI Express
	Port type	One-Lane-Port
	Frequency	1.5 GHz
	Connector Type	40 pin connector (SAMTEC FSI-120-03-G-D-AB)
CANopen communication	Supported firmware	CANopen Master, CANopen Slave
CANopen interface	Transmission rate	10 kBits/s to 1 MBit/s
	Interface type	ISO 11898, potential free
Diagnostic Interface	USB	Signal at host interface Available only if integrated in host system
Display	LEDs	SYS System Status, CAN Communication Status
Power supply	Voltage	+3.3 V \pm 5 % DC
	Current at 3.3 V (typically)	590 mA
	Power Consumption	1.95 W (at 590 mA)
Signal lines	Voltage of IO signal lines	+3.3 V \pm 5 %
Environmental conditions	Ambient temperature range for operation	-20 ... +65 °C
Dimensions (L x W x H)	Length	68.2 mm / 60 mm (with / without DSUB connector)
	Width	53.4 mm (at front panel) / 50.4 mm (at body)
	Height	25.2 mm (at front panel) / 19.2 mm (at body)
Weight	Weight	approx. 68 g
Device	Housing	Closed module
	Protection class	IP40
	Width / distance of pins	0.55 mm / 0.45 mm
	Mounting	Via milled footprint holes in the carrier board and retaining brackets. No mounting accessories required.
	Mounting/pulling cycles	max. 10
	Hot plugging	No
Certification	CE Sign	Yes
	RoHS	Yes
	Reach	Yes
	UL Certification	Yes, cURus
	UL File No.	E334100
Applied tests	Emission	CISPR 11; Class A
	Immunity	according to EN 61131-2:2003
	Shock and vibration	EN60068-2-6 Fc / EN60068-2-27 Ea

Table 73: Technical Data NJ 100EN-CO

12.1.8 NJ 100EN-DN

NJ 100EN-DN	Parameter	Value
Device identification	Part number	1625.510
Communication controller	Type	netX 100 processor
Integrated memory	RAM	8 MB SDRAM
	FLASH	4 MB serial Flash EPROM
Host interface	Type	PCI Express
	Port type	One-Lane-Port
	Frequency	1.5 GHz
	Connector Type	40 pin connector, (SAMTEC FSI-120-03-G-D-AB)
DeviceNet communication	Supported firmware	DeviceNet Master, DeviceNet Slave
DeviceNet interface	Transmission rate	125 kBits/s, 250 kBits/s, 500 kBits/s
	Interface type	ISO 11898, potential free
	Connector	CombiCon connector, 5-pin
Diagnostic Interface	USB	Signal at host interface Available only if integrated in host system
Display	LEDs	SYS System Status, MNS Module Network Status (green: MS, red: NS)
Power supply	Voltage	+3.3 V \pm 5 % DC
	Current at 3.3 V (typically)	590 mA
	Power Consumption	1.95 W (at 590 mA)
Signal lines	Voltage of IO signal lines	+3.3 V \pm 5 %
Environmental conditions	Ambient temperature range for operation	-20 ... +65 °C
Dimensions (L x W x H)	Length	60 mm
	Width	53.4 mm (at front panel) / 50.4 mm (body)
	Height	25.2 mm (at front panel) / 19.2 mm (body)
Weight	Weight	approx. 54 g
Device	Housing	Closed module
	Protection class	IP40
	Width / distance of pins	0.55 mm / 0.45 mm
	Mounting	Via milled footprint holes in the carrier board and retaining brackets. No mounting accessories required.
	Mounting/pulling cycles	max. 10
	Hot plugging	No
Certification	CE Sign	Yes
	RoHS	Yes
	Reach	Yes
	UL Certification	Yes, cURus
	UL File No.	E334100
Applied tests	Emission	CISPR 11; Class A
	Immunity	according to EN 61131-2:2003
	Shock and vibration	EN60068-2-6 Fc / EN60068-2-27 Ea

Table 74: Technical Data NJ 100EN-DN

12.1.9 NJ 100EN-DP

NJ 100EN-DP	Parameter	Value
Device identification	Part number	1625.400
Communication controller	Type	netX 100 processor
Integrated memory	RAM	8 MB SDRAM
	FLASH	4 MB serial Flash EPROM
Host interface	Type	PCI Express
	Port type	One-Lane-Port
	Frequency	1.5 GHz
	Connector Type	40 pin connector (SAMTEC FSI-120-03-G-D-AB)
PROFIBUS communication	Supported firmware	PROFIBUS DP Master, PROFIBUS DP Slave
PROFIBUS interface	Transmission rate	Fixed values ranging from 9.6 kBits/s to 12 MBit/s
	Interface type	RS-485, potential-free
Diagnostic Interface	USB	Signal at host interface Available only if integrated in host system
Display	LEDs	SYS System Status, COM Communication Status
Power supply	Voltage	+3.3 V \pm 5 % DC
	Current at 3.3 V (typically)	560 mA
	Power Consumption	1.85 W (at 560 mA)
Signal lines	Voltage of IO signal lines	+3.3 V \pm 5 %
Environmental conditions	Ambient temperature range for operation	-20 ... +70 °C
Dimensions (L x W x H)	Length	68.2 mm (with DSUB connector), 60 mm (without DSUB connector)
	Width	53.4 mm (at front panel), 50.4 mm (body)
	Height	25.2 mm (at front panel), 19.2 mm (body)
Weight	Weight	approx. 68 g
Device	Housing	Closed module
	Protection class	IP40
	Width / distance of pins	0.55 mm / 0.45 mm
	Mounting	Via milled footprint holes in the carrier board and retaining brackets. No mounting accessories required.
	Mounting/pulling cycles	max. 10
	Hot plugging	No
Certification	CE Sign	Yes
	RoHS	Yes
	Reach	Yes
	UL Certification	Yes, cURus
	UL File No.	E334100
Applied tests	Emission	CISPR 11; Class A
	Immunity	according to EN 61131-2:2003
	Shock and vibration	EN60068-2-6 Fc / EN60068-2-27 Ea

Table 75: Technical Data NJ 100EN-DP

12.1.10 NJ 100DN-RE

NJ 100DN-RE	Parameter	Value
Device identification	Part number	1623.100
Communication controller	Type	netX 100 processor
Integrated memory	RAM	8 MB SDRAM
	FLASH	4 MB serial Flash EPROM
Host interface	Type	Dual-port memory, parallel
	Dual-port memory size	64 KB (16 address lines), where 16 KB used by firmware (14 address lines, lowest 16 KB)
	Data width (parallel)	8 or 16 bit
	Connector Type	80 pin connector (SAMTEC FSI-140-03-G-D-AB)
Ethernet communication	Supported firmware	EtherCAT Master, EtherCAT Slave, EtherNet/IP Scanner/ Master, EtherNet/IP Adapter/Slave, Open Modbus/TCP, POWERLINK Controlled Node/Slave, PROFINET IO Controller (Master), PROFINET IO Device (Slave), Sercos Master, Sercos Slave, TCP/IP, VARAN Client
Ethernet interface	Transmission rate	100 MBit/s or 10 MBit/s (depending on loaded firmware)
	Interface type	100 BASE-TX, isolated or 10 BASE-T (depending on loaded firmware)
	Half duplex/Full duplex	supported (at 100 MBit/s)
	Auto-Negotiation	depending on firmware
	Auto-Crossover	depending on firmware
Diagnostic Interface	USB or UART	Signal at host interface Available only if integrated in host system
Display	LEDs	SYS System Status, COM0/1 Communication status, Link, Activity
Power supply	Voltage	+3.3 V \pm 5 % DC
	Current at 3.3 V (typically)	620 mA
	Power Consumption	2.11 W
Signal lines	Voltage of IO signal lines	+3.3 V \pm 5 %
Environmental conditions	Ambient temperature range for operation	-20°C – 70°C
	Ambient temperature range for storage	-40 ... +85°C
Dimensions (L x W x H)	Length	62 mm / 60 mm (with / without RJ45 connector)
	Width	53.4 mm (at front panel) / 50.4 mm (at body)
	Height	25.2 mm (at front panel) / 19.2 mm (at body)
Weight	Weight	< 80 g
Device	Housing / protection class	Closed module / IP40
	Width / distance of pins	0.55 mm / 0.45 mm
	Mounting	Via milled footprint holes in the carrier board and retaining metal brackets. No mounting accessories required.
	Mounting/pulling cycles	max. 10
	Hot plugging	No
Certification	CE Sign	Yes
	RoHS	Yes
	Reach	Yes
	UL Certification	Yes, cURus
	UL File No.	E334100

NJ 100DN-RE	Parameter	Value
Applied tests	Emission	CISPR 11; Class A
	Immunity	according to EN 61131-2:2003
	Shock and vibration	EN60068-2-6 Fc / EN60068-2-27 Ea

Table 76: Technical Data NJ 100DN-RE

12.1.11 NJ 100DN-CO

NJ 100DN-CO	Parameter	Value
Device identification	Part number	1623.500
Communication controller	Type	netX 100 processor
Integrated memory	RAM	8 MB SDRAM
	FLASH	4 MB serial Flash EPROM
Host interface	Type	Dual-port memory, parallel
	Dual-port memory size	64 KB (16 address lines), where 16 KB used by firmware (14 address lines, lowest 16 KB)
	Data width (parallel)	8 or 16 bit
	Connector Type	80 pin connector, SAMTEC FSI-140-03-G-D-AB
CANopen communication	Supported firmware	CANopen Master, CANopen Slave
CANopen interface	Transmission rate	10 kBits/s to 1 MBit/s
	Interface type	ISO 11898, potential free
Diagnostic Interface	USB or UART	Signal at host interface Available only if integrated in host system
Display	LEDs	SYS System Status, CAN Communication Status
Power supply	Voltage	+3.3 V \pm 5 % DC
	Current at 3.3 V (typically)	490 mA
	Power Consumption	1,67 W
Signal lines	Voltage of IO signal lines	+3.3 V \pm 5 %
Environmental conditions	Ambient temperature range for operation	-20°C – 70°C
	Ambient temperature range for storage	-40 ... +85°C
Dimensions (L x W x H)	Length	68.20 mm (with DSUB connector), 60 mm (without DSUB connector)
	Width	53.4 mm (at front panel), 50.4 mm (at body)
	Height	25.2 mm(at front panel), 19.2 mm (at body)
Weight	Weight	< 80 g
Device	Housing	Closed module
	Protection class	IP40
	Width / distance of pins	0.55 mm / 0.45 mm
	Mounting	Via milled footprint holes in the carrier board and retaining metal brackets. No mounting accessories required.
	Mounting/pulling cycles	max. 10
	Hot-plugging	No
Certification	CE Sign	Yes
	RoHS	Yes
	Reach	Yes
	UL Certification	Yes, cURus
	UL File No.	E334100
Applied tests	Emission	CISPR 11; Class A
	Immunity	according to EN 61131-2:2003
	Shock and vibration	EN60068-2-6 Fc / EN60068-2-27 Ea

Table 77: Technical Data NJ 100DN-CO

12.1.12 NJ 100DN-DN

NJ 100DN-DN	Parameter	Value
Device identification	Part number	1623.510
Communication controller	Type	netX 100 processor
Integrated memory	RAM	8 MB SDRAM
	FLASH	4 MB serial Flash EPROM
Host interface	Type	Dual-port memory, parallel
	Dual-port memory size	64 KB (16 address lines), where 16 KB used by firmware (14 address lines, lowest 16 KB)
	Data width (parallel)	8 or 16 bit
	Connector Type	80 pin connector, SAMTEC FSI-140-03-G-D-AB
DeviceNet communication	Supported firmware	DeviceNet Master, DeviceNet Slave
DeviceNet interface	Transmission rate	125 kBits/s, 250 kBits/s, 500 kBits/s
	Interface type	ISO 11898, potential free
	Connector	CombiCon connector, 5-pin
Diagnostic Interface	USB or UART	Signal at host interface Available only if integrated in host system
Display	LEDs	SYS System Status, MNS Module Network Status
Power supply	Voltage	+3.3 V \pm 5 % DC
	Current at 3.3 V (typically)	530 mA
	Power Consumption	1.82 W
Signal lines	Voltage of IO signal lines	+3.3 V \pm 5 %
Environmental conditions	Ambient temperature range for operation	-20°C – 70°C
	Ambient temperature range for storage	-40 ... +85°C
Dimensions (L x W x H)	Length	60 mm
	Width	53.4 mm (at front panel) / 50.4 mm (body)
	Height	25.2 mm (at front panel) / 19.2 mm (body)
Weight	Weight	< 80 g
Device	Housing /	Closed module
	Protection class	IP40
	Width / distance of pins	0.55 mm / 0.45 mm
	Mounting	Via milled footprint holes in the carrier board and retaining metal brackets. No mounting accessories required.
	Mounting/pulling cycles	max. 10
	Hot plugging	No
Certification	CE Sign	Yes
	RoHS	Yes
	Reach	Yes
	UL Certification	Yes, cURus
	UL File No.	E334100
Applied tests	Emission	CISPR 11; Class A
	Immunity	according to EN 61131-2:2003
	Shock and vibration	EN60068-2-6 Fc / EN60068-2-27 Ea

Table 78: Technical Data NJ 100DN-DN

12.1.13 NJ 100DN-DP

NJ 100DN-DP	Parameter	Value
Device identification	Part number	1623.400
Communication controller	Type	netX 100 processor
Integrated memory	RAM	8 MB SDRAM
	FLASH	4 MB serial Flash EPROM
Host interface	Type	Dual-port memory, parallel
	Dual-port memory size	64 KB (16 address lines), where 16 KB used by firmware (14 address lines, lowest 16 KB)
	Data width (parallel)	8 or 16 bit
	Connector Type	80 pin connector, SAMTEC FSI-140-03-G-D-AB
PROFIBUS communication	Supported Firmware	PROFIBUS DP Master, PROFIBUS DP Slave
PROFIBUS interface	Transmission rate	Fixed values ranging from 9.6 kBits/s to 12 MBit/s
	Interface type	RS-485, potential-free
Diagnostic Interface	USB or UART	Signal at host interface Available only if integrated in host system
Display	LEDs	SYS System Status, COM Communication status
Power supply	Voltage	+3.3 V \pm 5 % DC
	Current at 3.3 V (typically)	Not measured yet
	Power Consumption	Not measured yet
Signal lines	Voltage of IO signal lines	+3.3 V \pm 5 %
Environmental conditions	Ambient temperature range for operation	-20°C – 70°C
	Ambient temperature range for storage	-40 ... +85°C
Dimensions (L x W x H)	Length	68.20 mm (with DSUB connector), 60 mm (without DSUB connector)
	Width	53.4 mm (at front panel), 50.4 mm (at body)
	Height	25.2 mm(at front panel), 19.2 mm (at body)
Weight	Weight	approx. 68 g
Device	Housing /	Closed module
	Protection class	IP40
	Width / distance of pins	0.55 mm / 0.45 mm
	Mounting	Via milled footprint holes in the carrier board and retaining metal brackets. No mounting accessories required.
	Mounting/pulling cycles	max. 10
	Hot plugging	No
Certification	CE Sign	Yes
	RoHS	Yes
	Reach	Yes
	UL Certification	Yes, cURus
	UL File No.	E334100
Applied tests	Emission	CISPR 11; Class A
	Immunity	according to EN 61131-2:2003
	Shock and vibration	EN60068-2-6 Fc / EN60068-2-27 Ea

Table 79: Technical Data NJ 100DN-DP

12.2 Technical Data of the Real-Time Ethernet Systems

12.2.1 EtherCAT Master V3

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	5760 bytes
Maximum number of cyclic output data	5760 bytes
Minimum bus cycle time	205 μ s, 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.
Acyclic communication	CoE (CANopen over EtherCAT) CoE-Upload, CoE-Download Maximum 1500 bytes
Functions	Get OD List Get object description Get entry description Emergency Slave diagnostics
Bus Scan	Supported
Redundancy	Supported, but not at the same time with Distributed Clocks
Distributed Clocks	Supported, but not at the same time with Redundancy
Topology	Line or ring
Baud rate	100 MBit/s
Data transport layer	Ethernet II, IEEE 802.3
Configuration File (ethercat.xml or config.nxd)	NJ 100EN-RE, NJ 100DN-RE: Maximum 2 MByte
Limitations	The size of the bus configuration file is limited by the size of the RAM Disk (1 Mbyte) or FLASH disk (2 Mbyte). All CoE Uploads, Downloads and information services must fit in one TLR-Packet. Fragmentation is not supported Distributed Clock and Redundancy cannot be used at the same time.
Reference to firmware/stack version	V3.0

Table 80: Technical Data EtherCAT Master Protocol V3

12.2.2 EtherCAT Master V4

Parameter	Description
Maximum number of EtherCAT slaves	Maximum of 388 slaves, if RCX_GET_SLAVE_HANDLES_REQ service is used for determining number of slaves. The number of usable slaves depends on several parameters: the available memory for the configuration file (see 'configuration file' below), used cycle time, frame propagation time.
Maximum number of cyclic input data	Appr. 4600 bytes, if no LRW command (Logical Read Write) is used for process data
Maximum number of cyclic output data	Appr. 4600 bytes, if no LRW command (Logical Read Write) is used for process data
Acyclic communication	CoE (CANopen over EtherCAT): SDO, SDOINFO, Emergency FoE (File Access over EtherCAT) SoE (Servo Drive Profile over EtherCAT) EoE (Ethernet over EtherCAT) Configurable with SYCON.net: CoE If the file ETHERCAT.XML contains the appropriate configuration information (e.g. created with "EtherCAT Configurator"), following functions can be used: CoE, SoE, EoE
Mailbox protocols	CoE, EoE, FoE, SoE
Functions	Distributed Clocks Redundancy Slave diagnostics Bus scan
Minimum bus cycle time	250 µs, depending on the used number of slaves and the used number of cyclic input data and output data.
Topology	Line or ring
Slave station address range	1 – 14335
Data transport layer	Ethernet II, IEEE 802.3, 100 MBit/s, full-duplex
Configuration file (ETHERCAT.XML or CONFIG.NXD)	Maximum 1 MByte (CONFIG.NXD), maximum 3 MByte (ETHERCAT.XML)
Synchronization via ExtSync	Supported (not configurable with SYCON.net)
ENI Slave-to-Slave copy infos	Supported (not configurable with SYCON.net)
Hot Connect	Supported (not configurable with SYCON.net)
EoE (Ethernet over EtherCAT)	Via NDIS

Parameter	Description
Limitations	<p>The size of the bus configuration file is limited by the size of the RAM disk (1 MByte) or Flash disk (3 MByte).</p> <p>Store-and-forward switches cannot be used within network topology due to hard receive timing model</p> <p>RCX_GET_SLAVE_HANDLES_REQ can only communicate up to 388 slaves.</p> <p>Process data is restricted by the dual-port memory to 5760 bytes.</p>
Reference to firmware / stack version	V4.4

Table 81: Technical data EtherCAT Master protocol

12.2.3 EtherCAT Slave V2.5 and V4.6

Parameter	Description NJ 51X-RE	Description NJ 100XX-RE
Maximum number of cyclic input data	1024 bytes	256* bytes
Maximum number of cyclic output data	1024 bytes	256* bytes
Acyclic communication	SDO SDO Master-Slave SDO Slave-Slave (depending on Master capability)	SDO SDO Master-Slave SDO Slave-Slave (depending on Master capability)
Type	Complex Slave	Complex Slave
Functions	Emergency	Emergency
FMMUs	8	3
SYNC Manager	4	4
Distributed Clocks (DC)	Supported, 32 Bit	Supported, 32 Bit
Baud rate	100 MBit/s	100 MBit/s
Data transport layer	Ethernet II, IEEE 802.3	Ethernet II, IEEE 802.3
Limitation	LRW is not supported	LRW is not supported
Reference to firmware/ stack version	V4.6	V2.5 and V4.6

Table 82: Technical Data EtherCAT Slave Protocol



Note:

for NJ 100XX-RE: * The loadable firmware supports for the number of cyclic input data and for cyclic output data in total up to 512 bytes. If more than 256 bytes for input data or for output data shall be exchanged via EtherCAT, then a customer specific XML file is necessary. Additionally the following formula applies: The sum of the input data length and the output data length may not exceed 512 bytes, where each length has to be rounded up to the next multiple of 4 for this calculation.

12.2.4 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)
Maximum number of unscheduled data	1400 bytes per telegram
UCMM, Class 3	Supported
Explicit Messages, Client and Server Services	Get_Attribute_Single/All Set_Attribute_Single/All
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
Maximal number of user specific objects	20
Topology	Tree, Line, Ring
DLR (Device Level Ring)	Beacon based 'Ring Node'
ACD (Address Conflict Detection)	Supported
DHCP	Supported
BOOTP	Supported
Baud rates	10 and 100 MBit/s
Data transport layer	Ethernet II, IEEE 802.3
Switch function	Integrated
Limitations	CIP Sync Services are not implemented TAGs are not supported
Reference to firmware/stack version	V2.9

Table 83: Technical data EtherNet/IP Scanner (master) protocol

12.2.5 EtherNet/IP-Adapter

Parameter	Description
Maximum number of input data	504 bytes
Maximum number of output data	504 bytes
IO connection types (implicit)	1 exclusive owner, 1 listen only, 1 input only
IO Connection trigger types	Cyclic, minimum 1 ms* Application Triggered, minimum 1 ms* Change Of State, minimum 1 ms* * depending on number of connections and number of input and output data
Explicit Messages	Connected and unconnected
Maximum number of connections	8, explicit and implicit connections
Unconnected Message Manager (UCMM)	Supported
Quick connect	Supported
Predefined standard objects	Identity Object Message Route Object Assembly Object Connection Manager DLR Object QoS Object TCP/IP Object Ethernet Link Object Time Sync Object
Reset services	Identity Object Reset Service of Type 0 and 1
Maximum number of user specific objects	20
DLR V2 (ring topology)	Supported
ACD (Address Conflict Detection)	Supported
DHCP	Supported
BOOTP	Supported
Baud rates	10 and 100 MBit/s
Duplex modes	Half duplex, Full duplex, Auto negotiation
MDI modes	MDI, MDI-X, Auto-MDIX
Data transport layer	Ethernet II, IEEE 802.3
Switch function	Integrated
Limitations	CIP Sync Services are not implemented TAGs are not supported
Reference to firmware/stack version	V2.11

Table 84: Technical Data EtherNet/IP Adapter (Slave) Protocol

12.2.6 Open Modbus/TCP

Parameter	Description
Maximum number of input data	2880 Registers
Maximum number of output data	2880 Registers
Acyclic communication	Read/Write Register: - Maximum 125 Registers per Read Telegram (FC 3, 4, 23), - Maximum 121 Registers per Write Telegram (FC 23), - Maximum 123 Registers per Write Telegram (FC 16) Read/Write Coil: - Maximum 2000 Coils per Read Telegram (FC 1, 2), - Maximum 1968 Coils per Write Telegram (FC 15)
Modbus Function Codes	1, 2, 3, 4, 5, 6, 7, 15, 16, 23* 43 * Function Code 23 can be used via the packet API, but not with the Command Table.
Protocol Mode	Message Mode (Client Mode): - Client (using the Command Table: The data is stored in the I/O process data image) - Client (using the packet API: The I/O process data image is not used) - Server (using the packet API: The I/O process data image is not used) I/O Mode (Server Mode): - Server (only) (The data is stored in the I/O process data image)
Command table (configuration API only)	Max. 16 servers configurable Max. 256 commands
Baud rates	10 and 100 MBit/s
Data transport layer	Ethernet II, IEEE 802.3
Reference to firmware/stack version	V2.6

Table 85: Technical Data Open Modbus/TCP Protocol

12.2.7 POWERLINK Controlled Node V2

Parameter	Description
Maximum number of cyclic input data	1490 bytes
Maximum number of cyclic output data	1490 bytes
Acyclic data transfer	SDO Upload/Download
Functions	SDO over ASND and UDP
Baud rate	100 MBit/s, half-duplex
Data transport layer	Ethernet II, IEEE 802.3
Ethernet POWERLINK version	V 2
Limitation	No slave to slave communication
Reference to firmware/stack version	V2.1

Table 86: Technical data POWERLINK Controlled Node protocol

12.2.8 POWERLINK Controlled Node V3

Parameter	Description
Maximum number of cyclic input data	1490 bytes
Maximum number of cyclic output data	1490 bytes
Acyclic data transfer	SDO Upload/Download
Functions	SDO over ASND and UDP
Baud rate	100 MBit/s, half-duplex
Data transport layer	Ethernet II, IEEE 802.3
Ethernet POWERLINK version	V 2
Limitation	No slave to slave communication
Reference to firmware/stack version	V3.2/V3.3

Table 87: Technical data POWERLINK Controlled Node protocol

12.2.9 PROFINET IO Controller V2

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)
Acyclic communication	Read/Write Record Limited to 1392 bytes per telegram Limited to 4096 bytes per request
Alarm processing	yes, but requires handling in host application program
Diagnostic data	One 200 byte buffer per IO device
DCP functions via API	Name Assignment IO-Devices (DCP SET NameOfStation) Set IO-Devices IP (DCP SET IP) Signal IO-Device (DCP SET SIGNAL) Reset IO-Device to factory settings (DCP Reset FactorySettings) Bus scan (DCP IDENTIFY ALL)
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	RT over UDP not supported Multicast communication not supported DHCP is not supported (neither for PROFINET IO-Controller nor for the IO-Devices) 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) WriteMultiple-Record service is not supported
Reference to firmware/stack version	V2.6

Table 88: Technical data PROFINET IO RT Controller

12.2.10 PROFINET IO Controller V3

Parameter	Description
Maximum number of ARs (Application Relation)	128 for RT communication 64 for IRT communication
Maximum number of cyclic input data	5652 bytes, including provider and consumer status
Maximum number of cyclic output data	5700 bytes, including provider and consumer status
Send clock	1 ms, 2 ms, 4 ms for RT mode 250 µs, 500 µs, 1 ms, 2 ms, 4 ms for IRT mode
Performance limits of ARs	Max. 8 ARs, if a send clock < 500 µs Max. 16 ARs, if a send clock < 1 ms Max. 64 ARs, if a send clock < 2 ms
Maximum number of submodules	2048
Maximum amount of data per IOCR	1440 bytes
Number of IOCRs per AR	1 Input IOCR 1 Output IOCR
Maximum amount of data for acyclic read/write record access	65536 bytes
Maximum amount of record data per AR	16384 bytes
Alarm processing (configurable)	Stack processes alarms automatically Applikation processes alarms
Maximum number of ARVendorBlock	256
Maximum size of ARVendorBlockData	512 bytes
Device Access AR CMI Timeout	20 s
Functions	Automatic Name Assignment Media Redundancy Client Media Redundancy Manager (requires license)
DCP function API	Name Assignment IO-Devices (DCP SET NameOfStation) Set IO-Devices IP (DCP SET IP) Signal IO-Device (DCP SET SIGNAL) Reset IO-Device to factory settings (DCP Reset FactorySettings) Bus scan (DCP IDENTIFY ALL) DCP GET
PROFINET specification	Implemented according to V2.3 ED2 MU3 Legacy Startup supported according to PROFINET specification V2.2

Parameter	Description
Limitations	<p>The size of the bus configuration file is limited by the size of the RAM Disk (1 Mbyte)</p> <p>The usable (minimum) cycle time depends on the number of used IO Devices, the number of used input and output data.</p> <p>RT over UDP not supported</p> <p>Multicast communication not supported</p> <p>DHCP is not supported (neither for PROFINET IO Controller nor for IO-Devices)</p> <p>Only one IOCR per IO-Device per direction</p> <p>One instance of DeviceAccess AR can be used at the same time only</p> <p>MRPD is not supported</p> <p>Planning of IRT is not done by the PROFINET IO Controller protocol stack</p> <p>Sync Slave is not supported</p> <p>One fragmented acyclic services can be used at the same time only</p> <p>Multiple MRP Managers are not supported</p> <p>One DCP Service can be used in parallel only</p> <p>Multiple Sync Masters are not supported</p>
Reference to firmware / stack version	V3.2

Table 89: Technical data PROFINET IO-Controller protocol

12.2.11 PROFINET IO Device V3.4

Parameter	Description
Maximum number of cyclic input data	1024 bytes
Maximum number of cyclic output data	1024 bytes
Acyclic communication	Read/Write Record, max. 1024 bytes per telegram
Alarm Types	Process Alarm, Diagnostic Alarm, Return of SubModule Alarm Plug Alarm (implicit), Pull Alarm (implicit)
Supported protocols	RTC – Real Time Cyclic Protocol, Class 1 and 2 (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
Used Protocols (subset)	UDP, IP, ARP, ICMP (Ping)
Topology recognition	LLDP, SNMP V1, MIB2, physical device
VLAN- and priority tagging	yes
Context Management by CL-RPC	Supported
Identification & Maintenance	Read and write of I&M1-4
Minimum cycle time	1 ms for RTC1 and RTC2 250 µs for RTC3
Baud rate	100 MBit/s
Data transport layer	Ethernet II, IEEE 802.3
Limitations	RT over UDP not supported Multicast communication not supported Only one device instance is supported DHCP is not supported IRT “flex” (synchronized RT Class 2) is not supported FastStartUp is not supported. Media Redundancy (except MRP client) is not supported Access to the submodule granular status bytes (IOCS) is not supported. The amount of configured IO-data influences the minimum cycle time that can be reached. Supervisor-AR is not supported, Supervisor-DA-AR is supported Only 1 Input-CR and 1 Output-CR are supported Multiple WriteRequests are not supported Using little endian (LSB-MSB) byte order for cyclic process data instead of default big endian (MSB-LSB) byte order may have a negative impact on minimum reachable cycle time
Reference to firmware/stack version	V3.4

Table 90: Technical Data PROFINET IO RT IRT Device Protocol

12.2.12 PROFINET IO Device V3.10

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 8 IO-ARs, one Supervisor AR and one Supervisor-DA AR at the same time
Acyclic communication	Read/Write Record, max. 8 KB (fragmented)
Alarm Types	Process Alarm, Diagnostic Alarm, Return of SubModule Alarm, Plug Alarm (implicit), Pull Alarm (implicit)
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&M1-5
Minimum cycle time	1 ms for RT_CLASS_1 250 µs for RT_CLASS_3
IRT Support	RT_CLASS_3
Media Redundancy	MRP client is supported
Additional features	DCP, VLAN- and priority tagging, Shared Device (max. 1 RTC3 AR)
Baud rate	100 MBit/s
Data transport layer	Ethernet II, IEEE 802.3
PROFINET IO specification	V2.2 (legacy startup) and V2.3
Limitations	<p>RT over UDP not supported.</p> <p>Multicast communication not supported.</p> <p>Only one device instance is supported.</p> <p>DHCP is not supported.</p> <p>FastStartUp is not supported.</p> <p>The amount of configured IO-data influences the minimum cycle time that can be reached.</p> <p>Only 1 Input-CR and 1 Output-CR per AR are supported.</p> <p>Using little endian (LSB-MSB) byte order for cyclic process data instead of default big endian (MSB-LSB) byte order may have a negative impact on minimum reachable cycle time.</p> <p>System Redundancy (SR-AR) and Configuration-in-Run (CiR) are not supported.</p> <p>Max. 255 submodules can be used simultaneously within one specific Application Relation.</p> <p>SharedInput is not supported.</p> <p>MRPD is not supported.</p> <p>DFP and other HighPerformance-profile related features are not supported.</p> <p>PDEV functionality is only supported for submodules located in slot 0.</p> <p>Submodules can not be configured or used by an AR in subslot 0.</p> <p>DAP and PDEV submodules only supported in slot 0.</p>

Parameter	Description
Reference to firmware/stack version	V3.10

Table 91: Technical Data PROFINET IO Device Protocol

12.2.13 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
Hot-Plug	supported
Cross Communication	supported, but only if the master is configured by the host application program by packets.
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
Limitation	NRT channel not usable via the API.
Reference to firmware/stack version	V2.1

Table 92: Technical data Sercos Master protocol

12.2.14 Sercos Slave

Parameter	Description NJ 51D-RE	Description NJ 100DN-RE and NJ 100EN-RE
Maximum number of cyclic produced data	284 bytes (including 2 bytes Connection Control and 2 bytes IO Status)	132 bytes (including 2 bytes Connection Control and 2 bytes IO Status)
Maximum number of cyclic consumed data	276 bytes (including 2 bytes Connection Control and 2 bytes IO Control)	124 bytes (including 2 bytes Connection Control and 2 bytes IO Control)
Maximum number of slave devices	8	8
Maximum number of applicable Sercos addresses	1 ... 511	1 ... 511
Minimum cycle time	250 µs	250 µs
Topology	Line and ring	Line and ring
Communication phases	NRT, CP0, CP1, CP2, CP3, CP4, HP0, HP1, HP2	NRT, CP0, CP1, CP2, CP3, CP4, HP0, HP1, HP2
Descriptors for connections (including Connection Control and IO Status/Control)	Max. 64	Max. 64
Cross Communication (CC)	Supported	Supported
Acyclic Communication (Service Channel)	Read/Write/Standard Commands	Read/Write/Standard Commands
Baud rate	100 MBit/s	100 MBit/s
Data transport layer	Ethernet II, IEEE 802.3	Ethernet II, IEEE 802.3
Supported Sercos version	Communication Specification Version 1.3.0	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 SCP_HP Version 1.1.1 SCP_SysTime Version 1.3	SCP_FixCFG Version 1.1.1 SCP_VarCFG Version 1.1.1 SCP_VarCFG Version 1.1.3 SCP_HP Version 1.1.1 SCP_SysTime Version 1.3
Supported User SCP Profiles	SCP_WD Version 1.1.1 SCP_Diag Version 1.1.1 SCP_RTb Version 1.1.1 SCP_Mux Version 1.1.1 SCP_Sig 1.1.1 SCP_ExtMuX 1.1.2 SCP_RTbListProd 1.3 SCP_RTbListCons 1.3 SCP_RTbWordProd 1.3 SCP_RTbWordCons 1.3 SCP_OvSBasic 1.3 SCP_WDCon 1.3	SCP_WD Version 1.1.1 SCP_Diag Version 1.1.1 SCP_RTb Version 1.1.1 SCP_Mux Version 1.1.1 SCP_Sig 1.1.1 SCP_ExtMuX 1.1.2 SCP_RTbListProd 1.3 SCP_RTbListCons 1.3 SCP_RTbWordProd 1.3 SCP_RTbWordCons 1.3 SCP_OvSBasic 1.3 SCP_WDCon 1.3
Supported FSP profiles	FSP_IO FSP_Drive FSP_Encoder	FSP_IO FSP_Drive FSP_Encoder
SCP Sync	Supported	Supported
SCP_NRT	NRT Channel only forwarding	NJ 100EN-RE: Supported NJ 100DN-RE: NRT Channel only forwarding
S/IP	Supported	Supported
Identification LED	Supported	Supported
Storage location of object dictionary	Mixed mode	Mixed mode

Parameter	Description NJ 51D-RE	Description NJ 100DN-RE and NJ 100EN-RE
Limitations	Max. 2 connections: 1 for consumer and 1 for producer Modifications of the Service-Channel Object Dictionary will be volatile after reset (if it resides on device) Ethernet interface (API) not supported	Max. 2 connections: 1 for consumer and 1 for producer Modifications of the Service-Channel Object Dictionary will be volatile after reset (if it resides on device) NJ 100DN-RE: Ethernet interface (API) not supported
Reference to firmware/stack version	V3.4	V3.4

Table 93: Technical Data Sercos Slave Protocol

12.2.15 VARAN Client

Parameter	Description
Maximum number of cyclic input data	128 bytes
Maximum number of cyclic output data	128 bytes
Memory Area	Read Memory Area 1, Write Memory Area 1
Functions	Memory Read Memory Write
Integrated 2 port splitter for daisy chain topology	Supported
Baud rate	100 MBit/s
Data transport layer	Ethernet II, IEEE 802.3
VARAN protocol version	1.1.1.0
Limitations	Integrated EMAC for IP data exchange with client application not supported SPI single commands (optional feature) not supported Memory area 2 is not supported.
Reference to firmware/stack version	V1.0

Table 94: Technical Data VARAN Client Protocol

12.3 Technical Data of the Fieldbus Systems

12.3.1 CANopen Master

Parameter	Description
Maximum number of CANopen nodes	126
Maximum number of cyclic input data	3584 bytes
Maximum number of cyclic output data	3584 bytes
Maximum number of receive PDOs	512
Maximum number of transmit PDOs	512
Exchange of process data	Via PDO transfer: - synchronized, - remotely requested and - event driven (change of date)
Acyclic communication	SDO Upload/Download, max. 512 bytes per request
Functions	Emergency message (consumer and producer) Node guarding / life guarding, heartbeat PDO mapping NMT Master SYNC protocol (producer) Simple boot-up process, reading object 1000H for identification
Baud rates	10 kBits/s, 20 kBits/s, 50 kBits/s, 100 kBits/s, 125 kBits/s, 250 kBits/s, 500 kBits/s, 800 kBits/s, 1 MBits/s
CAN layer 2 access	Send/receive via API supported (11 bit/29 bit)
Data transport layer	CAN Frames
CAN Frame type for CANopen	11 Bit
Reference to version	V2.11.x.x

Table 95: Technical data CANopen Master protocol

12.3.2 CANopen Slave

Parameter	Description NJ 10D-COS	Description NJ 100DN-CO and NJ 100EN-CO
Maximum number of cyclic input data	64 bytes	512 bytes
Maximum number of cyclic output data	64 bytes	512 bytes
Maximum number of receive PDOs	8	64
Maximum number of transmit PDOs	8	64
Exchange of process data	Via PDO transfer <ul style="list-style-type: none"> • synchronized, • remotely requested and • event driven (change of date, event timer) On request of the host application program by packet	Via PDO transfer <ul style="list-style-type: none"> • synchronized, • remotely requested and • event driven (change of date, event timer) On request of the host application program by packet
Acyclic communication	SDO upload/download (server only) Emergency message (producer) Timestamp (producer/consumer)	SDO upload/download (server only) Emergency message (producer) Timestamp (producer/consumer)
Functions	Node guarding / life guarding Heartbeat: 1 producer, max. 4 consumer PDO mapping NMT Slave SYNC protocol (consumer) Error behaviour (configurable): <ul style="list-style-type: none"> • in state operational: change to state pre-operational • in any state: no state change • in state operational or pre-operational: change to state stopped 	Node guarding / life guarding Heartbeat: 1 producer, max. 64 consumer PDO mapping NMT Slave SYNC protocol (consumer) Error behaviour (configurable): <ul style="list-style-type: none"> • in state operational: change to state pre-operational • in any state: no state change • in state operational or pre-operational: change to state stopped
Baud rates	10 kBits/s, 20 kBits/s, 50 kBits/s, 100 kBits/s, 125 kBits/s, 250 kBits/s, 500 kBits/s, 800 kBits/s, 1 MBits/s Auto baudrate detection is supported	10 kBits/s, 20 kBits/s, 50 kBits/s, 100 kBits/s, 125 kBits/s, 250 kBits/s, 500 kBits/s, 800 kBits/s, 1 MBits/s Auto baudrate detection is supported
CAN layer 2 access	Send/receive via API supported (11 bit/29 bit)	Send/receive via API supported (11 bit/29 bit)
Data transport layer	CAN Frames	CAN Frames
CAN Frame type for CANopen	11 Bit	11 Bit
Reference to firmware/stack version	V3.6.x.x	V3.6.x.x

Table 96: Technical Data CANopen Slave Protocol

12.3.3 CC-Link Slave

Parameter	Description
Firmware works according to CC-Link Version 2.0:	
Station Types	Remote Device Station (up to 4 occupied stations)
Maximum input data	368 bytes
Maximum output data	368 bytes
Input data remote device station	112 bytes (RY) and 256 bytes (RWw)
Output data remote device station	112 bytes (RX) and 256 bytes (RWr)
Extension cycles	1, 2, 4, 8
Baud rates	156 kBit/s, 625 kBit/s, 2500 kBit/s, 5 MBit/s, 10 MBit/s
Limitation	Intelligent Device Station not supported
Firmware works according to CC-Link Version 1.11:	
Station Types	Remote I/O station, Remote device station' (up to 4 occupied stations)
Maximum input data	48 bytes
Maximum output data	48 bytes
Input data remote I/O station	4 bytes (RY)
Output data remote I/O station	4 bytes (RX)
Input data remote device station	4 bytes (RY) and 8 bytes (RWw) per occupied station
Output data remote device station	4 bytes (RX) and 8 bytes (RWr) per occupied station
Baud rates	156 kBit/s, 625 kBit/s, 2500 kBit/s, 5 MBit/s, 10 MBit/s
Firmware	
Reference to firmware/stack version	V2.9.x.x

Table 97: Technical Data CC-Link-Slave Protocol

12.3.4 DeviceNet Master

Parameter	Description
Maximum number of DeviceNet slaves	63
Maximum number of total cyclic input data	3584 bytes
Maximum number of total cyclic output data	3584 bytes
Maximum number of cyclic input data	255 bytes/connection
Maximum number of cyclic output data	255 bytes/connection
Maximum Configuration data	1000 bytes/slave
Acyclic communication	Explicit connection All service codes are supported
Connections	Bit Strobe Change of State Cyclic Poll Explicit Peer-to-Peer Messaging
Function	Quick Connect
Fragmentation	Explicit and I/O
UCMM	Supported
Objects	Identity Object (Class Code 0x01) Message Router Object (Class Code 0x02) DeviceNet Object (Class Code 0x03) Connection Object (Class Code 0x05) Acknowledge Handler Object (Class Code 0x06)
Baud rates	125 kBits/s, 250 kBit/s, 500 kBit/s Auto baudrate detection is not supported
Data transport layer	CAN frames
Reference to firmware/stack version	V2.3.x.x

Table 98: Technical data DeviceNet Master protocol

12.3.5 DeviceNet Slave

Parameter	Description
Maximum number of cyclic input data	255 bytes
Maximum number of cyclic output data	255 bytes
Acyclic communication	Get_Attribute_Single/All Max. 240 bytes per request Set_Attribute_Single/All Max. 240 bytes per request
Connections	Poll Change-of-state Cyclic Bit-strobe
Explicit messaging	Supported
Fragmentation	Explicit and I/O
UCMM	Not supported
Baud rates	125 kBits/s, 250 kBit/s, 500 kBit/s Auto baudrate detection is not supported
Data transport layer	CAN frames
Reference to firmware/stack version	V2.3.x.x

Table 99: Technical Data DeviceNet Slave Protocol

12.3.6 PROFIBUS DP Master

Parameter	Description
Maximum number of PROFIBUS DP slaves	125 (DPV0/DPV1)
Maximum number of total cyclic input data	5712 bytes
Maximum number of total cyclic output data	5760 bytes
Maximum number of cyclic input data	244 bytes per slave
Maximum number of cyclic output data	244 bytes per slave
Configuration data	Max. 244 bytes per slave
Parameterization data per slave	7 bytes standard parameter per slave Max. 237 bytes application specific parameters per slave
Acyclic communication	DPV1 class 1 read, write DPV1 class 1 alarm DPV1 class 2 initiate, read, write, data transport, abort
Maximum number of acyclic read/write	240 bytes per slave and telegram
Functions	Configuration in Run (CiR), requires host application program support Timestamp (Master functionality)
Redundancy	Supported, requires host application program support
Baud rate	9,6 kBits/s, 19,2 kBits/s, 31,25 kBits/s, 45,45 kBits/s, 93,75 kBits/s, 187,5 kBits/s, 500 kBits/s, 1, 5 MBits/s, 3 MBits/s, 6 MBits/s, 12 MBit/s Auto baud rate detection is not supported
Data transport layer	PROFIBUS FDL
Limitations	DPV2 isochronous mode and slave slave communication are not supported. The redundancy function cannot be used, if the master is configured by the host application program by packets.
Reference to firmware/stack version	2.6.x.x

Table 100: Technical data PROFIBUS DP Master protocol

12.3.7 PROFIBUS DP Slave

Parameter	Description
Maximum number of cyclic input data	244 bytes
Maximum number of cyclic output data	244 bytes
Maximum number of acyclic data (read/write)	240 bytes/telegram
Maximum number of modules	24
Configuration data	Max. 244 bytes
Parameter data	237 bytes application specific parameters
Acyclic communication	DP V1 Class 1 Read/Write DP V1 Class 1 Alarm DP V1 Class 2 Read/Write/Data Transport
Baud rate	9.6 kBits/s, 19.2 kBits/s, 31.25 kBits/s, 45.45 kBits/s, 93.75 kBits/s, 187.5 kBits/s, 500 kBits/s, 1.5 MBits/s, 3 MBits/s, 6 MBits/s, 12 MBit/s Auto baud rate detection is supported
Data transport layer	PROFIBUS FDL
Limitations	SSCY1S – Slave to slave communication state machine not implemented Data exchange broadcast not implemented I&M LR services other than Call-REQ/RES are not supported yet
Reference to firmware/stack version	V2.7.x.x

Table 101: Technical Data PROFIBUS DP Slave Protocol

12.4 PCI IDs netJACK on the PCI Bus

On the PCI bus, the NJ 100EN communication modules have the following PCI IDs:

PCI IDs	Value	Value
VendorID	0x15CF	0x15CF
DeviceID	0x0020	0x0020
Subsystem Vendor ID	0x15CF	0x15CF
Subsystem Device ID	0x0000	0x0001
Remark	netJACK 100 RAM based device	netJACK 100 FLASH based device

Table 102: PCI IDs netJACK on the PCI Bus

12.5 EtherNet/IP Adapter/Slave – Instance ID of I/O Data

I/O Data	Instance ID	Remark
Consumed I/O Data	100	I/O Data: EtherNet/IP Scanner/Master → EtherNet/IP Adapter/Slave.
Produced I/O Data	101	I/O Data: EtherNet/IP Adapter/Slave → EtherNet/IP Scanner/Master.

Table 103: EtherNet/IP Adapter/Slave – Instance ID of I/O Data

List of Figures

Figure 1:	Elektrostatic Sensitive Device	47
Figure 2:	Monting Principle of the netJACK.....	47
Figure 3:	Host Interface and Power Connector on NJEB-D	57
Figure 4:	Updating firmware in host system running under Windows.....	59
Figure 5:	Updating firmware by external PC.....	60
Figure 6:	Updating firmware with SYCON.net via USB interface	61
Figure 7:	Updating firmware with SYCON.net via serial interface	62
Figure 8:	Updating firmware via HTTP and Ethernet interface	63
Figure 9:	Updating firmware of a netJACK with PCI Express via Evaluation Board.....	64
Figure 10:	Updating firmware of a netJACK with PCI Express via Evaluation Board.....	65
Figure 11:	Updating firmware of a netJACK with DPM via Evaluation Board and USB or serial interface	66
Figure 12:	Updating firmware of a netJACK with DPM via Evaluation Board and NXPCAPCI	67
Figure 13:	netJACK project in SYCON.net.....	69
Figure 14:	Choosing driver	70
Figure 15:	Choosing device	71
Figure 16:	Downloading firmware to the device.....	72
Figure 17:	Top view of netJACK devices.....	78
Figure 18:	Bottom view of netJACK devices.....	79
Figure 19:	Device type label netJACK	79
Figure 20:	Device type name netJACK.....	80
Figure 21:	Pinning of Ethernet connectors	112
Figure 22:	Pinning CANOpen interface (D-Sub-Plug, 9-poles)	113
Figure 23:	Pinning CC-Link interface (CombiCon connector, 5-pole).....	113
Figure 24:	Pinning DeviceNet interface (CombiCon connector, 5-pole).....	114
Figure 25:	Pinning PROFIBUS DP interface (D-Sub-female connector, 9-pole).....	114

List of Tables

Table 1:	List of revisions	6
Table 2:	PROFINET IO-Controller firmware V2 and V3 on the product DVD	10
Table 3:	EtherCAT Master firmware V3 and V4 on the product DVD	11
Table 4:	EtherCAT Slave firmware version 2.5 and 4.6, Header, XML and Protocol API Manual	12
Table 5:	POWERLINK Controlled Node Firmware V2 and V3 on the product DVD	14
Table 6:	Reference to hardware and firmware	15
Table 7:	Reference to software tools	17
Table 8:	Reference to Drivers	17
Table 9:	Device description files for netJACK serving as Real-Time Ethernet slave	18
Table 10:	Device description files for netJACK serving as fieldbus slave	18
Table 11:	Device description files for netJACK serving as Real-Time Ethernet master	19
Table 12:	Which netJACK can be used for which protocol and host interface?	25
Table 13:	Safety symbols and sort of warning or principle	30
Table 14:	Signal words	30
Table 15:	Which netJACK for Which Protocol and Host Interface?	31
Table 16:	Steps for Installing Soft- and Hardware, configuring and Diagnosing a netJACK Communication Module (Master and Slave)	37
Table 17:	Notes on configuring RTE master device	41
Table 18:	Notes on configuring fieldbus master device	42
Table 19:	Device names in SYCON.net by communication protocol	42
Table 20:	Troubleshooting firmware update with SYCON.net	74
Table 21:	System status LED states	88
Table 22:	LED states for the EtherCAT Master(V3) protocol	89
Table 23:	LED state definitions for the EtherCAT Master(V3) protocol	89
Table 24:	LED states for the EtherCAT Master(V4) protocol	90
Table 25:	LED state definitions for the EtherCAT Master(V4) protocol	91
Table 26:	LED states for the EtherCAT Slave protocol	92
Table 27:	LED state definitions for the EtherCAT Slave protocol	92
Table 28:	LED states for the EtherNet/IP Scanner protocol	93
Table 29:	LED state definitions for the EtherNet/IP Scanner protocol	93
Table 30:	LED states for the EtherNet/IP Adapter protocol	94
Table 31:	LED state definitions for the EtherNet/IP Adapter protocol	94
Table 32:	LED states for the OpenModbusTCP protocol	95
Table 33:	LED state definitions for the OpenModbusTCP protocol	95
Table 34:	LED states for the POWERLINK Controlled Node protocol	96
Table 35:	LED state definitions for the POWERLINK Controlled Node protocol	96
Table 36:	LED states for the PROFINET IO-Controller protocol	97
Table 37:	LED state definitions for the PROFINET IO-Controller protocol	97
Table 38:	PROFINET IO Controller, SYS, COM0 and COM1 LEDs states	98

Table 39:	PROFINET IO Controller, Ethernet LEDs states	99
Table 40:	PROFINET IO Controller, LEDs states definitions.....	99
Table 41:	LED states for the PROFINET IO-Device protocol	100
Table 42:	LED state definitions for the PROFINET IO-Device protocol.....	100
Table 43:	LED states for the Sercos Master protocol	101
Table 44:	LED state definitions for the Sercos Master protocol.....	102
Table 45:	LED states for the Sercos Slave protocol	103
Table 46:	LED state definitions for the Sercos Slave protocol.....	104
Table 47:	LED states for the VARAN Client protocol.....	105
Table 48:	LED state definitions for the VARAN Client protocol	105
Table 49:	LED states for the CANopen Master protocol.....	106
Table 50:	LED state definitions for the CANopen Master protocol	106
Table 51:	States of the CAN LED for the CANopen Slave protocol	107
Table 52:	LED state definitions for the CANopen Slave protocol	107
Table 53:	LED states for the CC-Link Slave protocol	108
Table 54:	LED states for the DeviceNet Master protocol.....	109
Table 55:	LED state definitions for the DeviceNet Master protocol	109
Table 56:	LED states for the DeviceNet Slave protocol.....	110
Table 57:	LED state definitions for the DeviceNet Slave protocol	110
Table 58:	LED states for the PROFIBUS DP Master protocol.....	111
Table 59:	LED state definitions for the PROFIBUS DP Master protocol	111
Table 60:	LED states for the PROFIBUS DP Master protocol.....	111
Table 61:	LED state definitions for the PROFIBUS DP Master protocol	111
Table 62:	Ethernet interface channel 0 and channel 1 pin assignments	112
Table 63:	Pinning CANopen interface	113
Table 64:	Pinning CC-Link.....	113
Table 65:	Pinning DeviceNet interface	114
Table 66:	Pinning PROFIBUS DP interface.....	114
Table 67:	Technical Data NJ 10D-COS	117
Table 68:	Technical Data NJ 10D-CSS	118
Table 69:	Technical Data NJ 10D-DNS	119
Table 70:	Technical Data NJ 10D-DPS	120
Table 71:	Technical Data NJ 51D-RE.....	121
Table 72:	Technical Data NJ 100EN-RE	123
Table 73:	Technical Data NJ 100EN-CO	124
Table 74:	Technical Data NJ 100EN-DN	125
Table 75:	Technical Data NJ 100EN-DP	126
Table 76:	Technical Data NJ 100DN-RE	127
Table 77:	Technical Data NJ 100DN-CO	129
Table 78:	Technical Data NJ 100DN-DN	130
Table 79:	Technical Data NJ 100DN-DP	131

Table 80:	Technical Data EtherCAT Master Protocol V3	132
Table 81:	Technical data EtherCAT Master protocol.....	133
Table 82:	Technical Data EtherCAT Slave Protocol.....	135
Table 83:	Technical data EtherNet/IP Scanner (master) protocol	136
Table 84:	Technical Data EtherNet/IP Adapter (Slave) Protocol	137
Table 85:	Technical Data Open Modbus/TCP Protocol.....	138
Table 86:	Technical data POWERLINK Controlled Node protocol	139
Table 87:	Technical data POWERLINK Controlled Node protocol	139
Table 88:	Technical data PROFINET IO RT Controller	140
Table 89:	Technical data PROFINET IO-Controller protocol.....	141
Table 90:	Technical Data PROFINET IO RT IRT Device Protocol	143
Table 91:	Technical Data PROFINET IO Device Protocol.....	144
Table 92:	Technical data Sercos Master protocol	146
Table 93:	Technical Data Sercos Slave Protocol	147
Table 94:	Technical Data VARAN Client Protocol	149
Table 95:	Technical data CANopen Master protocol	150
Table 96:	Technical Data CANopen Slave Protocol	151
Table 97:	Technical Data CC-Link-Slave Protocol	152
Table 98:	Technical data DeviceNet Master protocol	153
Table 99:	Technical Data DeviceNet Slave Protocol	154
Table 100:	Technical data PROFIBUS DP Master protocol	155
Table 101:	Technical Data PROFIBUS DP Slave Protocol	156
Table 102:	PCI IDs netJACK on the PCI Bus	157
Table 103:	EtherNet/IP Adapter/Slave – Instance ID of I/O Data	157

Contacts

HEADQUARTERS

Germany

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

Support

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

SUBSIDIARIES

China

Hilscher Systemautomation (Shanghai) Co. Ltd.
200010 Shanghai
Phone: +86 (0) 21-6355-5161
E-mail: info@hilscher.cn

Support

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

France

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

Support

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

India

Hilscher India Pvt. Ltd.
Pune, Delhi, Mumbai
Phone: +91 8888 750 777
E-mail: info@hilscher.in

Italy

Hilscher Italia S.r.l.
20090 Vimodrone (MI)
Phone: +39 02 25007068
E-mail: info@hilscher.it

Support

Phone: +39 02 25007068
E-mail: it.support@hilscher.com

Japan

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

Support

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

Korea

Hilscher Korea Inc.
Seongnam, Gyeonggi, 463-400
Phone: +82 (0) 31-789-3715
E-mail: info@hilscher.kr

Switzerland

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

Support

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

USA

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

Support

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