User Manual

netJACK Communication Module

Installation, Operation and Hardware Description

Hilscher Gesellschaft für Systemautomation mbH

www.hilscher.com

Table of Contents

1 Introduction

1.1 About This Manual

1.1.1 Description of the Content

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 on page 21 ff.

1.1.2 List of Revisions

Index	Date	Chapter	Revision
1	2011-02-03	all	Created
2	2012-03-30	1.4	Section Ensuring Access Security added
		5	Note added, stating that interfaces can only be used by one software at the same time.
		11.1	Mounting/pulling cycles added
		12.1	Section *EtherNet/IP Adapter/Slave – Instance ID of I/O Data* added
3	2012-07-11	9.4.2.2	LED Description of EtherCAT slave updated
		11.2.4	Technical Data of EtherNet/IP adapter protocol updated
		11.2.11	Technical Data of Sercos slave protocol updated
		11.3.2	Technical Data of CANopen slave protocol updated
4	2013-12-19	5	Instructions for installing software were taken out of this document. Instructions for installing software can now be found in separate User Manual *Software Installation comX and netJACK*, DOC130405UMxxEN.
		1.2.1	Section *Important Changes* containing information about new firmware versions added
		all	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
		9.4	LED Descriptions for the following protocols updated: DeviceNet Master DeviceNet Slave Sercos Master Sercos Slave
		11.1	Section *Technical Data of the netJACK Communication Modules* updated.
		11.2	Technical data of the following Real-Time Ethernet protocols updated: EtherCAT Slave EtherNet/IP Scanner EtherNet/IP Adapter PROFINET IO Device (V3.5) Sercos Master Sercos Slave
		11.3	Technical data of the following fieldbus protocols updated: CANopen Slave CC-Link Slave PROFIBUS DP Master

Table 1: List of Revisions

1.1.3   Conventions in This Manual

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

Notes

Important: <important note>

Note: <note>

<note, where to find further information>

Operation Instructions

1. <instruction>

2. <instruction>

or

➢ <instruction>

Results

➯ <result>

For a description of the labeling of **Safety Messages**, see *Labeling of Safety Messages* section on page 26.

1.2 Versions of Devices, Firmware, Software Tools and Drivers

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.

1.2.1 Important Changes

1.2.1.1 New Firmware Version 3.5 for PROFINET IO Devices

The PROFINET IO Device firmware was revised and completed, and is available in version 3.5 since the third quarter 2013.

Use the PROFINET IO Device firmware in version 3.5 for a new installation, when you create or develop your application program for the first time.

If you want to change from PROFINET IO Device firmware version 3.4 to version 3.5 in an existing system, please note the following guidelines:

1. Customize your application program according to the Migration Guide **PROFINET IO Device, Migration from V3.4 to V3.5**.

> If you want to change to V3.5, please check in the Migration Guide **PROFINET IO Device, Migration from V3.4 to V3.5** which changes are necessary in the application program in order to use version 3.5.

2. Adjust the configuration of your PROFINET IO Controller. Use the new GSDML files in the configuration software of the PROFINET IO Controller for this:
   - *GSDML-V2.3-HILSCHER-NJ 50X-RE PNS-20131001.xml*,
   - *GSDML-V2.3-HILSCHER-NJ 51X-RE PNS-20131001.xml* and
   - *GSDML-V2.3-HILSCHER-NJ 100XX-RE PNS-20131001.xml*.

3. Update the PROFINET IO Device firmware in your device to version 3.5.

Note also:

- SYCON.net V1.360.x.x can configure the PROFINET IO Device firmware V3.4 as well as V3.5

- netX Configuration Tool V1.0510.x.x can configure the PROFINET IO Device firmware V3.4 as well as V3.5.

- The development of the PROFINET IO Device firmware V3.4 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 V3.4 and V3.5 are available:

	PROFINET IO-Device V3.4 Directory on the DVD \ File:	PROFINET IO-Device V3.5 Directory on the DVD \ File:
Firmware	*Firmware\NETJACK\J030D000.nxf*	*Firmware\NETJACK\PNS V3.5.X\J030D000.nxf*
	Firmware\NETJACK\J020D000.nxf	*Firmware\NETJACK\PNS V3.5.X\J020D000.nxf*
Header	*Examples and API\0. Header\Firmware\PROFINET IO Device V3.4.X*	*Examples and API\0. Header\Firmware\PROFINET IO Device V3.5.X*
GSDML	*EDS\PROFINET\V3.4.X\GSDML-V2.3-HILSCHER-NJ 50X-RE PNS-20130806.xml*	*EDS\PROFINET\V3.5.X\GSDML-V2.3-HILSCHER-NJ 50X-RE PNS-20131001.xml*
	-	*EDS\PROFINET\V3.5.X\GSDML-V2.3-HILSCHER-NJ 51X-RE PNS-20131001.xml*
	EDS\PROFINET\V3.4.X\GSDML-V2.3-HILSCHER-NJ 100XX-RE PNS-20130806.xml	*EDS\PROFINET\V3.5.X\GSDML-V2.3-HILSCHER-NJ 100XX-RE PNS-20131001.xml*
Protocol API	*Documentation\7. Programming Manuals\EN\3. Protocol API\PROFINET IO Device V3.4\PROFINET IO Device Protocol API 13 EN.pdf*	*Documentation\7. Programming Manuals\EN\3. Protocol API\PROFINET IO Device V3.5\PROFINET IO Device V3.5 Protocol API 06 EN.pdf*
	TCP IP - Packet Interface API 13 EN.pdf	*PROFINET IO Device - Migration from Version 3.4 to 3.5 MG 03 EN.pdf*

Table 2: PROFINET IO-Device Firmware Version 3.4 and 3.5, Header, GSDML and Protocol API Manual

1.2.1.2 New Firmware Version 4.2 for EtherCAT Slaves

The EtherCAT Slave firmware was revised and completed and is available in version 4.2 since the third quarter 2013.

Use the EtherCAT Slave firmware in version 4.2 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 4.2 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 V4.2, 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 4.2.

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 50XX RE ECS V4.2.X.xml*
   - *Hilscher NJ 100XX RE ECS V4.2.X.xml*.

3. Update the EtherCAT Slave firmware in your device to version 4.2.

Note also:

- SYCON.net V1.360.x.x can configure the EtherCAT Slave firmware V2.5 as well as V4.2.10.0 and higher.

- The netX Configuration Tool V1.0510.x.x can configure the EtherCAT Slave firmware V2.5 as well as V4.2.

- 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 V4.2 are available:

	EtherCAT-Slave V2.5 Directory on the DVD \ File:	**EtherCAT-Slave V4.2** Directory on the DVD \ File:
Firmware	*Firmware\NETJACK\J030F000.nxf*	*Firmware\NETJACK\ECS V4.X\J030F000.nxf*
	Firmware\NETJACK\ J020F000.nxf	*Firmware\NETJACK\ECS V4.X\J020F000.nxf*
Header	*Examples and API\0. Header\Firmware\EtherCAT Slave V2.5.X*	*Examples and API\0. Header\Firmware\EtherCAT Slave V4.2.X*
XML	*EDS\EtherCAT\Slave\V2.X\Hilscher NJ 50XX RE ECS V2.5.X.xml*	*EDS\EtherCAT\Slave\V4.X\Hilscher NJ 50XX RE ECS V4.2.X.xml*
	-	*EDS\EtherCAT\Slave\V4.X\Hilscher NJ 51XX RE ECS V4.2.X.xml*
	EDS\EtherCAT\Slave\V2.X\Hilscher NJ 100XX RE ECS V2.5.X.xml	*EDS\EtherCAT\Slave\V4.X\Hilscher NJ 100XX RE ECS V4.2.X.xml*
Protocol API	*Documentation\7. Programming Manuals\EN\3. Protocol API\EtherCAT Slave V2\EtherCAT Slave Protocol API 21 EN.pdf*	*Documentation\7. Programming Manuals\EN\3. Protocol API\EtherCAT Slave V4\EtherCAT Slave V4 Protocol API 03 EN.pdf*
		EtherCAT Slave - Migration from Version 2.5 to 4.2 MG 02 EN.pdf
		Object Dictionary V3 03 API EN.pdf

Table 3: EtherCAT-Slave Firmware Version 2.5 and 4.2 Header, XML and Protocol API Manual

1.2.2 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	3.6.x.x
NJ 10D-CCS	Dual-Port Memory 60 Pin	CC-Link Slave	1652.740/CCS	1	J0509000.nxf	2.9.x.x
NJ 10D-DNS	Dual-Port Memory 60 Pin	DeviceNet Slave	1652.520/DNS	1	J0507000.nxf	2.3.x.x
NJ 10D-DPS	Dual-Port Memory 60 Pin	PROFIBUS DP Slave	1652.420/DPS	1	J0502000.nxf	2.7.x.x
NJ 50D-RE	Dual-Port Memory 60 Pin	EtherCAT Slave	1632.100/ECS	1	J030F000.nxf	2.5.x.x 4.2.x.x
		EtherNet/IP Adapter	1632.100/EIS	1	J030H000.nxf	2.7.x.x
		Open Modbus/TCP	1632.100/OMB	1	J030L000.nxf	2.5.x.x
		POWERLINK Controlled Node	1632.100/PLS	1	J030K000.nxf	2.1.x.x
		PROFINET IO Device	1632.100/PNS	1	J030D000.nxf	3.4.x.x 3.5.x.x
		Sercos Slave	1632.100/S3S	1	J030J000.nxf	3.1.x.x
		VARAN Client	1632.100/VRS	1	J030T000.nxf	1.0.x.x
NJ 51D-RE	Dual-Port Memory 60 Pin	EtherCAT Slave	1662.100/ECS	1	J060F000.nxf	4.2.x.x
		EtherNet/IP Adapter	1662.100/EIS	1	J060H000.nxf	2.7.x.x
		Open Modbus/TCP	1662.100/OMB	1	J060L000.nxf	2.5.x.x
		PROFINET IO Device	1662.100/PNS	1	J060D000.nxf	3.5.x.x
		Sercos Slave	1662.100/S3S	1	J060J000.nxf	3.1.x.x
NJ 100DN-RE	Dual-Port Memory 80 Pin	EtherCAT Master	1623.100/ECM	1	J020E000.nxf	3.0.x.x
		EtherCAT Slave	1623.100/ECS	1	J020F000.nxf	2.5.x.x 4.2.x.x
		EtherNet/IP Scanner	1623.100/EIM	1	J020G000.nxf	2.6.x.x
		EtherNet/IP Adapter	1623.100/EIS	1	J020H000.nxf	2.7.x.x
		Open Modbus/TCP	1623.100/OMB	1	J020L000.nxf	2.5.x.x
		POWERLINK Controlled Node	1623.100/PLS	1	J020K000.nxf	2.1.x.x
		PROFINET IO Controller	1623.100/PNM	1	J020C000.nxf	2.6.x.x
		PROFINET IO Device	1623.100/PNS	1	J020D000.nxf	3.4.x.x 3.5.x.x
		Sercos Master	1623.100/S3M	1	J020I000.nxf	2.1.x.x
		Sercos Slave	1623.100/S3S	1	J020J000.nxf	3.1.x.x
		VARAN Client	1623.100/VRS	1	J020T000.nxf	1.0.x.x
NJ 100DN-CO	Dual-Port Memory 80 Pin	CANopen Master	1623.500/COM	1	J0204000.nxf	2.11.x.x
		CANopen Slave	1623.500/COS	1	J0205000.nxf	3.6.x.x
NJ 100DN-DN	Dual-Port Memory 80 Pin	DeviceNet Master	1623.510/DNM	1	J0206000.nxf	2.3.x.x
		DeviceNet Slave	1623.510/DNS	1	J0207000.nxf	2.3.x.x

netJACK device type name	Host interface	Protocol	Part number	Hardware revision	Firmware	Firmware version
NJ 100DN-DP	Dual-Port Memory 80 Pin	PROFIBUS DP Master	1623.400/DPM	1	J0201000.nxf	2.6.x.x
		PROFIBUS DP Slave	1623.400/DPS	1	J0202000.nxf	2.7.x.x
NJ 100EN-RE	PCI Express 40 Pin	EtherCAT Master	1625.100/ECM	1	J020E000.nxf	3.0.x.x
		EtherCAT Slave	1625.100/ECS	1	J020F000.nxf	2.5.x.x 4.2.x.x
		EtherNet/IP Scanner	1625.100/EIM	1	J020G000.nxf	2.6.x.x
		EtherNet/IP Adapter	1625.100/EIS	1	J020H000.nxf	2.7.x.x
		Open Modbus/TCP	1625.100/OMB	1	J020L000.nxf	2.5.x.x
		POWERLINK Controlled Node	1625.100/PLS	1	J020K000.nxf	2.1.x.x
		PROFINET IO Controller	1625.100/PNM	1	J020C000.nxf	2.6.x.x
		PROFINET IO Device	1625.100/PNS	1	J020D000.nxf	3.4.x.x 3.5.x.x
		Sercos Master	1625.100/S3M	1	J020I000.nxf	2.1.x.x
		Sercos Slave	1625.100/S3S	1	J020J000.nxf	3.1.x.x
		VARAN Client	1625.100/VRS	1	J020T000.nxf	1.0.x.x
NJ 100EN-CO	PCI Express 40 Pin	CANopen Master	1625.500/COM	1	J0204000.nxf	2.11.x.x
		CANopen Slave	1625.500/COS	1	J0205000.nxf	3.6.x.x
NJ 100EN-DN	PCI Express 40 Pin	DeviceNet Master	1625.510/DNM	1	J0206000.nxf	2.3.x.x
		DeviceNet Slave	1625.510/DNS	1	J0207000.nxf	2.3.x.x
NJ 100EN-DP	PCI Express 40 Pin	PROFIBUS DP Master	1625.400/DPM	1	J0201000.nxf	2.6.x.x
		PROFIBUS DP Slave	1625.400/DPS	1	J0202000.nxf	2.7.x.x

Table 4: Reference to Hardware and Firmware

1.2.3   Software Tools

This manual refers to the following software versions:

Software	File name	Version
SYCON.net	`SYCONnet netX setup.exe`	1.360.x.x or higher
netX Configuration Tool	`netXConfigurationUtility_Setup.exe`	1.0510.x.x or higher

Table 5: Reference to Softwaretools

1.2.4   Drivers

This manual refers to the following driver versions:

Driver	File name	Version
cifX Device Driver	`cifX Device Driver Setup.exe`	1.2.x.x
USB Driver Windows	`Setup.exe`	-

Table 6: Reference to Drivers

1.3   Contents of the Product DVD

The *Communication Solutions DVD*, which is shipped together with the Evaluation Boards of the netJACK communication modules, contains:

- Installation programs for SYCON.net and slave configuration tools

- Firmware

- Drivers

- Device description files (GSD, GSDML, EDS, XML, XDD, CSP)

- Documentation

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.

Note: You can download contents of the DVD from our website www.hilscher.com under **Support** > **Downloads**.

1.3.1 Device Description Files

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

netJACK Communication Module Serving as Real-Time Ethernet Slave

Real-Time Ethernet protocol	Name of device description file	Required to configure
EtherCAT Slave V2.5	`Hilscher NJ 50XX RE ECS V2.5.X.xml` `Hilscher NJ 100XX RE ECS V2.5.X.xml`	EtherCAT Master

EtherCAT Slave V4.2	`Hilscher NJ 50XX RE ECS V4.2.X.xml`
	`Hilscher NJ 51XX RE ECS V4.2.X.xml`
	`Hilscher NJ 100XX RE ECS V4.2.X.xml`	

EtherNet/IP Adapter (Slave)	`HILSCHER NJ 50XX-RE EIS V1.1.EDS`
	`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 50XX RE PLS.xdd` `00000044_NJ 100XX RE PLS.xdd`	POWERLINK Managing Node
PROFINET IO Device V3.4 (Slave)	`GSDML-V2.3-HILSCHER-NJ 50XX-RE PNS-20130806.xml` `GSDML-V2.3-HILSCHER-NJ 100XX-RE PNS-20130806.xml`	PROFINET IO Controller (Master)

PROFINET IO Device V3.5 (Slave)	`GSDML-V2.3-HILSCHER-NJ 50XX-RE PNS-20131001.xml`
	`GSDML-V2.3-HILSCHER-NJ 51XX-RE PNS-20131001.xml`
	`GSDML-V2.3-HILSCHER-NJ 100XX-RE PNS-20131001.xml`	

Sercos Slave (V3)	`Hilscher NJ 50XX RE S3S FixCFG FSPIO Default.xml`
	`Hilscher NJ 51XX RE S3S FixCFG FSPIO Default.xml`
	`Hilscher NJ 100XX RE S3S FixCFG FSPIO Default.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 7: 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 Communication Module 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 8: Device Description Files for netJACK Serving as Fieldbus Slave

netJACK Communication Module 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 9: 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.

1.3.2   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.

You can also download the latest edition of a manual from our website www.hilscher.com under **Support** > **Downloads** > **Manuals**.

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

1.5.1 Copyright

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1.5.2 Important Notes

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* for the design, construction, maintenance or operation of nuclear facilities;

* in air traffic control systems, air traffic or air traffic communication systems;

* in life support systems;

* in systems in which failures in the software could lead to personal injury or injuries leading to death.

We inform you that the software was not developed for use in dangerous environments requiring fail-proof control mechanisms. Use of the software in such an environment occurs at your own risk. No liability is assumed for damages or losses due to unauthorized use.

1.5.4   Warranty

Although the hardware and software was developed with utmost care and tested intensively, Hilscher Gesellschaft für Systemautomation mbH does not guarantee its suitability for any purpose not confirmed in writing. It cannot be guaranteed that the hardware and software will meet your requirements, that the use of the software operates without interruption and that the software is free of errors. No guarantee is made regarding infringements, violations of patents, rights of ownership or the freedom from interference by third parties. No additional guarantees or assurances are made regarding marketability, freedom of defect of title, integration or usability for certain purposes unless they are required in accordance with the law and cannot be limited. Warranty claims are limited to the right to claim rectification.

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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 50D-RE	1632.100/ECS	EtherCAT Slave	
	1632.100/EIS	Ethernet/IP Adapter	
	1632.100/OMB	Open Modbus/TCP	
	1632.100/PLS	POWERLINK Controlled Node	
	1632.100/PNS	PROFINET IO Device	
	1632.100/S3S	Sercos Slave	
	1632.100/VRS	VARAN Client	
NJ 51D-RE	1662.100/ECS	EtherCAT Slave	
	1662.100/EIS	EtherNet/IP Adapter	
	1662.100/OMB	Open Modbus/TCP	
	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	

netJACK device type name	Part number	Network/Protocol/ device functioning as	Host interface
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	
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 10: 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* on page 108 ff.

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* on page 108 ff.

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]

2.7   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 11: 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.
Note	Indicates an important note in the manual.	Indicates an important note in the manual.

Table 12: Signal Words

3 Descriptions and Requirements

3.1 Device Description

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 50D-RE	1632.100/ECS	EtherCAT Slave	
	1632.100/EIS	Ethernet/IP Adapter	
	1632.100/OMB	Open Modbus/TCP	
	1632.100/PLS	POWERLINK Controlled Node	
	1632.100/PNS	PROFINET IO Device	
	1632.100/S3S	Sercos Slave	
	1632.100/VRS	VARAN Client	
NJ 51D-RE	1662.100/ECS	EtherCAT Slave	
	1662.100/EIS	EtherNet/IP Adapter	
	1662.100/OMB	Open Modbus/TCP	
	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	

netJACK device type name	Part number	Network/Protocol	Host interface
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	
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 13: Which netJACK for Which Protocol and Host Interface?

Firmware, Driver and Configuration Software

The firmware of the netJACK supports both Dual-Port Memory and PCI Express 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 Communcation 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 Communcation Solutions DVD.

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).

3.2   Prerequisites for Operation

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

3.2.1   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 V ± 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.

3.2.2   Firmware, Drivers and Configuration Software

- 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 the *Reference to Hardware and Firmware* table on page 13.

- 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.

3.2.2.1 System Requirements SYCON.net

- PC with 1 GHz processor or higher

- Windows® XP SP3, Windows® Vista (32 bit) SP2, Windows® 7 (32 bit) SP1, Windows® 7 (64 bit) SP1, Windows® 8 (32 bit) or Windows® 8 (64 bit)

- Administrator privilege required for installation

- Internet Explorer 5.5 or higher

- Free disk space: min. 400 MByte

- DVD ROM drive

- RAM: min. 512 MByte, recommended 1024 MByte

- Graphic resolution: min. 1024 x 768 pixel

- Keyboard and Mouse

- USB, serial or Ethernet interface

Note: If the project file is saved and opened again or if it is used on another PC, the system requirements must match. Particularly the DTM must be installed on the used PC.

Restriction

Touch screen is not supported.

3.2.3 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.

4 Getting Started

4.1 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* on page 55.

#	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	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**.	User Manual *Software Installation comX and netJACK*
		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.	Toolkit Manual *cifX/netX Toolkit DPM*
1.1.2	Installing driver for the diagnostic interface	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**. → **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.	User Manual *Software Installation comX and netJACK*

#	Step	Description	For Details see
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	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. 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.	User Manual *Software Installation comX and netJACK*
1.2.2	Installing configuration software for netJACK as slave device	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. 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.	User Manual *Software Installation comX and netJACK*
2	**Installing Hardware**		
2.1	Preparing Hardware Installation		
2.1.1	Take safety precautions	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. **⚠ 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!	Section *Electrical Shock Hazard,* page 23
2.1.2	Prepare netJACK for mounting	Remove the cardboard cover from the underside of the netJACK and pull the sliding latch into mounting position. **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.	Chapter *Mounting netJACK,* page 45 ff

#	Step	Description	For Details see
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 *Mounting netJACK,* page 45 ff
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)	**Note:** Use the RJ45 socket only for LAN, not for telecommunication circuits. Note for netJACK PROFINET IO Controller (Master): **Important for Hardware Wiring:** 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.	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	• 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.	Operating Instruction Manual for the DTM of the concerned protocol also Section *Device Names in* SYCON.net, page 38 also Section *Instructions for Updating Firmware with SYCON.net*, page 64
3.1.1b	**OR**: Configuring slave by using netX Configuration Tool	• 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 *netX Configuration Tool for cifX, comX and netJACK*

#	Step	Description	For Details see
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	• 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 *Notes on Configuring Master Devices*, page 37 and *Device Names in* SYCON.net, page 38
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	• 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	• 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	• 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 *netX Configuration Tool for cifX, comX and netJACK*

#	Step	Description	For Details see
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**	
	Diagnosis	• 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	• Right click on device symbol. • In the context menu, select **Diagnosis** entry. • Select **Tools > I/O Monitor**. • Check the input or output data.	

Table 14: Steps for Installing Soft- and Hardware, configuring and Diagnosing a netJACK Communication Module (Master and Slave)

4.2 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
EtherCAT Slave	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: (number of input bytes + 3)/4 + (number of output bytes + 3)/4 must be less or equal to 128.
EtherNet/IP-Adapter	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.
POWERLINK-Controlled-Node/Slave	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.
PROFINET IO-Device (Slave)	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.
Sercos Slave	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. Therefor 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.
Fieldbus-System	**Notes**
PROFIBUS DP Slave	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).
CANopen Slave	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.
DeviceNet Slave	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 15: Notes for the Configuration of the Master Device

For further information on device description files, see *Device Description Files* section on page 15.

4.3 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 50D-RE	EtherCAT Slave V2.5	Gateway/Stand-Alone Slave	NJ 50XX RE/ECS V1.0
	EtherCAT Slave V4.2	Gateway/Stand-Alone Slave	NJ 50XX RE/ECS V2.4
	EtherNet/IP Adapter/Slave	Gateway/Stand-Alone Slave	NJ 50X-RE/EIS
	Open Modbus/TCP	Gateway/Stand-Alone Slave	NJ 50X-RE/OMB
	POWERLINK Controlled Node	Gateway/Stand-Alone Slave	NJ 50X-RE/PLS
	PROFINET IO Device V3.4 (Slave)	Gateway/Stand-Alone Slave	NJ 50X-RE/PNS V3.4.19 – V3.4.x
	PROFINET IO Device V3.5 (Slave)	Gateway/Stand-Alone Slave	NJ 50X-RE/PNS V3.5.18 – V3.5.x
	Sercos Slave	Gateway/Stand-Alone Slave	NJ_50XX-RE_S3S_FIXCFG
	VARAN Client	Gateway/Stand-Alone Slave	NJ 50X-RE/VRS
NJ 51D-RE	EtherCAT Slave V4.2	Gateway/Stand-Alone Slave	NJ 51X-RE/ECS V2.4
	EtherNet/IP Adapter/Slave	Gateway/Stand-Alone Slave	NJ 51X-RE/EIS
	Open Modbus/TCP	Gateway/Stand-Alone Slave	NJ 51X-RE/OMB
	PROFINET IO Device V3.5 (Slave)	Gateway/Stand-Alone Slave	NJ 51X-RE/PNS V3.5.18 – 3.5.x
	Sercos Slave	Gateway/Stand-Alone Slave	NJ_51X-RE_S3S_FIXCFG
NJ 100DN-DP NJ 100EN-DP	PROFIBUS DP Master	Master	NJ 100XX-DP/DPM
	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 NJ 100EN-RE	EtherCAT Master	Master	NJ 100XX-RE/ECM
	EtherCAT Slave V2.5	Gateway/Stand-Alone Slave	NJ 100XX RE/ECS V0.2
	EtherCAT Slave V4.2	Gateway/Stand-Alone Slave	NJ 100XX RE/ECS V2.4
	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 (Master)	Master	NJ 100XX-RE/PNM
	PROFINET IO Device V3.4 (Slave)	Gateway/Stand-Alone Slave	netJACK 100XX-RE/PNS V3.4.19 – V3.4.x
	PROFINET IO Device V3.5 (Slave)	Gateway/Stand-Alone Slave	netJACK 100XX-RE/PNS V3.4.18 – V3.5.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 NJ 100EN-CO	CANopen Master	Master	NJ 100XX-CO/COM
	CANopen Slave	Gateway/Stand-Alone Slave	NJ 100XX-CO/COS (NJ 100XX-CO COS.eds)
NJ 100DN-DN NJ 100EN-DN	DeviceNet Master	Master	NJ 100XX-DN/DNM
	DeviceNet Slave	Gateway/Stand-Alone Slave	NJ 100XX-DN/DNS (NJ_100XX-DN_DNS.EDS)

Table 16: Device Names in SYCON.net by Communication Protocol

5 Software Overview

Note: Firmware, drivers and configuration software are provided on the Communcation 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 Communcation 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.

5.1 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* table on page 13, 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* on page 55 ff.

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).

5.2 Software fo 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)

6 Mounting/Removing netJACK

6.1 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!

Important!

netJACK communication modules are not designed for „hot-plugging". Therefore, only mount or remove the netJACK if no voltage is applied to the 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 wriststrap.
- If available, use a static-safe workstation.
- When not in use, store the device in an appropriate static-safe packaging.

Figure 1: Electrostatic Sensitive Device

6.2   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.
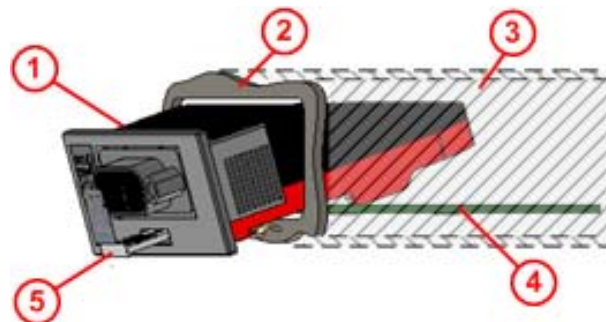
Figure 2: Mounting Principle of the netJACK

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

6.3 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.
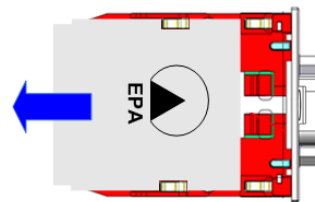
Figure 3: Remove Cover

> ### 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.
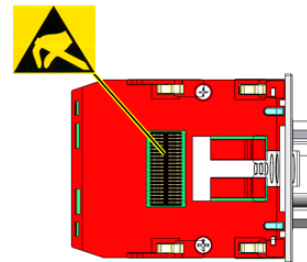
Figure 4: Electrostatic Sensitive Device

➢ 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.
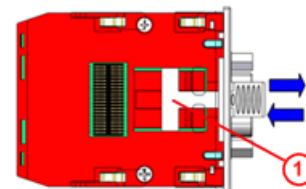
Figure 5: Bring Sliding Latch into Mounting Position

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

Figure 6: Push netJACK Inside

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

Figure 7: 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.
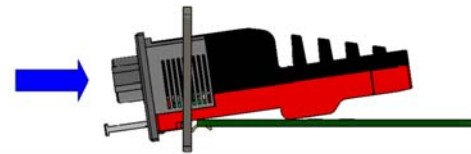
Figure 8: Push netJACK Further in
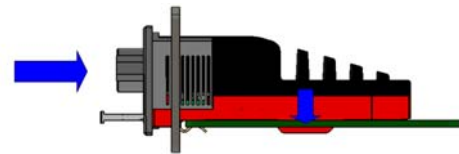
Figure 9: Engage netJACK Vertically

➢ 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.
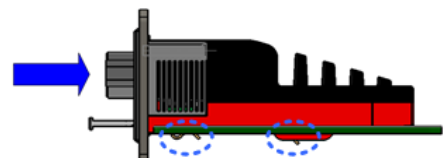
Figure 10: Engage netJACK in Final Position

  ↳ The brackets now fix the netJACK to the carrier board.

IMPORTANT!
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.
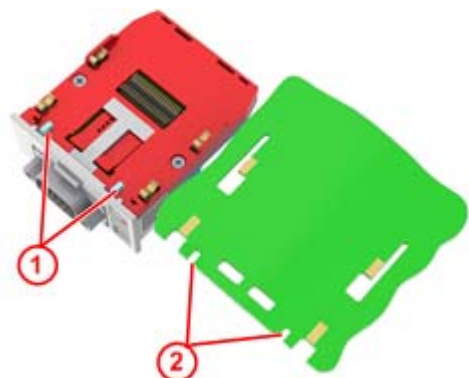
Figure 11: Protection Against Mounting Wrong netJACK

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

> ✎ You have mounted the netJACK communication module.
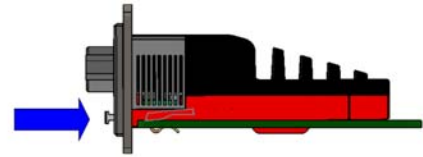
Figure 12: Lock netJACK

6.4 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.
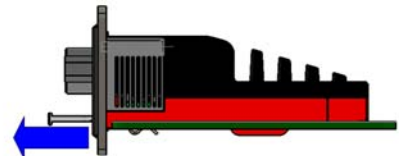
Figure 13: Unlock netJACK

> ➢ 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.

> ✎ You have removed the netJACK communication module.
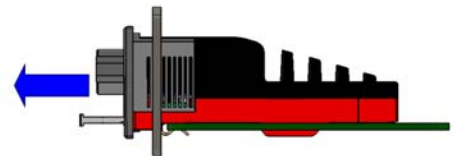
Figure 14: Pull out netJACK

7   Using the Evaluation Board

7.1   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 Communcation 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.

7.1.1   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

7.1.2   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.

7.2   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 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!

Important!

The netJACK communication module, the Evaluation Board and the Adapterboard 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 Adapterboard 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 theses devices:

- Touch a grounded object to discharge potential static.
- Wear an approved grounding wriststrap.
- 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.

7.3   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.
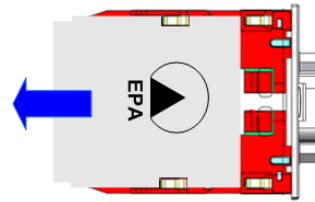
Figure 15: Remove Cover

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.
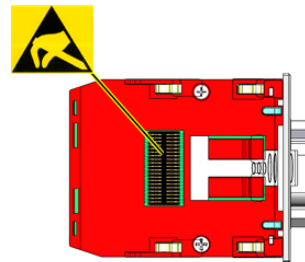
Figure 16: Electrostatic Sensitive Device

➢ 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.
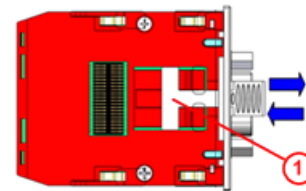
Figure 17: Bring Sliding Latch into Mounting Position

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

Figure 18: Mount netJACK onto Evaluation Board

Figure 19: 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.

Figure 20: Engage netJACK in Final Position

↳ The brackets now fix the netJACK to the Evaluation Board.

IMPORTANT!
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.
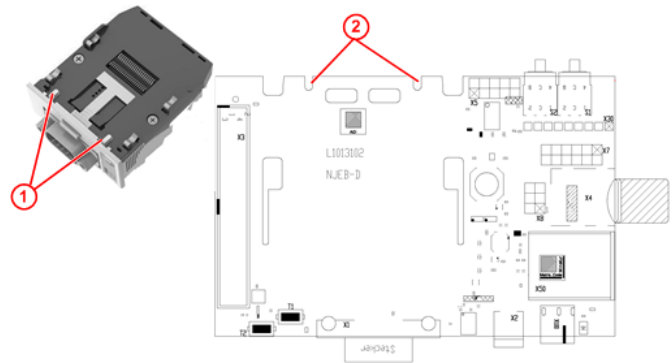
Figure 21: Protection Against Mounting Wrong netJACK

➢ 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.
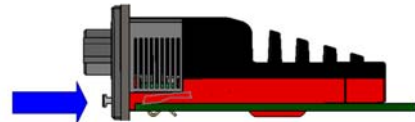
Figure 22: Lock netJACK

7.4 Connecting Evaluation Board to PC

7.4.1 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*. 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* on page 49.

➢ 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/PCIe Device** is displayed in the Windows® Device Manager.

7.4.2   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*. 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.

NOTE

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), since 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* on page 49.

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.

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

➢   Connect the CAB-NXPCA-PCI cable to the NXPCA-PCI Adapterboard.

NOTE: 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.
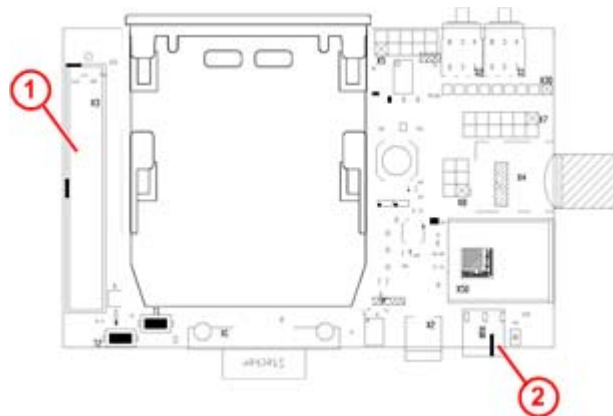
Figure 23: Host Interface and Power Connector on NJEB-D

➢ 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.

8 Updating Firmware

8.1 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.

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.
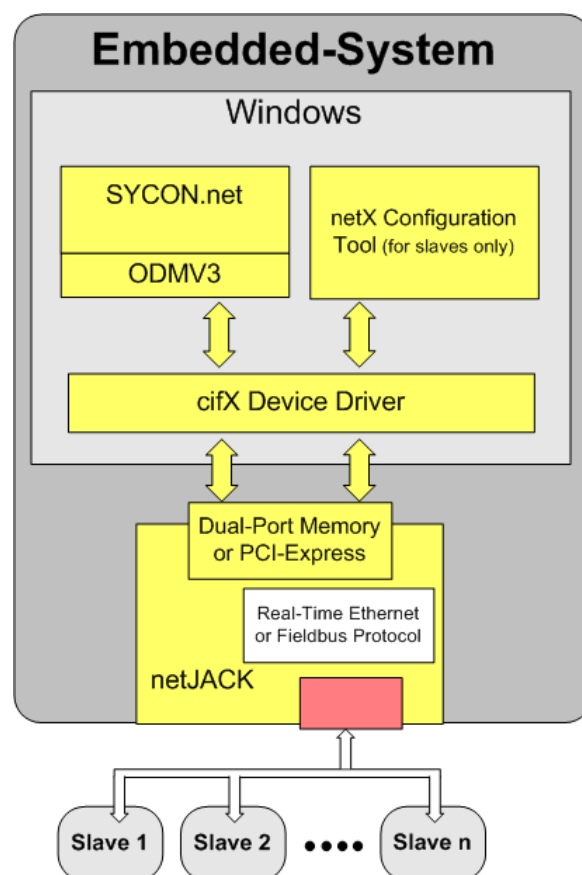
Figure 24: Updating Firmware in Host System Running Under Windows

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.
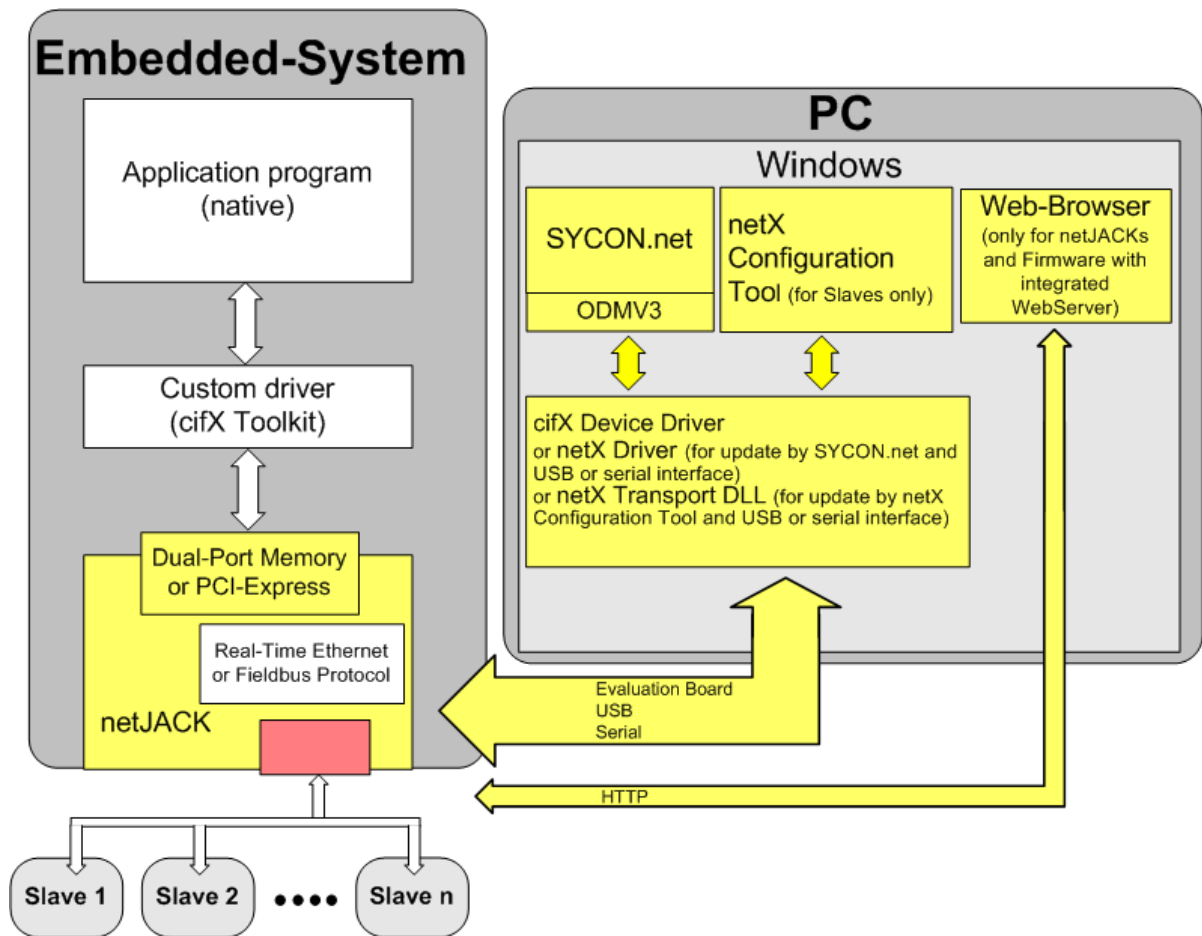
Figure 25: Updating Firmware by External PC

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* on page 64.

8.1.1 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:

8.1.1.1 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.
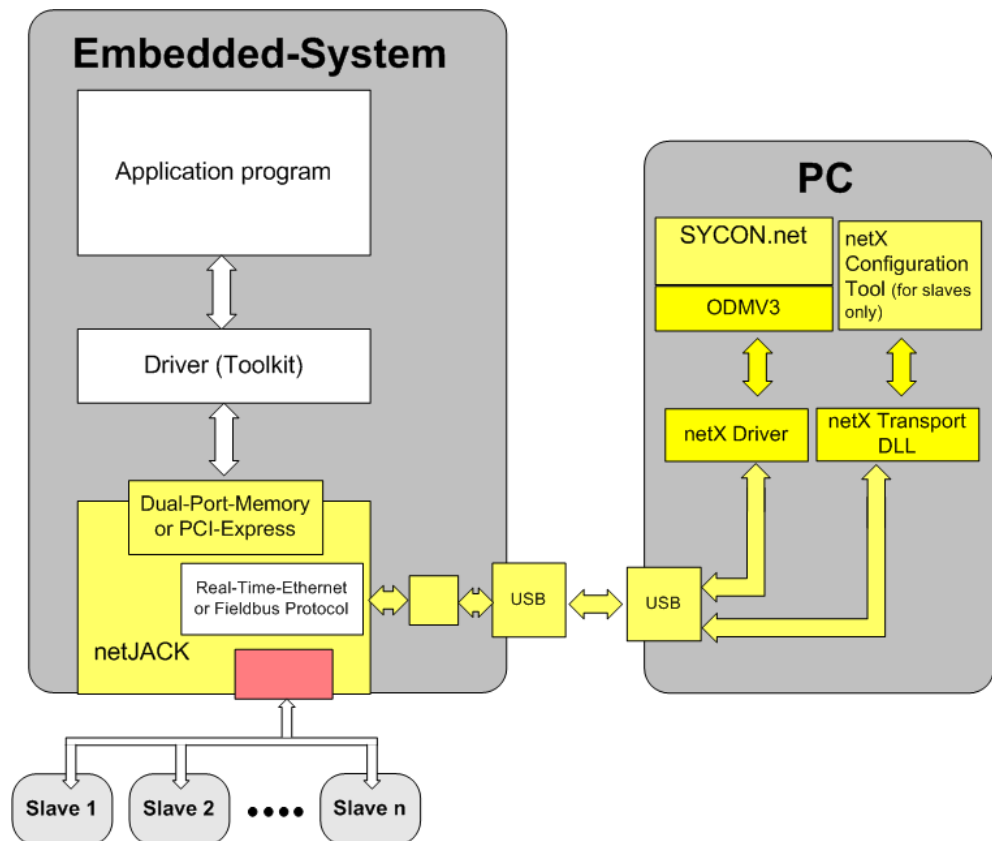
Figure 26: Updating Firmware with SYCON.net via USB Interface

8.1.1.2 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.
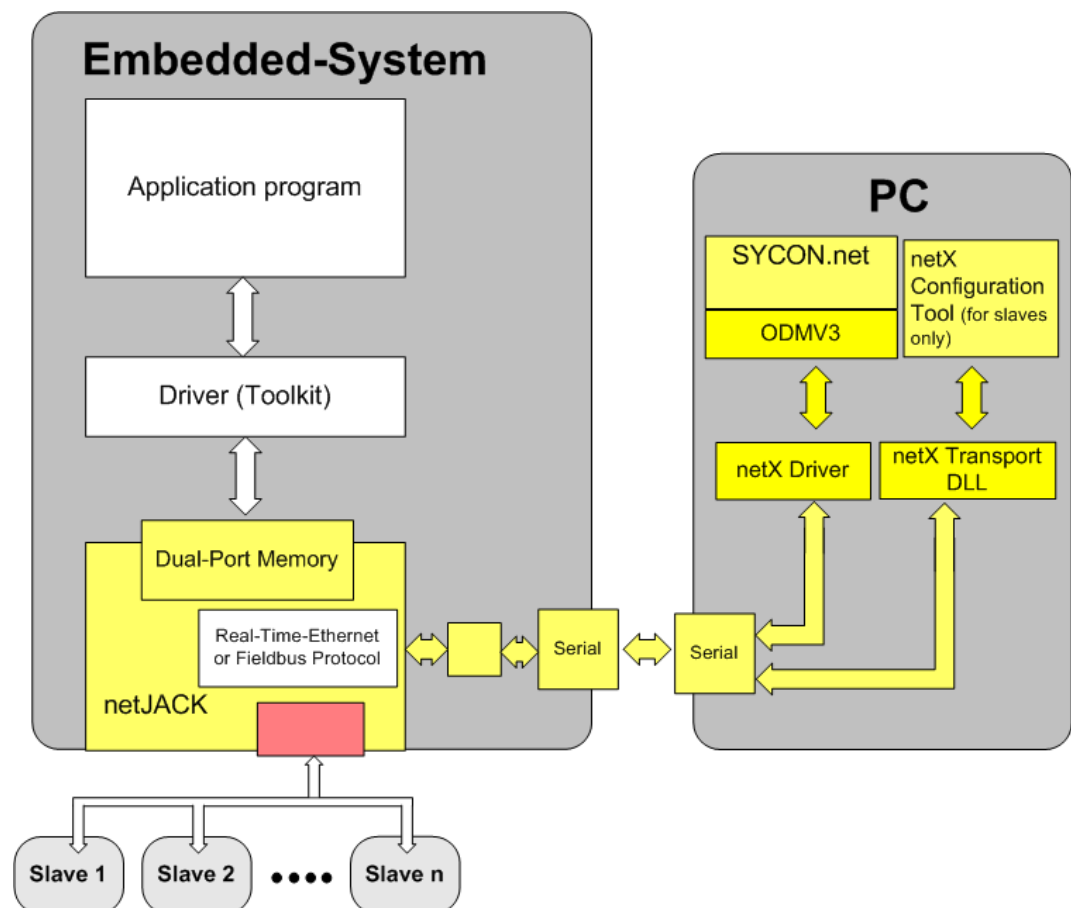
Figure 27: Updating Firmware with SYCON.net via Serial Interface

8.1.1.3 Setup A3: Updating Firmware via HTTP and Ethernet Interface

This option is only available for netJACK communication modules NJ 50D-RE, 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 50D-RE, 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.
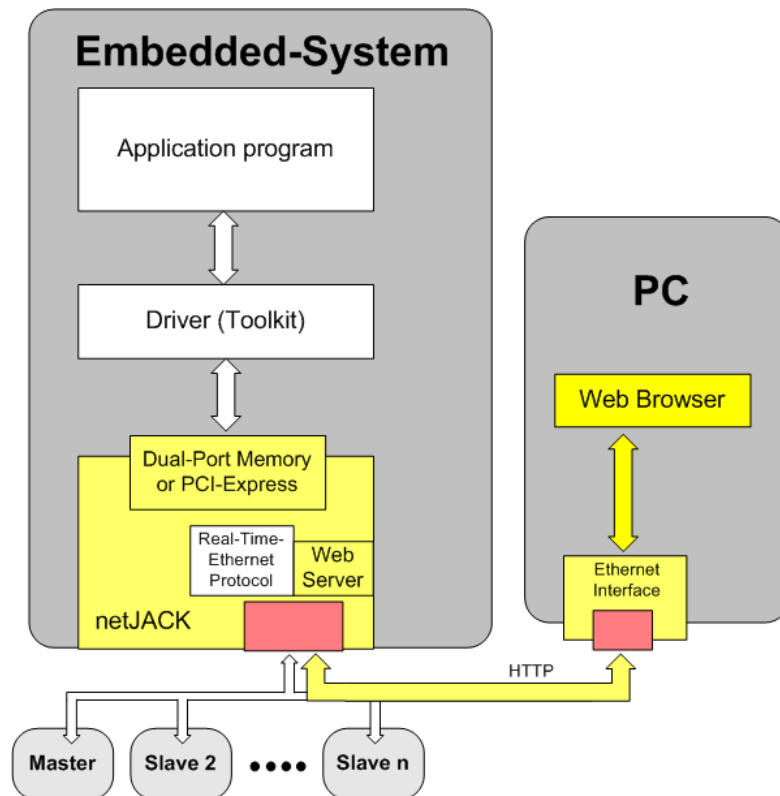
Figure 28: Updating Firmware via HTTP and Ethernet Interface

Note: 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*.

8.1.2 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.

8.1.2.1 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.
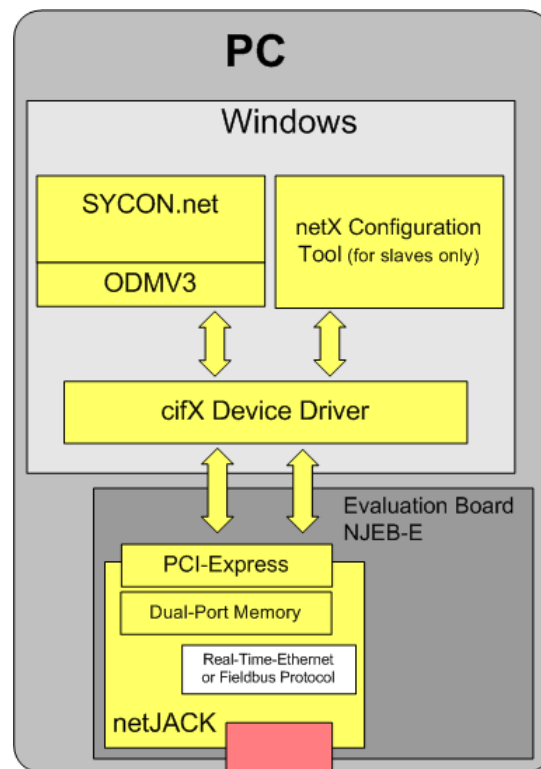
Figure 29: Updating Firmware of a netJACK with PCI Express via Evaluation Board

8.1.2.2   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.
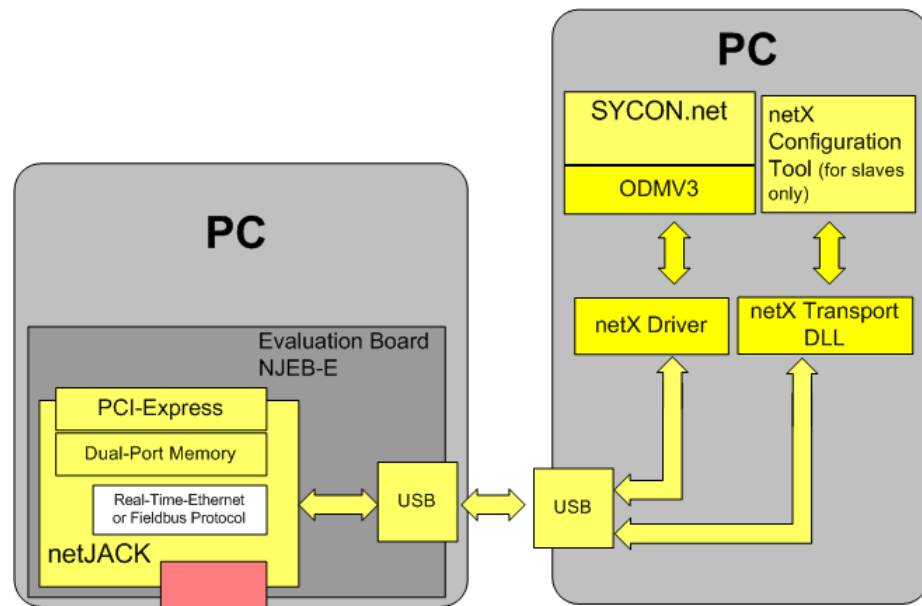
Figure 30: Updating Firmware of a netJACK with PCI Express via Evaluation Board and USB Interface

8.1.2.3   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.
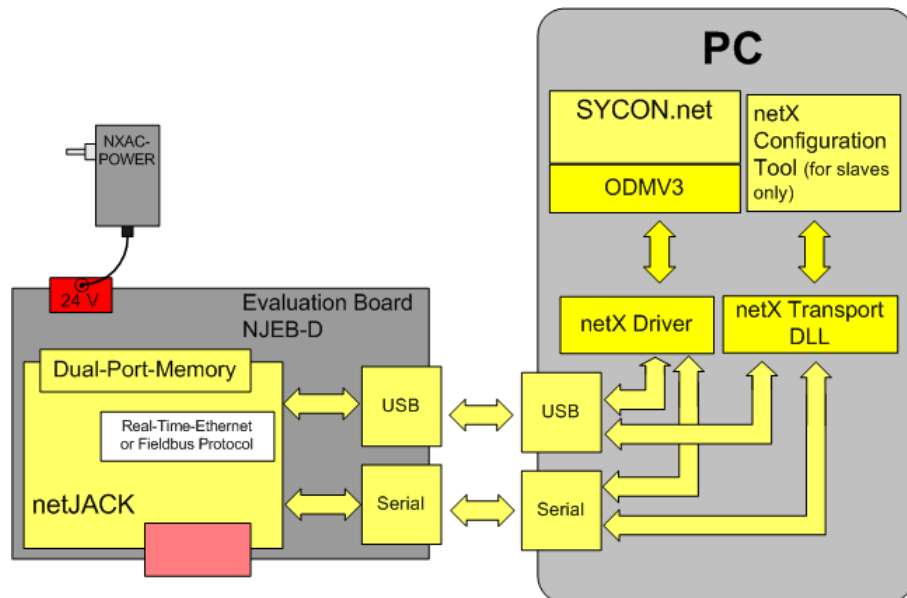
Figure 31: Updating Firmware of a netJACK with DPM via Evaluation Board and USB or Serial Interface

8.1.2.4 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.
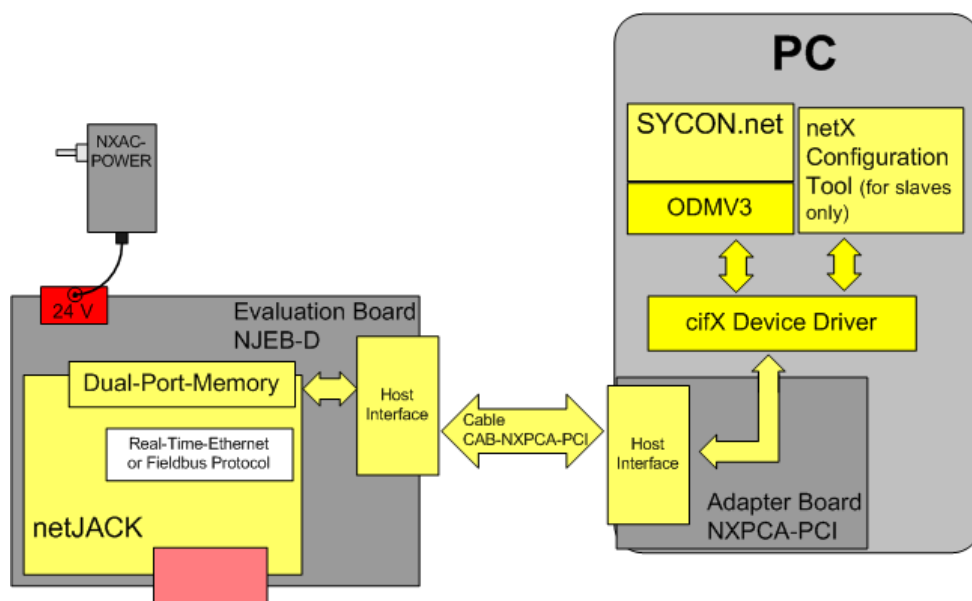
Figure 32: Updating Firmware of a netJACK with DPM via Evaluation Board and NXPCA-PCI Adapter Board

8.2 Instructions for Updating Firmware with SYCON.net

8.2.1 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 55 ff) and that SYCON.net and the necessary drivers are installed on the PC.

8.2.2 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 55 ff.)

3. Choose netJACK to be updated (Device Assignment)

4. Download firmware into the netJACK (Firmware Download)

Note: 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.*

8.2.3 Step by Step Instructions for Updating Firmware

Start SYCON.net configuration software.

➢ In the Windows **Start** menu, select **Programs** > **SYCON.net System Configurator** > **SYCON.net**.

↳ SYCON.net is opened.

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.

Note: 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.
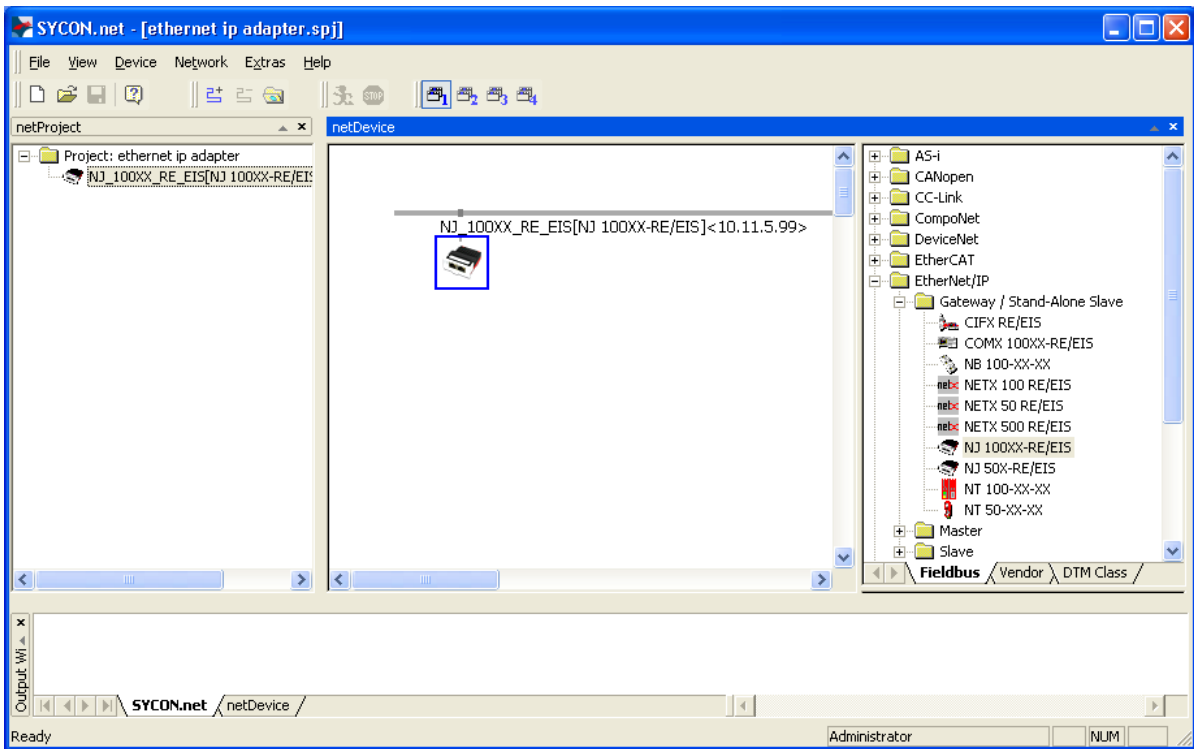
Figure 33: netJACK Project in SYCON.net

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 is opened.

Choose adequate driver.

➢ In the **Navigation Area**, select **Settings > Driver**.

✎ The **Driver** list is opened.
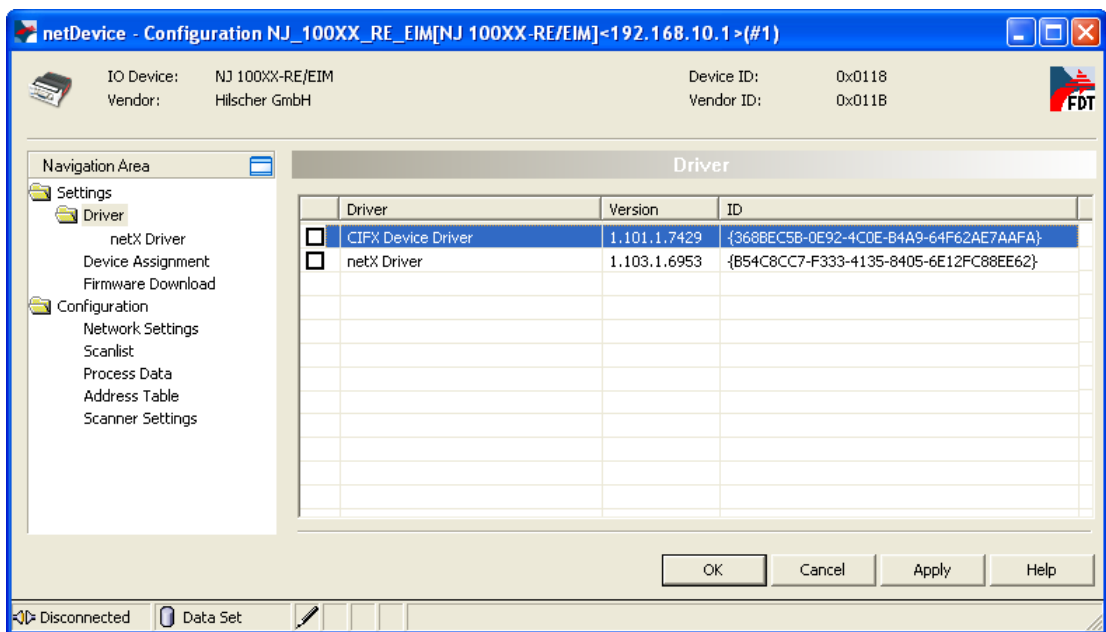
Figure 34: Choosing Driver

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.

Note: 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.

Choose the netJACK, for which you want to update the firmware.

➢ In the **Navigation Area**, select **Settings > Driver > Device Assignment**.

� The **Device Assignment** window is opened.

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.

Choose the device.

➢ Check the box in front of the appropriate device and click **Apply** button.
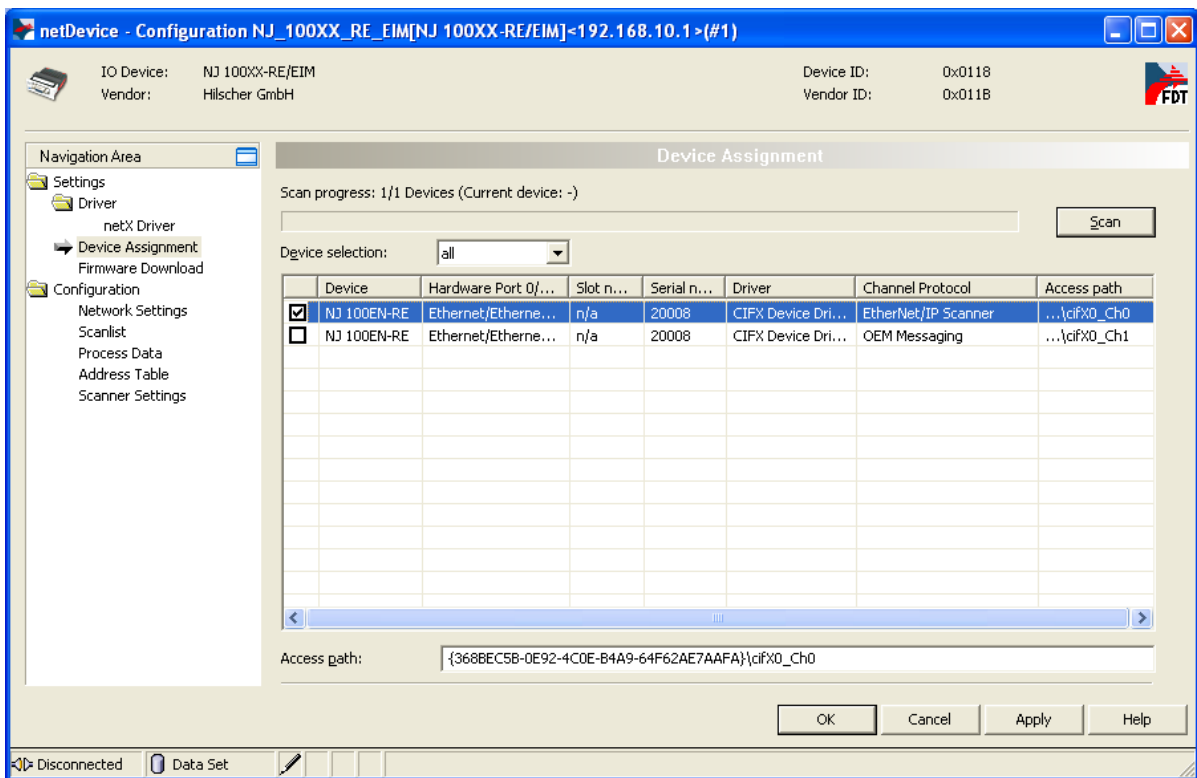
Figure 35: Choosing Device

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

Download the firmware to the netJACK.

➢ In the **Navigation Area**, select **Settings > Driver > Firmware-Download**.

↳ The **Firmware-Download** window is opened.

Choose the firmware, you want to load to the netJACK.

➢ Click **Browse…** button.

↳ The **Select Firmware File** dialog is opened.

➢ 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 table *Reference to Hardware and Firmware* on page 13.

⇨ Name and version of the selected firmware are displayed in the **Firmware-Download** window.
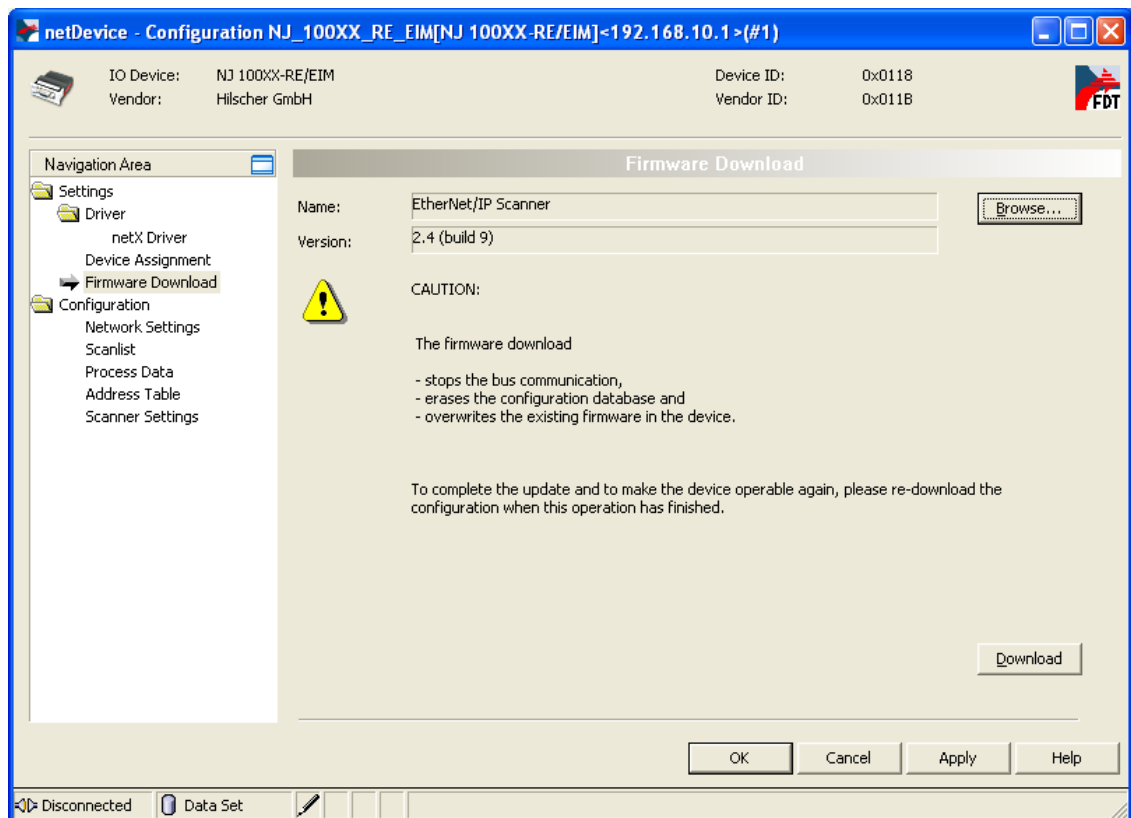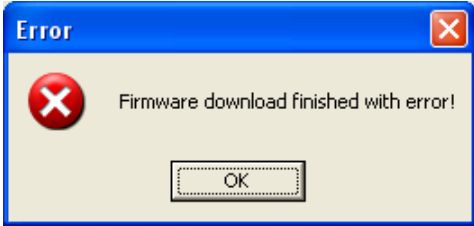
Figure 36: Downloading Firmware to the Device

After checking name and version of the firmware and reading the warning message, you can start the download.

➢ Click **Download** button

⇨ The firmware is downloaded to the netJACK.

➢ To close the configuration window, click **OK** button.

8.2.4 Troubleshooting Firmware Update

Problem	Error message
	appears
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 *Reference to Hardware and Firmware* table, page 13.
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	Error message
	appears
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	Error message
	appears
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	Error message
	appears.
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 *Reference to Hardware and Firmware* table, page 13.
Problem	Error message
	appears

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	Error message **Select Firmware File** ⚠ Invalid Firmware for the assigned device! The protocol classes do not match. Required: EtherNet/IP Firmware file: SERCOS III The communication classes do not match. Required: Scanner Firmware file: Master Shall the firmware file nevertheless be applied for the download? [Yes] [No] appears.
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 50D-RE, NJ 100EN-RE), click **Yes** to perform the intended change. In all other cases click **No**.
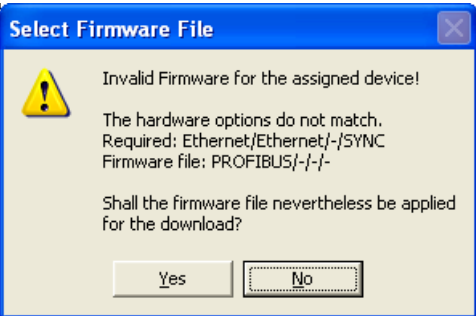
Problem	Error message
	Select Firmware File
	Invalid Firmware for the assigned device!
	The hardware options do not match.
	Required: Ethernet/Ethernet/-/SYNC
	Firmware file: PROFIBUS/-/-/-
	Shall the firmware file nevertheless be applied for the download?
	[Yes] [No]
	appears.
Cause	The hardware options 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 17: 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?

9 Device Pictures, Connectors and LEDs

9.1 Device Pictures

netJACK Top View
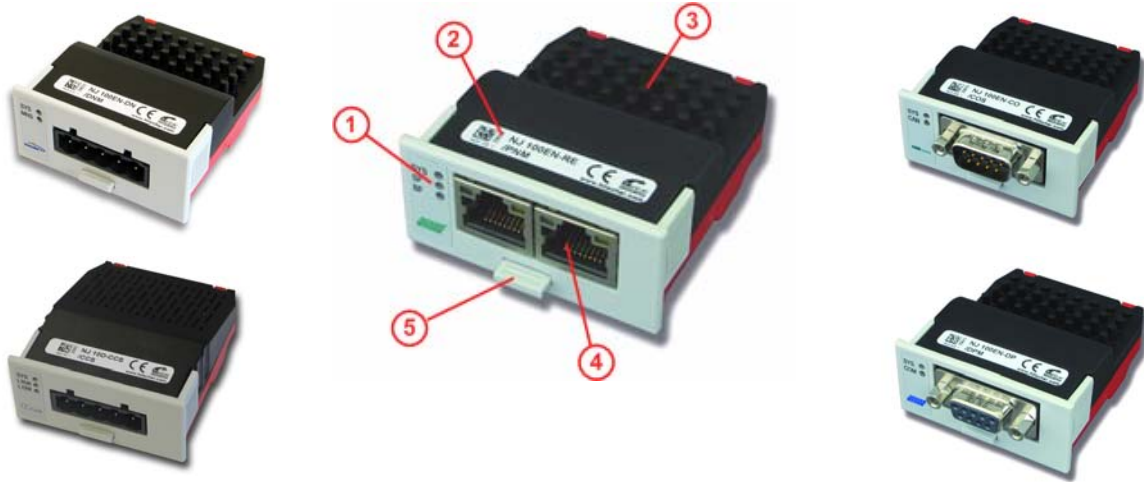
Figure 37: netJACKs Top View

① Status LEDs. The arrangement of the LEDs depends on the network protocol. See section *Positions of the LEDs and Control Elements* on page 76 ff.

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* on page 76 ff.

⑤ Sliding latch

netJACK Bottom View
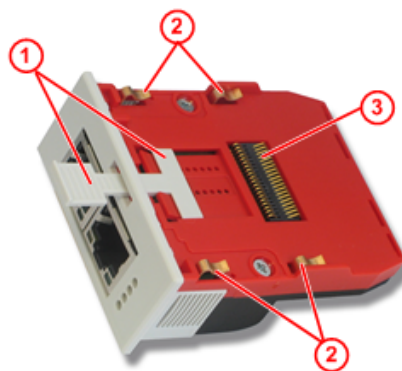
Figure 38: netJACK Bottom View

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.

9.2   Device Type Label

Each netJACK communication module carries a device type label, which provides the following information:
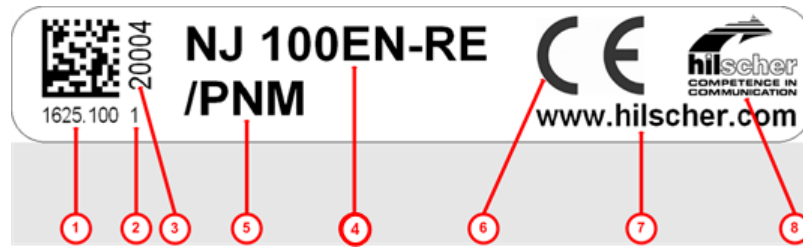
Figure 39: Device Type Label netJACK

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:

NJ 100EN-RE / PNM

① Abbreviation of the Hilscher netJACK product line

② Type of built-in netX processor:

10 = netX 10
50 = netX 50
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	
COM = CANopen Master	**COS** = CANopen Slave
DPM = PROFIBUS DP Master	**DPS** = PROFIBUS DP Slave
DNM = DeviceNet Master	**DNS** = DeviceNet Slave
ECM = EtherCAT Master	**ECS** = EtherCAT Slave
EIM = EtherNet/IP Scanner/Master	**EIS** = Ethernet/IP Adapter/Slave
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	

9.3 Positions of the LEDs and Control Elements

9.3.1 netJACK for Real-Time Ethernet Systems

9.3.1.1 Front view of netJACK with EtherCAT Master
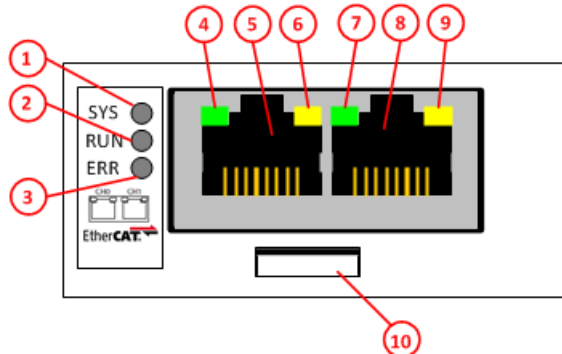
Figure 40: Front view netJACK EtherCAT Master

①	System LED (SYS)
②	Run LED (RUN)
③	ERROR LED (ERR)
④	LINK LED for channel 0
⑤	Interface Channel 0
⑥	Activity LED (ACT) for channel 0
⑦	Not in use
⑧	Not in use
⑨	Not in use
⑩	Sliding latch

For a description of the LED signals used by EtherCAT (Master), see section *LEDs EtherCAT Master* on page 84.

For a description of the pinning of the network interface, see section *Pinning Real-Time Ethernet Interface* on page 104.

9.3.1.2 Front view of netJACK with EtherCAT Slave
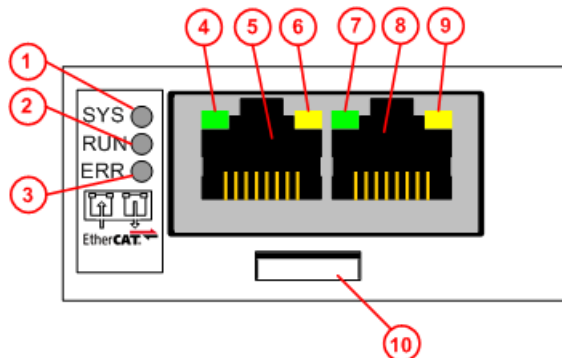
Figure 41: Front view netJACK EtherCAT Slave

①	System LED (SYS)
②	Run LED (RUN)
③	ERROR LED (ERR)
④	Link/Activity LED Input (L/A IN) for channel 0
⑤	Interface channel 0 (input) I
⑥	Not in use
⑦	Link/Activity Output LED (L/A OUT) for channel 1
⑧	Interface channel 1 (output)
⑨	Not in use
⑩	Sliding latch

For a description of the LED signals used by EtherCAT (Slave), see section *LEDs EtherCAT Slave* on page 85.

For a description of the pinning of the network interface, see section *Pinning Real-Time Ethernet Interface* on page 104.

9.3.1.3 Front view of netJACK with EtherNet/IP
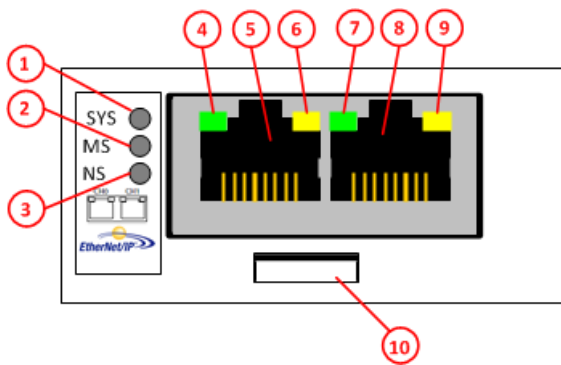
Figure 42: Front view netJACK EtherNet/IP

①	System LED (SYS)
②	Module Status LED (MS)
③	Network Status LED (NS)
④	LINK LED for channel 0
⑤	Interface channel 0
⑥	Activity LED (ACT) for channel 0
⑦	LINK LED for channel 1
⑧	Interface channel 1
⑨	Activity LED (ACT) for channel 1
⑩	Sliding latch

For a description of the LED signals used by EtherNet/IP, see section *LEDs EtherNet/IP* on page 87 and section *LEDs EtherNet/IP* on page 88.

For a description of the pinning of the network interface, see section *Pinning Real-Time Ethernet Interface* on page 104.

9.3.1.4 Front view of netJACK with Open Modbus/TCP
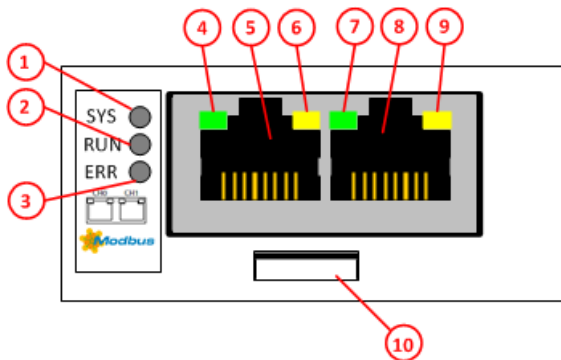
Figure 43: Front view netJACK Open Modbus/TCP

①	System LED (SYS)
②	Run LED (RUN)
③	Error LED (ERR)
④	LINK LED for channel 0
⑤	Interface channel 0
⑥	Activity LED (ACT) for channel 0
⑦	LINK LED for channel 1
⑧	Interface channel 1
⑨	Activity LED (ACT) for channel 1
⑩	Sliding latch

For a description of the LED signals used by Open Modbus/TCP, see section *LEDs Open Modbus/TCP* on page 89.

For a description of the pinning of the network interface, see section *Pinning Real-Time Ethernet Interface* on page 104.

9.3.1.5 Front view of netJACK with POWERLINK
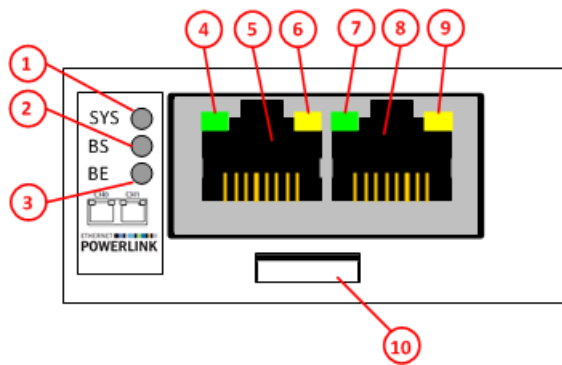
Figure 44: Front view netJACK POWERLINK

①	System LED (SYS)
②	Bus Status LED (BS)
③	Bus Error LED (BE)
④	Link/Activity LED (L/A) for channel 0
⑤	Interface channel 0
⑥	Not in use
⑦	Link/Activity LED (L/A) for channel 1
⑧	Interface channel 1
⑨	Not in use
⑩	Sliding latch

For a description of the LED signals used by POWERLINK, see section *LEDs POWERLINK* on page 90.

For a description of the pinning of the network interface, see section *Pinning Real-Time Ethernet Interface* on page 104.

9.3.1.6 Front view of netJACK with PROFINET IO
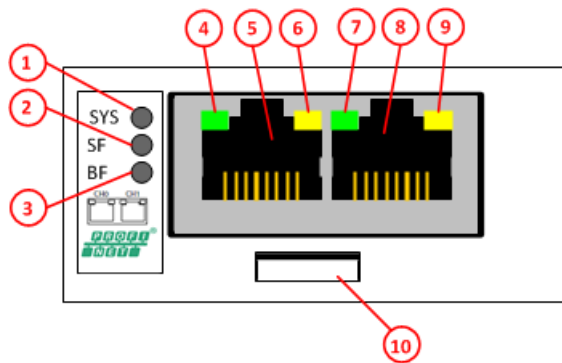
Figure 45: Front view netJACK PROFINET IO

①	System LED (SYS)
②	System Error LED (SF)
③	Bus Error LED (BF)
④	LINK LED for channel 0
⑤	Interface channel 0
⑥	Receive/Transmit LED (RX/TX) for channel 0
⑦	LINK LED for channel 1
⑧	Interface channel 1
⑨	Receive/Transmit LED (RX/TX) for channel 1
⑩	Sliding latch

For a description of the LED signals used by PROFINET IO, see section *LEDs PROFINET IO Controller* on page 91 and section *LEDs PROFINET IO Device* on page 92.

For a description of the pinning of the network interface, see section *Pinning Real-Time Ethernet Interface* on page 104.

9.3.1.7 Front view of netJACK with Sercos Master
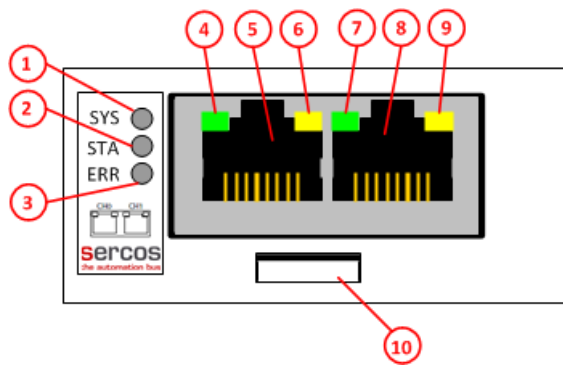
Figure 46: Front view netJACK Sercos Master

① System LED (SYS)

② Status LED (STA)

③ Error LED (ERR)

④ Link/Activity LED (L/A) for channel 0

⑤ Interface channel 0

⑥ Not in use

⑦ Link/Activity LED (L/A) for channel 1

⑧ Interface channel 1

⑨ Not in use

⑩ Not in use

For a description of the LED signals used by Sercos (Master), see section *LEDs Sercos Master* on page 93.

For a description of the pinning of the network interface, see section *Pinning Real-Time Ethernet Interface* on page 104.

9.3.1.8 Front view of netJACK with Sercos Slave
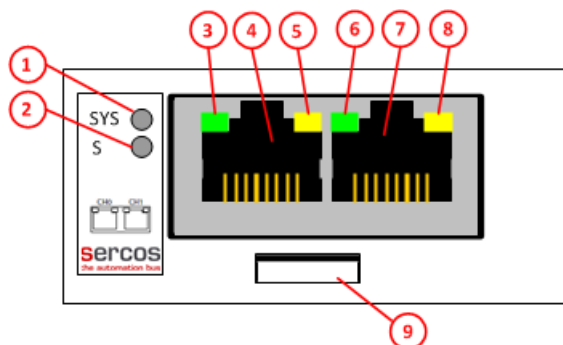
Figure 47: Front view netJACK Sercos Slave

① System LED (SYS)

② Status/Error LED (S)

③ Link/Activity LED (L/A) for channel 0

④ Interface channel 0

⑤ Not in use

⑥ Link/Activity LED (L/A) for channel 1

⑦ Interface channel 1

⑧ Not in use

⑨ Sliding latch

For a description of the LED signals used by Sercos (Slave), see section *LEDs Sercos Slave* on page 95.

For a description of the pinning of the network interface, see section *Pinning Real-Time Ethernet Interface* on page 104.

9.3.1.9 Front view of netJACK with VARAN Client
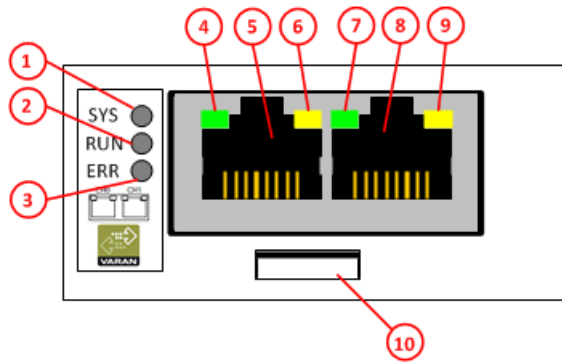
Figure 48: Front view netJACK VARAN Client

①	System LED (SYS)
②	Run LED (RUN)
③	Error LED (ERR)
④	LINK LED for channel 0
⑤	Interface channel 0
⑥	Activity LED (ACT) for channel 0
⑦	LINK LED for channel 1
⑧	Interface channel 1
⑨	Activity LED (ACT) for channel 1
⑩	Sliding latch

For a description of the LED signals used by VARAN (Client), see section *LEDs VARAN Client* on page 97.

For a description of the pinning of the network interface, see section *Pinning Real-Time Ethernet Interface* on page 104.

9.3.2   netJACK for Fieldbus Systems

9.3.2.1   Front view of netJACK with CANopen

①	System LED (SYS)
②	Communication Status LED (CAN)
③	D-Sub connector, 9 pins
④	Sliding latch
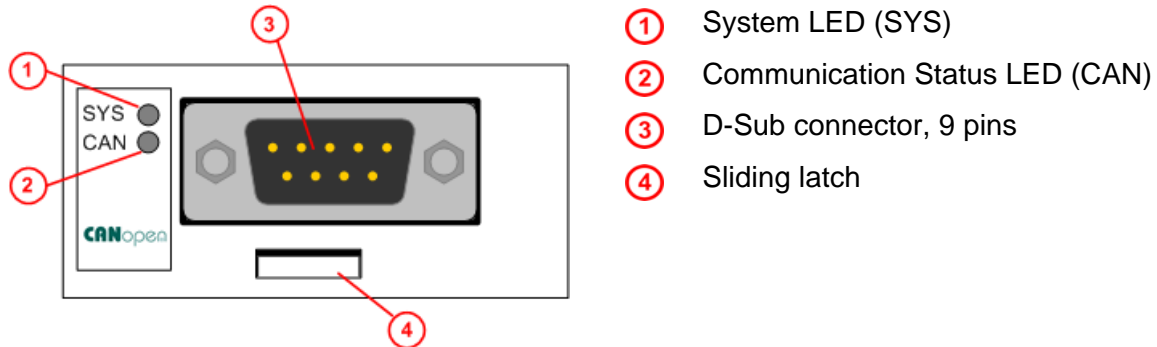
Figure 49: Front view netJACK CANopen

For a description of the LED signals used by CANopen, see section *LEDs CANopen Master* on page 98 and section *LEDs CANopen Slave* on page 99.

For a description of the pinning of the network interface, see section *Pinning CANopen Interface* on page 104.

9.3.2.2   Front view of netJACK with CC-Link

①	System LED (SYS)
②	LED Link-Run
③	LED Link-Error
④	CombiCon connector, 5 pins
⑤	Sliding latch
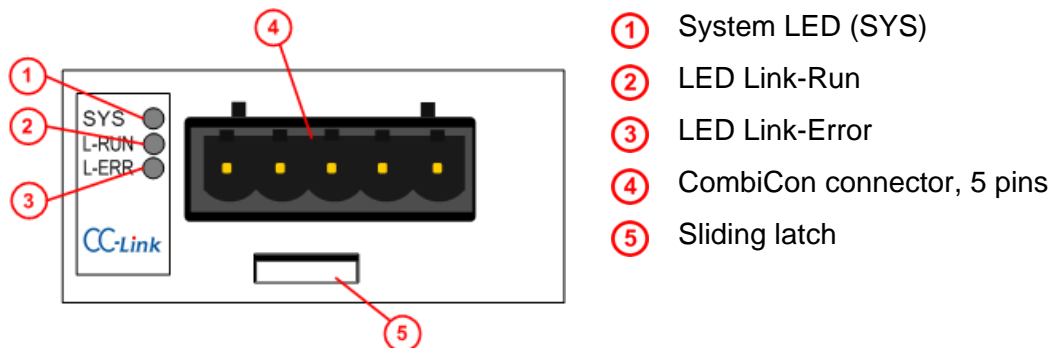
Figure 50: Front view netJACK CC-Link

For a description of the LED signals used by CC-Link, see section *LEDs CC-Link Slave* on page 100.

For a description of the pinning of the network interface, see section *Pinning CC-Link Interface* on page 105.

9.3.2.3 Front view of netJACK with DeviceNet

①	System LED (SYS)
②	Module Network Status LED (MNS)
③	CombiCon connector, 5 pins
④	Sliding latch
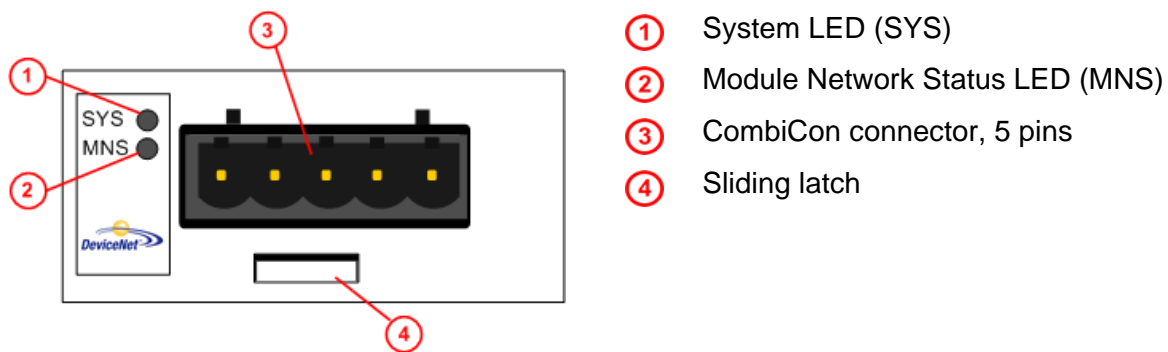
Figure 51: Front view netJACK DeviceNet

For a description of the LED signals used by DeviceNet, see section *LEDs DeviceNet Master* on page 101 and section *LEDs DeviceNet Slave* on page 102.

For a description of the pinning of the network interface, see section *Pinning DeviceNet Interface* on page 105.

9.3.2.4 Front view of netJACK with PROFIBUS DP

①	System LED (SYS)
②	Communication Status LED (COM)
③	D-Sub connector, 9 poles
④	Sliding latch
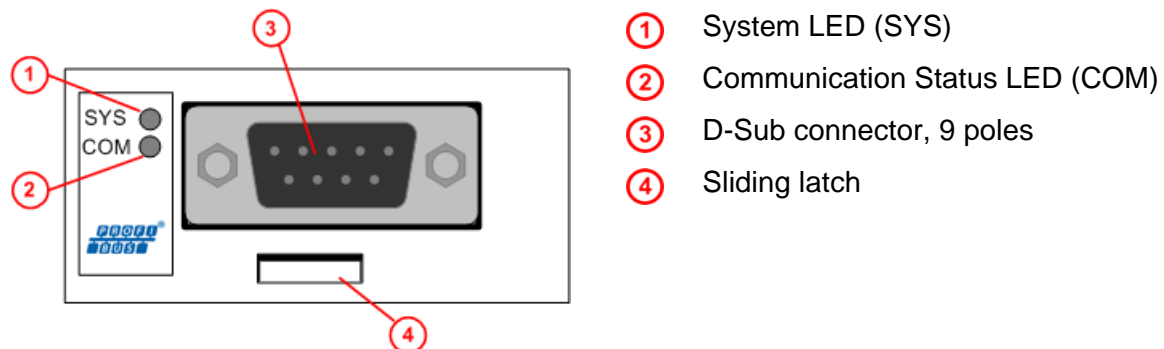
Figure 52: Front view netJACK PROFIBUS DP

For a description of the LED signals used by PROFIBUS DP, see section *LEDs PROFIBUS DP Master* on page 103 and section *LEDs PROFIBUS DP Slave* on page 103

For a description of the pinning of the network interface, see section *Pinning PROFIBUS DP Interface* on page 106.

9.4 Descriptions of the LEDs

9.4.1 System LED

The subsequent table describes the meaning of the system LED.

LED	Color	State	Meaning
SYS	**Duo LED yellow/green**		
Name in the device drawing: ①	(yellow)	static	Bootloader netX (= romloader) is waiting for second stage bootloader
	(green/ yellow)	Blinking green/ yellow	Second stage bootloader is waiting for firmware
	(green)	On	Operating System and firmware is running
	(off)	Off	Power supply for the device is missing or hardware defect.

Table 18: System LED

9.4.2 LEDs Real-Time Ethernet Systems

9.4.2.1 LEDs EtherCAT Master

The subsequent table describes the meaning of the LEDs for netJACK communication module when the firmware of the EtherCAT Master protocol is loaded to the device.

LED	Color	State	Meaning
RUN Name in the device drawing: ②	**Duo LED red/green**		
	(off)	Off	**INIT**: The device is in state INIT
	(green)	Blinking	**PRE-OPERATIONAL**: The device is in PRE-OPERATIONAL state
	(green)	Flickering	**BOOT**: Device is in Boot mode
	(green)	Single Flash	**SAFE-OPERATIONAL**: The device is in SAFE-OPERATIONAL state
	(green)	On	**OPERATIONAL**: The device is in OPERATIONAL state
ERR Name in the device drawing: ③	**Duo LED red/green**		
	(off)	Off	Master has no errors
	(red)	On	Master has detected a communication error. The error is indicated in the DPM
LINK RJ45 Ch0 ④	**LED green**		
	(green)	On	A link is established
	(off)	Off	No link established
ACT RJ45 Ch0 ⑥	**LED yellow**		
	(yellow)	Flickering	The device sends/receives Ethernet frames

Table 19: LEDs EtherCAT Master

LED State Definition for EtherCAT Master for the RUN ② and ERR LEDs ③

Indicator state	Definition
On	The indicator is constantly on.
Off	The indicator is constantly off.
Blinking	The indicator turns on and off with a frequency of 2,5 Hz: on for 200 ms, followed by off for 200 ms.
Flickering	The indicator turns on and off with a frequency of approximately 10 Hz: on for approximately 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).

Table 20: LED State Definition for EtherCAT Master for the RUN and ERR LEDs

The positions of the LEDs are indicated in section *Front view of netJACK with EtherCAT Master*, page 76.

9.4.2.2 LEDs EtherCAT Slave

The subsequent table describes the meaning of the LEDs for the netJACK communication module when the firmware of the EtherCAT Slave protocol is loaded to the device.

LED	Color	State	Meaning
RUN Number in the device drawing: ②	**Duo LED red/green**		
	(off)	Off	**INIT**: The device is in state INIT
	(green)	Blinking	**PRE-OPERATIONAL**: The device is in state PRE-OPERATIONAL
	(green)	Single Flash	**SAFE-OPERATIONAL**: The device is in state SAFE-OPERATIONAL
	(green)	On	**OPERATIONAL**: The device is in state OPERATIONAL
ERR Number in the device drawing: ③	**Duo LED red/green**		
	(off)	Off	**No error**: The EtherCAT communication of the device is in working condition
	(red)	Blinking	**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 RJ45 Ch0 ④ **L/A OUT** RJ45 Ch1 ⑦	**LED green**		
	(green)	On	A link is established
	(green)	Flickering	The device sends/receives Ethernet frames
	(off)	Off	No link established
RJ45 Ch0 ⑥ RJ45 Ch1 ⑨	**LED yellow**		
	(yellow)	-	This LED is not used.

Table 21: LEDs EtherCAT Slave

LED State Definition for EtherCAT Slave for the LEDs RUN ② and ERR LED ③

Indicator state	Definition
On	The indicator is constantly on.
Off	The indicator is constantly off.
Blinking	The indicator turns on and off with a frequency of 2,5 Hz: on for 200 ms, followed by off for 200 ms.
Flickering	The indicator turns on and off with a frequency of approximately 10 Hz: on for approximately 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).
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 22: LED State Definition for EtherCAT Slave for the RUN and ERR LEDs

The positions of the LEDs are indicated in section *Front view of netJACK with EtherCAT Slave*, page 76.

9.4.2.3 LEDs EtherNet/IP Scanner

The subsequent table describes the meaning of the LEDs for the netJACK communication module when the firmware of the EtherNet/IP Scanner (Master) protocol is loaded to the device.

LED	Color	State	Meaning
MS	**Duo LED red/green**		
Number in the device drawing: ②	(green)	On	**Device operational**: If the device is operating correctly, the module status indicator shall be steady green.
	(green)	Flashing	**Standby**: If the device has not been configured, the module status indicator shall be flashing green.
	(red)	On	**Major fault**: If the device has detected a non-recoverable major fault, the module status indicator shall be steady red.
	(red)	Flashing	**Minor fault**: If the device has detected a recoverable minor fault, the module status indicator shall be flashing red. NOTE: An incorrect or inconsistent configuration would be considered a minor fault.
	(red/green)	Flashing	**Self-test**: While the device is performing its power up testing, the module status indicator shall be flashing green/red.
	(off)	Off	**No power**: If no power is supplied to the device, the module status indicator shall be steady off.
NS	**Duo LED red/green**		
Number in the device drawing: ③	(green)	On	**Connected**: If the device has at least one established connection (even to the Message Router), the network status indicator shall be steady green.
	(green)	Flashing	**No connections**: If the device has no established connections, but has obtained an IP address, the network status indicator shall be flashing green.
	(red)	On	**Duplicate IP**: If the device has detected that its IP address is already in use, the network status indicator shall be steady red.
	(red)	Flashing	**Connection timeout**: If one or more of the connections in which this device is the target has timed out, the network status indicator shall be flashing red. This shall be left only if all timed out connections are reestablished or if the device is reset.
	(red/green)	Flashing	**Self-test**: While the device is performing its power up testing, the network status indicator shall be flashing green/red.
	(off)	Off	**Not powered, no IP address**: If the device does not have an IP address (or is powered off), the network status indicator shall be steady off.
LINK/RJ45 Ch0 & Ch1 ④ & ⑦	**LED green**		
	(green)	On	A connection to the Ethernet exists
	(off)	Off	The device has no connection to the Ethernet
ACT/RJ45 Ch0 & Ch1 ⑥ & ⑨	**LED yellow**		
	(yellow)	Flashing	The device sends/receives Ethernet frames

Table 23: LEDs EtherNet/IP Scanner (Master)

9.4.2.4   LEDs EtherNet/IP Adapter

The subsequent table describes the meaning of the LEDs for the netJACK communication module when the firmware of the EtherNet/IP Adapter (Slave) protocol is loaded to the device.

LED	Color	State	Meaning
MS Number in the device drawing: ②	**Duo LED red/green**		
	🟢 (green)	On	**Device operational**: If the device is operating correctly, the module status indicator shall be steady green.
	🟢 (green)	Flashing	**Standby**: If the device has not been configured, the module status indicator shall be flashing green.
	🔴 (red)	On	**Major fault**: If the device has detected a non-recoverable major fault, the module status indicator shall be steady red.
	🔴 (red)	Flashing	**Minor fault**: If the device has detected a recoverable minor fault, the module status indicator shall be flashing red. NOTE: An incorrect or inconsistent configuration would be considered a minor fault.
	🔴🟢 (red/green)	Flashing	**Self-test**: While the device is performing its power up testing, the module status indicator shall be flashing green/red.
	⚪ (off)	Off	**No power**: If no power is supplied to the device, the module status indicator shall be steady off.
NS Number in the device drawing: ③	**Duo LED red/green**		
	🟢 (green)	On	**Connected**: If the device has at least one established connection (even to the Message Router), the network status indicator shall be steady green.
	🟢 (green)	Flashing	**No connections**: If the device has no established connections, but has obtained an IP address, the network status indicator shall be flashing green.
	🔴 (red)	On	**Duplicate IP**: If the device has detected that its IP address is already in use, the network status indicator shall be steady red.
	🔴 (red)	Flashing	**Connection timeout**: If one or more of the connections in which this device is the target has timed out, the network status indicator shall be flashing red. This shall be left only if all timed out connections are reestablished or if the device is reset.
	🔴🟢 (red/green)	Flashing	**Self-test**: While the device is performing its power up testing, the network status indicator shall be flashing green/red.
	⚪ (off)	Off	**Not powered, no IP address**: If the device does not have an IP address (or is powered off), the network status indicator shall be steady off.
LINK/RJ45 Ch0 & Ch1 ④ & ⑦	**LED green**		
	🟢 (green)	On	A connection to the Ethernet exists
	⚪ (off)	Off	The device has no connection to the Ethernet
ACT/RJ45 Ch0 & Ch1 ⑥ & ⑨	**LED yellow**		
	🟡 (yellow)	Flashing	The device sends/receives Ethernet frames

Table 24: LEDs EtherNet/IP Adapter (Slave)

The positions of the LEDs are indicated in section *Front view of netJACK with EtherNet/IP*, page 77.

9.4.2.5   LEDs Open Modbus/TCP

The subsequent table describes the meaning of the LEDs for the netJACK communication module when the firmware of the Open Modbus/TCP protocol is loaded to the device.

LED	Color	State	Meaning
RUN Number in the device drawing: ②	**Duo LED red/green**		
	(off)	Off	**Not Ready** OMB task is not ready
	(green)	Flashing cyclic with 1Hz	**Ready, not configured yet** OMB task is ready and not configured yet
	(green)	Flashing cyclic with 5Hz	**Waiting for Communication:** OMB task is configured
	(green)	On	**Connected:** OMB task has communication – at least one TCP connection is established
ERR Number in the device drawing: ③	**Duo LED red/green**		
	(off)	Off	No communication error
	(red)	Flashing cyclic with 2Hz (On/Off Ratio = 25 %)	System error
	(red)	On	Communication error active
LINK/RJ45 Ch0 & Ch1 ④ & ⑦	**LED green**		
	(green)	On	A connection to the Ethernet exists
	(off)	Off	The device has no connection to the Ethernet
ACT/RJ45 Ch0 & Ch1 ⑥ & ⑨	**LED yellow**		
	(yellow)	Flashing	The device sends/receives Ethernet frames

Table 25: LEDs Open Modbus/TCP

The positions of the LEDs are indicated in section *Front view of netJACK with Open Modbus/TCP*, page 77.

9.4.2.6 LEDs POWERLINK

The subsequent table describes the meaning of the LEDs for the netJACK communication module when the firmware of the POWERLINK Controlled Node/Slave protocol is loaded to the device.

LED	Color	State	Meaning
BS Number in the device drawing: ②	**Duo LED red/green**		
	(off)	Off	Slave initializing
	(green)	Flickering	Slave is in 'Basic Ethernet' state
		Single Flash	Slave is in 'Pre-Operational 1' state
		Double Flash	Slave is in 'Pre-Operational 2' state
		Triple Flash	Slave is in 'ReadyToOperate' state
		On	Slave is in 'Operational' state
		Blinking	Slave is in 'Stopped' state
BE Number in the device drawing: ③	**Duo LED red/green**		
	(off)	Off	Slave has no error
	(red)	On	Slave has detected an error
L/A/RJ45 Ch0 & Ch1 ④ & ⑦	**LED green**		
	(green)	On	**Link**: A connection to the Ethernet exists
	(green)	Flickering	**Activity**: The device sends/receives Ethernet frames
	(off)	Off	The device has no connection to the Ethernet
RJ45 Ch0 & Ch1 ⑥ & ⑨	**LED yellow**		
	-	-	This LED is not used.

Table 26: LEDs POWERLINK Controlled Node/Slave

<u>LED State Definition for POWERLINK Controlled Node/Slave for the BS/BE LEDs</u>

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

Table 27: LED State Definition for POWERLINK Controlled Node/Slave for the BS/BE LEDs

The positions of the LEDs are indicated in section *Front view of netJACK with POWERLINK*, page 78.

9.4.2.7 LEDs PROFINET IO Controller

The subsequent table describes the meaning of the LEDs for the netJACK communication module when the firmware of the PROFINET IO-RT Controller protocol is loaded to the device.

LED	Color	State	Meaning
SF Name in the device drawing: ②	**Duo LED red/green**		
	(red)	On	*(***together** *with BF „red ON")* **No valid Master license**
	(red)	Flashing cyclic at 2 Hz	**System error**: Invalid configuration, Watchdog error or internal error
	(off)	Off	No error
BF Name in the device drawing: ③	**Duo LED red/green**		
	(red)	On	**No Connection:** No Link. *or (***together** *with SF „red ON")* **No valid Master license**
	(red)	Flashing cyclic at 2 Hz	**Configuration fault:** not all configured IO-Devices are connected.
	(off)	Off	No error
LINK RJ45 Ch0 & Ch1 ④ & ⑦	**LED green**		
	(green)	On	A connection to the Ethernet exists
	(off)	Off	The device has no connection to the Ethernet
RX/TX RJ45 Ch0 & Ch1 ⑥ & ⑨	**LED yellow**		
	(yellow)	Flashing	The device sends/receives Ethernet frames

Table 28: LEDs PROFINET IO-RT Controller

The positions of the LEDs are indicated in section *Front view of netJACK with PROFINET IO*, page 78.

9.4.2.8   LEDs PROFINET IO Device

The subsequent table describes the meaning of the LEDs for the netJACK communication module when the firmware of the PROFINET IO-RT-Device protocol is loaded to the device.

LED	Color	State	Meaning
SF Number in the device drawing: ②	**Duo LED red/green**		
	(red)	On	Watchdog timeout; channel, generic or extended diagnosis present; system error
	(red)	Flashing cyclic at 2 Hz (for 3 sec.)	DCP signal service is initiated via the bus
	(off)	Off	No error
BF Number in the device drawing: ③	**Duo LED red/green**		
	(red)	On	No configuration; or low speed physical link; or no physical link
	(red)	Flashing cyclic at 2 Hz	No data exchange
	(off)	Off	No error
LINK/RJ45 Ch0 & Ch1 ④ & ⑦	**LED green**		
	(green)	On	A connection to the Ethernet exists
	(off)	Off	The device has no connection to the Ethernet
RX/TX/RJ45 Ch0 & Ch1 ⑥ & ⑨	**LED yellow**		
	(yellow)	Flashing	The device sends/receives Ethernet frames

Table 29: LEDs PROFINET IO-RT-Device

The positions of the LEDs are indicated in section *Front view of netJACK with PROFINET IO*, page 78.

9.4.2.9 LEDs Sercos Master

The subsequent table describes the meaning of the LEDs for the netJACK communication module when the firmware of the sercos Master protocol is loaded to the device.

LED	Color	State	Meaning
STA	**Duo LED red/green**		
Name in the device drawing: ②	(green)	Blinking	**CP0:** Communication phase 0
	(green)	Flickering	Master isn't configured and is in NRT. After a status change this isn't indicated again
	(green)	Single Flash	**CP1:** Communication phase 1
	(green)	Double Flash	**CP2:** Communication phase 2
	(green)	Triple Flash	**CP3:** Communication phase 3
	(green)	On	**CP4:** Communication phase 4
	(off)	Off	**NRT:** Non Real-time Mode
ERR	**Duo LED red/green**		
Name in the device drawing: ③	(red)	Blinking	Error in the configuration database.
	(red)	Flickering	Boot-up was stopped due to an error.
	(red)	Double Flickering	Slave is missing.
	(red)	Single Flickering	Channel Init was executed at the Master.
	(red)	Quadruple Flash	No Master license present in the device
	(red)	Triple Flash	DPM Watchdog has expired.
	(red)	Double Flash	Internal Stop of the bus cycle
	(red)	Single Flash	Bus Sync Error Threshold
	(off)	Off	No error
L/A RJ45 Ch0 & Ch1 ④ & ⑦	**LED green**		
	(green)	On	Link: A connection to the Ethernet exists
	(green)	Flickering	Activity: The device sends/receives Ethernet frames
	(off)	Off	The device has no connection to the Ethernet
RJ45 Ch0 & Ch1 ⑥ & ⑨	**LED yellow**		
	-	-	This LED is not used.

Table 30: LEDs sercos Master

LED State Definition for sercos Master for the STA ② and ERR LEDs ③

Indicator state	Definition
Off	The indicator is constantly off.
Blinking	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 turns on for approximately 50 ms, followed by off for 500 ms.
Double Flickering	The indicator turns on / off / on each for approximately 50 ms, followed by off for 500 ms.
Flickering	The indicator turns on and off with a frequency of approximately 10 Hz: on for approximately 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).
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).

Table 31: LED State Definition for sercos Master for the STA and ERR LEDs

The positions of the LEDs are indicated in section *Front view of netJACK with Sercos Master*, page 79.

9.4.2.10   LEDs Sercos Slave

The subsequent table describes the meaning of the LEDs for the netJACK communication module when the firmware of the sercos Slave protocol is loaded to the device.

LED	Color	State	Meaning
S (STA)	**Duo LED red/green/orange** (orange = red/green simultaneously)		
Name in the device drawing: ②	⚪ (off)	Off	**NRT-Mode**: No sercos Communication
	🟢 (green)	On	**CP4**: Communication phase 4, Normal operation, no error
	🟢 (green)	Flashing (4 Hz)	**Loopback**: The network state has changed from „fast-forward" to „loopback".
	🟢🟠 (green/ orange)	Flashing (1 x green / 3 s)	**CP1**: Communication phase 1: Flashing green for 250 ms, then orange on for 2 second and 750 ms
		Flashing (2 x green / 3 s)	**CP2**: Communication phase 2: Flashing green / orange / green, each for 250 ms, then orange on for 2 seconds and 250 ms
		Flashing (3 x green / 3 s)	**CP3**: Communication phase 3: Flashing green / orange / green / orange / green, each for 250 ms, then orange on for 1 second and 750 ms
	🟠🟢 (orange/ green)	Flashing (4 Hz)	**HP0**: Hot-plug mode (not yet implemented): Flashing orange permanently
		Flashing (1 x orange / 3 s)	**HP2**: Hot-plug mode (not yet implemented): Flashing orange for 250 ms, then green on for 2 seconds an 750 ms
		Flashing (2 x orange / 3 s)	**HP3**: Hot-plug mode (not yet implemented): Flashing orange / green / orange, each for 250 ms, then green on for 2 seconds and 250 ms
	🟠 (orange)	On	**CP0**: Communication phase 0
	🟠 (orange)	Flashing (4 Hz)	**Identification**: Corresponds to C-DEV.Bit 15 in the Slave's Device Control indicating remote address allocation or configuration errors between Master and Slaves (for details refer to sercos Slave V3 Protocol API Manual).
	🟢🔴 (green/ red)	Flashing (4 Hz), *The LED flashes at least for 2 seconds from green to red.*	**MST losses ≥ (S-0-1003/2)**: Depends on IDN S-0-1003 (for details refer to sercos Slave Protocol API manual). Corresponds to S-DEV.Bit 15 in the Device Status indicating a communication warning (Master SYNC telegrams have not been received)
	🔴🟠 (red /orange)	Flashing (4 Hz)	**Application error (C1D)**: See GDP & FSP Status codes class error. See sercos Slave V3 Protocol API Manual.
	🔴 (red)	Flashing (4 Hz)	**Watchdog error**: Application is not running (not yet implemented)
	🔴 (red)	On	**Communication Error (C1D)**: Error detected according to sercos Class 1 Diagnosis, see SCP Status codes class error. See sercos Slave V3 Protocol API Manual.
L/A/RJ45 Ch0 & Ch1 ③ & ⑥	**LED green**		
	🟢 (green)	On	Link: A connection to the Ethernet exists
	🟢 (green)	Flickering	Activity: The device sends/receives Ethernet frames
	⚪ (off)	Off	The device has no connection to the Ethernet
RJ45 Ch0 & Ch1 ⑤ & ⑧	**LED yellow**		
	-	-	This LED is not used.

Table 32: LEDs sercos Slave

LED State Definition for sercos Slave for the S LED (STA) ②

Indicator state	Definition
On	The indicator is constantly on.
Off	The indicator is constantly off.
Flashing (4 Hz)	The indicator turns on and off with a frequency of 4 Hz: first color for appr. 125 ms, followed by the second color for appr. 125 ms.
Flickering	The indicator turns on and off with a frequency of approximately 10 Hz: on for approximately 50 ms, followed by off for 50 ms.

Table 33: LED State Definition for sercos Slave for the S LED (STA LED)

The positions of the LEDs are indicated in section *Front view of netJACK with Sercos Slave*, page 79.

9.4.2.11   LEDs VARAN Client

The subsequent table describes the meaning of the LEDs for the netJACK communication module when the firmware of the VARAN Client protocol is loaded into the device.

LED	Color	State	Meaning
RUN Name in the device drawing: ②	**Duo LED red/green**		
	(off)	Off	Not configured.
	(green)	Blinking	Configured and communication is inactive.
	(green)	On	Configured and communication is active.
ERR Name in the device drawing: ③	**Duo LED red/green**		
	(off)	Off	Configured.
	(red)	Blinking	Not configured.
	(red)	On	Communication error occurred.
LINK RJ45 Ch0 & Ch1 ④ & ⑦	**LED green**		
	(green)	On	A connection to the Ethernet exists
	(off)	Off	The device has no connection to the Ethernet
ACT RJ45 Ch0 & Ch1 ⑥ & ⑨	**LED yellow**		
	(yellow)	Flashing	The device sends/receives Ethernet frames

Table 34: LEDs VARAN Client

LED State Definition for VARAN Client for the RUN and ERR LEDs

Indicator state	Definition
On	The indicator is constantly on.
Off	The indicator is constantly off.
Blinking	The indicator turns on and off with a frequency of 5 Hz: on for 100 ms, followed by off for 100 ms.

Table 35: LED State Definition for VARAN Client for the RUN and ERR LEDs

The positions of the LEDs are indicated in section *Front view of netJACK with VARAN Client*, page 80.

9.4.3   LEDs Fieldbus Systems

9.4.3.1   LEDs CANopen Master

The subsequent table describes the meaning of the LEDs for the netJACK communication module when the CANopen Master firmware is loaded to the device.

LED	Color	State	Meaning
CAN	**Duo LED red/green**		
Name in the device drawing: ②	(off)	Off	**RESET:** The device is executing a reset
	(green)	Single flash	**STOPPED:** The device is in STOPPED state
	(green)	Blinking	**PREOPERATIONAL:** The device is in the PREOPERATIONAL state
	(green)	On	**OPERATIONAL:** The device is in the OPERATIONAL state
	(red)	Single flash	**Warning Limit reached:** At least one of the error counters of the CAN controller has reached or exceeded the warning level (too many error frames).
	(red)	Double flash	**Error Control Event:** A guard event (NMT Slave or NMT-master) or a heartbeat event (Heartbeat consumer) has occurred.
	(red)	On	**Bus Off:** The CAN controller is bus off

Table 36: LEDs CANopen Master

LED State Definition for CANopen Master for the CAN LED

Indicator state	Definition
On	The indicator is constantly on.
Off	The indicator is constantly off.
Flickering	The indicator turns on and off with a frequency of 10 Hz: on for 50 ms, followed by off for 50 ms.
Blinking	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 37: LED State Definition for CANopen Master for the CAN LED

The positions of the LEDs are indicated in section *Front view of netJACK with CANopen*, page 81.

9.4.3.2 LEDs CANopen Slave

The subsequent table describes the meaning of the LEDs for the netJACK communication module when the CANopen Slave firmware is loaded to the device.

LED	Color	State	Meaning
CAN Name in the device drawing: ②	**Duo LED red/green**		
	(off)	Off	**RESET:** The device is executing a reset
	(green)	Single flash	**STOPPED:** The device is in STOPPED state
	(green)	Blinking	**PREOPERATIONAL:** The device is in the PREOPERATIONAL state
	(green)	On	**OPERATIONAL:** The device is in the OPERATIONAL state
	(red/ green)	Flickering (alternatively red / green)	**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 bus off

Table 38: LEDs CANopen Slave

LED State Definition for CANopen Slave for the CAN LED

Indicator state	Definition
On	The indicator is constantly on.
Off	The indicator is constantly off.
Flickering	The indicator turns on and off with a frequency of 10 Hz: on for 50 ms, followed by off for 50 ms.
Blinking	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 39: LED State Definition for CANopen Slave for the CAN LED

The positions of the LEDs are indicated in section *Front view of netJACK with CANopen*, page 81.

9.4.3.3 LEDs CC-Link Slave

The subsequent table describes the meaning of the LEDs for the netJACK communication module when the firmware of the CC-Link Slave protocol is loaded to the device.

LED	Color	State	Meaning
L RUN Number in the device drawing: ②	**LED green**		
	(off)	Off	1. Before participating in the network 2. Unable to detect carrier 3. Timeout 4. Resetting hardware
	(green)	On	Receive both refresh and polling signals or just the refresh signal normally, after participating in the network.
L ERR Number in the device drawing: ③	**LED green**		
	(off)	Off	1. Normal communication 2. Resetting hardware
	(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)

Table 40: LEDs CC-Link Slave

The positions of the LEDs are indicated in section *Front view of netJACK with CC-Link* on page 81.

9.4.3.4 LEDs DeviceNet Master

The subsequent table describes the meaning of the LEDs for the netJACK communication module when the DeviceNet Master firmware is loaded to the device.

LED	Color	State	Meaning
MNS	**Duo LED red/green**		
Name in the device drawing: ②	🟢 (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 Green/Red/Off	**Selftest after power on:** Green on for 250 ms, then red on for 250 ms, then off.
	🔴 (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
	🔴 (red)	On	**Critical Fault orCritical 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 completed the Dup_MAC_ID test yet. - The device is powered, but the network power is missing.

Table 41: LEDs DeviceNet Master

LED State Definition for DeviceNet Master for the MNS LED

Indicator state	Definition
On	The indicator is constantly on.
Off	The indicator is constantly off.
Flashing (1 Hz) green	The indicator turns on and off with a frequency of appr. 1 Hz: on for appr. 500 ms, followed by off for appr. 500 ms.
Flashing (1 Hz) red	The indicator turns on and off with a frequency of appr. 1 Hz: on for appr. 500 ms, followed by off for appr. 500 ms.

Table 42: LED State Definition for DeviceNet Master for the MNS LED

9.4.3.5   LEDs DeviceNet Slave

The subsequent table describes the meaning of the LEDs for the netJACK communication module when the DeviceNet Slave firmware is loaded to the device.

LED	Color	State	Meaning
MNS	Duo LED red/green		
Name in the device drawing: ②	(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 Green/Red/Off	**Selftest after power on:** Green on for 250 ms, then red on for 250 ms, then off.
	(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
	(red)	On	**Critical Fault orCritical 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 completed the Dup_MAC_ID test yet. - The device is powered, but the network power is missing.

Table 43: LEDs DeviceNet Slave

LED State Definition for DeviceNet Slave for the MNS LED

Indicator state	Definition
On	The indicator is constantly on.
Off	The indicator is constantly off.
Flashing (1 Hz) green	The indicator turns on and off with a frequency of appr. 1 Hz: on for appr. 500 ms, followed by off for appr. 500 ms.
Flashing (1 Hz) red	The indicator turns on and off with a frequency of appr. 1 Hz: on for appr. 500 ms, followed by off for appr. 500 ms.

Table 44: LED State Definition for DeviceNet Slave for the MNS LED

The positions of the LEDs are indicated in section *Front view of netJACK with DeviceNet*, page 82.

9.4.3.6 LEDs PROFIBUS DP Master

The subsequent table describes the meaning of the LEDs for the netJACK communication module when the PROFIBUS DP Master firmware is loaded to the device.

LED	Color	State	Meaning
COM Name in the device drawing: ②	**Duo LED red/green**		
	(green)	Flashing acyclic	No configuration or stack error
	(green)	Flashing cyclic	Profibus is configured, but bus communication is not yet released from the application
	(green)	On	Communication to all Slaves is established
	(red)	Flashing cyclic	Communication to at least one Slave is disconnected
	(red)	On	Communication to one/all Slaves is disconnected or annother serious error has occured. Redundant Mode: The active Master was not found.

Table 45: LEDs PROFIBUS DP Master

9.4.3.7 LEDs PROFIBUS DP Slave

The subsequent table describes the meaning of the LEDs for the netJACK communication module when the PROFIBUS DP Slave firmware is loaded to the device.

LED	Color	State	Meaning
COM Name in the device drawing: ②	**Duo LED red/green**		
	(green)	On	RUN, cyclic communication
	(red)	On	Wrong configuration at PROFIBUS-DPside.
	(red)	Flashing cyclic	STOP, no communication, connection error
	(red)	Flashing acyclic	not configured

Table 46: LEDs PROFIBUS DP Slave

The positions of the LEDs are indicated in section *Front view of netJACK with PROFIBUS DP*, page 82.

9.5   Pinning

9.5.1   Pinning Real-Time Ethernet Interface

The following picture shows the pinning of the Real-Time Ethernet interface of the netJACK communication module:
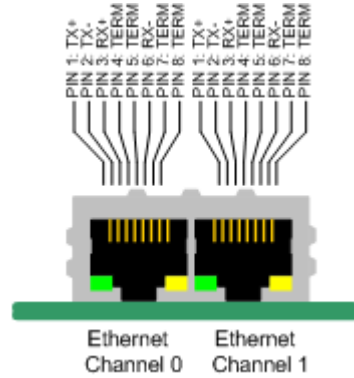
Figure 53: Pinning of Ethernet Connectors

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 47: Ethernet Interface Channel 0 and Channel 1 Pin Assignment

Note: Auto-crossover function is supported by the netJACK modules.

9.5.2   Pinning CANopen Interface

The following picture shows the pinning of the CANopen interface of the netJACK communication module:
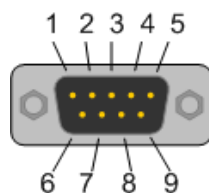
Figure 54: Pinning CANopen Interface (D-Sub-Plug, 9-poles)

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

Table 48: Pinning CANopen Interface

9.5.3 Pinning CC-Link Interface

The following picture shows the pinning of the CC-Link interface of the netJACK communication module:
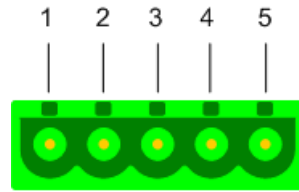
Figure 55: Pinning CC-Link Interface (CombiCon connector, 5-pole)

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 49:Pinning CC-Link

9.5.4 Pinning DeviceNet Interface

The following picture shows the pinning of the DeviceNet interface of the netJACK communication module:
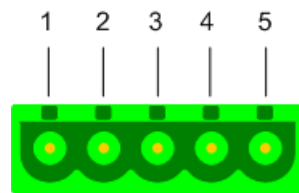
Figure 56: Pinning DeviceNet Interface (CombiCon connector, 5-pole)

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 50: Pinning DeviceNet Interface

9.5.5 Pinning PROFIBUS DP Interface

The following picture shows the pinning of the PROFIBUS interface of the netJACK communication module:
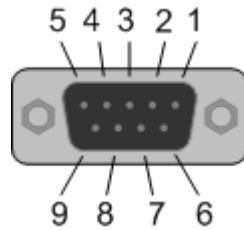
Figure 57: Pinning PROFIBUS DP Interface (D-Sub-female connector, 9-pole)

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 51: Pinning PROFIBUS DP Interface

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

10 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* section on page 30).

Note: 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* table on page 14.

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* on page 83 ff.

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.

11 Technical Data

11.1 Technical Data of the netJACK Communication Modules

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

11.1.1   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 ± 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 ± 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
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 52: Technical Data NJ 10D-COS

11.1.2   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 ± 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 ± 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
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 53: Technical Data NJ 10D-CSS

11.1.3 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 ± 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 ± 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
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 54: Technical Data NJ 10D-DNS

11.1.4   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 ± 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 ± 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
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 55: Technical Data NJ 10D-DPS

11.1.5   NJ 50D-RE

NJ 50D-RE	Parameter	Value
Device ID	Part number	1632.100
Communication controller	Type	netX 50 processor
Integrated memory	RAM	8 MB SDRAM
	FLASH	4 MB serial Flash EPROM
Host interface	Type	Dual-port memory, parallel
	Data width (parallel)	8 or 16 bit
	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, POWERLINK Controlled Node/Slave, PROFINET IO Device (Slave), Sercos Slave, 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 loaded firmware
	Auto-Crossover	depending on loaded 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
		Link0/1, Activity0/1
Power supply	Voltage	+3.3 V ± 5 % DC
	Current at 3.3 V (typically)	800 mA
	Power Consumption	Approx. 2.65 W (at 800 mA)
Signal lines	Voltage of IO signal lines	+3.3 V ± 5 %
Environmental conditions	Ambient temperature range for operation	-20 … +65°C
	Ambient temperature range for storage	-40 … +85°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
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 56: Technical Data NJ 50D-RE

11.1.6   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 ± 5 % DC
	Current at 3.3 V (typically)	not measured yet
	Current at 3.3 V (maximum)	not measured yet
	Power consumption	not measured yet
Signal lines	Voltage of IO signal lines	+3,3 V ± 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
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 57: Technical Data NJ 51D-RE

11.1.7   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 ± 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 ± 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
Certification	CE Sign	yes
	RoHS	yes
	Reach	yes
	UL Certification	yes, cURus
	UL File No.	E334100

NJ 100EN-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 58: Technical Data NJ 100EN-RE

11.1.8   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 ± 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 ± 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
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 59: Technical Data NJ 100EN-CO

11.1.9   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 ± 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 ± 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
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 60: Technical Data NJ 100EN-DN

11.1.10 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 ± 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 ± 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
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 61: Technical Data NJ 100EN-DP

11.1.11 NJ 100DN-RE (preliminary)

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 ± 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 ± 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
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 62: Technical Data NJ 100DN-RE

11.1.12 NJ 100DN-CO (preliminary)

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 ± 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 ± 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
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 63: Technical Data NJ 100DN-CO

11.1.13 NJ 100DN-DN (preliminary)

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 ± 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 ± 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
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 64: Technical Data NJ 100DN-DN

11.1.14 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 ± 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 ± 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
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 65: Technical Data NJ 100DN-DP

11.2 Technical Data of the Real-Time Ethernet Systems

11.2.1 EtherCAT Master

Parameter	Description
Maximum number of EtherCAT slaves	Maximum 200 Slaves. The number of usable slaves depends on the available memory for the configuration file. See 'configuration file' below.
Maximum number of cyclic input data	5760 bytes
Maximum number of cyclic output data	5760 bytes
Minimum bus cycle time	205 µs, depending on the used number of slaves and the used number of cyclic input data and output data. Recommended is a cycle time of 1 ms and higher.
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 Distubuted Clock and Redundancy can not be used at the same time.
Reference to firmware/stack version	V3.0.x.x

Table 66: Technical Data EtherCAT Master Protocol

11.2.2   EtherCAT Slave V2.5 and V4.2

Parameter	Description NJ 50X-RE	Description NJ 51X-RE	Description NJ 100XX-RE
Maximum number of cyclic input data	1024 bytes	1024 bytes	256* bytes
Maximum number of cyclic output data	1024 bytes	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)	SDO SDO Master-Slave SDO Slave-Slave (depending on Master capability)
Type	Complex Slave	Complex Slave	Complex Slave
Functions	Emergency	Emergency	Emergency
FMMUs	8	8	3
SYNC Manager	4	4	4
Distributed Clocks (DC)	Supported, 32 Bit	Supported, 32 Bit	Supported, 32 Bit
Baud rate	100 MBit/s	100 MBit/s	100 MBit/s
Data transport layer	Ethernet II, IEEE 802.3	Ethernet II, IEEE 802.3	Ethernet II, IEEE 802.3
Limitation	LRW is not supported	LRW is not supported	LRW is not supported
Reference to firmware/stack version	V2.5.x.x and V4.2.x.x	V4.2.x.x	V2.5.x.x and V4.2.x.x

Table 67: 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 ouput data length may not exceed 512 bytes, where each length has to be rounded up to the next multiple of 4 for this calculation.

11.2.3 EtherNet/IP-Scanner

Parameter	Description
Maximum number of EtherNet/IP connections	64 connections for implicit and explicit
Maximum number of total cyclic input data	5712 bytes
Maximum number of total cyclic output data	5760 bytes
Maximum number of cyclic input data	504 bytes per slave per telegram
Maximum number of cyclic output data	504 bytes per slave per telegram
IO Connection type	Cyclic, minimum 1 ms (depending on used number of connections and used number of input and output data)
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	V2.6.x.x

Table 68: Technical Data EtherNet/IP Scanner (Master) Protocol

11.2.4   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
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	V2.7.x.x

Table 69: Technical Data EtherNet/IP Adapter (Slave) Protocol

11.2.5   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* * 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)
Baud rates	10 and 100 MBit/s
Data transport layer	Ethernet II, IEEE 802.3
Reference to firmware/stack version	V2.5.x.x

Table 70: Technical Data Open Modbus/TCP Protocol

11.2.6   POWERLINK

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.x.x

Table 71: Technical Data POWERLINK Controlled Node (Slave) Protocol

11.2.7 PROFINET IO Controller

Parameter	Description
Maximum number of PROFINET IO Devices	128
Maximum number of total cyclic input data	5712 bytes (including IOxS status bytes)
Maximum number of total cyclic output data	5760 bytes (including IOxS status bytes)
Maximum number of cyclic input data	1440 bytes per device (= IOCR data length including IOxS status bytes)
Maximum number of cyclic output data	1440 bytes per device (= IOCR data length including IOxS status bytes)
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

Parameter	Description
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.x.x

Table 72: Technical Data PROFINET IO RT Controller

11.2.8   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 an negative impact on minimum reachable cycle time
Reference to firmware/stack version	V3.4.x.x

Table 73: Technical Data PROFINET IO RT IRT Device Protocol

11.2.9   PROFINET IO Device V3.5

Parameter	Description
Maximum number of cyclic input data	1440 bytes
Maximum number of cyclic output data	1440 bytes
Maximum number of submodules	255 submodules per Application Relation at the same time, 1000 submodules can be configured
Multiple Application Relations (AR)	The Stack can handle up to 2 IO-ARs, one Supervisor AR and one Supervisor-DA AR at the same time
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 (unsynchronized), class 3 (synchronized)
	RTA – Real Time Acyclic Protocol
	DCP – Discovery and configuration Protocol
	CL-RPC – Connectionless Remote Procedure Call
	LLDP – Link Layer Discovery Protocol
	SNMP – Simple Network Management Protocol
	MRP – MRP Client
Topology recognition	LLDP, SNMP V1, MIB2, physical device
Identification & Maintenance	Read and write of I&M1-4
Minimum cycle time	1 ms for RT_CLASS_1
	1 ms for RT_CLASS_3 (NJ 50X-RE)
	500 µs for RT_CLASS_3 (NJ 51X-RE)
	250 µs for RT_CLASS_3 (NJ 100XX-RE)
IRT Support	RT_CLASS_3
Media Redundancy	MRP client is supported
Additional features	DCP, VLAN- and priority tagging, Shared Device
Baud rate	100 MBit/s
Data transport layer	Ethernet II, IEEE 802.3
PROFINET IO specification	V2.2 (legacy startup) and V2.3 (but advanced startup only for RT) are supported

Parameter	Description
Limitations	RT over UDP not supported
	Multicast communication not supported
	Only one device instance is supported
	DHCP is not supported
	FastStartUp is not supported
	The amount of configured IO-data influences the minimum cycle time that can be reached.
	Only 1 Input-CR and 1 Output-CR are supported
	Using little endian (LSB-MSB) byte order for cyclic process data instead of default big endian (MSB-LSB) byte order may have an negative impact on minimum reachable cycle time
	System Redundancy (SR-AR) and Configuration-in-Run (CiR) are not supported
	Max. 255 submodules can be used simultaneously within one specific Application Relation
	Advanced Startup according Profinet specification V2.3 is NOT yet supported for IRT
	As there is no official certification available for Profinet IO specification V2.3 at the time of release of the stack there is no guarantee that this implementation will pass such a certification once it is available
Reference to firmware/stack version	V3.5.26.x

Table 74: Technical Data PROFINET IO RT IRT Device Protocol

11.2.10 SERCOS in the Third Generation – 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.x.x

Table 75: Technical Data sercos Master Protocol

11.2.11 SERCOS in the Third Generation – Slave

Parameter	Description NJ 50D-RE and NJ 51D-RE	Description NJ 100DN-RE and NJ 100EN-RE
Maximum number of cyclic input data (Tx) of all slaves	254 bytes (including Connection Control and IO Status)	128 bytes (including Connection Control and IO Status)
Maximum number of cyclic output data (Rx) of all slaves	254 bytes (including Connection Control and IO Status)	128 bytes (including Connection Control and IO Status)
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	NRT, CP0, CP1, CP2, CP3, CP4
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	sercos in the third generation Communication Specification Version 1.1.2	sercos in the third generation Communication Specification Version 1.1.2
Supported sercos Communication Profiles	SCP_FixCFG Version 1.1.1 SCP_VarCFG Version 1.1.1 SCP_VarCFG Version 1.1.3	SCP_FixCFG Version 1.1.1 SCP_VarCFG Version 1.1.1 SCP_VarCFG Version 1.1.3
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 Version 1.1.1 SCP_ExtMuX Version 1.1.2 SCP_RTBListProd Version 1.3 SCP_RTBListCons Version 1.3 SCP_RTBWordProd Version 1.3 SCP_RTBWordCons Version 1.3 SCP_OvSBasic Version 1.3 SCP_WDCon Version 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 Version 1.1.1 SCP_ExtMuX Version 1.1.2 SCP_RTBListProd Version 1.3 SCP_RTBListCons Version 1.3 SCP_RTBWordProd Version 1.3 SCP_RTBWordCons Version 1.3 SCP_OvSBasic Version 1.3 SCP_WDCon Version 1.3
Supported FSP profiles	FSP_IO FSP_Drive	FSP_IO FSP_Drive
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	Description
	NJ 50D-RE and NJ 51D-RE	**NJ 100DN-RE and NJ 100EN-RE**
Limitations	Max. 2 connections: 1 for consumer and 1 for producer	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)	Modifications of the Service-Channel Object Dictionary will be volatile after reset (if it resides on device)
	Hot plug is not supported	Hot plug is not supported
	Cross communication not supported	Cross communication not supported
	Ethernet interface (API) not supported	NJ 100DN-RE: Ethernet interface (API) not supported
Reference to firmware/stack version	V3.1.x.x	V3.1.x.x

Table 76: Technical Data sercos Slave Protocol

11.2.12 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.x.x

Table 77: Technical Data VARAN Client Protocol

11.3 Technical Data of the Fieldbus Systems

11.3.1 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 78: Technical Data CANopen Master Protocol

11.3.2   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 ▪ synchronized, ▪ remotely requested and ▪ event driven (change of date, event timer) On request of the host application program by packet	Via PDO transfer ▪ 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): ▪ 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): ▪ 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 79: Technical Data CANopen Slave Protocol

11.3.3   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 80: Technical Data CC-Link-Slave Protocol

11.3.4   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 81: Technical Data DeviceNet Master Protocol

11.3.5   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 82: Technical Data DeviceNet Slave Protocol

11.3.6   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 can not be used, if the master is configured by the host application program by packets.
Reference to firmware/stack version	V2.6.x.x

Table 83: Technical Data PROFIBUS DP Master Protocol

11.3.7   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 baudrate 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 84: Technical Data PROFIBUS DP Slave Protocol

11.4 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 85: PCI IDs netJACK on the PCI Bus

12 Annex

12.1 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 86: EtherNet/IP Adapter/Slave – Instance ID of I/O Data

12.2 List of Figures

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