User Manual

netSCOPE Data Acquisition Cards for Real-Time Ethernet

PCI (NSCP-C100-RE\50)

PCI Express (NSCP-C100-RE\50E)

Low Profile PCIe (NSCP-C100-RE\70E)

Compact PCI (NSCP-C100-RE\80)

Mini PCI Express (NSCP-C100-RE\90E)

Installation, Operation and Hardware Description

Hilscher Gesellschaft für Systemautomation mbH

www.hilscher.com

DOC131006UM01EN | Revision 1 | English | 2013-11 | Released | Public

Table of Contents

1 Introduction

1.1 About the User Manual

This user manual provides descriptions and installation instructions of

- the **installation of the software** and
- the **installation**, **operation** and **hardware**

of the netSCOPE data aquistion card *PCI, PCI Express*, *Low Profile PCI Express*, *Compact PCI* and *Mini PCI Express* under Windows® XP, Windows® Vista, Windows® 7 and Windows® 8, as listed subsequently.

netSCOPE data aquistion card for Real-Time Ethernet:

- PCI (NSCP-C100-RE\50)
- PCI Express (NSCP-C100-RE\50E)
- Low Profile PCIe (NSCP-C100-RE\70E)
- Compact PCI (NSCP-C100-RE\80)
- Mini PCI Express (NSCP-C100-RE\90E)

for NSCP-C100-RE\90E inclusively the AIFX Assembly Interface[1]:

- Ethernet (AIFX-RE)

for the Real-Time Ethernet system:

- EtherCAT

The **devices described in this manual** are listed in the sections
- *netSCOPE Data Acquisition Cards* (page 18)

The devices are described in detail in the chapters
- *Hardware Installation and Uninstalling* (page 40),
- *LED Descriptions* (page 49),
- *Device Connections* (page 50) and
- *Technical Data* (page 54).

1.1.1 List of Revisions

Index	Date	Chapter	Revisions
1	13-10-21	All	Created

Table 1: List of Revisions

[1] The AIFX Assembly Interface is also named as „Detached Network Interface“.

1.1.2 Notes on Hardware, Software and Driver Versions

Note: The hardware revisions and the versions for the firmware, the driver or the software listed in this section functionally belong together.

1.1.2.1 Hardware: netSCOPE Data Acquisition Cards

netSCOPE Data Acquisition Card	Part No.	Hardware Revision
NSCP-C100-RE\50	7330.100	5
NSCP-C100-RE\50E	7330.101	5
NSCP-C100-RE\70E	7330.102	1
NSCP-C100-RE\80	7330.103	3
NSCP-C100-RE\90E, inclusively Ethernet Assembly Interface (AIFX-RE)	7330.105	B

Table 2: Reference on Hardware netSCOPE Data Acquisition Cards

1.1.2.2 Drivers and Software

Name			File Name	Version	Path on the netSCOPE LabVIEW DVD
netANALYZER / netSCOPE Windows Device Driver	Setup		netANALYZER / netSCOPE Windows Device Driver Setup.exe	1.5.x.x	*Driver*
	Windows® XP, Windows® Vista	32-Bit	netANALYZER / netSCOPE Windows Device Driver X86.msi	-	*Driver\MSI*
	Windows® 7, Windows® 8	64-Bit	netANALYZER / netSCOPE Windows Device Driver X64.msi	-	*Driver\MSI*
netSCOPE for LabVIEW Instrument Driver			netSCOPE.zip	1.0.x.x	*LabVIEW*

Table 3: Reference on Drivers

Name	File Name	Version
NI LabVIEW 2013 Platform Windows 8/7/Vista/XP/Server	DVD Set	August 2013

Table 4: Reference on Software

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>

Safety Instructions

The labeling of safety and warning instructions is explained separately in chapter *Safety,* in section *Labeling of Safety Instructions.*

1.1.4 Used Terminology

netSCOPE data acquisition card	Hilscher netSCOPE data acquisition card based on the netX technology.
NSCP-C100-RE\50	Example for the type name of a netSCOPE data aquistion card for Real-Time Ethernet.

1.2 Contents of the netSCOPE LabVIEW DVD

The **netSCOPE LabVIEW DVD** for the netSCOPE data aquistion card contains:

- The netANALYZER / netSCOPE Windows Device Driver file for 32-bit and for 64-bit
- netSCOPE for LabVIEW Instrument Driver
- The documentation
  1. netSCOPE User Manual (this document)
  2. netSCOPE Operating Instruction Manual

1.2.1 Directory Structure of the netSCOPE LabVIEW DVD

Directory Name	Description
Root Directory	Flash Animation (*netSCOPE-for-LabVIEW.exe*)
Documentation	Documentation in the Acrobat® Reader Format (PDF), Adobe® Reader Installation
Driver	**netANALYZER / netSCOPE Windows Device Driver** for 32-bit (for Windows® XP and Windows® Vista) respectively for 64-bit (for Windows® 7 and Windows® 8) **netSCOPE for LabVIEW Instrument Driver**
fscommand	Help files for the installation program.
LabVIEW	netSCOPE.zip with the LabVIEW instrument driver

Table 5: Directory Structure of the netSCOPE LabVIEW DVD

1.2.2 Documentation

The following documentation overview gives information, for which items you can find further information in which manual. *Available on the netSCOPE LabVIEW DVD*

Document Type	Title	Document ID	File Name
User Manual	netSCOPE Data Acquisition Cards for Real-Time Ethernet […] Installation, Operation and Hardware Description	DOC131006UMXXEN	netSCOPE Data Acquisition Cards for RTE UM xx EN.pdf
Operating Instruction Manual	netSCOPE, VIs for LabVIEW	DOC131005OIXXEN	netSCOPE for LabVIEW OI xx EN.pdf

Table 6: Documentations netSCOPE LabVIEW DVD

These documents are available on the DVD delivered with the device underneath the directory **Documentation**, in Adobe Acrobat® Reader format (PDF) or you can download the latest edition of a manual from the website www.hilscher.com under **Support** > **Downloads** > **Manuals** or under **Products** directly with the information about your product.

1.3 Legal Notes

1.3.1 Copyright

1.3.2 Important Notes

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

We reserve the right to change our products and their specification as well as related user manuals, accompanying texts and documentation at all times and without advance notice, without obligation to report the change. Changes will be included in future manuals and do not constitute any obligations. There is no entitlement to revisions of delivered documents. The manual delivered with the product applies.

Hilscher Gesellschaft für Systemautomation mbH is not liable under any circumstances for direct, indirect, incidental or follow-on damage or loss of earnings resulting from the use of the information contained in this publication.

1.3.3 Exclusion of Liability

The software was produced and tested with utmost care by Hilscher Gesellschaft für Systemautomation mbH and is made available as is. No warranty can be assumed for the performance and flawlessness of the software for all usage conditions and cases and for the results produced when utilized by the user. Liability for any damages that may result from the use of the hardware or software or related documents, is limited to cases of intent or grossly negligent violation of significant contractual obligations. Indemnity claims for the violation of significant contractual obligations are limited to damages that are foreseeable and typical for this type of contract.

It is strictly prohibited to use the software in the following areas:

- for military purposes or in weapon systems;
- 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.

1.3.4 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.

1.3.5 Export Regulations

The delivered product (including the technical data) is subject to export or import laws as well as the associated regulations of different counters, in particular those of Germany and the USA. The software may not be exported to countries where this is prohibited by the United States Export Administration Act and its additional provisions. You are obligated to comply with the regulations at your personal responsibility. We wish to inform you that you may require permission from state authorities to export, re-export or import the product.

1.3.6 Registered Trademarks

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

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

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

LabVIEW is a graphical programming system from National Instruments.

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

CompactPCI™ is a trademark of the PCI Industrial Manufacturers Group (PICMG).

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

1.3.7 Obligation to read and understand the Manual

Important!

- To avoid personal injury and to avoid property damage to your system or to your netSCOPE data aquistion card, you must read and understand all instructions in the manual and all accompanying texts to your netSCOPE data aquistion card, before installing and operating your netSCOPE data aquistion card.
- First read the **Safety Instructions** in the safety chapter.
- Obey to all **Safety Messages** in the manual.
- Keep the product DVD providing the product manuals.

1.3.8 Hilscher Software License Agreement

When you install the Hilscher software you are asked to read the Hilscher Software License Agreement and explain your acceptance to it.

2 Safety

2.1 General Note

The documentation in the form of a user manual, an operating instruction manual or other manual types, as well as the accompanying texts have been created for the use of the products by educated personnel. When using the products, all Safety Messages, Safety Messages, 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 netSCOPE data aquistion card described in this User Manual each work as a passive Ethernet analyzer in RT-Ethernet systems. The netSCOPE data aquistion card analyze the data in a communication link and capture the incoming Ethernet frames.

Name	netSCOPE Data Acquisition Card
netSCOPE data acquisition card PCI for Real-Time Ethernet	NSCP-C100-RE\50
netSCOPE data acquisition card PCI Express for Real-Time Ethernet	NSCP-C100-RE\50E
netSCOPE data acquisition card Low Profile PCIe for Real-Time Ethernet	NSCP-C100-RE\70E
netSCOPE data acquisition card Compact PCI for Real-Time Ethernet	NSCP-C100-RE\80
netSCOPE data acquisition card Mini PCI for Express Real-Time Ethernet	NSCP-C100-RE\90E, inclusively Ethernet Assembly Interface (AIFX-RE)

Table 7: netSCOPE Data Acquisition Cards

If the netSCOPE data aquistion cards are used outside of the scope described in this user manual, an error free function can not be guaranteed.

2.3 Personnel Qualification

The netSCOPE data aquistion card 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 topics:

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

2.4 Safety Instructions to avoid Personal Injury

To ensure your own personal safety and to avoid personal injury, you necessarily must read, understand and follow the following safety instructions and safety messages in this manual about danger causing personal injury, before you install and operate your netSCOPE data aquistion card.

2.4.1 Electrical Shock Hazard

The danger of a lethal electrical shock caused by parts with more than 50V may occur if you open the PC cabinet to install the netSCOPE data aquistion card.

- HAZARDOUS VOLTAGE is present inside of the PC or of the connecting device, into which the netSCOPE data aquistion card is integrated. Strictly obey to all safety rules provided by the device's manufacturer in the documentation!
- First disconnect the power plug of the PC or of the connecting device, before you open the cabinet.
- Make sure, that the power supply is off at the PC or at the connecting device.
- Open the PC cabinet and install or remove the netSCOPE data aquistion card only after disconnecting power.

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 are not considered as dangerous if the contact area is equivalent to the size of a human hand.

Reference Safety [S2]

2.5 Safety Instructions to avoid Property Damage

To avoid property damage respectively device destruction to the netSCOPE data aquistion card and to your system, you necessarily must read, understand and follow the following safety instructions and safety messages in this manual about danger causing property damage, before you install and operate your netSCOPE data aquistion card.

2.5.1 Device Destruction by exceeding allowed Supply Voltage

To avoid device destruction due to high supply voltage to your netSCOPE data aquistion card, you must observe the following instructions. These instructions apply to all netSCOPE data aquistion cards described in this manual.

The netSCOPE data aquistion card 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 netSCOPE data aquistion card! A supply voltage below the lower limit can cause malfunction in the netSCOPE data aquistion card. The allowed range for the supply voltage is defined by the tolerances specified in this manual.

For the netSCOPE data aquistion cards listed hereafter adhere specifically: The netSCOPE data aquistion card

- NSCP-C100-RE\50,
- NSCP-C100-RE\50E,
- NSCP-C100-RE\70E,
- NSCP-C100-RE\80,
- NSCP-C100-RE\90E

may not be powered by a 5V supply voltage! The netSCOPE data aquistion card may only be powered by a 3.3 V dc ±5 % supply voltage.

The data on the mandatory supply voltage for the netSCOPE data aquistion cards described in this manual you find in section *Power Supply and Host Interface* on page 23. There the required and permitted supply voltage is provided by device type inclusively the permitted tolerance range.

2.5.2 Device Destruction by exceeding allowed Signaling Voltage

To avoid device destruction due to high signal voltage to your netSCOPE data aquistion card, you must observe the following instructions. These instructions apply to all netSCOPE data aquistion cards described in this manual.

- All I/O signal pins at the netSCOPE data aquistion card tolerate only the specified signaling voltage!
- Operating of your netSCOPE data aquistion card with a signaling voltage other than the specified signaling voltage may lead to severe damage to the netSCOPE data aquistion card!

The data on the mandatory signaling voltage for the netSCOPE data aquistion cards described in this manual you find in the section *Power Supply and Host Interface* on page 23.There the required and permitted signaling voltage is provided by device type.

2.5.3 Electrostatically sensitive Devices

This equipment is sensitive to electrostatic discharge, which cause internal damage and affect normal operation. Therefore adhere to the necessary safety precautions for components that are vulnerable with electrostatic discharge if you install or replace your device. Follow the guidelines listed hereafter when you handle this equipment:

- Touch a grounded object to discharge potential static.
- Wear an approved grounding wriststrap.
- Do not touch connectors or pins on the netSCOPE data aquistion card.
- Do not touch circuit components inside the equipment.
- If available, use a static-safe workstation.
- When not in use, store the equipment in appropriate static-safe packaging.

Reference Safety [S3]

2.6 Labeling of Safety Messages

- The **Section Safety Messages** at the beginning of a chapter are pinpointed particularly. They are highlighted with a specific safety symbol and a signal word according to the degree of endangerment. Inside the safety message the danger is exactly named.
- The **Integrated Safety Messages** within an instruction description are highlighted with a signal word according to the degree of endangerment and possibly by a principle symbol. Inside the safety message the danger is exactly named.

Safety Symbol	USA	Sort of Warning or Principle
		Warning of Personal Injury and Property Damage Message **USA:** Warning of Personal Injury As in the scope of the ANSI Z535 Standard (for USA) instructions to a property damage message may not contain a warning triangle, this property damage messages are listed separately for the USA.
		Warning of Lethal Electrical Shock
		Warning of Damages by Electrostatic Discharge
		Principle: Disconnect the Power Plug

Table 8: 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 isn't 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 isn't 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 simple battery if it isn't 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 9: Signal Words

In this document all Safety Instructions and Safety Messages are designed according both to the international used safety conventions as well as to the ANSI Z535 standard, refer to reference safety [S1].

2.7 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

3 Descriptions and Requirements

3.1 Introduction to netSCOPE

The main characteristics of the netSCOPE data aquistion cards are:

- Process monitoring
- Process documentation
- Data acquisition of process values directly from the network
- No additional signal wiring
- No modification in PLC necessary

You can use the netSCOPE data aquistion cards to record and analyze data of Ethernet based automation network or its components conforming to the Ethernet II IEEE 802.3 specification.

For visualization, archiving or machine diagnosis purposes, not even network telegrams but process values are captured from the network. The netSCOPE data aquistion card is connected to the automation network as a purely passive node.

Process values are converted to be displayed in LabVIEW for analyzing purposes without changing your PLC program at all. All data from the network is recorded with precision timestamp. All collected process data is being recorded in a way that it is associated to a certain network cycle ("communication cycle accurate"). At any point of time the record is complete, allowing examination of information like measurements, status and control values by going back in time to find out what had happen in your process.

A detailed description how to use the netSCOPE instrument driver in LabVIEW you find in the **Operating Instruction Manual netSCOPE, VIs for LabVIEW**.

3.2 netSCOPE Data Acquisition Cards

netSCOPE Data Acquisition Cards with integrated Ethernet Interface

netSCOPE Data Acquisition Card	Description
NSCP-C100-RE\50	 netSCOPE data acquisition card PCI for Real-Time Ethernet
NSCP-C100-RE\50E	 netSCOPE data acquisition card PCI Express for Real-Time Ethernet
NSCP-C100-RE\70E	 netSCOPE data acquisition card Low Profile PCIe for Real-Time Ethernet

netSCOPE Data Acquisition Card	Description
NSCP-C100-RE\80	 netSCOPE data acquisition card Compact PCI for Real-Time Ethernet

Table 10: netSCOPE Data Acquisition Cards with integrated Ethernet Interface

The netSCOPE data aquistion cards NSCP-C100-RE\50, NSCP-C100-RE\50E, NSCP-C100-RE\70E and NSCP-C100-RE\80 provide an integrated Ethernet interface.

netSCOPE Data Acquisition Card with AIFX Assembly Interface Ethernet

netSCOPE Data Acquisition Card	Description
NSCP-C100-RE\90E	 netSCOPE data acquisition card Mini PCI Express for Real-Time Ethernet inclusively Ethernet Assembly Interface AIFX-RE (with Ethernet interface)

Table 11: netSCOPE Data Acquisition Card with AIFX Assembly Interface Ethernet

The netSCOPE data aquistion card NSCP-C100-RE\90E is composed of a basic card and an assembly interface AIFX. The basic card NSCP-C100-RE\90E is equipped with a **Cable Connector Ethernet**, to connect the Ethernet assembly interface (AIFX-RE).

Important! Operating the netSCOPE data aquistion card Mini PCI Express NSCP-C100-RE\90E requires proper connection of the Ethernet assembly interface (AIFX-RE) to the basic card!

Note: The device height and the power input of the netSCOPE data aquistion card NSCP-C100-RE\90E do not comply with the standard specifications.

3.3 Recording and analyzing Data Traffic

For devices with EtherCAT communication the netSCOPE data aquistion card captures the Ethernet frames, provides them with time stamps and analyzes the recorded data.

So the netSCOPE data aquistion card must be connected over two Ethernet connection cables from the netSCOPE data aquistion card TAP to the Ethernet interface of the EtherCAT Master and to the Ethernet interface of the Slave 1.

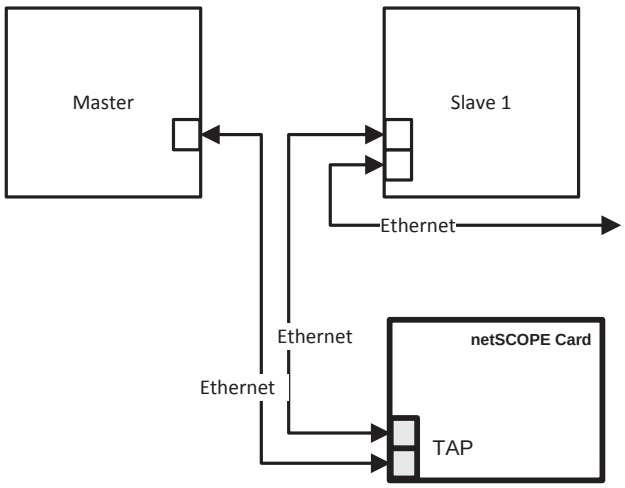


Figure 1: Connection Schema - Capturing and analyzing the Communication between a EtherCAT Master and the EtherCAT Slave 1

3.4 Hardware Requirements

3.4.1 PC

PC with the following specification:

- Intel compatible CPU, approx. 2 GHz or faster
- 1 GB RAM or more
- 1 PCI slot (refer to section *Slot for the netSCOPE Data Acquisition Cards* page 21)

Note: The netSCOPE data aquistion card NSCP-C100-RE\90E can be used together with main boards according to any earlier revision (1.1 and 1.2) of the Mini PCI Express specification [bus spec 6], as well as to the latest revision (2.0).

For the reference for [bus spec 6] for the bus specification for Mini PCI Express refer to section *References PCI Specifications* on page 52 of this manual.

3.4.2 Slot for the netSCOPE Data Acquisition Cards

PC with slot (3.3 V) for netSCOPE data aquistion cards *PCI, PCI Express*, *Low Profile PCI Express*, *Compact PCI* and *Mini PCI Express*:

netSCOPE Data Acquisition Cards	PCI Bus [Pins]	Slot
NSCP-C100-RE\50	124	**PCI slot** (3.3 V)
NSCP-C100-RE\50E, NSCP-C100-RE\70E	36	**PCI Express x1 slot** (3.3 V), x1[2] = One Lane [bus spec 3]
NSCP-C100-RE\80	110	**Compact PCI Slot** (3.3 V)
NSCP-C100-RE\90E	52	**PCI Express Mini System Connector** (3.3 V), X1/X2[3] = One Lane **Note:** As the basic card NSCP-C100-RE\90E can be inserted correctly into the Mini PCI Express slot, the element height in the Mini PCI Express slot of the connecting device must meet to the standard specifications.

Table 12: Slot for the netSCOPE Data Acquisition Cards

[2] The term "x1" refers to the convention of the PCI Express specifications [bus spec 3] to the number of lanes in the slot.

[3] X1, X2 corresponds to the Hilscher convention for „interface“ on the top or the bottom side of the netSCOPE Data Acquisition Card.

3.4.3 Card Height and Panel Cutout NSCP-C100-RE\90E

3.4.3.1 Notes on the Card Height

Only for netSCOPE Data Acquisition Card Mini PCI Express NSCP-C100-RE\90E:

netSCOPE Data Acquisition Card	Dimensions (L x B x D)			Note
NSCP-C100-RE\90E	**51 x (30,2 +/- 0,1) x 11 mm**	NSCP-C100-RE\90E	Tolerance	The element heights on top of the netSCOPE data aquistion card NSCP-C100-RE\90E **Mini PCI Express** do not meet the standard specifications. **Note**: The element height at the bottom side of the netSCOPE data aquistion card NSCP-C100-RE\90E is in accordance with the standard specifications. As the netSCOPE data aquistion card NSCP-C100-RE\90E can be inserted correctly into the Mini PCI Express slot, the element height in the Mini PCI Express slot of the connecting device must meet to the standard specifications. **Note:** The element heights of the cable connectors Ethernet (X4)[4] including the cable are app. 8,5 mm over PCB each.
	netX 100 Cooling Element	+ 6,4	+/- 0,2	
	Element height topside	+ 1,83	+/- 0,18	
	Height of the printed circuit	+ 1,0	+/- 0,1	
	Element height bottom side	+ 1,3	+/- 0,1	
	Max. total height (D) of the netSCOPE data aquistion card in milli meter	= ~ 11 mm		

Table 13: Notes on the Card Height - netSCOPE Data Acquisition Card Mini PCI Express

3.4.3.2 Panel Cutout for Installing AIFX

Only for netSCOPE Data Acquisition Card Mini PCI Express NSCP-C100-RE\90E:

In order to connect the AIFX assembly interface to a netSCOPE data aquistion card **Mini PCI Express** with cable connector Ethernet, make sure that **the housing panel of the PC or of the connecting device** has an appropriate cutout and holes for fastening the AIFX.

The panel cutout must be dimensioned sufficiently large for the interface, display or control elements placed on the AIFX. Partial standard cutouts can be used.

netSCOPE Data Acquisition Card	AIFX	Panel Cutout and Holes	
NSCP-C100-RE\90E	AIFX-RE	Panel Cutout	at the housing panel of the PC
		Required Cutout	for two RJ45 Sockets **Important!** The panel cutout layout must also cover the LEDs COM 0 and COM1 at the AIFX-RE.
		Standard cutout	D-Sub-15
		Holes	2, distance between the holes 37,3 mm
		Further Information	In the data sheet *MOD JACK – MJIM* [2], as well as in section as in section *Ethernet - AIFX-RE* on page 33.

Table 14: Required Panel Cutout and Holes for AIFX

[4] The term "X4" is a place name on the netSCOPE data aquistion card.

3.4.4 Power Supply and Host Interface

For the power supply and the host interface used for the netSCOPE data aquistion cards *PCI, PCI Express*, *Low Profile PCI Express*, *Compact PCI* and *Mini PCI Express* you must observe the following requirements:

netSCOPE Data Acquisition Cards	Supply Voltage	Signaling Voltage Host Interface	Host Interface (PCI slot)
NSCP-C100-RE\50	+3,3 V dc ±5 %/ Max. 1 A	5 V or 3.3 V	PCI
NSCP-C100-RE\50E, NSCP-C100-RE\70E	+3,3 V dc ±5 %/ Max. 1 A	PCIe-compatible	PCI Express
NSCP-C100-RE\80	+3.3 V dc ±5 %/ Max. 1 A	5 V or 3.3 V	Compact PCI
NSCP-C100-RE\90E	+3.3 V dc ±5 %/ Max. 1 A *Note:* The power input of the NSCP-C100-RE\90E does not comply with the standard specifications.	PCIe-compatible	Mini PCI Express

Table 15: Requirements Power Supply and Host Interface for netSCOPE Data Acquisition Cards

The data in the *Table 15* above have the following meaning:

Supply Voltage
The required and permissible supply voltage at the netSCOPE data aquistion card *PCI, PCI Express*, *Low Profile PCI Express*, *Compact PCI* and *Mini PCI Express*.

Note: To ensure that the compatibility between different systems is guaranteed, providing a maximum of 1 A (for +3,3 VDC ±5 %) is recommended.

The typical current depends on the type of the netSCOPE data aquistion card. For detailed values on the typical current see section *Technical Data netSCOPE Data Acquisition Cards* on page 54.

Signaling Voltage Host Interface
The required or tolerated signaling voltage at the I/O signal pins at the
- PCI bus of the netSCOPE PCI card,
- PCI express bus of the netSCOPE PCIe and Low Profile PCIe cards.
- Compact PCI bus of the netSCOPE Compact PCI card,
- Mini PCI Express bus of the netSCOPE Mini PCI Express card

Host Interface (PCI slot) Type of the host interface

3.5 Software Requirements

- Operating System:
  - Windows® XP Professional, SP3, (32-bit and 64-bit Version),
  - Windows® Vista, (32-bit and 64-bit Version),
  - Windows® 7, (32-bit and 64-bit Version),
  - Windows® 8, (32-bit and 64-bit Version).
- The program **LabVIEW (Version August 2013)** must be installed. (NI LabVIEW 2013 Platform Windows 8/7/Vista/XP/Server)
- The **netANALYZER / netSCOPE Windows Device Driver** V 1.5.x.x must be installed.
- The **netSCOPE for LabVIEW Instrument Driver** must be installed.

For netSCOPE for LabVIEW the following components must be installed on your PC:

- Microsoft .NET 4.0
- Microsoft Visual C++ 2008 Redistributable
- Microsoft Visual C++ 2010 Redistributable

If these Microsoft components are not installed on your computer, use the installation files provided on the netSCOPE LabVIEW DVD.

The descriptions on how to install the driver and software you find in chapter *Software Installation* on page 34.

4 Getting Started

4.1 Notes for Installation and Operation

You must read and obey the following notes about installation and operation of your netSCOPE data aquistion card to guarantee proper installation and an error-free operation of your device.

Note	Description
Hardware and Software Requirements	The hardware and software requirements described in chapter 3 must be met!
Software Installation	The following software and drivers must be installed: **1. LabVIEW (Version August 2013)** **2. netANALYZER / netSCOPE Windows Device Driver (V1.5.x.x)** This is the driver for the Host Interface PCI, PCI Express, Compact PCI or Mini PCI Express. **2. netSCOPE for LabVIEW Instrument Driver**
Hardware Installation	**For the netSCOPE data aquistion card Mini PCI Express NSCP-C100-RE\90E:** **Important!** Operating the NSCP-C100-RE\90E requires proper connection of the Ethernet (AIFX-RE) assembly interface to the basic card!

Table 16: Notes about Installation and Operation

4.2 Installation and Configuration netSCOPE Data Acquisition Card

The following table describes the steps for the software and hardware installation and for the configuration of a netSCOPE data aquistion card Real-Time Ethernet.

#	Step	Description	For detailed information see manual / section	Page
1	**Installing Driver and Software**			
1.1	Install **netANALYZER / netSCOPE Windows Device Driver**	- Insert the **netSCOPE LabVIEW DVD** - select **Install Windows Device Driver** Open Instrument Driver Directory and follow to the instructions of the installation wizard to install the netANALYZER / netSCOPE Windows Device Driver. **Note:** If the installation program does not start automatically start the **.msi* or *Setup.exe* program of the netANALYZER / netSCOPE Windows Device Driver in the driver folder of the DVD.	*Software Installation*	
1.2	Install **netSCOPE for LabVIEW Instrument Driver**	- Select Open Instrument Driver Directory. - Extract the instrument driver.zip file to an arbitrary location.		34
2	**Preparing Hardware Installation**			
2.1	Take precautions on Electrostatically sensitive Devices	 **NOTICE** **Electrostatically sensitive Devices** Make sure, that the netSCOPE data aquistion card is grounded via the endplate and the PC and make sure, that you are discharged when you install/ uninstall the netSCOPE data aquistion card.	*Electrostatically sensitive Devices*	*15*
2.2	Glue sticker on the front plate.	For NSCP-C100-RE\50, NSCP-C100-RE\50E, NSCP-C100-RE\70E, NSCP-C100-RE\80 - Glue the sticker on the front plate of the netSCOPE data aquistion card.	*Installing netSCOPE Data Acquisition Card*	42
3	**Hardware Settings**	Installing netSCOPE data aquistion card. Take required safety precautions.		
3.1	Take safety precautions	 **WARNING** **Lethal Electrical Shock caused by parts with more than 50V!** Disconnect the power plug of the PC or of the connecting device. Make sure, that the power supply is off at the PC or at the connecting device.	*Electrical Shock Hazard*	13
3.2	Open cabinet	- Now open the cabinet of the PC or of the connecting device.	*Installing netSCOPE Data Acquisition Card*	42
3.3	Installing netSCOPE data aquistion card	- Plug in and mount the netSCOPE data aquistion card.		

#	Step	Description	For detailed information see manual / section	Page
3.4	Connect AIFX (only for NSCP-C100-RE\90E)	**Important!** Operating the netSCOPE Data Acquisition Cards with AIFX assembly interface requires proper connection of the AIFX-RE assembly interface to the basic card! - If so, connect the Ethernet (AIFX-RE) assembly interface to the basic card NSCP-C100-RE\90E.	*Installing netSCOPE Data Acquisition Card*	42
3.5	Close cabinet	- Close the cabinet of the PC or connecting device.		
3.6	Insert the netSCOPE Data Acquisition Card into the Communication Link	Note for all netSCOPE Data Acquisition Cards Real-Time Ethernet: **Note!** The RJ45 socket is only for use in LAN, not for telecommunication circuits. - Connect the netSCOPE data aquistion card via two Ethernet connecting cables with the Ethernet interfaces of the Master and Slave1, in parallel to the communication connection to be analyzed.	*Ethernet Interface* *Installing netSCOPE Data Acquisition Card*	50 42
3.7	Connect the PC to the power / switch on.	Connect the PC or the connecting device to the power supply and switch it on.		
4	**Data Processing with netSCOPE LabVIEW**			
4.1	Programming steps	- Perform required programming steps in LabVIEW.	*Operating Instruction Manual netSCOPE*	
5.1	Date Processing	- Perform data recording, processing and representation in LabVIEW.		

Table 17: Steps for the Software and Hardware Installation, the Configuration and for the Diagnosis of a netSCOPE Data Acquisition Card

5 Device Drawings

5.1 netSCOPE Data Acquisition Cards PCI (NSCP-C100-RE\50) and PCI Express (NSCP-C100-RE\50E)

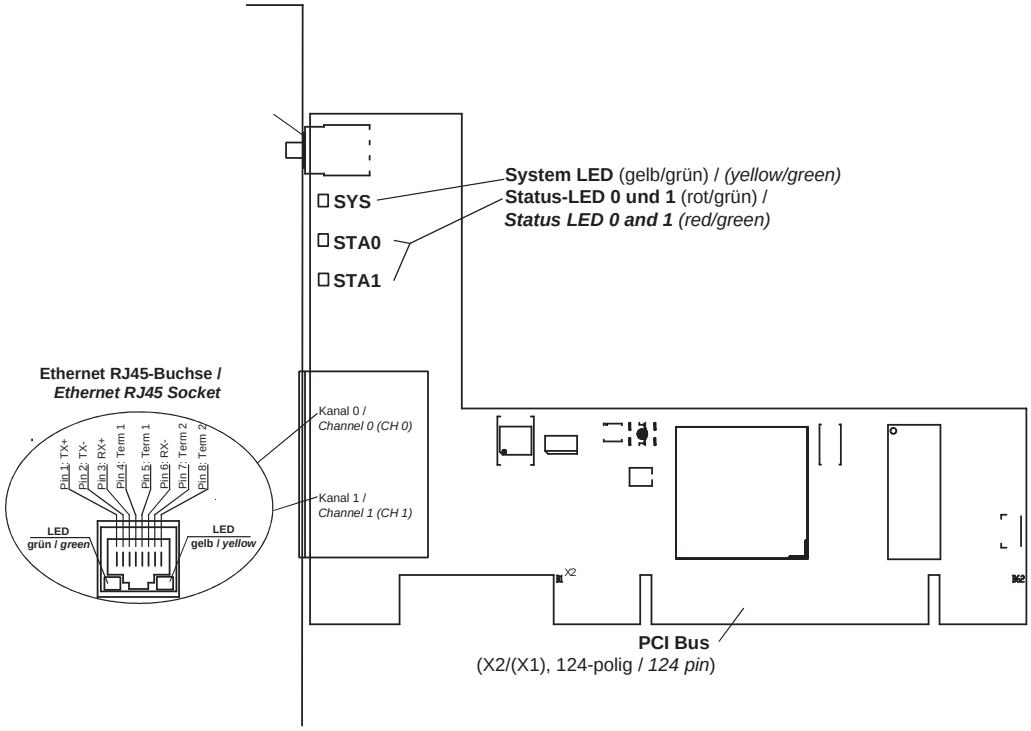


*Figure 2: NSCP-C100-RE\50**

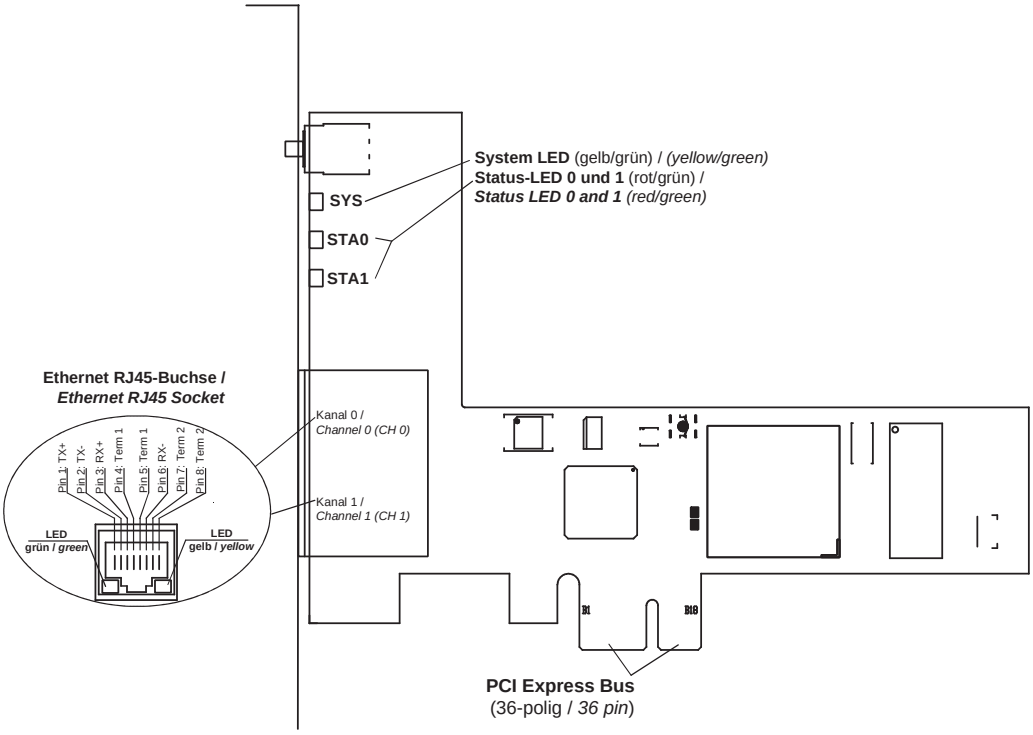
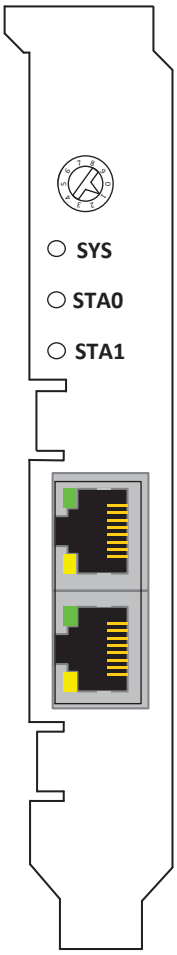


*Figure 3: NSCP-C100-RE\50E**

Note: *Device supports Auto Crossover Function. Only 100 Mbit/s connections 100BASE-T are supported.

The figure below shows the front plate of the netSCOPE data aquistion cards NSCP-C100-RE\50 and NSCP-C100-RE\50E*:*



1 ❶ (not used)

2 ❷ **System LED** (yellow/green)

3 ❸ **Communication Status LED 0*** (red/green)

4 ❹ **Communication Status LED 1*** (red/green),
(*Designation and meaning depends by protocol)
Refer also to chapter *LED Descriptions*, page 49.

5 ❺ **Ethernet Interface Channel 0**

6 ❻ **Ethernet Interface Channel 1**
Refer also to section *Ethernet Interface*, page 50.

Figure 4: Front Plate for NSCP-C100-RE\50, NSCP-C100-RE\50E

5.2 netSCOPE Data Acquisition Cards Low Profile PCI Express (NSCP-C100-RE\70E)

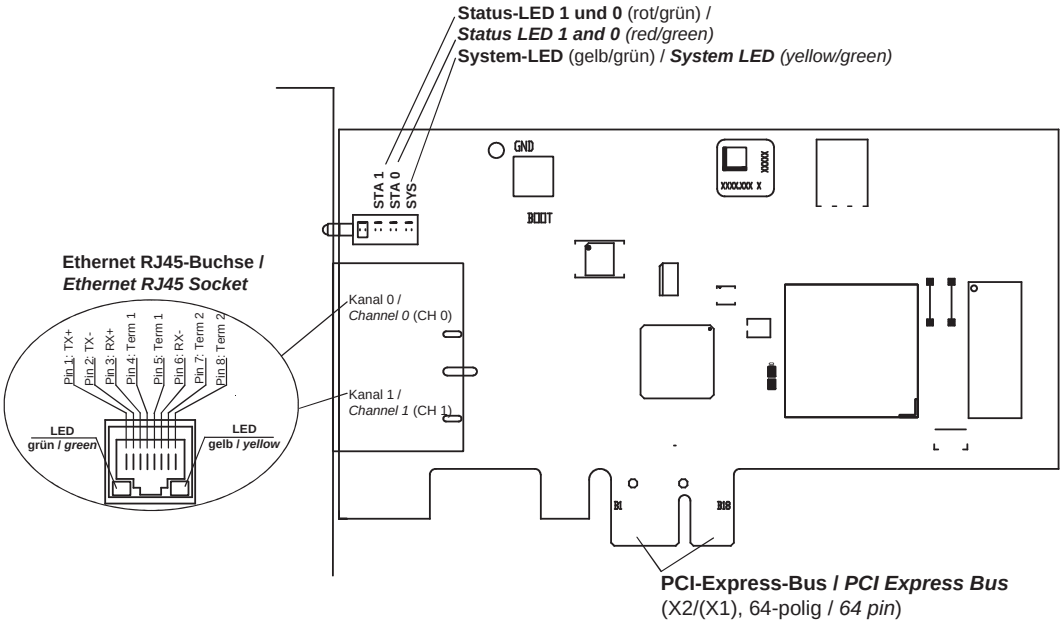
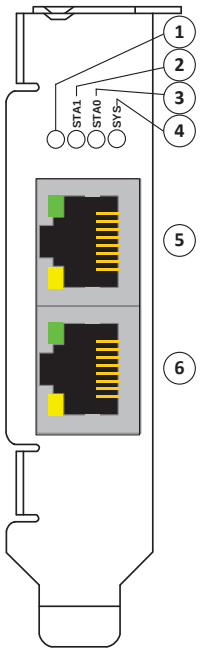


Figure 5: NSCP-C100-RE\70E (Hardware revision 1)*

Note: *Device supports Auto Crossover Function. Only 100 Mbit/s connections 100BASE-T are supported.

The figure below shows the front plate of the netSCOPE data aquistion card NSCP-C100-RE\70E:



❶ (not used)

❷ **Communication Status LEDs COM1***

❸ **Communication Status LEDs COM0***

❹ **System LED** (yellow/green)

(*red/green, Designation and meaning depends by protocol). Refer also to chapter *LED Descriptions*, page 49.

❺ **Ethernet Interface Channel 0**

❻ **Ethernet Interface Channel 1**
Refer also to section *Ethernet Interface*, page 50.

Figure 6: Front Plate for NSCP-C100-RE\70E

5.3 netSCOPE Data Acquisition Cards Compact PCI (NSCP-C100-RE\80)

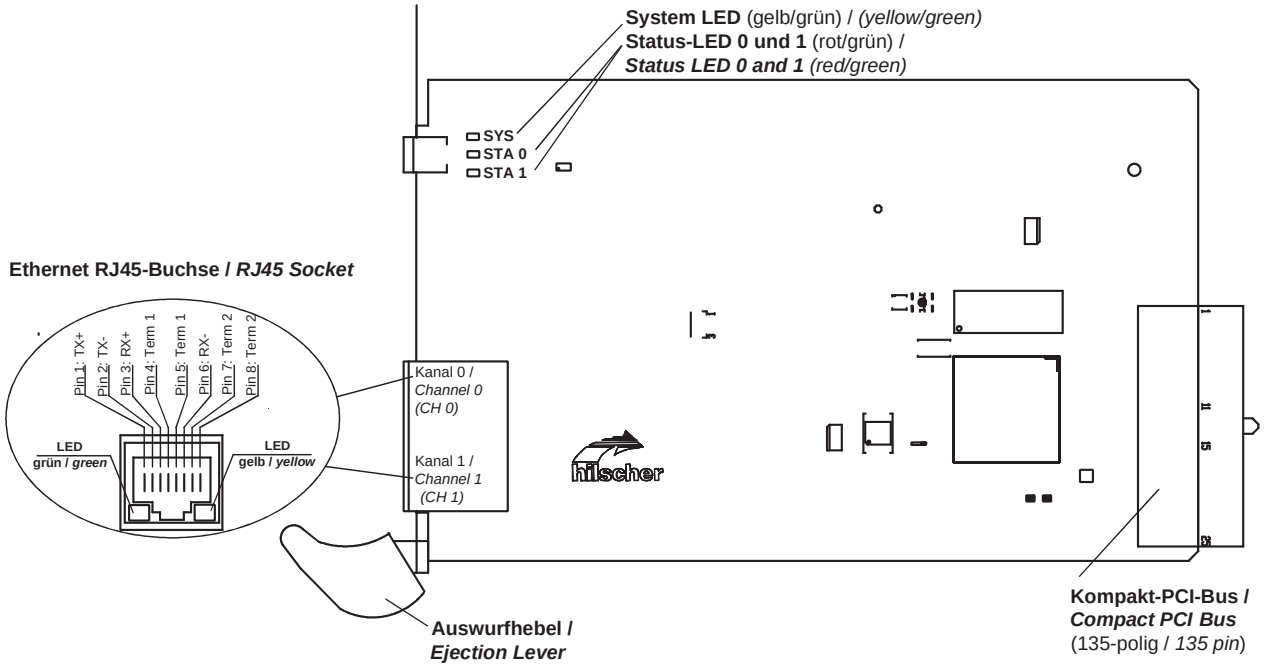
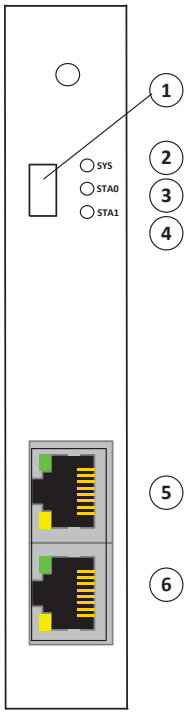


*Figure 7: NSCP-C100-RE\80**

Note: *Device supports Auto Crossover Function. Only 100 Mbit/s connections 100BASE-T are supported.

The figure below shows the front plate of the netSCOPE data aquistion card NSCP-C100-RE\80:



❶ Mini B USB Plug (not used)

❷ **System LED** (yellow/green)
❸ **Status LED COM0** (red/green)
❹ **Status LED COM1** (red/green)
Refer also to chapter, *LED Descriptions*, page 49.

❺ **Ethernet Interface Channel 0**

❻ **Ethernet Interface Channel 1**
Refer also to section *Ethernet Interface*, page 50.

Figure 8: Front Plate NSCP-C100-RE\80

5.4 netSCOPE Data Acquisition Cards Mini PCI Express

5.4.1 NSCP-C100-RE\90E

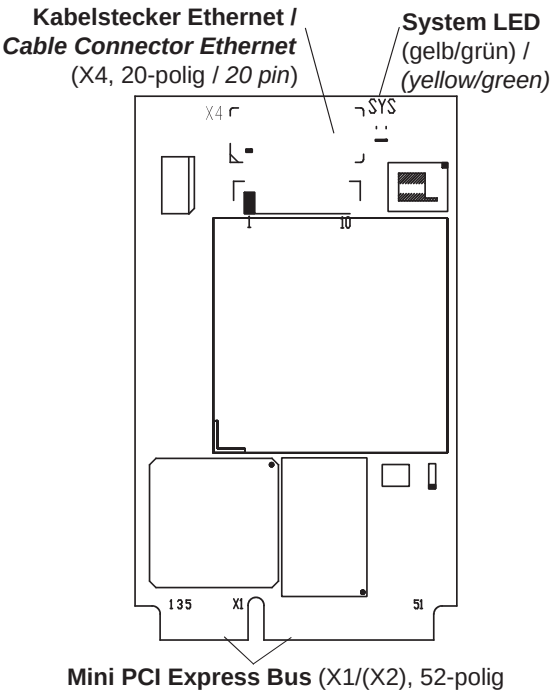


*Figure 9: Basic Card for NSCP-C100-RE\90E**

Note: *Device supports Auto Crossover Function. Only 100 Mbit/s connections 100BASE-T are supported.

For the **pin assignment** of the **Mini PCI Express** bus to section *Pin Assignment for Mini PCI Express Bus* on page 53.

For information on the **card height** refer to section the *Card Height and Panel Cutout NSCP-C100-RE\90E*

Notes on the Card Height on page 22.

5.5 AIFX Assembly Interface Ethernet - AIFX-RE

Only for NSCP-C100-RE\90E:

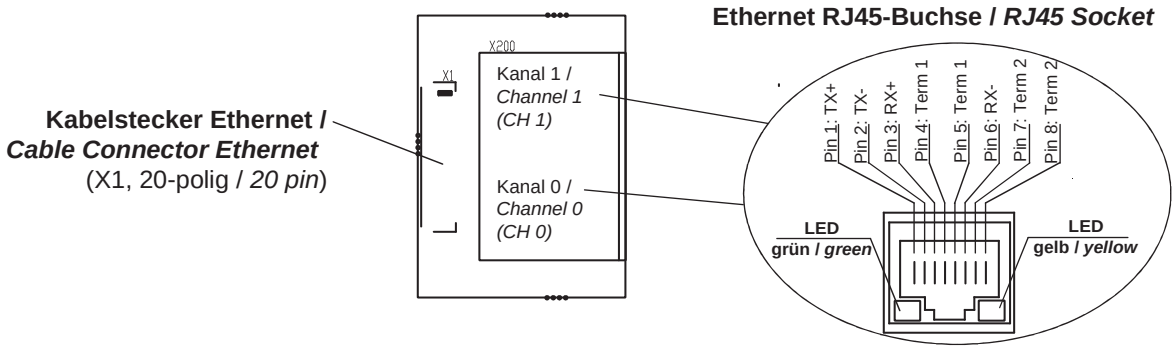
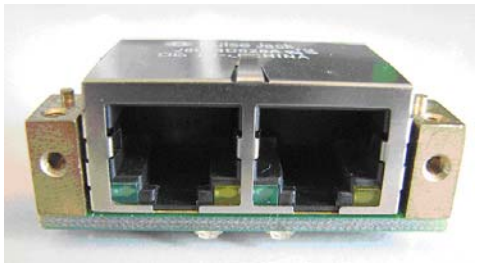


*Figure 10: Ethernet Assembly Interface (AIFX-RE)**

Note: *Assembled device supports Auto Crossover Function. Only 100 Mbit/s connections 100BASE-T are supported.



The meaning of the **LEDs STA0** and **STA1** at the reverse side of the AIFX-RE and the meaning of the green and yellow LEDs at RJ45Ch0 and RJ45Ch1 corresponds to the description in chapter *LED Descriptions* beginning from page 49.

Figure 11: Front Side Ethernet Assembly Interface (AIFX-RE)

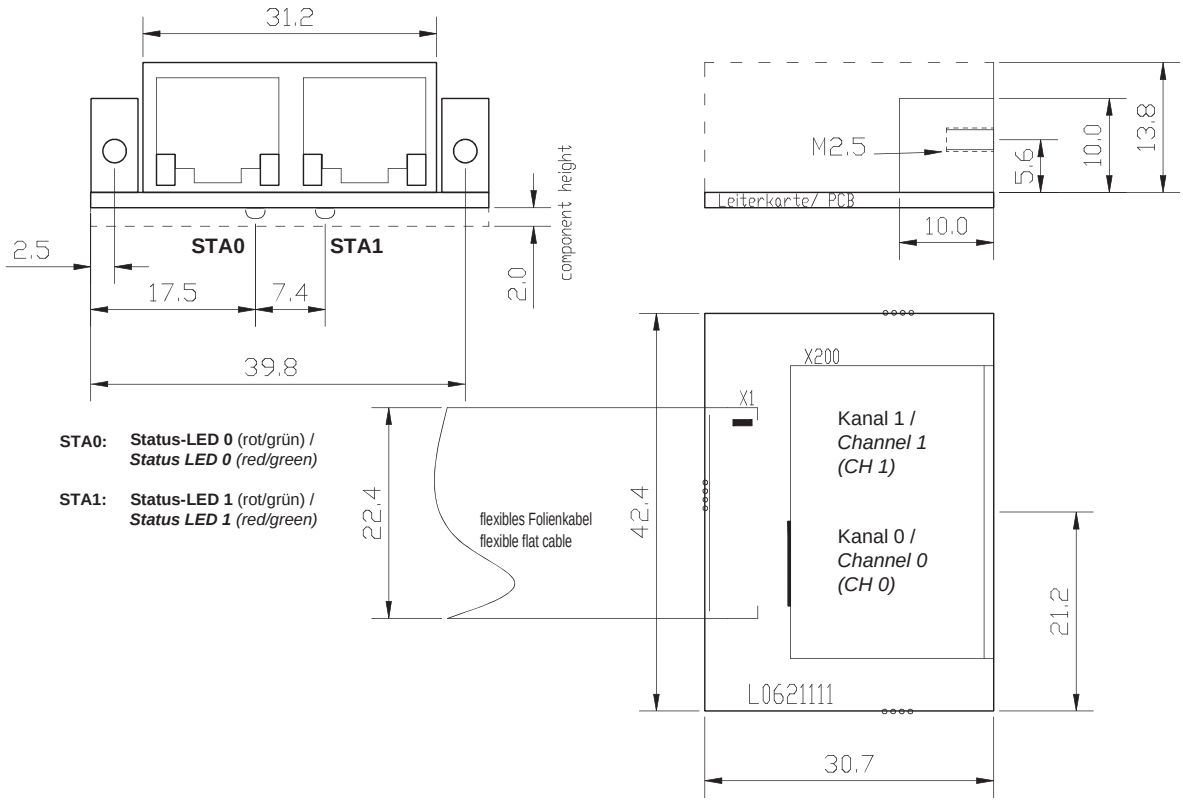


Figure 12: Dimensioning and LED Display Ethernet Assembly Interface (AIFX-RE)

6 Software Installation

6.1 netSCOPE LabVIEW DVD Autostart Menu

For the software installation for your netSCOPE data aquistion card the netSCOPE LabVIEW DVD provides the netANALYZER / netSCOPE Windows Device Driver, the netSCOPE Software and the documentations.

In the netSCOPE LabVIEW DVD autostart menu you can select:

- **Install Windows Device Driver**

Via this option you can install the **netANALYZER / netSCOPE Windows Device Driver**

- **Open Instrument Driver Directory**

Via this option you can install the **netSCOPE for LabVIEW Instrument Driver**

- **Open Documentation Directory**

Via this option you can access to the documentations (netSCOPE User and Operating Instruction Manual)

6.2 netANALYZER / netSCOPE Windows Device Driver

To install the **netANALYZER / netSCOPE Windows Device Driver** proceed as described hereafter:

1. Close all programs!
2. Enter the netSCOPE LabVIEW DVD in the local DVD ROM drive.

↪ The start screen of the autostart menu is displayed with the following options:

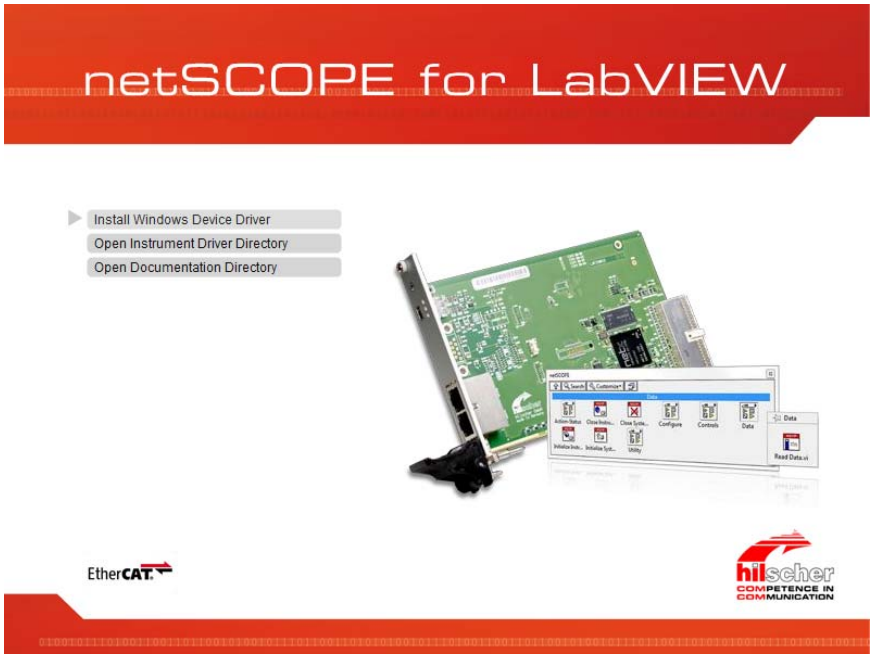


Figure 13: Options in the netSCOPE for LabVIEW Autostart Menu

3. Select **Install Windows Device Driver** in the autostart menu.

Note: Under Windows® you need administration rights for the installation!

The netANALYZER / netSCOPE Windows Device Driver Setup Wizard **netANALYZER Device Driver** appears.

Figure 14: netANALYZER / netSCOPE Windows Device Driver Setup Wizard

4. Click on **Install**.

The installation is started.

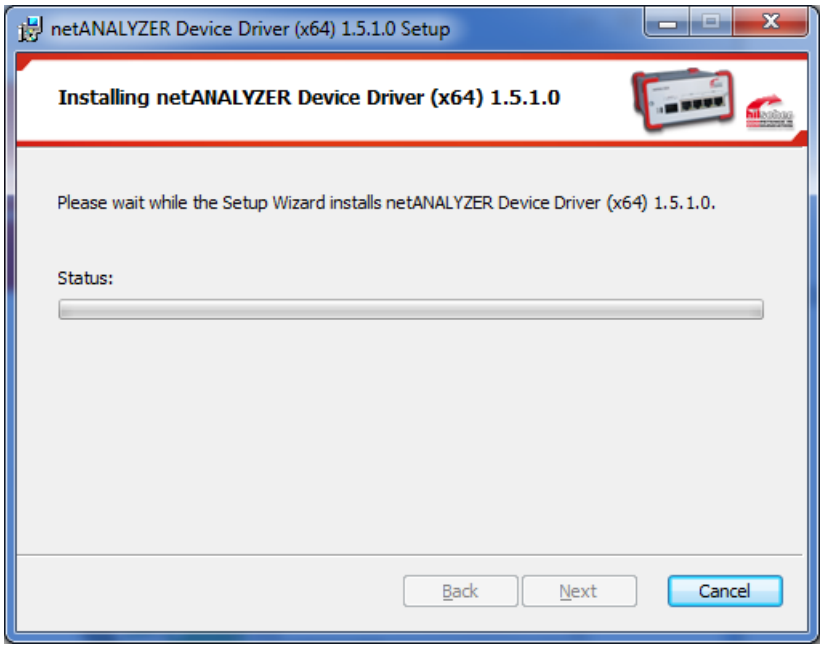


Figure 15: netANALYZER / netSCOPE Windows Device Driver Setup Wizard

➮ The screen **Completed** is displayed.

Figure 16: netANALYZER / netSCOPE Windows Device Driver Setup Wizard

➢ Click **Finish**.

➮ The netANALYZER / netSCOPE Windows Device Driver installation is complete.

6.3 netSCOPE for LabVIEW Instrument Driver

To install the **netSCOPE for LabVIEW Instrument Driver** proceed as described hereafter:

1. Close all programs!
2. Enter the netSCOPE LabVIEW DVD in the local DVD ROM drive.

↬ The start screen of the autostart menu is displayed with the following options:

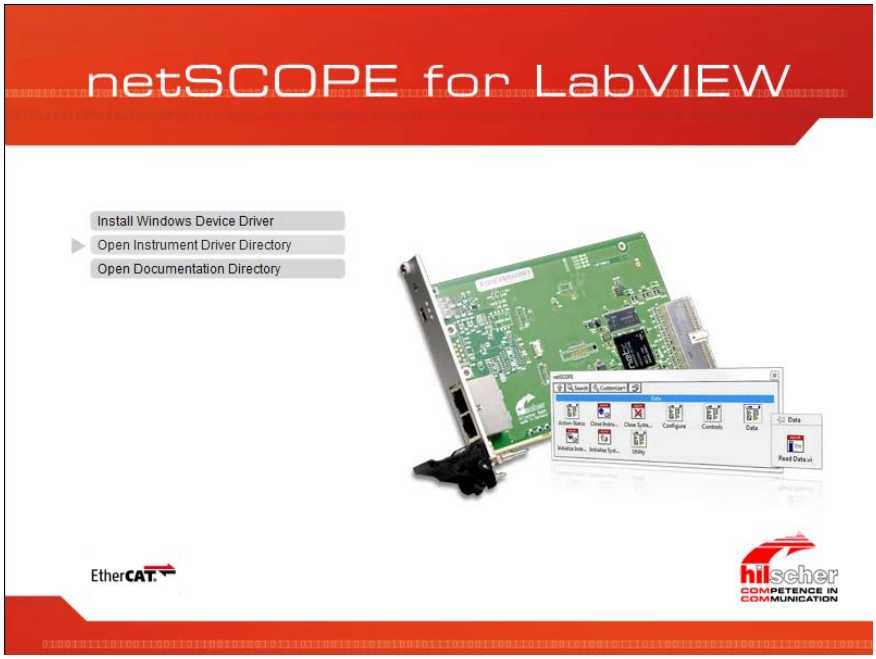


Figure 17: Options in the netSCOPE for LabVIEW Autostart Menu

3. Select **Open Instrument Driver Directory** in the autostart menu.

↬ The netSCOPE for LabVIEW Instrument Driver directory appears.

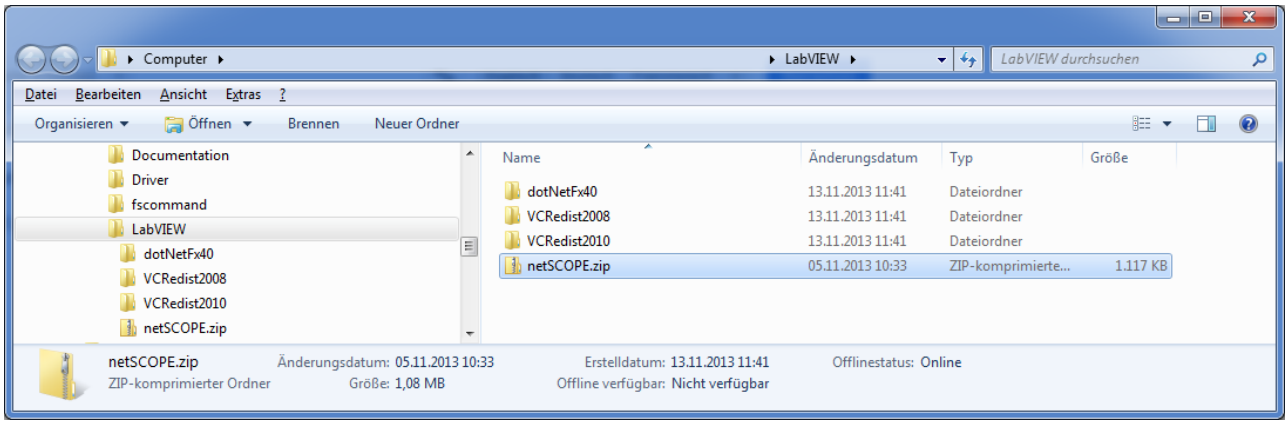


Figure 18: netSCOPE for LabVIEW Instrument Driver Directory

4. Extract the *netSCOPE.zip* file for the netSCOPE for LabVIEW Instrument Driver to an arbitrary location.

6.4 Microsoft Software Components

If the Microsoft components

- Microsoft .NET 4.0
- Microsoft Visual C++ 2008 Redistributable
- Microsoft Visual C++ 2010 Redistributable

are not installed on your computer, install them from the netSCOPE LabVIEW DVD. Therefore:

1. Close all programs!
2. Enter the netSCOPE LabVIEW DVD in the local DVD ROM drive.

↬ The start screen of the autostart menu is displayed with the following options:

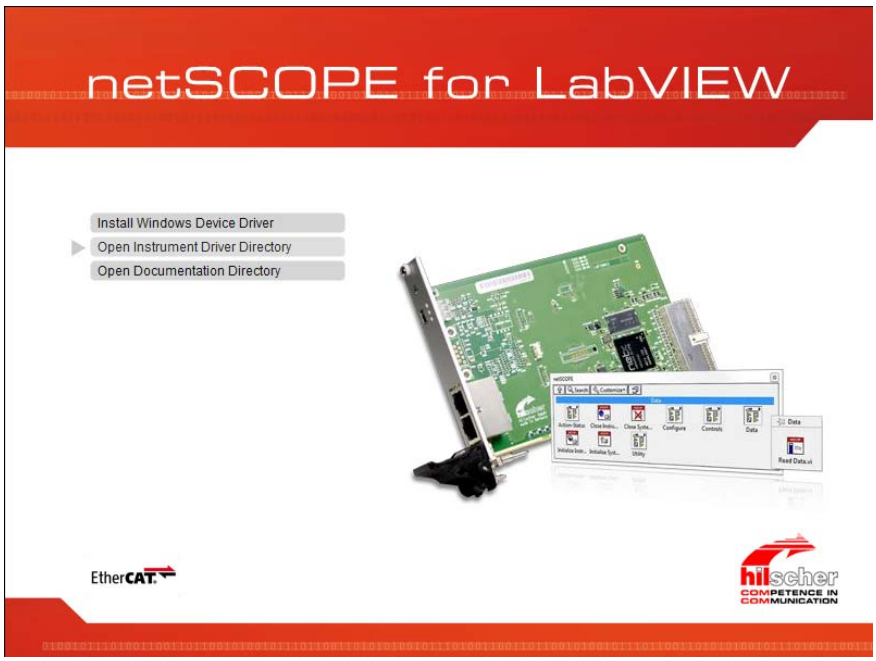


Figure 19: Options in the netSCOPE for LabVIEW Autostart Menu

3. Select **Open Instrument Driver Directory** in the autostart menu.

↬ The LabVIEW directory appears.

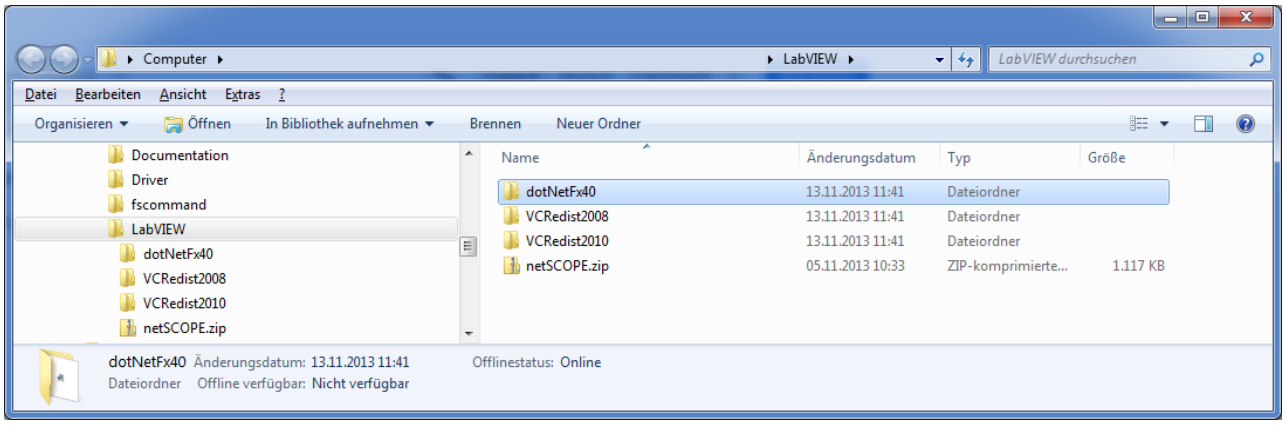


Figure 20: LabVIEW Directory

4. Install the components to your computer.

6.5 Documentation

To open the **Documentation** directory

1. Enter the netSCOPE LabVIEW DVD in the local DVD ROM drive.

➪ The start screen of the autostart menu is displayed with the following options:

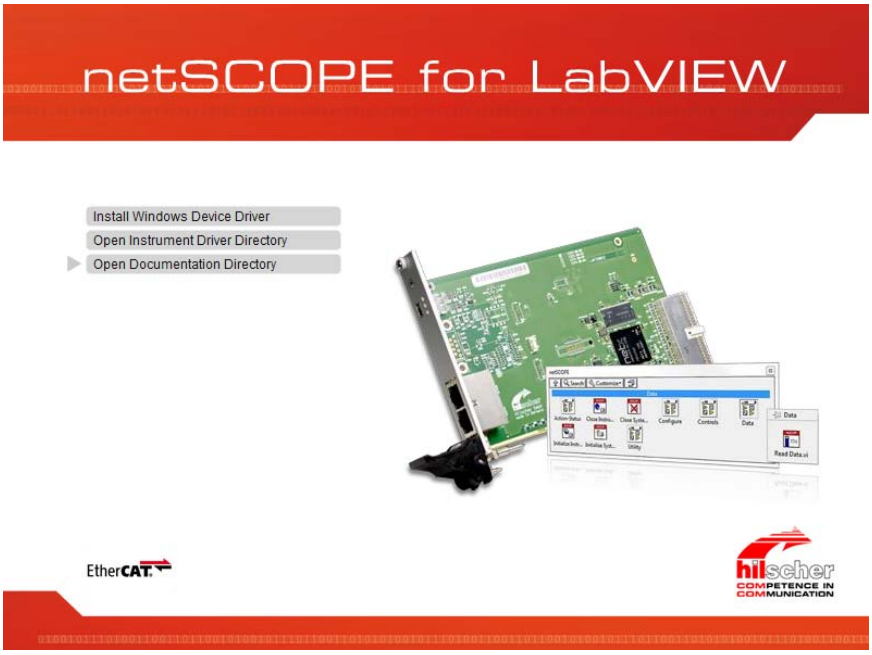


Figure 21: Options in the netSCOPE for LabVIEW Autostart Menu

2. Select **Documentation** in the autostart menu.

➪ The **Documentation** directory appears.

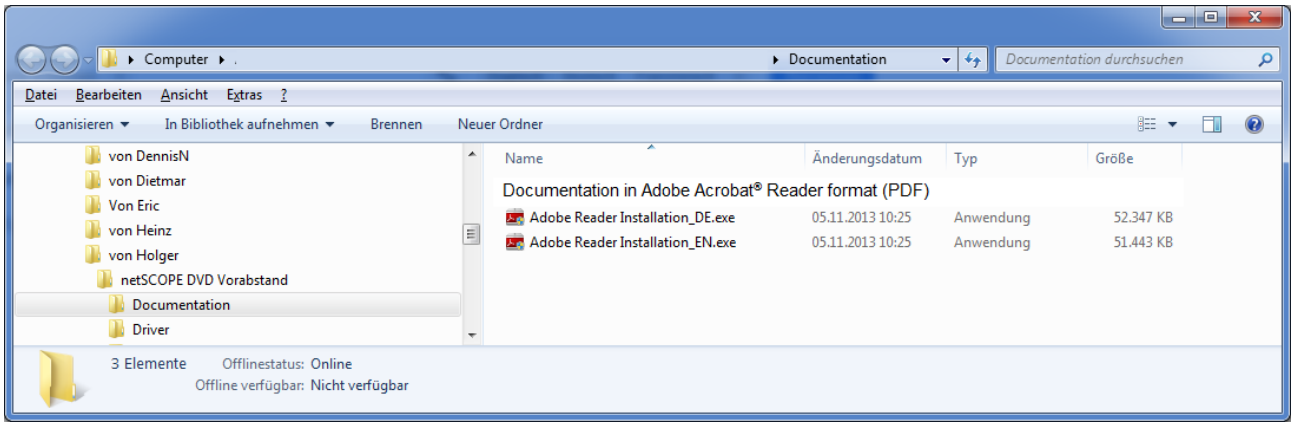


Figure 22: netSCOPE for LabVIEW Documentation Directory

7 Hardware Installation and Uninstalling

To install / uninstall the netSCOPE data aquistion cards for Real-Time Ethernet:

- PCI (NSCP-C100-RE\50)
- PCI Express (NSCP-C100-RE\50E)
- Low Profile PCIe (NSCP-C100-RE\70E)
- Compact PCI (NSCP-C100-RE\80)
- Mini PCI Express (NSCP-C100-RE\90E)

handle as described in the sections hereafter. The device drawing of your netSCOPE data aquistion card gives information on the manual control elements of your device.

This user manual provides descriptions of the **installation of the software** and the **installation**, **operation** and **hardware** of the netSCOPE data aquistion cards *PCI, PCI Express*, *Low Profile PCI Express*, *Compact PCI* and *Mini PCI Express* under Windows® XP, Windows® Vista, Windows® 7 and Windows® 8, as listed subsequently.

For the installation, uninstalling and replacement of the netSCOPE data aquistion card check any notes in the overview in chapter *Getting Started* on page 25.

7.1 Safety Messages on Personal Injury

Obey to the following safety messages on personal injury, when installing, uninstalling or replacing the netSCOPE data aquistion card.

7.1.1 Electrical Shock Hazard

WARNING

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

- HAZARDOUS VOLTAGE inside of the PC or of the connecting device.
- Strictly obey to all safety rules provided by the device's manufacturer in the documentation!
- First disconnect the power plug of the PC or of the connecting device, before you open the cabinet.
- Make sure, that the power supply is off at the PC or at the connecting device.
- Open the PC cabinet and install or remove the netSCOPE data aquistion card only after disconnecting power.

7.2 Property Damage Messages

Obey to the following property damage messages, when installing, uninstalling or replacing the netSCOPE data aquistion card.

7.2.1 Device Destruction by exceeding allowed Supply Voltage

Adhere for all netSCOPE data aquistion cards described in this manual the instruction hereafter:

NOTICE

Device Destruction!

- Use only the permissible supply voltage to operate the netSCOPE data aquistion card.
- Operating the netSCOPE data aquistion card with a supply voltage above of the specified range leads to device destruction.

7.2.2 Device Destruction by exceeding allowed Signaling Voltage

Adhere for all netSCOPE data aquistion cards described in this manual the instruction hereafter:

NOTICE

Device Destruction!

- All I/O signal pins at the netSCOPE data aquistion card tolerate only the specified signaling voltage!
- Operation the netSCOPE data aquistion card with a signaling voltage other than the specified signaling voltage may lead to severe damage to the netSCOPE data aquistion card!

For detailed information on the supply and signaling voltage of the netSCOPE data aquistion cards described in this manual, refer to section *Power Supply and Host Interface* on page 23.

7.2.3 Electrostatically sensitive Devices

Adhere to the necessary safety precautions for components that are vulnerable with electrostatic discharge.

NOTICE

Electrostatically sensitive Devices

- To prevent damage to the PC and the netSCOPE data aquistion card, make sure, that the netSCOPE data aquistion card is grounded via the endplate and the PC and make sure, that you are discharged when you install/uninstall the netSCOPE data aquistion card.

7.3 Installing netSCOPE Data Acquisition Card

Electrostatically sensitive Devices

1. Adhere to the necessary safety precautions for components that are vulnerable with electrostatic discharge.

NOTICE

Electrostatically sensitive Devices

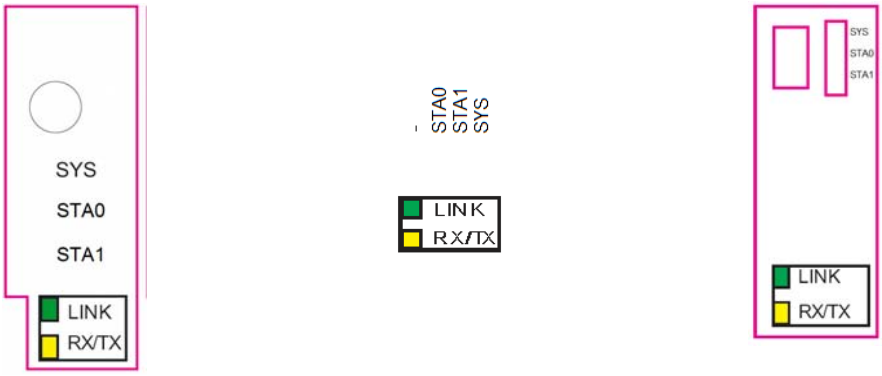
➢ To prevent damage to the PC and the netSCOPE card, make sure, that the netSCOPE card is grounded via the endplate and the PC and make sure, that you are discharged when you install/uninstall the netSCOPE card.

Front Plate Sticker

Only NSCP-C100-RE\50, NSCP-C100-RE\50E, NSCP-C100-RE\70E and NSCP-C100-RE\80.

2. Fix Front Plate Sticker.

Note: Your netSCOPE data aquistion card contains a front plate sticker, depending by your card type.



NSCP-C100-RE\50 or NSCP-C100-RE\50E | NSCP-C100-RE\70E | NSCP-C100-RE\80

Figure 23: Front Plate Stickers for different netSCOPE Data Acquisition Card Types

The label on the sticker indicates the following LED names:

LED Name	Color	Meaning
SYS	(yellow/green)	System LED
STA 0	(red/ green)	Status LED 0
STA 1	(red/ green)	Status LED 1
LINK	(green)	RJ45 Ethernet female connector LED Channel 0
RX/TX	(yellow)	RJ45 Ethernet female connector LED Channel 0
LINK	(green)	RJ45 Ethernet female connector LED Channel 1
RX/TX	(yellow)	RJ45 Ethernet female connector LED Channel 1

Table 18: LED Labeling

For further information refer to chapter *LED Descriptions* page 49.

➢ Glue the sticker on the front plate of the netSCOPE data aquistion card.

For the netSCOPE data aquistion card NSCP-C100-RE\70E consists from two parts.

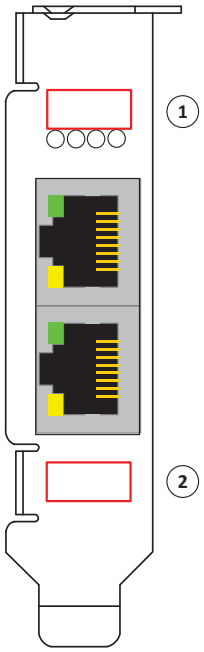
NSCP-C100-RE\70E	How to
	1. Glue the "partial sticker above" with the LED names STA1, STA0 and SYS above the LEDs ① on the front plate. 2. Glue the "partial sticker below " with the **names LINK and RX/TX** below of the RJ45 ② on the front plate.

Table 19: Fix Front Plate Sticker at the NSCP-C100-RE\70E

Installing the netSCOPE data aquistion card

3. Take safety precautions.

⚠ WARNING

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

➢ Disconnect the power plug of the PC or of the connecting device.

➢ Make sure, that the power supply is off at the PC or at the connecting device.

4. Open cabinet.

➢ Open the cabinet of the PC or of the connecting device.

5. Install the netSCOPE data aquistion card.

PCI, PCI Express or Low Profile PCI Express:

➢ Plug the netSCOPE data aquistion card PCI into a free PCI slot.

➢ Plug the netSCOPE data aquistion card PCI Express or Low Profile PCI Express into a free PCI express slot.

➢ Fix the netSCOPE data aquistion card using the hole intended.

Compact PCI:

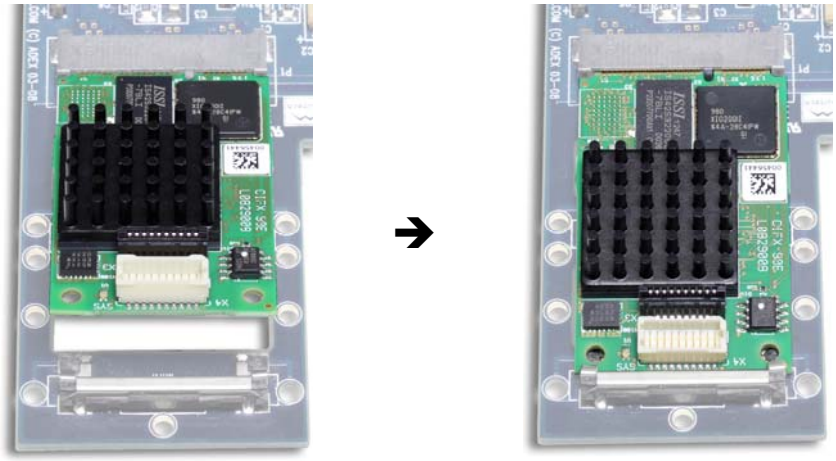
➢ Possibly remove a blank plate.

➢ Put down the ejection lever at the netSCOPE data aquistion card.

- Plug the netSCOPE data aquistion card Compact PCI into a free Compact PCI slot.
- Fasten the netSCOPE data aquistion card.
- Tip up the lever and click in.
- Screw the netSCOPE data aquistion card with two screws on the wholes above and below.

Mini PCI Express:

- Plug the basic card NSCP-C100-RE\90E into the PCI Express Mini System Connector on the mainboard.
- Press down the basic card until it snaps into place.



Plug the basic card into the PCI Express Mini System Connector on the mainboard …

… and press down the card until it snaps into place.

Figure 24: Mounting the basic Card NSCP-C100-RE\90E into the PCI Express Mini System Connector

Connecting AIFX Assembly Interface

(Only for NSCP-C100-RE\90E)

6. Connect the Ethernet assembly interface (AIFX-RE) to the basic card:

- Connect the **cable connector Ethernet X1** on the AIFX-RE with the cable.
- Connect the **cable connector Ethernet X4** on the basic card NSCP-C100-RE\90E with the cable.

AIFX-RE Assembly Interface with **Cable Connector Ethernet X1**

Example **NSCP-C100-RE\90E** with **Cable Connector Ethernet X4**

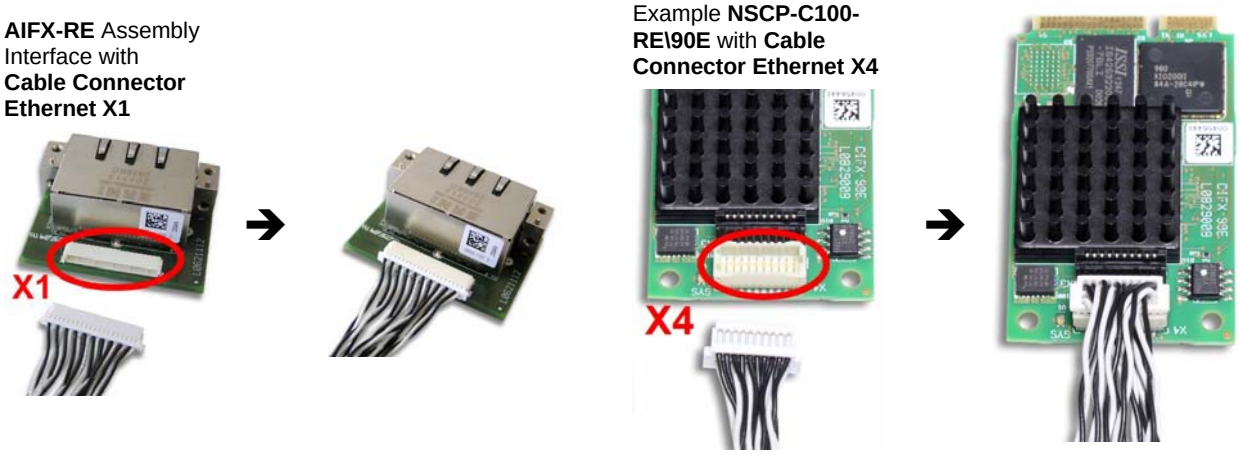


Figure 25: Connecting the Ethernet Assembly Interface (AIFX-RE) to the basic Card NSCP-C100-RE\90E (Example)

After this:

7. Close cabinet.

➢ Close the cabinet of the PC or connecting device.

Insert the netSCOPE Data Acquisition Card into the Communication Link

(all netSCOPE Data Acquisition Cards)

8. Insert the netSCOPE Data Acquisition Card into the Communication Link.

Note: The RJ45 socket is only for use in LAN, not for telecommunication circuits. For further information refer to section *Ethernet Interface* on page 50.

➢ Connect the netSCOPE data aquistion card via two Ethernet connecting cables with the Ethernet interfaces of the Master and Slave1, in parallel to the communication connection to be analyzed. Plug one of the Ethernet connecting cable to the Master and one to the Slave 1 as displayed in the picture below.

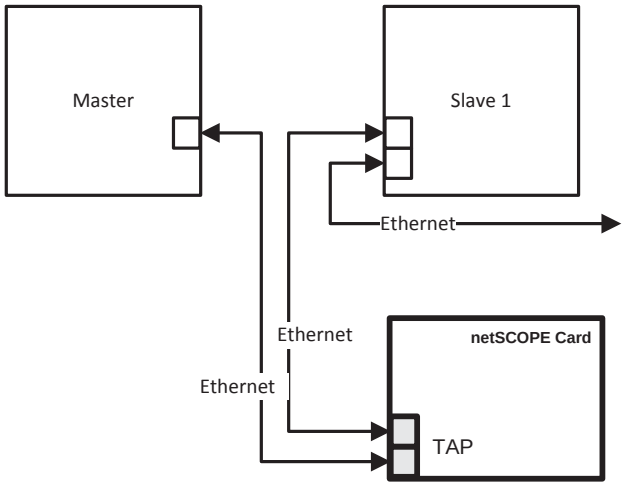


Figure 26: Connection Schema - Capturing and analyzing the Communication between a EtherCAT Master and the EtherCAT Slave 1

9. Connect the PC or the connecting device to the power supply and switch it on.

➢ Connect the PC or the connecting device to the power supply.

➢ Switch on the PC or the connecting device.

7.4 Uninstalling netSCOPE Data Acquisition Cards

1. Take safety precautions.

⚠ WARNING

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

- Disconnect the power plug of the PC or of the connecting device.
- Make sure, that the power supply is off at the PC or at the connecting device.

NOTICE

Electrostatically sensitive Devices

- To prevent damage to the PC and the netSCOPE card, make sure, that the netSCOPE card is grounded via the endplate and the PC and make sure, that you are discharged when you install/uninstall the netSCOPE card.

2. Remove the Ethernet connecting cables.
- Remove the Ethernet connecting cables between the netSCOPE data aquistion card and the Master or the Device.
3. Open cabinet.
- Open the cabinet of the PC or of the connecting device.
4. Uninstall netSCOPE data aquistion card.

PCI, PCI Express or Low Profile PCI Express:

- Loosen the netSCOPE data aquistion card.
- Remove the netSCOPE data aquistion card from the **PCI** slot or from the **PCI express** slot.

Compact PCI:

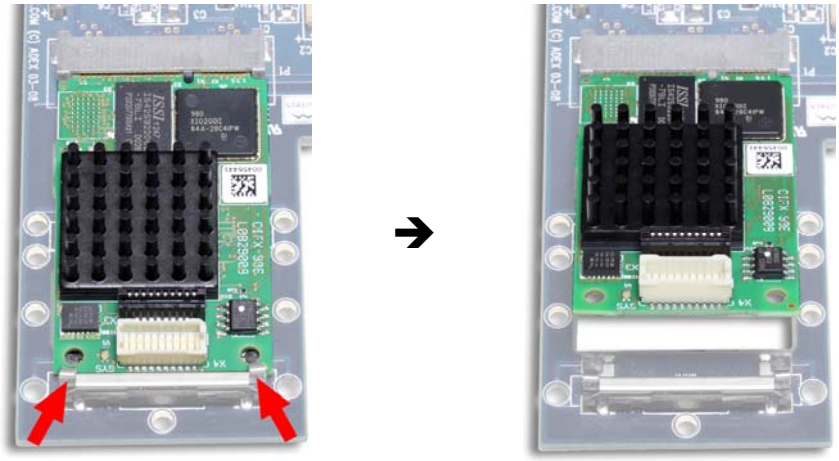
- Unscrew the netSCOPE data aquistion card.
- First press the grey button at the ejection lever.
- Then press the ejection lever downwards.
- Remove the netSCOPE data aquistion card from the compact PCI slot.
- Possibly reinsert a blank plate.

Mini PCI Express:

5. Uninstall the Ethernet (AIFX-RE) assembly interface. (Only NSCP-C100-RE\90E)
- Remove the AIFX-RE assembly interface from the PC housing panel.
- Disconnect the cable from the basic card NSCP-C100-RE\90E, cable connector Ethernet X4.

6. Remove the basic Card. (Only NSCP-C100-RE\90E)

➢ Press down the fastening clips (on the upper edge of the basic card), until the card flips up.



Press down the fastening clips (red arrows) of the basic card …

… until the card flips up.

Figure 27: Demounting the basic Card NSCP-C100-RE\90E from the PCI Express Mini System Connector

➢ Remove the basic card from the PCI Express Mini System Connector.

After this:

7. Close cabinet (All netSCOPE data aquistion cards)

➢ Close the cabinet of the PC or connecting device.

8 Troubleshooting

8.1 Instructions for Problem Solving

In case of any error, follow the instructions for problem solving given here:

General

- Check if the PC is on.
- Check the netSCOPE data aquistion card operating requirements according to the requirements given in the section *Notes for Installation and Operation* on page 25.

LINK-LEDs

- Check using the LINK LEDs status whether a connection to the Ethernet is established. Therefore use the descriptions on the LINK LEDs in the chapter *LED Descriptions* beginning from page 49.

Cable

- Check that the pin assignment of the cable is correct. This means, the cable by which you connect the netSCOPE data aquistion card to the Master or Device.

Configuration

- Check if the netSCOPE data aquistion card is configured properly.

9 LED Descriptions

LED	Color	State	Meaning
SYS	green	On	Operating System running
	yellow	Flashing cyclic at 1Hz	Device indicates boot error
	yellow	On	Bootloader is waiting for booting procedure or device is deinitialized
	-	Off	Power supply for the device is missing or hardware defect
STA0	green	On	Capturing process active
	green	Blinking	Blinks together with STA1 LED when ‘Identitfy Device’ is initiated in the netSCOPE for LabVIEW programming interface.
	red	On	Capturing process inactive
STA1	green	Blinking	Blinks together with STA0 LED when ‘Identitfy Device’ is initiated in the netSCOPE for LabVIEW programming interface.
	red	On	Error between PCI device and firmware to the PC
LINK / RJ45 Ch0 and Ch1	green	On	A connection to the Ethernet exists
	-	Off	The device has no connection to the Ethernet
RX/TX / RJ45 Ch0 and Ch1	yellow	Flashing / On	The device sends/receives Ethernet frames

Table 20: LEDs netSCOPE Data Acquisition Cards

Fatal Error

LED	Color	State	Meaning
SYS	yellow	On	Fatal Error: Firmware is not able to start because of an hardware problem.
STA0	red	On	
STA1	red	On	

Table 21: LEDs netSCOPE Data Acquisition Cards

Indicator States

Indicator state	Definition
On	The indicator is constantly on.
Off	The indicator is constantly off.
Blinking	The indicator turns on and off for approximately 10 seconds.
Single Flash	The indicator shows one short flash followed by an off phase. The interval period for the flash when triggering a GPIO event is 100 ms.

Table 22: Indicator States

10 Device Connections

10.1 Ethernet Interface

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

10.1.1 Ethernet Pin Assignment at the RJ45 Socket

Note: The device supports the **Auto Crossover** function. Due to this fact RX and TX can be switched.
Only 100 Mbit/s connections 100BASE-T are supported.

The following figure shows the RJ45 standard pin assignment:

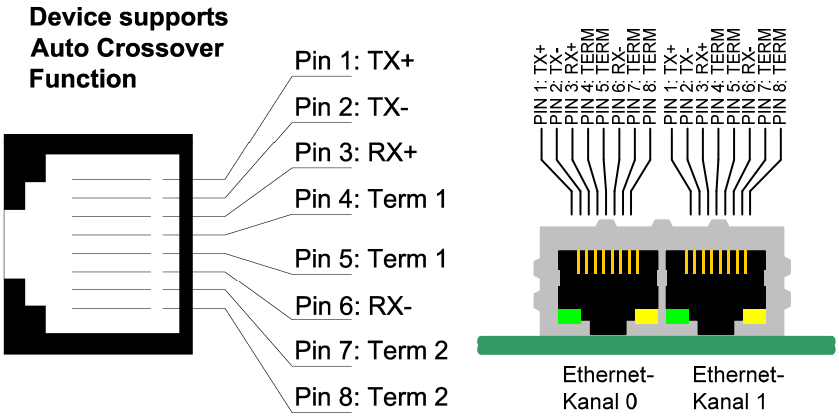


Figure 28: Ethernet Pin Assignment at the RJ45 Socket for netSCOPE Data Acquisition Card or AIFX

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

Table 23: Ethernet Pin Assignment at the RJ45 Socket for netSCOPE Data Acquisition Card or AIFX

Note: The RJ45 socket is only for use in LAN, not for telecommunication circuits.

10.1.2 Ethernet Connection Data

Medium	2 x 2 Twisted-Pair cupric cable, CAT5 (100 MBit/s)
Length of cable	Typ. 100 m
Transmission rate	100 MBit/s

Table 24: Ethernet Connection Data

10.2 Cable Connector

10.2.1 Pin Assignment for Cable Connector Ethernet

Only for NSCP-C100-RE\90E.

Pin Assignment for Cable Connector Ethernet X4 - Cable 20 pin Ethernet and Status LEDs:

Pin	Signal
1	GND
2	+3V3 Analog
3	STA0_green (*RE LED COM 0*)
4	STA0_red (*RE LED COM 0*)
5	XM0_TX
6	STA1_green (*RE LED COM 1*)
7	CH0_LINKn
8	CH0_ACTIVITY
9	AIFINIT
10	STA1_red (*RE LED COM 1*)

Pin	Signal
11	CH0_TXP
12	CH0_TXN
13	CH0_RXP
14	CH0_RXN
15	CH1_TXP
16	CH1_TXN
17	CH1_RXP
18	CH1_RXN
19	CH1_LINKn
20	CH1_ACTIVITY

Table 25: Pin Assignment for Cable Connector Ethernet X4

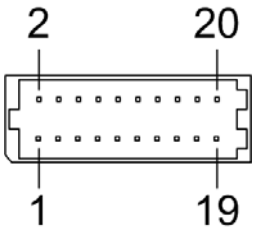


Figure 29: 2x20 Pins for NSCP-C100-RE\90E

10.3 Pin Assignment at the PCI Bus

10.3.1 Overview

For the netSCOPE data aquistion cards *PCI*, *PCI Express* and *Low Profile PCI Express* the table below gives an overview about the pin assignment at the PCI bus.

netSCOPE Data Acquisition Card	Hardwar Revision	PCI Bus Type	PCI Bus [Pins]	Pin Assignment at the PCI Bus		PCI Specification
				acc. to standard	compare section, page	
NSCP-C100-RE\50	5	PCI	124	*yes*	-	[bus spec 1]
NSCP-C100-RE\50E	5	PCI Express	36	*yes*	-	[bus spec 2, Rev. 2.0], [bus spec 3]
NSCP-C100-RE\70E	1					
NSCP-C100-RE\80	3	Compact PCI	110	*yes*	-	[bus spec 4]
NSCP-C100-RE\90E	B	Mini PCI Express	52	*no*	*Pin Assignment for Mini PCI Express Bus*, 53	[bus spec 2, Rev. 1.0a], [bus spec 6]

Table 26: Pin Assignment at the PCI Bus

10.3.2 References PCI Specifications

No.	Specification	Revision	Version	Date	www
[bus spec 1]	PCI Local Bus Specification	2.3	-	February 21, 2003	pcisig.com
[bus spec 2]	PCI Express® Base Specification	2.0	-	January 15, 2007	
[bus spec 3]	PCI Express® Card Electromechanical Specification	2.0	-	April 11, 2007	
[bus spec 4]	CompactPCI™ Specification Short Form	2.1	2.0	September 2, 1997	picmg.org
[bus spec 6]	PCI Express Mini Card Electromechanical Specification	1.1	-	March 28, 2005	pcisig.com
		1.2	-	October 26, 2007	
		2.0	-	April 21, 2012	

Table 27: References PCI Specifications

10.3.3 Pin Assignment for Mini PCI Express Bus (NSCP-C100-RE\90E)

Only for NSCP-C100-RE\90E (X1/X2):

Pin (X1)	Signal	Pin (X2)	Signal
51	(not used)	52	+3.3V
49	(not used)	50	GND
47	(not used)	**48**	**(not used)**
45	(not used)	**46**	**IO_SYNC0**
43	(not used)	**44**	**IO_SYNC1**
41	(not used)	**42**	**Bootstart**
39	(not used)	40	GND
37	(not used)	38	USB_D+ (*disabled – not used*)
35	GND	36	USB_D - (*disabled – not used*)
33	PERp0	34	GND
31	PERn0	32	(not used)
29	GND	30	(not used)
27	GND	**28**	**(not used)**
25	PETp0	26	GND
23	PETn0	**24**	**(not used)**
21	GND	22	PERST#
19	(not used)	20	(not used)
17	(not used)	18	GND
15	GND	16	(not used)
13	REFCLK+	14	(not used)
11	REFCLK-	12	(not used)
9	GND	10	(not used)
7	CLKREQ#	8	(not used)
5	(not used)	**6**	**(not used)**
3	(not used)	4	GND
1	(not used)	2	3.3V

Table 28: Pin Assignment Mini PCI Express Bus of the NSCP-C100-RE\90E Card, X1/X2

Unless otherwise noted, the pin assignment for Mini PCI Express bus, X1/X2 described in *Table 28* corresponds to the bus specification for Mini PCI Express [bus spec 6, Rev. 1.2, Section 3.3]. Please note the following deviations from the standard assignment:

The Pins **6**, **28**, **48**, **24**, **36**, and **38** are **'not used'**. As pin 24 is not used, the netSCOPE data aquistion card NSCP-C100-RE\90E can be used together with main boards according to any earlier revision (1.1 and 1.2) of the Mini PCI Express specification [bus spec 6], as well as to the latest revision (2.0). The USB connector (Pins 36 and 38) at the Mini PCI Express Bus of the netSCOPE data aquistion card NSCP-C100-RE\90E is directly connected to the CPU of the PC and is not used for external diagnosis. The Pins 36 and 38 are disabled and are 'not used'. When you start the PC, the operating system does not ask for an USB driver.

The pin assignment of the **Pins 42, 44, 46** deviates from the standard specification Mini PCI Express: For the netSCOPE data aquistion card NSCP-C100-RE\90E pin 42 is used for Bootstart and depending by the protocol the SYNC connection is realized via the pins 44 and 46 of the mini PCI Express bus.

For the reference for [bus spec 6] for the bus specification for Mini PCI Express refer to section *References PCI Specifications* on page 52.

11 Technical Data

11.1 Technical Data netSCOPE Data Acquisition Cards

Note: All technical data are temporarily and can be altered without notice.

11.1.1 NSCP-C100-RE\50

NSCP-C100-RE\50	Parameter	Value	
Part	Name	NSCP-C100-RE\50	
	Part No.	7330.100	
	Description	netSCOPE data aquistion card PCI for Real-Time Ethernet	
	Function	Data Acquisition Card for Real-Time Ethernet	
Communication Controller	Type	netX 500 processor	
Integrated Memory	RAM	8 MB SDRAM	
	FLASH	4 MB serial Flash EPROM	
	Size of the Dual-Port Memory	64 KByte	
System Interface	Bus Type	PCI, according to [bus spec 1], refer to section *Overview*, page 52.	
	Transmission Rate	33 MHz	
	Data Access	DPM	
	Width for the data access to the Dual-Port Memory (DPM)	32-Bit	
Process Data Interface	History depth and signal count	Unlimited, only restricted by PC memory	
	Signal types	Input and output process values	
Ethernet System	Supported Real-Time Ethernet system	EtherCAT	
	Ethernet Frame Types	Ethernet II	
	Baud rate	100 MBit/s	
	Data transport layer	Ethernet II, IEEE 802.3	
	Automated symbol import	EtherCAT: ENI file	
Ethernet Interface	Transmission rate	100 MBit/s (for EtherCAT)	
	Interface Type	100 BASE-TX (for EtherCAT), refer to section *Ethernet Interface*, page 50.	
	Galvanic Isolation	isolated	
	Isolation Voltage	1000 VDC (tested for 1 minute)	
	Full duplex	For EtherCAT: supported (at 100 MBit/s)	
	Auto-Negotiation	For EtherCAT: supported	
	Auto-Crossover	For EtherCAT: supported	
	Connector	2* RJ45 Socket	
	Ethernet channels	2x RJ45, passive TAP, Ethernet delay < 1 µs additional external TAP with zero-delay possible	
	Time-stamp resolution	10 ns	
Display	LED Display	SYS	System Status LED
		STA0	LED Status 0 (duo LED)
		STA1	LED Status 1 (duo LED)

NSCP-C100-RE\50	Parameter	Value		
		RJ45 Ch0 and Ch1	LED yellow	Ethernet Link Status
			LED green	Ethernet RX/TX Status
		Refer to chapter *LED Descriptions*, page 49.		
Power supply	Supply Voltage	+3,3 V dc ±5 %, refer to section *Power Supply and Host Interface*, page 23.		
	Maximum Current at 3,3 V (typically)	650 mA		
	Connector	Via PCI Bus		
Environmental Conditions	Operating temperature range*	0 °C ... +55 °C		
	*Air flow during measurement	0,5m/s		
	Storage temperature range	0 °C ... +70 °C		
	Humidity	10 … 95% relative humidity, 10 … 95% relative humidity, no condensation permitted		
Device	Dimensions (L x W x H)	120,0 x 86 x 18,5 mm (from hardware revision 3)		
	Mounting/Installation	PCI slot (3,3 V), refer to section *Slot for the netSCOPE Data Acquisition Cards*, page 21.		
	RoHS	Yes		
CE Sign	CE Sign	Yes		
	Emission	EN 55011:2009 + A1:2010, CISPR 11:2009, Class A (Radio disturbance characteristics - Limits and methods of measurement)		
	Immunity	EN 61000-4-2:2009 (Electrostatic discharge test) EN 61000-4-3:2006 + A1:2008 + A2:2010 (Radiated, radio-frequency, electromagnetic field test) EN 61000-4-4:2004 + A1:2010 (Burst Electrical fast transients/burst test) EN 61000-4-5:2006 (Surge test) EN 61000-4-6:2009 (to conducted disturbances, induced by radio- frequency fields) EN 61000-4-8:2010 (power frequency magnetic field test) EN 61000-6-2:2005 + B1:2011 (for industrial environments)		
Programm Interface	Interface	National Instruments: NI LabVIEW 2013 Platform Windows 8/7/Vista/XP/Server (Version August 2013)		
	Driver	netSCOPE for LabVIEW Instrument Driver (V1.0.x.x) Windows 8/7/Vista/XP		

Table 29: Technical Data NSCP-C100-RE\50

11.1.2 NSCP-C100-RE\50E

NSCP-C100-RE\50E	Parameter	Value		
Part	Name	NSCP-C100-RE\50E		
	Part No.	7330.101		
	Description	netSCOPE data aquistion card PCI Express for Real-Time Ethernet		
	Function	Data Acquisition Card for Real-Time Ethernet		
Communication Controller	Type	netX 500 processor		
Integrated Memory	RAM	8 MB SDRAM		
	FLASH	4 MB serial Flash EPROM		
	Size of the Dual-Port Memory	64 KByte		
System Interface	Bus Type	PCI Express, One Lane Port, according to [bus spec 2, Rev. 2.0] and [bus spec 3], refer to section *Overview*, page 52.		
	Transmission Rate	2 GBit/s		
	Data Access	DPM		
	Width for the data access to the Dual-Port Memory (DPM)	32-Bit		
Process Data Interface	History depth and signal count	Unlimited, only restricted by PC memory		
	Signal types	Input and output process values		
Ethernet system	Supported Real-Time Ethernet system	EtherCAT		
	Ethernet Frame Types	Ethernet II		
	Baud rate	100 MBit/s		
	Data transport layer	Ethernet II, IEEE 802.3		
	Automated symbol import	EtherCAT: ENI file		
Ethernet Interface	Transmission rate	100 MBit/s (for EtherCAT)		
	Interface Type	100 BASE-TX (for EtherCAT), refer to section *Ethernet Interface*, page 50.		
	Galvanic Isolation	isolated		
	Isolation Voltage	1000 VDC (tested for 1 minute)		
	Full duplex	For EtherCAT: supported (at 100 MBit/s)		
	Auto-Negotiation	For EtherCAT: supported		
	Auto-Crossover	For EtherCAT: supported		
	Connector	2* RJ45 Socket		
	Ethernet channels	2x RJ45, passive TAP, Ethernet delay < 1 µs additional external TAP with zero-delay possible		
	Time-stamp resolution	10 ns		
Display	LED Display	SYS		System Status LED
		STA0		LED Status 0 (duo LED)
		STA1		LED Status 1 (duo LED)
		RJ45 Ch0 and Ch1	LED yellow	Ethernet Link Status
			LED green	Ethernet RX/TX Status
		Refer to chapter *LED Descriptions*, page 49.		

NSCP-C100-RE\50E	Parameter	Value
Power supply	Supply Voltage	+3,3 V dc ±5 %, refer to section *Power Supply and Host Interface*, page 23.
	Maximum Current at 3,3 V (typically)	800 mA
	Connector	Via PCI Express Bus
Environmental Conditions	Operating temperature range*	0 °C ... +55 °C
	*Air flow during measurement	0,5m/s
	Storage temperature range	0 °C ... +70 °C
	Humidity	10 … 95% relative humidity, no condensation permitted
Device	Dimensions (L x W x H)	120,0 x 86 x 18,5 mm (from hardware revision 4)
	Mounting/Installation	PCI Express x1 slot (3.3 V), refer to section *Slot for the netSCOPE Data Acquisition Cards*, page 21.
	RoHS	Yes
CE Sign	CE Sign	Yes
	Emission	EN 55011:2009 + A1:2010, CISPR 11:2009, Class A (Radio disturbance characteristics - Limits and methods of measurement)
	Immunity	EN 61000-4-2:2009 (Electrostatic discharge test) EN 61000-4-3:2006 + A1:2008 + A2:2010 (Radiated, radio-frequency, electromagnetic field test) EN 61000-4-4:2004 + A1:2010 (Burst Electrical fast transients/burst test) EN 61000-4-5:2006 (Surge test) EN 61000-4-6:2009 (to conducted disturbances, induced by radio- frequency fields) EN 61000-4-8:2010 (power frequency magnetic field test) EN 61000-6-2:2005 + B1:2011 (for industrial environments)
Programm Interface	Interface	National Instruments: NI LabVIEW 2013 Platform Windows 8/7/Vista/XP/Server (Version August 2013)
	Driver	netSCOPE for LabVIEW Instrument Driver (V1.0.x.x) Windows 8/7/Vista/XP

Table 30: Technical Data NSCP-C100-RE\50E

11.1.3 NSCP-C100-RE\70E

NSCP-C100-RE\70E	Parameter	Value		
Part	Name	NSCP-C100-RE\70E		
	Part No.	7330.102		
	Description	netSCOPE data aquistion card Low Profile PCI Express for Real-Time-Ethernet (Low Profile PCIe with RTE)		
	Function	Data Acquisition Card for Real-Time Ethernet		
Communication Controller	Type	netX 100 processor		
Integrated Memory	RAM	8 MB SDRAM		
	FLASH	4 MB serial Flash EPROM		
	Size of the Dual-Port Memory	64 KByte		
System Interface	Bus Type	PCI Express, One Lane Port, according to [bus spec 2, Rev. 2.0] and [bus spec 3], refer to section *Overview*, page 52.		
	Transmission Rate	2 GBit/s		
	Data Access	DPM or DMA (Direct Memory Access)		
	Width for the data access to the Dual-Port Memory (DPM)	32-Bit		
Process Data Interface	History depth and signal count	Unlimited, only restricted by PC memory		
	Signal types	Input and output process values		
Ethernet system	Supported Real-Time Ethernet system	EtherCAT		
	Ethernet Frame Types	Ethernet II		
	Baud rate	100 MBit/s		
	Data transport layer	Ethernet II, IEEE 802.3		
	Automated symbol import	EtherCAT: ENI file		
Ethernet Interface	Transmission rate	100 MBit/s (for EtherCAT)		
	Interface Type	100 BASE-TX (for EtherCAT), refer to section *Ethernet Interface*, page 50.		
	Galvanic Isolation	isolated		
	Isolation Voltage	1000 VDC (tested for 1 minute)		
	Full duplex	For EtherCAT: supported (at 100 MBit/s)		
	Auto-Negotiation	For EtherCAT: supported		
	Auto-Crossover	For EtherCAT: supported		
	Connector	2* RJ45 Socket		
	Ethernet channels	2x RJ45, passive TAP, Ethernet delay < 1 µs additional external TAP with zero-delay possible		
	Time-stamp resolution	10 ns		
Display	LED Display	SYS		System Status LED
		STA0		LED Status 0 (duo LED)
		STA1		LED Status 1 (duo LED)
		RJ45 Ch0 and Ch1	LED yellow	Ethernet Link Status
			LED green	Ethernet RX/TX Status
		Refer to chapter *LED Descriptions*, page 49.		
Power supply	Supply Voltage	+3,3 V dc ±5 %, refer to section *Power Supply and Host*		

NSCP-C100-RE\70E	Parameter	Value
		Interface, page 23.
	Maximum Current at 3,3 V (typically)	800 mA
	Connector	Via PCI Express Bus
Environmental Conditions	Operating temperature range*	0 °C ... +65 °C
	*Air flow during measurement	0,5m/s
	Storage temperature range	0 °C ... +70 °C
	Humidity	10 … 95% relative humidity, no condensation permitted
Device	Dimensions (L x W x H)	119,0 x 69,0 x 18,5 mm
	Mounting/Installation	PCI Express x4 slot (3.3 V), refer to section *Slot for the netSCOPE Data Acquisition Cards*, page 21.
	RoHS	Yes
CE Sign	CE Sign	Yes
	Emission	EN 55011:2009 + A1:2010, CISPR 11:2009, Class A (Radio disturbance characteristics - Limits and methods of measurement)
	Immunity	EN 61000-4-2:2009 (Electrostatic discharge test) EN 61000-4-3:2006 + A1:2008 + A2:2010 (Radiated, radio-frequency, electromagnetic field test) EN 61000-4-4:2004 + A1:2010 (Burst Electrical fast transients/burst test) EN 61000-4-5:2006 (Surge test) EN 61000-4-6:2009 (to conducted disturbances, induced by radio- frequency fields) EN 61000-4-8:2010 (power frequency magnetic field test) EN 61000-6-2:2005 + B1:2011 (for industrial environments)
Programm Interface	Interface	National Instruments: NI LabVIEW 2013 Platform Windows 8/7/Vista/XP/Server (Version August 2013)
	Driver	netSCOPE for LabVIEW Instrument Driver (V1.0.x.x) Windows 8/7/Vista/XP

Table 31: Technical Data NSCP-C100-RE\70E

11.1.4 NSCP-C100-RE\80

NSCP-C100-RE\80	Parameter	Value		
Part	Name	NSCP-C100-RE\80		
	Part No.	7330.103		
	Description	netSCOPE data aquistion card Compact PCI for for Real-Time Ethernet Master or Slave		
	Function	Data Acquisition Card for Real-Time Ethernet		
Communication Controller	Type	netX 100 processor		
Integrated Memory	RAM	8 MB SDRAM		
	FLASH	4 MB serial Flash EPROM		
	Size of the Dual-Port Memory	64 KByte		
System Interface	Bus Type	Compact PCI, according to [bus spec 4], refer to section *Overview*, page 52.		
	Transmission Rate	33 MHz		
	Data Access	DPM or DMA (Direct Memory Access)		
	Width for the data access to the Dual-Port Memory (DPM)	32-Bit		
Process Data Interface	History depth and signal count	Unlimited, only restricted by PC memory		
	Signal types	Input and output process values		
Ethernet System	Supported Real-Time Ethernet system	EtherCAT		
	Ethernet Frame Types	Ethernet II		
	Baud rate	100 MBit/s		
	Data transport layer	Ethernet II, IEEE 802.3		
	Automated symbol import	EtherCAT: ENI file		
Ehernet Interface	Transmission rate	100 MBit/s (for EtherCAT)		
	Interface Type	100 BASE-TX (for EtherCAT), refer to section *Ethernet Interface*, page 50.		
	Galvanic Isolation	isolated		
	Isolation Voltage	1000 VDC (tested for 1 minute)		
	Full duplex	For EtherCAT: supported (at 100 MBit/s)		
	Auto-Negotiation	For EtherCAT: supported		
	Auto-Crossover	For EtherCAT: supported		
	Connector	2* RJ45 Socket		
	Ethernet channels	2x RJ45, passive TAP, Ethernet delay < 1 µs additional external TAP with zero-delay possible		
	Time-stamp resolution	10 ns		
Diagnostic Interface	USB Interface	Not used.		
Display	LED Display	SYS		System Status LED
		STA0		LED Status 0 (duo LED)
		STA1		LED Status 1 (duo LED)
		RJ45 Ch0 and Ch1	LED yellow	Ethernet Link Status
			LED green	Ethernet RX/TX Status
		Refer to chapter *LED Descriptions*, page 49.		

NSCP-C100-RE\80	Parameter	Value
Power supply	Supply Voltage	+3,3 V dc ±5 %, refer to section *Power Supply and Host Interface*, page 23.
	Maximum Current at 3,3 V (typically)	650 mA
	Connector	Via Compact PCI Bus
Environmental Conditions	Operating temperature range*	0 °C ... +70 °C
	*Air flow during measurement	0,5m/s
	Storage temperature range	0 °C ... +70 °C
	Humidity	10 … 95% relative humidity, no condensation permitted
Device	Dimensions (L x W x H)	162,2 x 100 x 20 mm
	Mounting/Installation	Compact PCI slot (3,3 V), refer to section *Slot for the netSCOPE Data Acquisition Cards*, page 21.
	RoHS	Yes
CE Sign	CE Sign	Yes
	Emission	EN 55011:2009 + A1:2010, CISPR 11:2009, Class A (Radio disturbance characteristics - Limits and methods of measurement)
	Immunity	EN 61000-4-2:2009 (Electrostatic discharge test) EN 61000-4-3:2006 + A1:2008 + A2:2010 (Radiated, radio-frequency, electromagnetic field test) EN 61000-4-4:2004 + A1:2010 (Burst Electrical fast transients/burst test) EN 61000-4-5:2006 (Surge test) EN 61000-4-6:2009 (to conducted disturbances, induced by radio- frequency fields) EN 61000-4-8:2010 (power frequency magnetic field test) EN 61000-6-2:2005 + B1:2011 (for industrial environments)
Programm Interface	Interface	National Instruments: NI LabVIEW 2013 Platform Windows 8/7/Vista/XP/Server (Version August 2013)
	Driver	netSCOPE for LabVIEW Instrument Driver (V1.0.x.x) Windows 8/7/Vista/XP

Table 32: Technical Data NSCP-C100-RE\80

11.1.5 NSCP-C100-RE\90E

NSCP-C100-RE\90E	Parameter	Value
Part	Name	NSCP-C100-RE\90E
	Part No.	7330.105
	Description	netSCOPE data aquistion card Mini PCI Express for for Real-Time Ethernet - with cable connector Ethernet for Ethernet assembly interface (AIFX-RE) **Note:** The device height and the power input of the netSCOPE data aquistion card Mini PCI Express NSCP-C100-RE\90E do not comply with the standard specifications.
	Function	Data Acquisition Card for Real-Time Ethernet
Communication Controller	Type	netX 100 processor
Integrated Memory	RAM	8 MB SDRAM
	FLASH	4 MB serial Flash EPROM
	Size of the Dual-Port Memory	64 KByte
System Interface	Bus Type	Mini PCI Express, One Lane Port, according to [bus spec 2], refer to section *Overview*, page 52 and *Pin Assignment for Mini PCI Express Bus*, page 53.
	Transmission Rate	33 MHz
	Data Access	DPM or DMA (Direct Memory Access)
	Width for the data access to the Dual-Port Memory (DPM)	32-Bit
Process Data Interface	History depth and signal count	Unlimited, only restricted by PC memory
	Signal types	Input and output process values
Ethernet System	Supported Real-Time Ethernet system	EtherCAT
	Ethernet Frame Types	Ethernet II
	Baud rate	100 MBit/s
	Data transport layer	Ethernet II, IEEE 802.3
	Automated symbol import	EtherCAT: ENI file
Ethernet Interface	Transmission Rate	100 MBit/s (for EtherCAT)
	Interface Type	100 BASE-TX (for EtherCAT), refer to section *Ethernet Interface*, page 50.
	Full duplex	For EtherCAT: supported (at 100 MBit/s)
	Auto-Negotiation	For EtherCAT: supported
	Auto-Crossover	For EtherCAT: supported
	Ethernet Assembly Interface	AIFX-RE, refer to section *AIFX-RE*, page 64. **Important!** Operating the netSCOPE data aquistion card NSCP-C100-RE\90E requires proper connection of the Ethernet assembly interface (AIFX-RE) to the basic card!
	Connector AIFX-RE	Cable Connector Ethernet X4 (JST BM20B-SRDS-G-TFC, Pitch 1,0 mm)
	Time-stamp resolution	10 ns
Display	LED Display	**SYS** System Status LED
Power supply	Supply Voltage	+3,3 V dc ±5 %, refer to section *Power Supply and Host Interface*, page 23.
	Maximum Current at at 3,3 V (typically)	800 mA
	Connector	Via Mini PCI Express Bus
Environmental	Operating temperature range*	0 °C ... +55 °C

NSCP-C100-RE\90E	Parameter	Value
Conditions	*Air flow during measurement	0,5m/s
	Storage temperature range	0 °C ... +70 °C
	Humidity	10 … 95% relative humidity, no condensation permitted
Device	Dimensions (L x W x H)	51 x 30,2 +/- 0,1 x 11 mm [W = 30,1mm ... 30,3 mm: The printed circuit board (PCB) has become wider on the right side by 0.1 mm … 0.3 mm, thus deviating from the norm]. For further details on the element heights refer to section *Card Height and Panel Cutout NSCP-C100-RE\90E* *Notes on the Card* Height on page 22.
	Mounting/Installation	PCI Express Mini System Connector (3,3 V), X1/X2[5] = One Lane, refer to section *Slot for the netSCOPE Data Acquisition Cards*, page 21.
	RoHS	Yes
CE Sign	CE Sign	Yes
	Emission	EN 55011:2009 + A1:2010, CISPR 11:2009, Class A (Radio disturbance characteristics - Limits and methods of measurement)
	Immunity	EN 61000-4-2:2009 (Electrostatic discharge test) EN 61000-4-3:2006 + A1:2008 + A2:2010 (Radiated, radio-frequency, electromagnetic field test) EN 61000-4-4:2004 + A1:2010 (Burst Electrical fast transients/burst test) EN 61000-4-5:2006 (Surge test) EN 61000-4-6:2009 (to conducted disturbances, induced by radio- frequency fields) EN 61000-4-8:2010 (power frequency magnetic field test) EN 61000-6-2:2005 + B1:2011 (for industrial environments)
Programm Interface	Interface	National Instruments: NI LabVIEW 2013 Platform Windows 8/7/Vista/XP/Server (Version August 2013)
	Driver	netSCOPE for LabVIEW Instrument Driver (V1.0.x.x) Windows 8/7/Vista/XP

Table 33: Technical Data NSCP-C100-RE\90E

[5] X1, X2 corresponds to the Hilscher convention for „interface“ on the top or the bottom side of the netSCOPE Data Acquisition Card.

11.1.6 AIFX-RE

AIFX-RE	Parameter	Value		
Part	Name	AIFX-RE		
	Part No.	2800.100		
	Description	Ethernet Assembly Interface (with Ethernet interface) for the netSCOPE data aquistion card NSCP-C100-RE\90E		
Interface netSCOPE data aquistion card	Connector	Cable Connector Ethernet X1 (JST SM20B-SRSS-TB(LF)(SN), Pitch 1.0 mm)		
Ethernet Interface	Galvanic Isolation	isolated		
	Isolation Voltage	1000 VDC (tested for 1 minute)		
	Connector	2* RJ45 Socket		
	Ethernet channels	2x RJ45, passive TAP, Ethernet delay < 1 µs additional external TAP with zero-delay possible		
Display	LED Display	SYS		System Status LED
		STA0		LED Status 0 (duo LED)
		STA1		LED Status 1 (duo LED)
		RJ45 Ch0 and Ch1	LED yellow	Ethernet Link Status
			LED green	Ethernet RX/TX Status
		Refer to chapter *LED Descriptions*, page 49.		
Power supply	Connector	Cable Connector Ethernet X1		
Environmental Conditions	Operating temperature range*	0 °C ... +70 °C		
	*Air flow during measurement	0,5m/s		
	Storage temperature range	0 °C ... +70 °C		
	Humidity	10 … 95% relative humidity, no condensation permitted		
Device	Dimensions (L x W x H)	30,7 x 42,3 x 18,5 mm		
	Mounting/Installation	At the netSCOPE data aquistion card NSCP-C100-RE\90E Cable Connector Ethernet X4		
	RoHS	Yes		
CE Sign	CE Sign	Yes		
	Emission, Immunity	Tested together with the corresponding netSCOPE data aquistion card.		

Table 34: Technical Data AIFX-RE

11.2 PCI IDs netSCOPE Data Acquisition Cards on the PCI Bus

On the PCI bus the netSCOPE data aquistion cards have the following PCI IDs:

PCI IDs	Value
VendorID	0x15CF
DeviceID	0x0000
Subsystem Vendor ID	0x15CF
Subsystem Device ID	0x0012

Table 35: PCI IDs netSCOPE Data Acquisition Cards on the PCI Bus

11.3 Supported PCI-Bus Commands

From the following table you can see which PCI bus commands are supported by the Hilscher netSCOPE data aquistion cards *PCI, PCI Express* and *Low Profile PCI Express*.

C/BE3#	C/BE2#	C/BE1#	C/BE0#	Command Type	supported
0	0	0	0	Interrupt Acknowledge	no
0	0	0	1	Special Cycle	no
0	0	1	0	I/O Read	✓
0	0	1	1	I/O Write	✓
0	1	0	0	Reserved	no
0	1	0	1	Reserved	no
0	1	1	0	Memory Read	✓
0	1	1	1	Memory Write	✓
1	0	0	0	Reserved	no
1	0	0	1	Reserved	no
1	0	1	0	Configuration Read	✓
1	0	1	1	Configuration Write	✓
1	1	0	0	Memory Read Multiple	no
1	1	0	1	Dual Address Cycle	no
1	1	1	0	Memory Read Line	no
1	1	1	1	Memory Write and Invalidate	no

Table 36: Supported / not supported PCI Bus Commands

C/BE = Bus Command and Byte Enable Signal of PCI

12 Annex

12.1 Matrix Label

A matrix label is on the device. It contains 3 items:

1. Part number
2. Hardware Revision
3. Serial number

The figure shows part number 7330.105, hardware revision 1 and serial number 22394.

① Part number

② Hardware Revision

③ Serial number

Figure 30: Matrix Label

12.2 Disposal of Waste Electronic Equipment

According to the European Directive 2002/96/EG “Waste Electrical and Electronic Equipment (WEEE)”, waste electronic equipment may not be disposed of as household waste. As a consumer, you are legally obliged to dispose of all waste electronic equipment according to national and local regulations.

Waste Electronic Equipment

- This product must not be treated as household waste.
- This product must be disposed of at a designated waste electronic equipment collecting point.

12.3 List of Figures

12.4 List of Tables

12.5 Glossary

100-Base TX

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

Auto-Crossover

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

Auto-Negotiation

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

Baud rate

Data transmission speed of a communication channel or interface.

Boot loader

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

Device Description File

A file containing configuration information about a device being a part of a network that can be read out by masters for system configuration. Device Description Files use various formats which depend on the communication system.

EtherCAT

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

Firmware

Software running inside a device providing the basic functionality of this device. The firmware is stored remanently in the flash memory circuit of the device. It can be updated by a firmware download.

Full duplex

Full duplex denominates a telecommunication system between two communication partners which allows simultaneous communication in both directions is called a full-duplex telecommunication system. At such a system, it will be possible to transmit data even if currently data are received. Full-duplex is the opposite of Half_duplex.

telecommunication system. At such a system, receiving data inhibits the transmission of data. Half-duplex is the opposite of _Full_duplex.

Industrial Ethernet

See Real-Time Ethernet

LabVIEW

Laboratory **V**irtual **I**nstrumentation **E**ngineering **W**orkbench

netSCOPE

Hilscher's netSCOPE is a tool to capture network traffic from Real-Time Ethernet systems and to display data content for analysis purposes.

netX

networX on chip, next generation of communication controllers

PCB

Printed Circuit Board, (printed = machine-made) circuit board

PCIe

Abbreviation for PCI Express

RE

RE stands for Real-Time Ethernet

Real-Time Ethernet

Real-Time Ethernet (Industrial Ethernet) is an extension of the Ethernet networking technology for industrial purposes with very good real-time features and performance. There is a variety of different Real-Time Ethernet systems on the market (e. g. EtherCAT) which are incompatible with each other.

RJ45

A connector type often used for Ethernet connection. It has been standardized by the Federal Communications Commission of the USA (FCC).

12.6 Contacts

Headquarters

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

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

Subsidiaries

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

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

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

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

India
Hilscher India Pvt. Ltd.
New Delhi - 110 065
Phone: +91 11 26915430
E-Mail: info@hilscher.in

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

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

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

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

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

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

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

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

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

