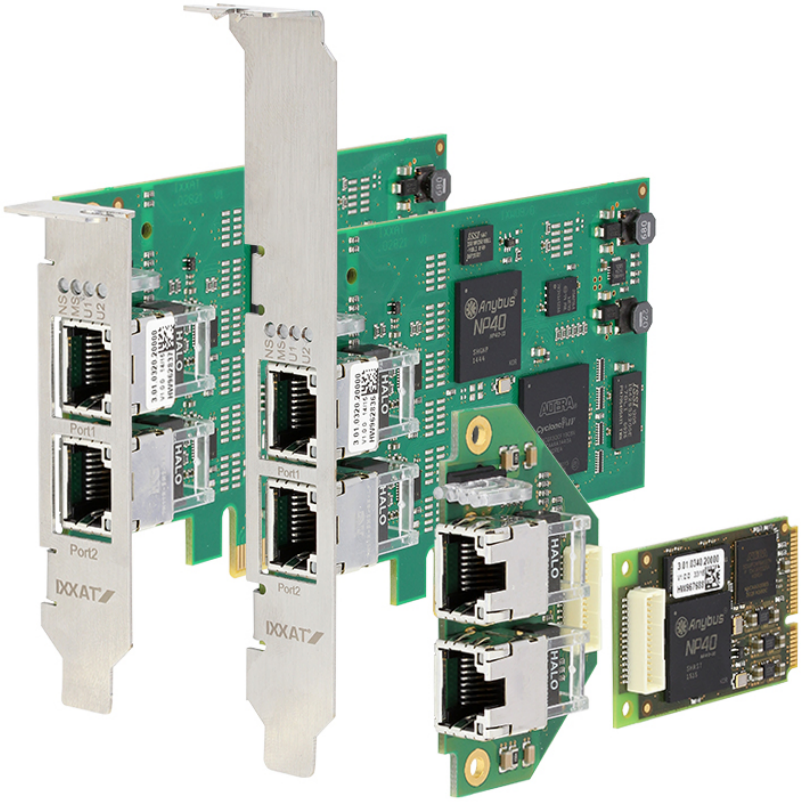
IXXAT®

INpact Slave PCIe

Industrial Ethernet PCIexpress Interface

USER MANUAL

4.01.0320.20000 1.2 ENGLISH



HMS Connecting Devices™

Important User Information

Liability

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There are many applications of the described product. Those responsible for the use of this device must ensure that all the necessary steps have been taken to verify that the applications meet all performance and safety requirements including any applicable laws, regulations, codes, and standards.

HMS Industrial Networks will under no circumstances assume liability or responsibility for any problems that may arise as a result from improper use or use that is not in accordance with the documented features of this product.

The examples and illustrations in this document are included solely for illustrative purposes.

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INpact Slave PCIe Industrial Ethernet PCIexpress Interface User Manual
4.01.0320.20000 1.2

Table of Contents

Page

1 User Guide

Please read the manual carefully. Make sure you fully understand the manual before using the product.

1.1 Related Documents

Document	Author
VCI Installation Manual	HMS
Anybus CompactCom 40 Software Design Guide (see www.anybus.com)	HMS
Anybus CompactCom 40 Network Guides	HMS
INpact Slave Getting Started	HMS

1.2 Document History

Version	Date	Author	Description
1.0	March 2016	CoMi	First release
1.1	April 2016	CoMi	Added INpact CE Slave PCIe Mini
1.2	June 2016	CoMi	Adjusted FCC Compliance Statement

1.3 Conventions

Instructions and results are shown in the following way:

- ▶ instruction 1
- ▶ instruction 2
  - ▷ result 1
  - ▷ result 2

Lists are shown in the following way:

- item 1
- item 2

Bold typeface indicates interactive parts such as connectors and switches on the hardware, or menus and buttons in a graphical user interface.

```
This font is used to indicate program code and other
kinds of data input/output such as configuration scripts.
```

This is a cross-reference within this document: *Conventions, p. 3*

This is an external link (URL): www.hms-networks.com

Safety advice is shown in the following way:

> **!** Cause of the hazard!
>
> Consequences of not taking remediate action.
>
> How to avoid the hazard.

Safety signs and signalwords are used dependent on the level of the hazard.

This is additional information which may facilitate installation and/or operation.

This instruction must be followed to avoid a risk of reduced functionality and/or damage to the equipment, or to avoid a network security risk.

Caution
This instruction must be followed to avoid a risk of personal injury.

WARNING
This instruction must be followed to avoid a risk of death or serious injury.

2 Safety and Dangers

2.1 Information on EMC

Risk of interference to radio and television if used in office or home environment!

Use exclusively included accessories.

Make sure shield of interface is connected with device plug and plug on other side.

Use exclusively shielded cables.

2.2 General Safety Notes

- Protect product from moisture and humidity.
- Protect product from too high or too low temperature (see *Technical Data, p. 22*).
- Protect product from fire.
- Don’t throw, drop or try to bend the product.
- Don’t paint the product.
- Don’t modify or disassemble the product. Service must be carried out by HMS Industrial Networks.
- Don’t use modified products.
- Store products in dry and dust-free place.

3 Scope of Delivery

Included in the scope of delivery of standard variant:

- INpact interface (Mini version with bus coupling unit and connection cable)
- CD with VCI driver and example application
- Installation Guide VCI
- User Manual INpact Slave PCIe

4 Features

The interface for Ethernet based industrial communication is designed to fulfill the high requirements of real time Ethernet protocols with big data volume. The interface supports the most used real time industrial Ethernet protocols. The modular approach of the INpact platform allows the interface to be customized, allowing the end product to appear as a vendor-specific implementation rather than a generic INpact interface.

Common feature set:

- one common Ethernet platform for Industrial Ethernet protocols
- event-based interface method enables easy access to input and output data at any time
- fast data transfer: up to 1500 bytes of process data in each direction with very low latency
- provides instant connectivity to all major industrial networks with only one development
- transparent network service channel enables profile integration (Drive, Motion, Semi, Other)
- standardized hardware and software interface independent of network
- continuous product maintenance by HMS Industrial Networks
- pre-certified for full interoperability and network compliance
- realtime-2-Port-Switch
- 10/100 Mbit, Full-/Half duplex
- Standard, Low Profile and Mini version available
- two RJ45 Ethernet ports

5 Installation

5.1 Install Software

For the operation of the interface a driver is needed.

Windows

▶ Install VCI driver (see Installation manual VCI).

Linux and Real-Time Operating Systems

▶ Observe information about supported operating systems and interfaces on www.ixxat.com.

5.2 Install Hardware

!	Risk of ESD damages caused by improper handling! Use ESD protective measures to avoid equipment damage.

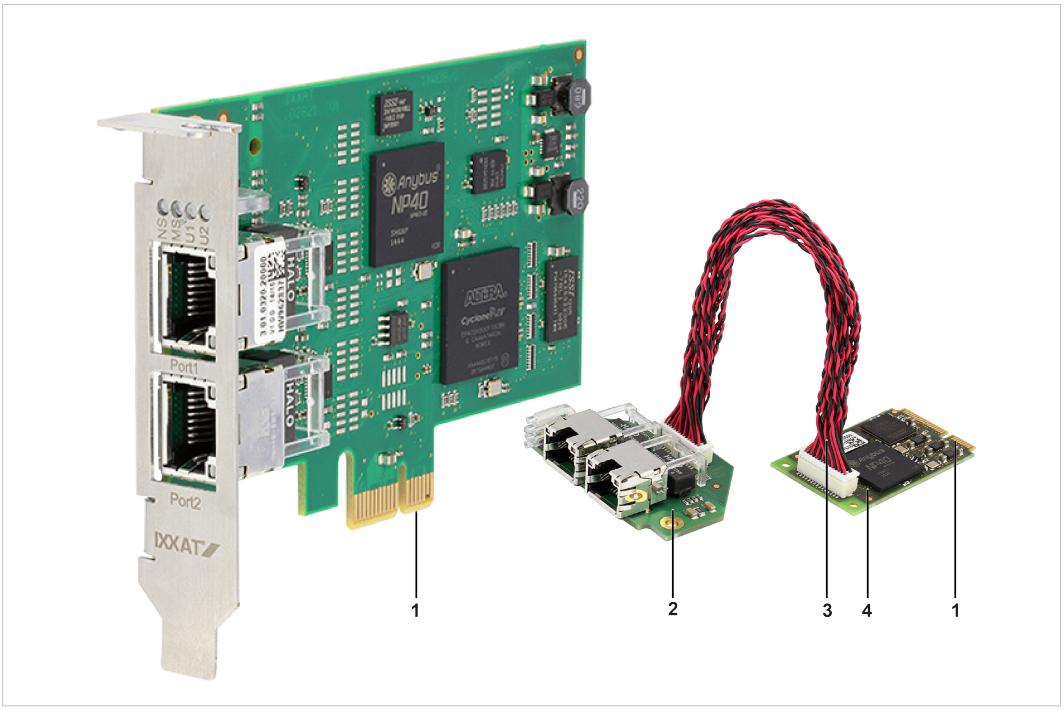

Fig. 1 Low Profile and Mini Version

1	Connector
2	Bus coupling unit
3	Connection cable
4	Mini interface

- ▶ Make sure that VCI driver is installed.
- ▶ Turn off computer.
- ▶ Pull power cord.
- ▶ Open computer case according to instructions of computer manufacturer.

If PCIe Mini is used:

- ▶ Install bus coupling unit (**2**).
- ▶ Connect interface (**4**) and bus coupling unit (**2**) with connection cable (**3**).
- ▶ Determine corresponding slot.
- ▶ Plug connector (**1**) in corresponding slot, without using force.
- ▶ Make sure interface is securely held in computer.
- ▶ Close computer case.
  - ▷ Hardware installation is complete.

6 Operation

The interface provides a common platform for different Industrial Ethernet networks.

> **!** Risk of damage caused by turning off computer during firmware update!
> Don’t turn off computer when LED MS is flashing red and green.

6.1 Overview

6.1.1 Standard and Low Profile

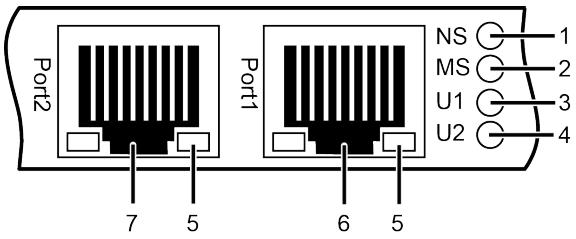

Fig. 2 Ethernet Ports and LEDs

1	LED NS (Network Status)
2	LED MS (Interface Status)
3	LED U1
4	LED U2
5	Link/Activity LED
6	Port 1
7	Port 2

LED U1 (**3**) and LED U2 (**4**) show state of boot up sequence.

LED NS (**1**), LED MS (**2**) and Link/Activity LEDs(**5**) are protocol specific and show current network, module and interface status.

Depending on the used protocol a test sequence of LED NS (**1**) and LED MS (**2**) is performed during the startup.

6.1.2 Mini

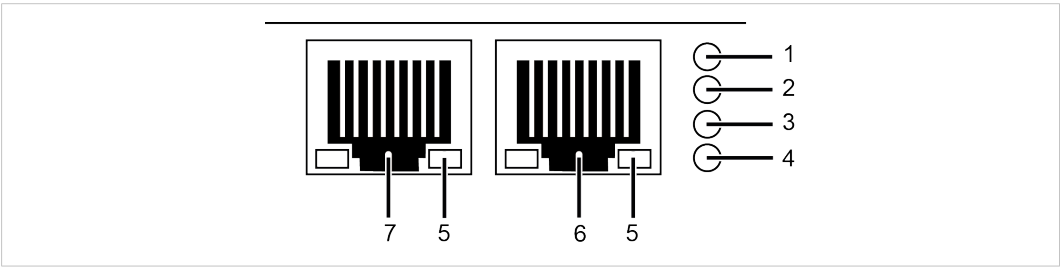

Fig. 3 Ethernet Ports and LEDs on Bus Coupling Unit

1	LED NS (Network Status)
2	LED MS (Interface Status)
3	LED U1
4	Power LED
5	Link/Activity LED
6	Port 1
7	Port 2

LED U1 (**3**) shows state of boot up sequence.

Power LED (**4**) shows if power is on or off.

LED NS (**1**), LED MS (**2**) and Link/Activity LEDs(**5**) are protocol specific and show current network, module and interface status.

Depending on the used protocol a test sequence of LED NS (**1**) and LED MS (**2**) is performed during the startup.

6.2 Ethernet Port RJ45

1	Tx+
2	Tx-
3	Rx+
6	Rx-
4,5,7,8	Normally unused; to ensure signal integrity pins are tied together and terminated to PE via filter circuit in interface.
Housing	Cable shield

Fig. 4 Pinning RJ45

6.3 Boot Up Sequence

In all protocols LED U1 **3** and LED U2 **4** show the current boot up state. In the Mini solution LED U2 is not visible, because LED U2 is integrated on the interface board.

LED state

Boot up state	LED U1	LED U2 (Standard and Low Profile version)	Description
1	Off	Off	Boot manager start (before start)
2	Red flashing	Green	Boot manager initialized
3	Red flashing	Green toggle	Boot manager command received
4	Orange	Off	Application firmware start
5	Green flashing	Green	Application firmware active
ERROR	Red	Red	Error in boot up sequence

7 Variants

It is possible to use the interface as a Common Ethernet interface or as a protocol specific interface.

7.1 Common Ethernet

7.1.1 Features

The Common Ethernet interface supports the following functions:

- two Ethernet ports (RJ45)
- common hardware platform for Ethernet networks
- 10/100 Mbit, full/half duplex operation
- web server with customizable content
- FTP server
- e-mail client
- JSON functionality
- Server Side Include (SSI) functionality
- Transparent Socket Interface

7.1.2 Operation (LEDs)

Observe protocol specific LED indications.

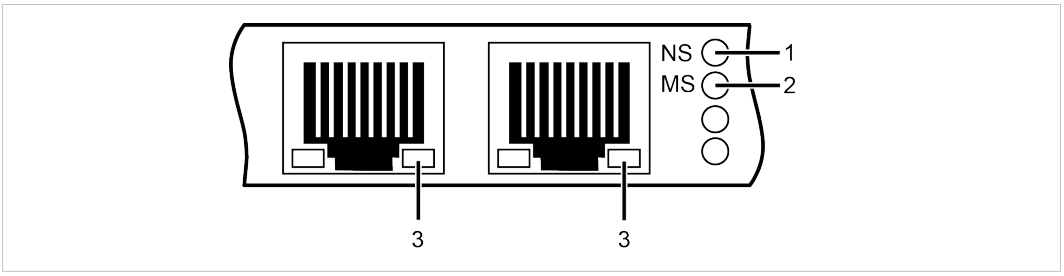

Fig. 5 LEDs Common Ethernet

1	LED NS
2	LED MS
3	Link/Activity LED

LED NS

LED state	Description
Off	Application not started
Green	IP address assigned
Green flashing	No IP address assigned
Red	IP address conflict detected, Error

LED MS

LED state	Description
Off	Not in EXCEPTION or WAIT_PROCESS state
Green	In WAIT_PROCESS state
Red	EXCEPTION error

Link/Activity LED

LED state	Description
Off	No link, no activity
Green	Link (100 Mbit/s) established
Green flashing	Activity (100 Mbit/s)
Yellow	Link (10 Mbit/s) established
Yellow flashing	Activity (10 Mbit/s)

7.1.3 Configure Protocol of INpact CE Slave

Using the Common Ethernet variant of the Interface, the real time protocol to be used must be downloaded by the customer. Several interfaces can be updated at one time.

After the configuration of a specific protocol it is possible to switch to other specific protocols.

To restore the Common Ethernet variant is not possible.

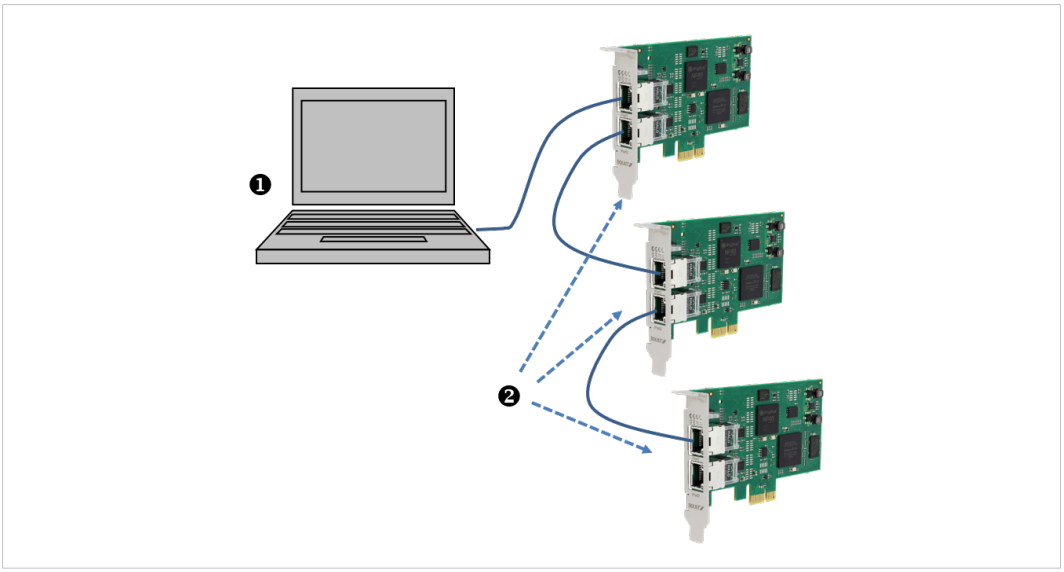

Fig. 6 Configure protocol

System conditions

1	Windows computer with HMS firmware manager and ETH protocol files
2	Target systems with installed VCI driver and installed INpact interface with a running application (e.g. example application described in the Software Design Guide *INpact Slave Getting Started*).

- Make sure that system conditions are met.
- To change protocol of Common Ethernet variant observe step-by-step video *Firmware Manager for Anybus CompactCom* on www.anybus.com (Anybus CompactCom 40-series/Firmware).
- Observe protocol specific LED indications.
- If necessary relabel LED NS and LED MS to conform to specific network certification requirements.

The step-by-step video shows a configuration on Anybus CompactCom hardware. The steps for the interface are the same.

7.2 Protocol-specific Preconfigured Variants

The communication software for the selected network is downloaded to the interface, which then seamlessly integrates to the network.

- Observe protocol specific LED indications.

8 Protocols

8.1 EtherCAT

8.1.1 Features

The EtherCAT slave interface supports the following functions:

- CANopen over EtherCAT (CoE)
- support for Modular Device Profile
- DS301 compliant
- customizable identity information
- emergency support
- up to 57343 ADIs can be accessed from the network as Manufacturer Specific Objects and Device Profile Specific Objects (generic mode)
- up to 16383 ADIs can be accessed form the network as Manufacturer Specific Objects and Device Profile Specific Objects (modular device profile enabled)
- up to 1486 bytes of fast cyclic I/O in each direction
- file access over EtherCAT (FoE)
- support for process data remap from the network
- possible to implement DS402 drive profile, semi device profiles and other device profiles

8.1.2 Operation (LEDs)

Observe renamed LED NS and LED MS.

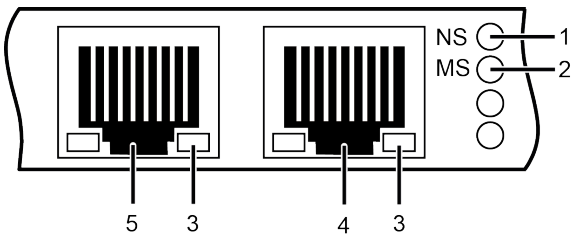

Fig. 7 LEDs EtherCAT

1	STAT LED (Status)
2	ERR LED (Error)
3	Link/Activity LED
4	EtherCAT (IN)
5	EtherCAT (OUT)

STAT LED

STAT LED **1** reflects status of EtherCAT communication.

LED state	Description	Comments
Off	Init	Interface in INIT state
Green	Operational	Interface in OPERATIONAL state
Green flashing	Pre-operational	Interface in PRE-OPERATIONAL state
Green single flash	Safe-operational	Interface in SAFE-OPERATIONAL state
Flickering	Boot	Interface in BOOT state
Red	If ERR LED **2** also red: fatal error	Internal error forces interface to passive state

▶ If STAT LED **1** and ERR LED **2** are red contact HMS Industrial Networks technical support.

ERR LED

ERR LED **2** indicates EtherCAT communications errors.

LED state	Description	Comments
Off	Not initialized	Interface in SETUP or NW_INIT state
Red blinking	Invalid configuration	State change received from master not possible due to invalid register of object settings
Red single flash	Unsolicited state change	Slave device application has changed the state autonomously
Red double flash	Application watchdog timeout	Sync manager watchdog timeout
Red	Application controller error	Interface in EXCEPTION state
Flickering	Booting error	E.g. due to firmware download failure

▶ If STAT LED **1** and ERR LED **2** are red contact HMS Industrial Networks technical support.

Link/Activity LED

Link/Aktivity LEDs **3** and **4** indicate EtherCAT link status and activity.

LED state	Description	Comments
Off	No link	No link, no communication present
Green	Link	Ethernet link established, no communication present
Green flashing	Activity	Ethernet link established, communication present

8.2 Ethernet/IP

8.2.1 Features

The Ethernet/IP slave interface supports the following functions:

- beacon based DLR (Device Level Ring) and linear network topology
- 10/100 Mbit, full/half duplex operation
- web server with customizable content
- FTP server
- email client
- Server Side Include (SSI) functionality
- customizable identity information
- up to 65535 ADIs
- CIP parameter object
- expandable CIP-object implementation
- unconnected CIP routing
- Transparent Socket Interface
- modular device functionality
- QuickConnect
- multiple IO assembly instances can be created

8.2.2 Operation (LEDs)

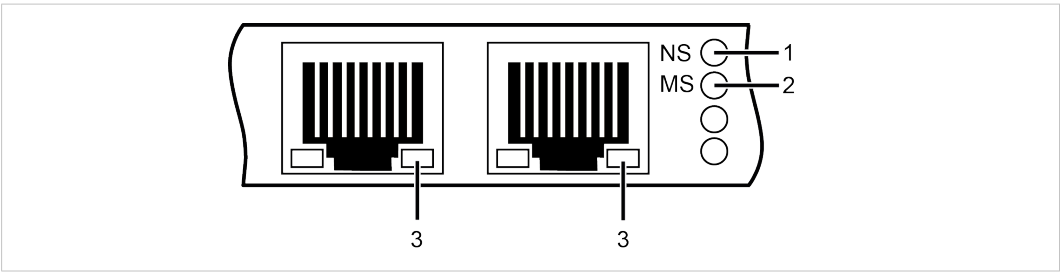

Fig. 8 LEDs Ethernet/IP

1	LED NS
2	LED MS
3	Link/Activity LED

LED NS

LED NS **1** reflects status of Ethernet/IP communication.

LED state	Description
Off	No IP address
Green	Online, one or more connections established (CIP class 1 or 3)
Green flashing	Online, no connections established
Red	Duplicate IP address, fatal error
Red flashing	One or more connections timed out (CIP class 1 or 3)

LED MS

LED state	Description
Off	Application not started
Green	Controlled by scanner in RUN state
Green flashing	Not configured or scanner in IDLE state
Red	Major error (EXCEPTION state, fatal error etc.)
Red flashing	Recoverable errors: Interface is configured but stored parameters differ from currently used parameters.

Link/Activity LED

LED state	Description
Off	No link
Green	Link (100 Mbit/s) established
Green flashing	Activity (100 Mbit/s)
Yellow	Link (10 Mbit/s) established
Yellow flashing	Activity (10 Mbit/s)

8.3 Powerlink

8.3.1 Features

The Powerlink slave interface supports the following functions:

- Ethernet Powerlink V2.0 Communication Profile Specification version 1.2.0 (Controlled Node)
- integrated hub
- 100 Mbit/s, half duplex operation
- ring redundancy
- customizable identity information
- 1 TPDO and 1 RPDO (each can hold 1490 bytes)
- up to 57343 ADIs
- adaptable XDD file included
- segmented SDO transfer
- PollResponse Chaining
- multiplexing

8.3.2 Operation (LEDs)

Observe renamed LED NS and LED MS.

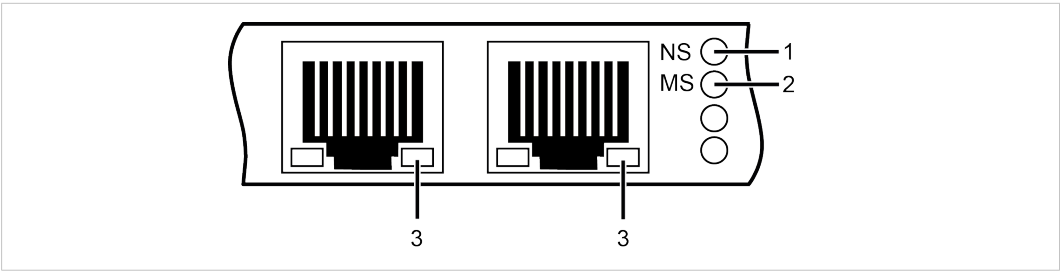

Fig. 9 LEDs Powerlink

1	STATUS LED
2	ERROR LED
3	Link/Activity LED

STATUS LED

STATUS LED **1** reflects status of Powerlink communication.

LED state	Description
Off	Initializing or not active
Green flashing (on 50 ms, off 50 ms)	NMT_CS_BASIC_ETHERNET Basic Ethernet state: no Powerlink traffic
Green single flash	NMT_CS_PRE_OPERATIONAL_1 only asynchronous data
Green double flash	NMT_CS_PRE_OPERATIONAL_2 asynchronous and synchronous data, no PDO data (any process data sent is declared not valid and received process data must be ignored)
Green triple flash	NMT_CS_READY_TO_OPERATE ready to operate, asynchronous and synchronous data, no PDO data (any process data sent is declared not valid and received process data must be ignored)
Green	NMT_CS_OPERATIONAL fully operational, asynchronous and synchronous data, PDO data is sent and received
Green fast flashing (on 200 ms, off 200 ms)	NMT_CS_STOPPED interface stopped (e.g. for controlled shutdown), asynchronous and synchronous data, no PDO data (any process data sent is declared not valid and received process data must be ignored)
Red	If ERROR LED **2** also red: fatal error

▶ If STATUS LED **1** and ERROR LED **2** are red contact HMS Industrial Networks technical support.

ERROR LED

LED state	Description
Off	No error
Red	Recoverable error
	If STATUS LED **1** also red: fatal error

▶ If STATUS LED **1** and ERROR LED **2** are red contact HMS Industrial Networks technical support.

Link/Activity LED

LED state	Description
Off	No link
Green	Link, no traffic
Green flashing	Link and traffic

8.4 Profinet

8.4.1 Features

The Profinet slave interface supports the following functions:

- up to 128 submodules in total
- up to 32767 ADIs
- 100 Mbit, full duplex
- generic and Profinet specific diagnostic support
- complies with Profinet IO conformance class C
- up to 1440 bytes I/O data in each direction, status bytes included
- SNMP agent
- FTP server
- e-mail client
- Server Side Include (SSI) functionality
- JSON functionality
- customizable identity information
- GSD file template provided by HMS Industrial Networks
- Media Redundancy Protocol (MRP)

8.4.2 Operation (LEDs)

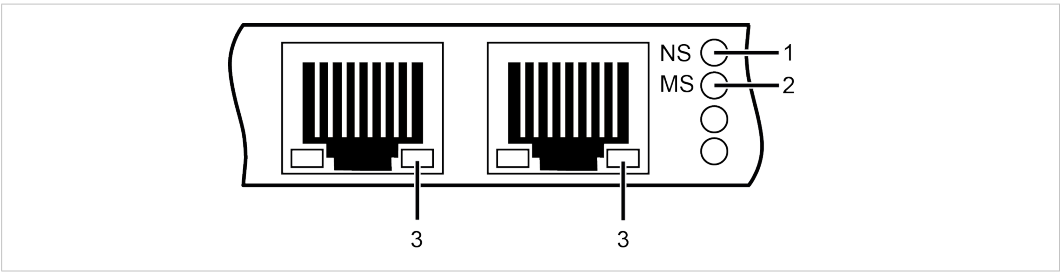

Fig. 10 LEDs Profinet

1	LED NS
2	LED MS
3	Link/Activity LED

LED NS

LED state	Description	Comments
Off	Offline	No connection with IO controller
Green	Online (run)	Connection with IO controller established, IO controller in RUN state
Green single flash	Online (stop)	Connection with IO controller established: IO controller in STOP state, IO data bad, IRT synchronisation not finished
Green flashing	Blink	Used by engineering tools to identify node on network
Red single flash	Station name error	Station name not set
Red double flash	IP address error	IP address not set
Red triple flash	Configuration error	Expected information differs from real identification

LED MS

LED state	Description	Comments
Off	Not initialized	Interface in setup or NW_INIT state
Green	Operational	Interface in OPERATIONAL state
Green single flash	Diagnostic events	Diagnostic events present
Red	EXCEPTION error	Interface in EXCEPTION state
	If LED NS **1** also red: fatal error	Internal error
Flashing red and green	Firmware update	Don’t turn off Interface to avoid permanent damage.

▶ If LED NS**1** and LED MS**2** are red contact HMS Industrial Networks technical support.

Link/Activity LED

LED state	Description	Comments
Off	No link	No link, no communication present
Green	Link	Ethernet link established, no communication present
Green flashing	Activity	Ethernet link established, communication present

8.5 Modbus

8.5.1 Features

The Modbus-TCP slave interface supports the following functions:

- 10/100 Mbit, full/half duplex operation
- Modbus-TCP server/slave (up to 4 simultaneous connections)
- web server with customizable content
- FTP server
- e-mail client
- JSON functionality
- Server Side Include (SSI) functionality
- customizable identity information
- transparent socket interface

8.5.2 Operation (LEDs)

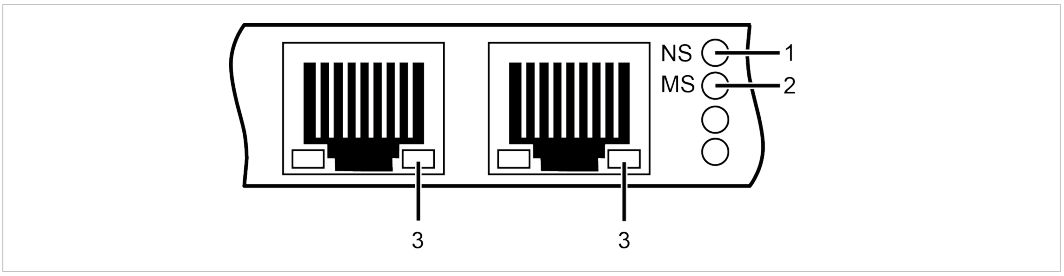

Fig. 11 LEDs Modbus

1	LED NS
2	LED MS
3	Link/Activity LED

LED NS

LED state	Description
Off	No IP address or EXCEPTION state
Green	At least one Modbus message received
Green flashing	Waiting for first Modbus message
Red	IP address conflict detected
	If LED MS **2** also red: fatal error
Red flashing	Connection timeout, no modbus message received within configured process active timeout time

▶ If LED NS**1** and LED MS**2** are red contact HMS Industrial Networks technical support.

LED MS

LED state	Description
Off	Application not started
Green	OPERATIONAL state
Red	Error, fatal error
	If LED NS **1** also red: fatal error
Red flashing	Recoverable error
Flashing red and green	Firmware update from file in progress

▶ If LED NS **1** and LED MS**2** are red contact HMS Industrial Networks technical support.

Link/Activity LED

LED state	Description
Off	No link, no activity
Green	Link (100 Mbit/s) established
Green flashing	Activity (100 Mbit/s)
Yellow	Link (10 Mbit/s) established
Yellow flashing	Activity (10 Mbit/s)

9 Technical Specification

9.1 Technical Data

9.1.1 Standard and Low Profile

PC-Interface	PCI Express Base Specification, Rev 1.1, single lane port (x1)
Dimensions	64 x 105 mm
Weight	approx. 52 g
Operating temperature	0 °C to +70 °C
Storage temperature	-40 °C to +85 °C
Power supply	Via PCIe socket (3.3/12 V DC)
Current consumption	typ. 3.3 V DC/270 mA, 12 V DC/110 mA
Galvanic isolation	1,500 Vrms
Relative humidity	10 % to 95 %, no condensation

9.1.2 Mini

PC-Interface	PCI Express Base Specification, Rev 1.1, single lane port (x1)
Form factor	F2: Full Mini with bottom-side keep outs
Dimensions	30 x 50.95 x 12 mm (with cable)
Weight	Approx. 26 g (interface, cable, bus coupling unit)
Operating temperature	-40 °C to 60 °C
Storage temperature	-40 °C to +85 °C
Power supply	Via PCIe (3.3 V)
Current consumption	Typ. 600 mA/3.3 V DC
Galvanic isolation	1,500 Vrms
Relative humidity	10 % to 95 %, no condensation

9.2 Ordering Information

▶ For ordering numbers and information see www.ixxat.com.

10 Support/Return Hardware

Observe the following information in the support area on www.ixxat.com:

- information about products
- FAQ lists
- installation notes
- updated product versions
- updates

10.1 Support

▶ Fill in the support form in support area on www.ixxat.com.

▶ If required use support phone contacts on www.ixxat.com.

10.2 Return Hardware

▶ Fill in the form for warranty claims and repair on www.ixxat.com.

▶ Print out the Product Return Number (PRN resp. RMA).

▶ Pack product in a physically- and ESD-safe way, use original packaging if possible.

▶ Enclose PRN number.

▶ Observe further notes on www.ixxat.com.

▶ Return hardware.

11 Disposal

▶ Dispose of product according to national laws and regulations.

▶ Observe further notes about disposal of products on www.ixxat.com.

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A Regulatory Compliance

A.1 EMC Compliance (CE)

CE

The product is in compliance with the Electromagnetic Compatibility Directive. More information and the Declaration of Conformity is found at www.ixxat.com.

A.2 FCC Compliance Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.

product name	IXXAT INpact Slave PCIe
model	CE/ETC/EIP/EIT/PIR/EPL
responsible party	HMS Industrial Networks Inc
address	35 E. Wacker Dr, Suite 1700 Chicago , IL 60601
phone	+1 312 829 0601

! Any changes or modifications not expressly approved by HMS Industrial Networks could void the user's authority to operate the equipment.

! This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.