

User manual

CIFX M223090AE-CO\F
PC card PCI Express M.2 2230 A-E CANopen Slave



Hilscher Gesellschaft für Systemautomation mbH
www.hilscher.com

DOC210203UM03EN | Revision 3 | English | 2022-02 | Released | Public

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1 Introduction

1.1 About the user manual

This user manual for your PC card CIFX M223090AE-CO\F CANopen informs you about the topics:

- Hardware description,
- installing the hardware and
- Firmware download.

Further information on how to download the firmware, as well as descriptions about configuration and diagnosis of your device can be found in separate operating instruction manuals.

1.2 List of revisions

Index	Date	Changes
1	21-08-26	created
2	21-09-16	CIFX M223090AE (Basic card) changed to hardware revision 4.
3	22-02-22	Section <i>Revision or version status of hardware and software</i> [▶ page 8]: Basic card CIFX M223090AE revision 4. Section <i>System Requirements</i> [▶ page 15] note on communication via PCI-Express added. Section <i>PC card CIFX M223090AE-CO\F</i> [▶ page 29] and <i>AIFX-V2-CO</i> [▶ page 30]: UKCA added.

Table 1: List of revisions

2 Devices and accessories

The PC card CIFX M223090AE-CO\F is a communication interface from Hilscher based on the communication controller netX 90 and consists of a basic card that is equipped with a detached network interface.

PC card	Description of the basic card	Accessories
CIFX M223090AE-CO\F	Communication Interface M.2 2230 Key A+E: CIFX M223090AE Type (according to the PCI Express M.2 specification): 2230 (=22x30 mm), Keys: A and E PCI Express slot (3.3 V), for M.2 type 2230-D3, Dual Key A-E (Socket 1 Connectivity)	Remote network interface CANopen: AIFX-V2-CO

Table 2: PC card CIFX M223090AE-CO\F

Product family	Card format and size	netX	Key	Network	Cable
CIFX	M 2230	90	AE	-CO	\F

Table 3: Meaning of the device name

The use refers exclusively to Slave systems. With the loaded CANopen slavefirmware, the PC card cifX executes the CANopen slave communication. Data is exchanged between the connected devices and the PC or connection device via the Dual-Port Memory.

2.1 Basic card CIFX M223090AE

In the following illustration with legend you can recognize the device elements significant for installation and operation each by a number.

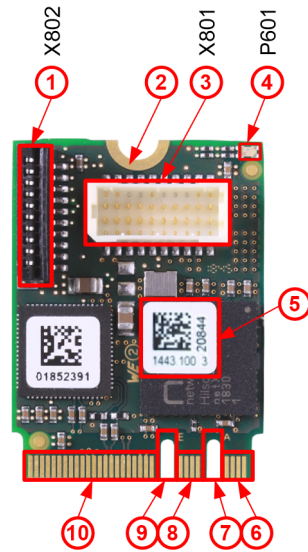


Figure 1: Basic card CIFX M223090AE (revision 3)

No.	Description
(1)	Cable connector fieldbus (X802, 10 pin)
(2)	Hole (with ground contact) for mounting the PC card
(3)	Cable connector Ethernet (X801, 20 pin)
(4)	System LED (yellow/green)
(5)	Matrix label
(6)	PCI Express M.2 bus, pin 1 to pin 7
(7)	PCI Express M.2 bus, pin 8 to pin 15 (key A)
(8)	PCI Express M.2 bus, pin 16 to pin 23
(9)	PCI Express M.2 bus, pin 24 to pin 31 (key E)
(10)	PCI Express M.2 bus, pin 32 to pin 75

Table 4: Legend on the basic card CIFX M223090AE

2.2 Detached network interface AIFX-V2-CO

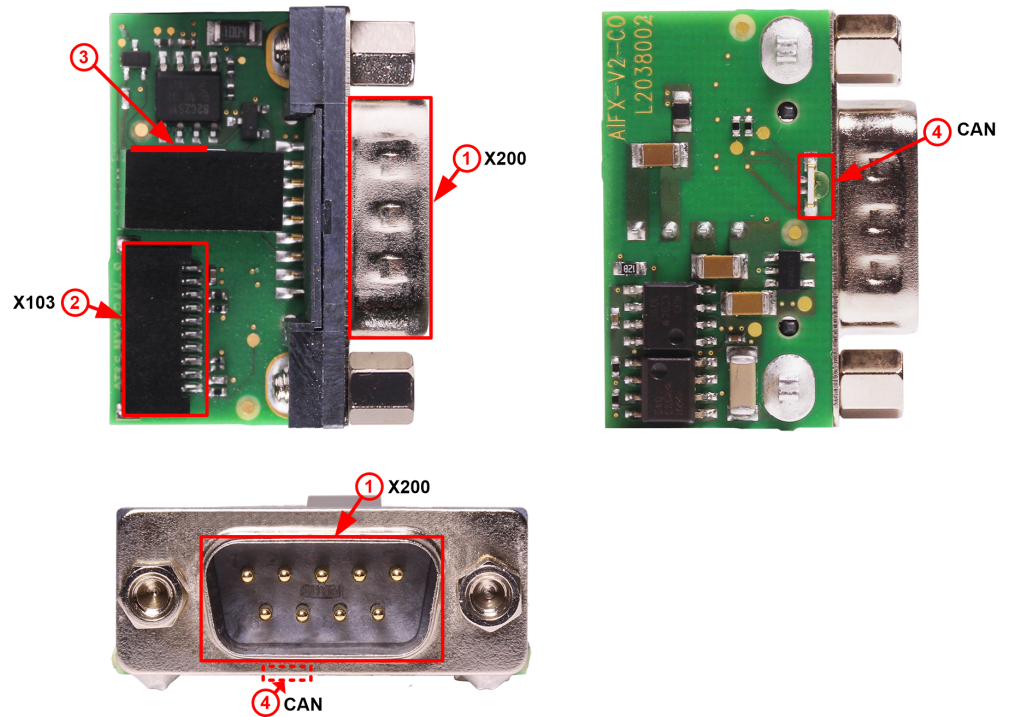


Figure 2: Detached network interface AIFX-V2-CO (Revision 2)

No.	Description
(1)	CANopen interface, DSub pug (X200)
(2)	Cable connector fieldbus (X103, 10-pin)
(3)	Mini matrix label (on the side of T100)
(4)	CAN : Communication status LED (red/green)

Table 5: Legend for the detached network interface AIFX-V2-CO



Important:

Note that the detached network interface CANopen AIFX-V2-CO especially is designed for netX 90-based devices and exclusively works together with them. In contrast, the detached network interface Ethernet AIFX-CO is only suitable for netX 100-based devices.

2.3 Product software

All the information and software you need for your product can be downloaded free of charge at the web-link

<https://kb.hilscher.com/display/CARDS/>.

- Select the link for the current release for the Communication Solution netX 90/4000 DVD.

After the download, you can start commissioning and configuring your device immediately.

- Check our website regularly for software updates for your product.

2.4 Revision or version status of hardware and software

The hardware revisions listed below, as well as the driver, software and firmware versions belong together functionally. If a hardware installation is available, the driver and the firmware must be updated according to these specifications.

Device name	Description	Part no.	Hardware revision
CIFX M223090AE-CO\F	Basic card CIFX M223090AE and AIFX-V2-CO	1443.501	-
CIFX M223090AE	Communication Interface M.2 2230 key A+E (basic card)	1443.100	4
AIFX-V2-CO	Detached network interface CANopen	2801.500	3

Table 6: Hardware revisions

Driver and software	Name	Version
Device driver	cifX Device Driver	2.3 or higher
Software to download the firmware	Device Explorer	1.3
Configuration software	Communication Studio	1.0

Table 7: Driver and software versions

Protocol	File name	Firmware version
CANopen Slave	X0905001.nxi	V5.1

Table 8: Firmware version and file names for permitted protocols



Note:

Unless otherwise stated, the firmware version in this manual is the same as the stack version.

2.5 Device label with matrix code

You can identify your device by means of the device label.

**Note:**

The position of the device label on your device is indicated in the device overview.

The device label consists of a matrix code and the information contained therein in plain text.

The 2D code (Data Matrix Code) contains the following information:

- ① Part number: 1234.567
- ② Hardware revision: 1
- ③ Serial number: 20000



Figure 3: Example 2D label

3 Safety

3.1 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 qualified personnel. When using the products, all Safety Messages, Integrated Safety Messages, Property Damage Messages and all valid legal regulations must be obeyed. Technical knowledge is presumed. The user has to assure that all legal regulations are obeyed.

3.2 Intended use

With the PC card C1FX M223090AE-CO\F a CANopen Slave communication can be realized if the corresponding firmware is loaded. Information about the permitted firmware versions can be found in section *Revision or version status of hardware and software* [▶ page 8].

3.3 Personnel qualification

The PC card may only be installed, configured, operated or uninstalled 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

3.4 Safety messages

3.4.1 Hazardous voltage, electric shock

Danger to life or risk of injury by electric shock may occur if you open the housing of your PC (or connection device) to install your PC card.

- **Hazardous voltages** are present in the PC (or connection device) for mounting. Always read and observe the safety instructions of the PC manufacturer before installation.
- First disconnect the power plug of the PC (or connection device), before opening the housing.
- Make sure that the power supply is off at the PC (or connection device).
- Only then open the housing and install or remove the PC card.

3.4.2 Personal injury, device damage due to hot swap/hot plug

The PC card is not designed or intended for a hot-swap or hot-plug connection. Performing hot-swap or hot-plug may pose a hazard to the PC card, the system platform and the person performing the action.

3.5 Property damage

3.5.1 Excessive supply voltage

The PC card may only be operated with the prescribed supply voltage, which corresponds to the tolerances specified in this manual. The limits of the permitted range must not be exceeded.

Device damage, malfunctions

- If the supply voltage is above the specified upper limit, this can lead to serious damage to the PC card!
- If the supply voltage is below the specified lower limit, malfunctions of the PC card may occur.

3.5.2 Excessive signaling voltage

All I/O signal pins on the PC card tolerate only the specified signal voltage, as specified in this manual.

Device destruction

Operating your PC card at a signal voltage that exceeds the specified signal voltage can cause serious damage to the PC card!

3.5.3 Electrostatic 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 PC 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.

3.5.4 Power drop during write and delete accesses in the file system

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

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

3.5.5 Exceeding the maximum number of permitted write and delete accesses

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

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

3.6 Information and data security

Take all usual measures for information and data security, in particular, for PC cards with Ethernet technology. Hilscher explicitly points out that a device with access to a public network (Internet) must be installed behind a firewall or only be accessible via a secure connection such as an encrypted VPN connection. Otherwise, the integrity of the device, its data, the application or system section is not safeguarded.

Hilscher cannot assume any warranty or liability for damage due to neglected security measures or incorrect installation.

3.7 Warnings

When installing your device, observe the following warnings on possible personal injury, as well as the warnings on property damage.



WARNING

Hazardous voltage!
Danger to life, risk of injury by electric shock



Hazardous voltages are present in the PC (or connection device).

- First disconnect the power plug of the PC (or connection device), before you open the housing.
- Make sure that the power supply is off at the PC (or connection device).

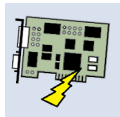


WARNING

Hazardous voltage!
Danger to life, risk of injury by electric shock

Hazardous voltages are present in the PC (or connection device).

- First disconnect the power plug of the PC (or connection device), before you open the housing.
- Make sure that the power supply is off at the PC (or connection device).



CAUTION

Personal injury, device damage due to hot swap/hot plug

The PC card is not designed or intended for a hot-swap or hot-plug connection.

Performing hot-swap or hot-plug may pose a hazard to the PC card, the system platform and the person performing the action.



NOTICE

Electrostatically sensitive devices

To prevent damage to the PC and PC card, make sure the PC card is grounded through the connection plate and PC, and make sure you are grounded when you install or uninstall the PC card.

4 Installing the hardware

4.1 System Requirements

In order to install your PC cards cifX, you need a PC or a connection device with a PCI Express M.2 slot (host interface) for mounting the PC card.

Host interface

PC card	Type	Supply voltage (1)	Current consumption (2)	Signal voltage (3)
CIFX M223090AE-CO\F	PCI Express slot (3.3 V), for M.2 type 2230-D3, Dual Key A-E (Socket 1 Connectivity)	+3.3 VDC $\pm 5\%$	Refer to section <i>PC card CIFX M223090AE-CO\F</i> [▶ page 29].	PCIe compatible

Table 9: Host interface requirements

Comments:

(1) Required or permissible supply voltage

(2) Typical current consumption at 3.3 V. The typical current consumption depends on the type of PC card. To ensure compatibility between different systems, it is recommended to supply a maximum of 1 A (at +3.3 VDC $\pm 5\%$).

(3) Required or tolerated signal voltage at the I/O signal pins on the PCIe bus of the PC card

Host system

For communication via PCI Express, the host system may only use the standard mode with a length of 5 bits for identification (tag field length). In the extended mode, i.e. at lengths of 8 bits for identification of the PCI-Express communication, communication errors occur. Note the errata "CIFX M223090AE" (Hilscher DOC-ID DOC220201ERR01EN) and the solutions and workarounds given therein. The reference is listed in the section *References* [▶ page 36] .

Mounting the basic card

In order to mount the basic card, the board on which the PCI Express M.2 slot is located must have a corresponding mounting bolt for screwing the basic card on. The dimension for positioning the mounting bolt can be taken from the dimension drawing for the basic card provided in this manual.

Operating system

For Device Explorer or Communication Studio: Windows® 10

Component heights

- The component height on the upper side of the basic card CIFX M223090AE is higher than the height of 1.5 mm specified by the standard because the height of the cable connectors (Ethernet X801, or fieldbus X802) including the cable is approx. 8.5 mm above the printed circuit board.
- The component height on the bottom side of the basic card CIFX M223090AE complies with the standard specifications.

Panel dimensioning

- **Panel cut-outs and holes for mounting AIFX**

To mount the detached network interface CANopen, the required panel cut-outs for the communication status LEDs and the CANopen plug, as well as the holes for mounting the AIFX, must be available on the housing of the PC or connection device.

Panel cut-outs	The layout for the panel cut-outs must be sufficiently dimensioned for: <ul style="list-style-type: none"> • The CANopen interface, DSub plug • The CAN communication LED
Drill holes	2, at a distance of 25.0 mm
Further information	The dimensions for the required panel cut-outs or the distance of the holes can be found in the dimension drawing for the AIFX, see section <i>Dimensions AIFX-V2-CO</i> [▶ page 35].

Table 10: Panel cut-outs and holes for mounting AIFX

- **The width of the front panel**

When dimensioning the front panel, note the width of the front panel specified in section *AIFX-V2-CO* [▶ page 30] .

4.2 Requirements for operation

The following described requirements must be fulfilled when operating the PC card.

Requirements	Specification	Refer to section
Hardware installation	Operating the PC card CIFX M223090AE-COF requires proper connection of the detached network interface CANopen AIFX-V2-CO to the basic card.	-
Communication	For the communication of a PC card (Slave) a CANopen Master device is required. To configure the Master device you need the device description file with the name for: <ul style="list-style-type: none"> • CANopen Slave: NETX 90 COS COS.eds The settings in the used Master must match the settings in the Slave.	-
Software installation	cifX Device Driver as driver for the host interface (latest version of the driver). Device Explorer as software for downloading or updating the firmware and configuration, as well as for setting the device driver. Communication Studio for configuration and diagnosis of netX 90-based devices.	<i>Revision or version status of hardware and software</i> [▶ page 8] and <i>References</i> [▶ page 36] (documentation on drivers and software)
Firmware download	The user must select the firmware using the Device Explorer software and download it to the PC card. The firmware includes a communication protocol.	
Parameter settings	By use of the Communication Studio configuration software the PC card must be parameterized.	

Table 11: Requirements for operation

4.3 Overview installation and firmware download

Below you will find an overview of the steps to install the hardware, the driver and the firmware for your PC card CIFX M223090AE-CO\F:

Step	Description	See section
Downloading installation files	<ul style="list-style-type: none"> Download the installation files from the Hilscher website for: <ul style="list-style-type: none"> - cifX Device Driver (atest version) - Device Explorer - Communication Studio Save the installation files to the local hard disk of your PC. 	<i>Revision or version status of hardware and software</i> [▶ page 8]
Install drivers and software	<ul style="list-style-type: none"> Double-click the appropriate installation file to open the startup menu. Start the installation from the home screen and follow the instructions in the installation menu. 	
Install hardware	<ul style="list-style-type: none"> Take the protective measures and safety precautions for the hardware installation. Open the housing of the PC or connection device. Insert the basic card into the PCI Express M.2 slot and mount the basic card. Mount the detached network interface to the front panel of the PC. Connect the detached network interface to the basic card. Close the housing of the PC or connection device. 	<i>Installing the hardware</i> [▶ page 19]
Firmware and configuration download	<ul style="list-style-type: none"> Download the firmware according to the information in the "Device Explorer" user manual. <p>The PC card cifX is now ready for operation and has yet to be configured.</p> <ul style="list-style-type: none"> Then download the configuration. 	<i>Loading firmware and configuration in the device or making an update</i> [▶ page 20]

Table 12: Overview for installation and firmware download



For detailed descriptions of how to install and operate the software, refer to the relevant operating instruction manual, section *References* [▶ page 36].

4.4 Installing the hardware

Install the PC card CIFX M223090AE-CO\F in your PC or connection device as described below.

1. Preparation

Note the requirements and prerequisites described in the sections *System Requirements* [▶ page 15] and *Requirements for operation* [▶ page 17].

2. Protective measures and safety precautions

⚠ WARNING Hazardous voltage! Danger to life, risk of injury by electric shock

- Disconnect the power plug of the PC (or connection device).
- Make sure that the power supply is off at the PC (or connection device).

⚠ CAUTION Personal injury, device damage due to hot-plug/hot-swap

- Do not "plug" or "unplug" the PC card during operation.

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

- Make sure that the device is grounded via the endplate and the PC, and make sure that you are discharged when you install/uninstall the device.

NOTICE Device damage due to over torquing of the mounting screw

- Do not over torque the screw used to mount the basic card to the board to prevent damage to the printed circuit board.

3. Installation

- Open the housing of the PC or connection device.
- Insert the basic card into the PCI Express M.2 slot.
- Screw the basic card onto the board. To do this, use the crescent-shaped hole on the top edge of the basic card. The ground contact via the screw head must be ensured.
- First, attach the detached network interface CANopen AIFX-V2-CO to the housing panel of the PC or connection device.
- Then connect the detached network interface CANopen AIFX-V2-CO to the basic card.



Important:

Note that the detached network interface CANopen AIFX-V2-CO especially is designed for netX 90-based devices and exclusively works together with them. In contrast, the detached network interface Ethernet AIFX-CO is only suitable for netX 100-based devices.

- To do this, first plug the cable into the cable connector fieldbus X103 on the AIFX-V2-CO.

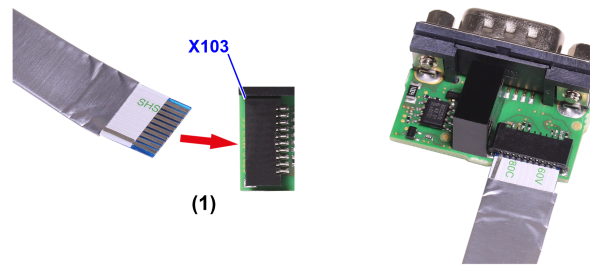


Figure 4: Connecting cable to the detached network interface CANopen AIFX-V2-CO

- Then plug the cable into the cable connector fieldbus X802 on the basic card.

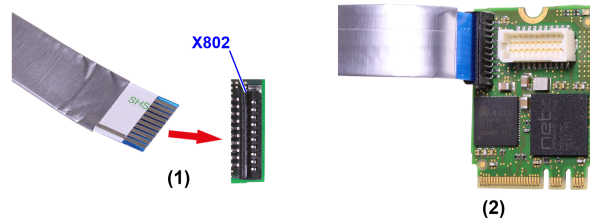


Figure 5: Connecting cable to the basic card, example CIFX M223090AE

- Close the housing of the PC or connection device again.

4.5 Loading firmware and configuration in the device or making an update

- Download the firmware from the Hilscher website and save the firmware on the local hard disk of your PC.
- If necessary, transfer the configuration to the PC. You create the configuration using a suitable configuration software.
- Use **Device Explorer** to load the firmware and configuration into the device or update the firmware and configuration in your device.
- When downloading the firmware and configuration to your device or when performing an update, follow the instructions in the "Device Explorer" operating instruction manual.



For the "Device Explorer" operating instruction manual, see section *References* [▶ page 36].

4.6 Hints for problem solving

In case of an error or malfunction during operation of your PC card cifX, observe the following troubleshooting instructions:

General

- Check that the requirements for operation of the PC card are met according to the information provided in this user manual.

SYS and CAN LEDs

You can troubleshoot the system by checking the behavior of the LEDs.

- The SYS LED (yellow/green) on the device indicates the general device status and can be switched on, off or blinks.
- The CAN LED (red/green) at the detached network interface CANopen indicates the status of the device communication and can be switched on or off permanently or in phases or blinks.

If the SYS LED and the CAN LED are static green, the PC card cifX is in the "in operation" state. The slave device is in the state of cyclic communication with the connected master device. The communication between the master device and the slave device runs without interference.

Cable

- Check that the pin assignment of the cable used to connect the PC card (Slave) to the Master device is correct.



Detailed descriptions of the behavior of the LEDs can be found in the chapter on LEDs in this manual. Information about the device diagnostics and its functions can be found in the user manual of the configuration software for your device.

4.7 Uninstalling the hardware

Uninstall the PC card CIFX M223090AE-CO\F from your PC or connection device as described below.

1. Protective measures and safety precautions

⚠ WARNING Hazardous voltage! Danger to life, risk of injury by electric shock

- Disconnect the power plug of the PC (or connection device).
- Make sure that the power supply is off at the PC (or connection device).

⚠ CAUTION Personal injury, device damage due to hot-plug/hot-swap

- Do not "plug" or "unplug" the PC card during operation.

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

- Make sure that the device is grounded via the endplate and the PC, and make sure that you are discharged when you install/uninstall the device.

2. Uninstallation

- Open the housing of the PC or connection device.
- Demount the detached network interface CANopen from the basic card.
- Therefore pull the cable out of the cable connector fieldbus X802 (on the basic card), as well as out of the cable connector fieldbus X103 on the AIFX-V2-CO.
- Loosen the screw that secures the basic card to the board.
- Remove the basic card from the PCI Express M.2 slot.
- Remove the detached network interface from the housing cover of the PC or connection device.
- Close the housing of the PC or connection device again.

4.8 Disposal of waste electronic equipment

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



Waste electronic equipment

This product must not be treated as household waste.

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

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

5 Diagnosis with LEDs

5.1 Overview





LED	CANopen
System status	SYS   Yellow/ green
Communication status	CAN   Red/green

Table 13: LEDs CANopen

5.2 System LED

The system status LED **SYS** can assume the states described below.











LED	Color	State	Description
SYS	Duo-LED: yellow RDY / green RUN		
	 (green)	On	The firmware is running.
	 (green)	Blinking	During the formatting of the file system
	 (yellow)	On	A system error has occurred.
	 (yellow)/  (green)	Blinking, 3x yellow, 3x green	Firmware crash, unrecoverable (an internal exception occurred that cannot be handled)
	 (yellow)/  (green)	Blinking, 1 Hz	Firmware update mode active: The firmware is idle and waiting for the update file.
	 (yellow)/  (green)	Blinking, 4 Hz	Firmware update mode active: A firmware update is being installed.
 (gray)	Off	<ul style="list-style-type: none"> No supply voltage: No supply voltage for the device or hardware defect. During a firmware reset 	

Table 14: States of the SYS-LED

LED state	Definition
Blinking	The LED turns on and off in phases.
Blinking, 3x yellow, 3x green	The LED turns on and off, with a frequency of approx. 1 Hz: <ul style="list-style-type: none"> 3x yellow "On" for 500 ms and "Off" for 500 ms and 3x green "On" for 500 ms and "Off" for 500 ms.
Blinking, yellow/green, 1 Hz, 4 Hz	The LED turns on in phases yellow or green, with a frequency of approx.: <ul style="list-style-type: none"> 1 Hz: 1 x yellow "On" for 500 ms and 1 x green "On" for 500 ms, 4 Hz: 1 x yellow "On" for 125 ms and 1 x green "On" for 125 ms.

Table 15: Definitions of the states of the SYS LED

5.3 CANopen Slave

For the CANopen Slave protocol, the communication status LED **CAN** can assume the states described below. This description is valid from stack version V3.4.









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

Table 16: States of the CAN LED for the CANopen Slave protocol

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

Table 17: LED state definitions for the CANopen Slave protocol

6 Connectors

6.1 CANopen interface

Isolated CANopen interface according to ISO 11898:

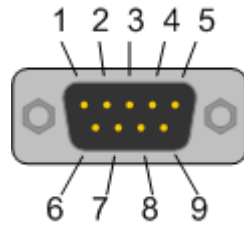


Figure 6: CANopen interface (DSub plug connector, 9-pin), X200

Connection with DSub plug	Signal	Description
2	CAN_L	CAN_Low bus line
3	CAN_GND	CAN Ground
7	CAN_H	CAN High Bus Line
1, 4, 5, 6, 8, 9	-	Do not connect!

Table 18: Pin assignment of the CANopen interface, X200

6.2 Cabel connector fieldbus X802, on CIFX M223090AE

Pin assignment for cable connector fieldbus X802 (10FMN-BMT-A-TF) on the basic card CIFX M223090AE, cable 10-pin fieldbus

Pin	Name	Description	Type
1	GND	Ground	Power
2	3V3	3.3V Power	Power
3	I2C_SCL	I2C clock signal	Output
4	I2C_SDA	I2C data signal	Input / Output
5	XM0_TX	Fieldbus transmit	Output
6	XM0_RX	Fieldbus receive	Input
7	XM0_IO0	Fieldbus input output 0	Input / Output
8	XM0_IO1	Fieldbus input output 1	Input / Output
9	RSTOUT#	Reset out	Output
10	MLED0 (COM0)	LED COM0 (red/green)	Output

Table 19: Pin assignment for cable connector fieldbus X802 (10FMN-BMT-A-TF), on CIFX M223090AE

6.3 Cable connector fieldbus X103, AIFX-V2-CO

Pin assignment for cable connector fieldbus X103, AIFX-V2-CO, 10-pin cable

Pin	Name	Description	Type
1	GND	Ground	Power
2	3V3	3.3V Power	Power
3	I2C_SCL	I2C clock signal	Input
4	I2C_SDA	I2C data signal	Input / Output
5	TX	Fieldbus transmit	Input
6	RX	Fieldbus receive	Output
7	-	(not used)	NC
8	-	(not used)	NC
9	RSTOUT#	Reset out	Input
10	MLED0 (COM0)	RE LED COM0 (red/green)	Input

Table 20: Pin assignment for cable connector fieldbus X103, AIFX-V2-CO

6.4 PCI Express M.2 bus

The following table applies for pin assignment on the PCI Express M.2 bus of the PC card CIFX M223090AE (basic card).

Pin	Name	Description	Type
1	GND	Return current path.	Power
2	3.3V	3.3V supply	Power
3	NC	(not used)	-
4	3.3V	3.3V supply	Power
5	NC	(not used)	-
6	BOOT#	Reserved (vendor defined pin for production purposes only).	Input
7	GND	Return current path.	Power
8-15	-	KEY A	-
16	NC	(not used)	-
17	NC	(not used)	-
18	GND	Return current path.	Power
19-23	NC	(not used)	-
24-31	-	KEY E	-
32	NC	(not used)	-
33	GND	Return current path.	Power
34	NC	(not used)	-
35	PERp0	PCIe TX/RX Differential signals defined by the PCI Express CEM Specification.	Input
36	NC	(not used)	-
37	PERn0	PCIe TX/RX Differential signals defined by the PCI Express CEM Specification.	Input
38	NC	(not used)	-
39	GND	Return current path.	Power
40	SYNC1	synchronisation pin for realtime systems	Output
41	PETp0	PCIe TX/RX Differential signals defined by the PCI Express CEM Specification.	Output
42	SYNC0	synchronisation pin for realtime systems	Output
43	PETn0	PCIe TX/RX Differential signals defined by the PCI Express CEM Specification.	Output
44	NC	(not used)	-
45	GND	Return current path.	Power
46	NC	(not used)	-
47	REFCLKP	PCIe Reference Clock signals (100 MHz) defined by the PCI Express CEM Specification.	Input
48	NC	(not used)	-
49	REFCLKN	PCIe Reference Clock signals (100 MHz) defined by the PCI Express CEM Specification.	Input
50	NC	(not used)	-
51	GND	Return current path.	Power
52	PERST#	PCIe Reset is a functional reset to the card as defined by the PCI Express Mini CEM Specification.	Input
53	CLKREQ#	PCIe Clock Request is a reference clock request signal as defined by the PCI Express Mini CEM Specification. This signal is also used by L1PM Substates. Open Drain with pull up on Platform. Active Low.	I/O
54	NC	(not used)	-
55	PEWAKE#	PCIe WAKE#. Open Drain with pull up on Platform. Active Low when used as PEWAKE#. When the Adapter supports wakeup, this signal is used to request that the system return from a sleep/suspend state to service a function-initiated wake event. When the Adapter supports OBFF mechanism, the PEWAKE#signal is used for OBFF signaling.	I/O
56	NC	(not used)	-
57	GND	Return current path.	Power
58-63	NC	(not used)	-
63	GND	Return current path.	Power

Pin	Name	Description	Type
64-68	NC	(not used)	-
69	GND	Return current path.	Power
70	NC	(not used)	-
71	NC	(not used)	-
72	3.3V	3.3V supply	Power
73	NC	(not used)	-
74	3.3V	3.3V supply	Power
75	GND	Return current path.	Power

Table 21: Pin assignment PCI Express M.2 bus X201, CIFX M223090AE

7 Technical data

7.1 PC card CIFX M223090AE-CO\F

Category	Parameter	Value	
Part		Name	Part number
	PC card (basic card with AIFX-V2-CO)	CIFX M223090AE-CO\F	1443.501
	Basic card	CIFX M223090AE	1443.100
	Function	Communication interface M.2 2230 key A+E, with PCI Express M.2 interface and CANopen interface. The use refers exclusively to slave systems.	
Communication controller	Type	netX 90	
Integrated memory	RAM	8 MB SDRAM	
	Flash	8 MB + 1 MB	
	Size of the Dual-Port Memory	64 Kbyte	
System interface	Bus type	PCI Express M.2, one-lane port	
	Transmission rate	33 MHz	
	Data access	DPM	
	Dual-Port Memory (DPM) data access width	32-Bit	
CANopen communication	Supported fieldbus communication system	CANopen Slave	
CANopen interface	Transmission rate	10 kBit/s, 20 kBit/s, 50 kBit/s, 100 kBit/s, 125 kBit/s, 250 kBit/s, 500 kBit/s, 800 kBit/s, 1 MBit/s	
	Interface type	ISO-11898	
	Detached network interface CANopen	AIFX-V2-CO Important! Operating the PC card CIFX M223090AE-CO\F requires proper connection of the detached network interface CANopen AIFX-V2-CO to the basic card.	
	Connector AIFX-V2-CO	Cable connector fieldbus X802 (JST 10FMN-BMT-A-TF, 1.0 mm pitch)	
Diagnosis with LEDs	LEDs	SYS	System status
Power supply	Supply voltage	+3.3 VDC ±5%	
	Current consumption at 3.3 V	330 mA (maximum)	
	Connector	via PCI Express Bus M.2	
Environmental conditions	Operating temperature range*	-20 °C ... +70 °C	-20 °C ... +60 °C
	*Air flow, during measurement	0.5 m/s	0.0 m/s
	Storage temperature range	-40 °C ... +85 °C	
	Humidity	10% ... 95% relative humidity, no condensation permitted	
	Environment	The device must be used only in a pollution degree 2 environment (or better).	

Category	Parameter	Value
Device	Dimensions (L x W x H)	30 x 22 x 7.0 mm
	Component heights	The component height on the top of the basic card CIFX M223090AE exceeds the height of 1.5 mm specified by the standard, because the height of the cable connectors (Ethernet X801, or fieldbus X802), including the cable, is approximately 8.5 mm above the circuit board. The component height on the bottom of the basic card CIFX M223090AE complies with the standard specifications.
	Host system	Note: The basic card CIFX M223090AE uses an ASIX Ax99100. Therefore, the PC card CIFX M223090AE-CO\F can only be operated with a PCIe host controller that supports accesses to the IO area of the card (IOBAR).
	Mounting/installation	PCI Express slot (3.3 V), for M.2 type 2230-D3, Dual key A-E (Socket 1 Connectivity)
EMC Compliance	CE sign	Yes
	UKCA sign	Yes
	Emission	DIN EN 61000-6-3/ BS EN 61000-6-3
	Immunity	DIN EN 61000-6-2/ BS EN 61000-6-2
	Documentation to prove the restriction of hazardous substances	EN 50581 / BS EN 50581
	RoHS	Yes
Firmware and configuration download	Software to download and update the firmware and configuration	Device Explorer
Configuration	Configuration software	Communication Studio

Table 22: Technical data CIFX M223090AE-CO\F

7.2 PCI identifiers on the PCI Express M.2 bus

The PC card CIFX M223090AE-CO\F is a multifunctional device at the PCI Express M.2 bus and requires two PCI identifiers. The following identifiers are valid:

PCI identifier	Value
Vendor ID	0x15CF
Device ID	0x0090
Subsystem vendor ID	0x15CF
Subsystem device ID	0x6001 (Flash-based device, SPM) 0x1002 (interrupt source, SPM)

Table 23: PCI identifiers on the PCI Express M.2 bus

7.3 AIFX-V2-CO

Category	Parameter	Value
Part	Name	AIFX-V2-CO
	Part number	2801.500
	Description	Detached network interface CANopen for all netX 90-based devices. Important! The detached network interface CANopen AIFX-V2-CO works exclusively together with netX 90 based devices.

Category	Parameter	Value	
Interface PC card	Connector	Cable connector fieldbus X103 (JST 10FMN-SMT-A-TF, 1.0 mm pitch)	
CANopen interface	Galvanic isolation	isolated	
	Isolation voltage	1000 VDC (tested for 1 minute)	
	Connector	SubD plug, 9-pin	
Diagnosis with LEDs	LEDs (on the reverse side of the device)	CAN	Communication status LED (Duo LED)
Power supply	Connector	Cabel connector fieldbus X103	
Environmental conditions	Operating temperature range*	-20 °C ... +70 °C	-20 °C ... +60 °C
	*Air flow, during measurement	0.5 m/s	0.0 m/s
	Storage temperature range	-40 °C ... +85 °C	
	Humidity	10% ... 95% relative humidity, no condensation permitted	
	Environment	The device must be used only in a pollution degree 2 environment (or better).	
Device	Dimensions (L x W x H)	17 x 31 x 15.6 mm, front panel width = 18.5 mm	
	Mounting/installation	On the netX 90-based basic card: Cable connector fieldbus X802. Mounting to the housing of the PC or connection device.	
EMC Compliance	CE sign	Yes	
	UKCA sign	Yes	
	Emission, Immunity	Tested together with the corresponding basic card.	
	RoHS	Yes	

Table 24: Technical data AIFX-V2-CO

7.4 Communication protocols

7.4.1 CANopen Slave

Parameter	Value
Maximum number of cyclic input data	128 bytes (Default)
Maximum number of cyclic output data	128 bytes (Default)
Maximum number of receive PDOs	16 (Default)
Maximum number of transmit PDOs	16 (Default)
Exchange of process data	Via PDO transfer <ul style="list-style-type: none"> • synchronized, • remotely requested, and • event driven (change of date, event timer) On request by host application program via packet
Acyclic communication	SDO upload/download (Server only) Emergency Message (Producer) Timestamp (Producer/Consumer)
Functions	Node Guarding / Life Guarding Heartbeat: 1 Producer, max. 8 Consumer PDO Mapping NMT Slave SYNC protocol (Consumer) Behaviour in case of error in state "operational" (configurable): <ul style="list-style-type: none"> • Change to "pre-operational" • No state change • Change to "stopped"
Baud rate	10 kBits/s, 20 kBits/s, 50 kBits/s, 100 kBits/s, 125 kBits/s, 250 kBits/s, 500 kBits/s, 800 kBits/s, 1 MBits/s Automatic baud rate detection is supported.
Data transport layer	CAN frames
CAN frame type for CANopen	11 bit
Reference to firmware/stack version	5.1

Table 25: Technical data CANopen Slave

8 Dimensions

8.1 Tolerances of PCB dimensions

The manufacturing tolerance of the PCB dimensions shown is ± 0.1 mm per milled PCB edge. For all indicated dimensions of the printed circuit board, a tolerance of ± 0.1 mm (per milled edge) $\times 2 = \pm 0.2$ mm results for the length L and for the width B respectively.

$B = [\text{width dimension of printed circuit board in mm}] \pm 0.2 \text{ mm}$

$L = [\text{Length dimension of the PCB in mm}] \text{ mm} \pm 0.2 \text{ mm}$

The depth T of the PCB depends on the highest component used or the PCB thickness plus the descenders. The thickness of the PCB is $= 0.8 \text{ mm} \pm 10 \%$.



Note:

The dimensions (L x W x H) given in the section *Technical data* [▶ page 29] (or the identical information in the product data sheet or on the Hilscher website) are rounded figures or the respective total measure (for example, including the front panel).

8.2 Dimensions CIFS M223090AE

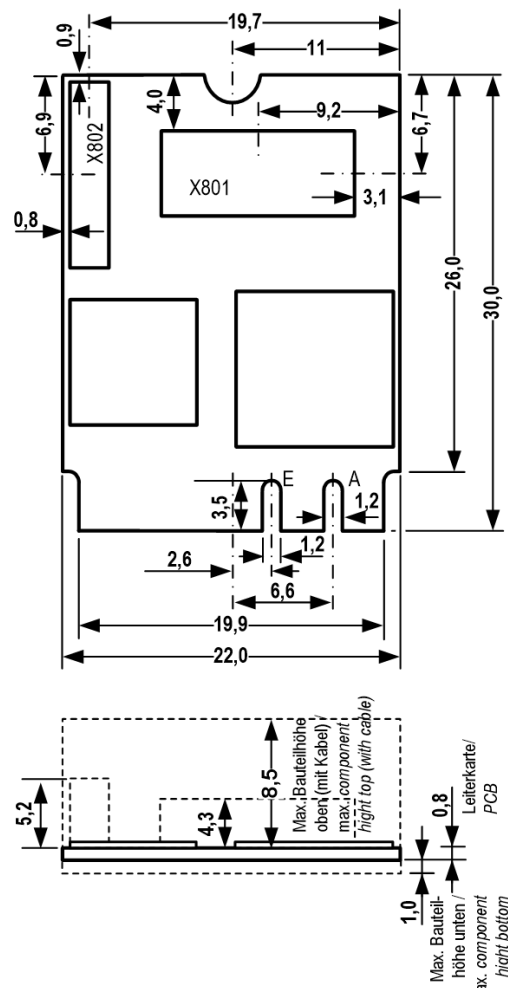


Figure 7: Dimensions CIFS M223090AE (revision 4)



Note:

The component height on the upper side of the basic card CIFS M223090AE does not comply with the standard specifications. For more information, see section *System Requirements* [▶ page 15].

8.3 Dimensions AIFX-V2-CO

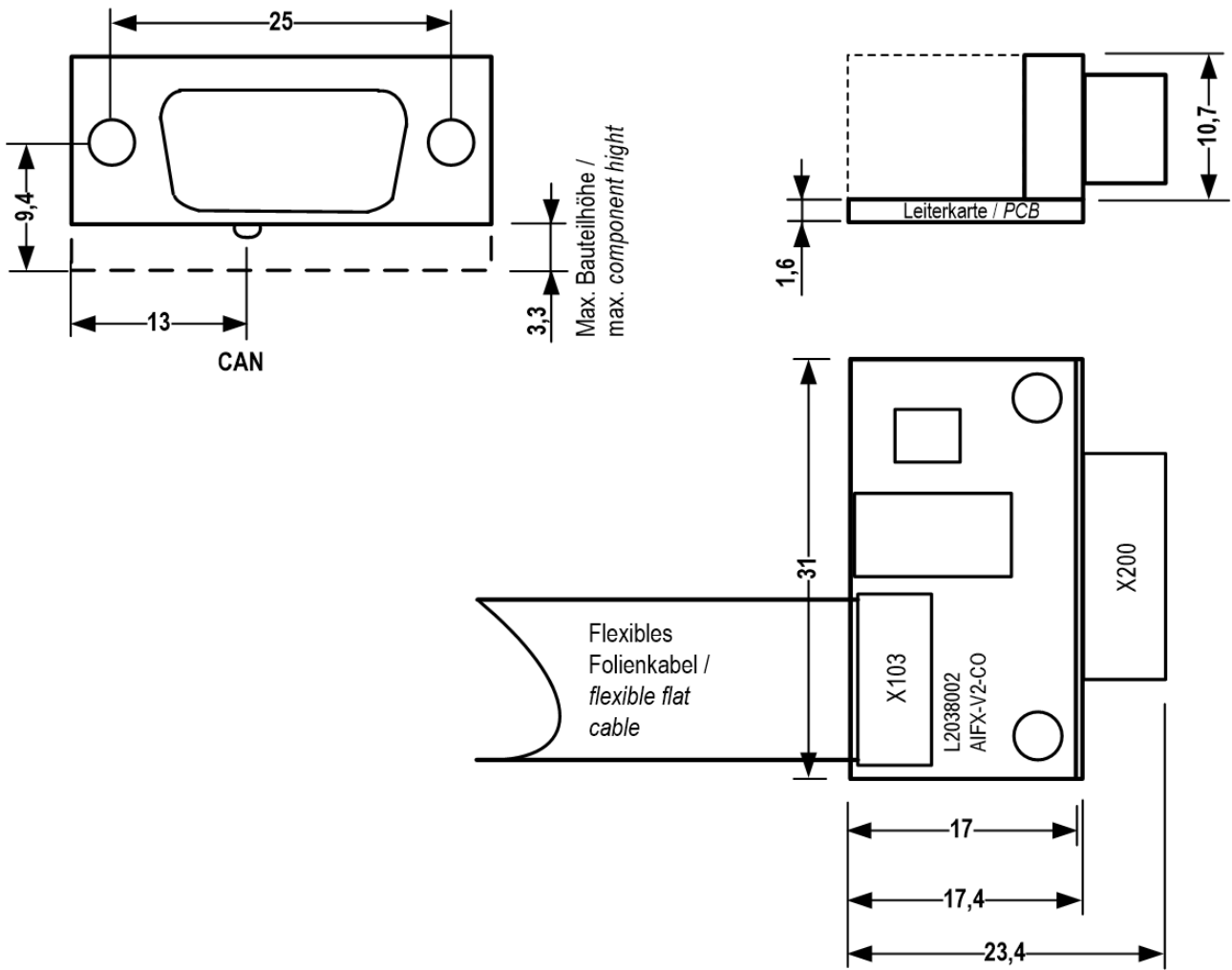


Figure 8: AIFX-V2-CO (Revision 3)

9 Appendix

9.1 FCC compliance

Federal Communications Commission (FCC)

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

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

Note: 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.

9.2 References

PCI Express M.2 specification

PCI-SIG (Special Interest Group), PCI Express M.2 Specification, Revision 1.1, English, 2016-12

Protocol API manuals

Hilscher Gesellschaft für Systemautomation mbH: Protocol API, CANopen Slave V3.8.0, Revision 7, DOC111001API07EN, English, 2020-11.

Documentations on drivers and software

Hilscher Gesellschaft für Systemautomation mbH: User manual, PC card CIFX M223090AE-CO\F CANopen, Hardware description and installation, DOC210203UMxxEN, English, 2021-03

Hilscher Gesellschaft für Systemautomation mbH: Operating instruction manual, cifX Device Driver, Installation and Operation for Windows XP/Vista/7/8/10, DOC060601OIxxEN, English, 2019-01

Hilscher Gesellschaft für Systemautomation mbH: Operating instruction manual, Device Explorer, Download firmware to device, DOC190302OIxxEN, English, 2020-02

Hilscher Gesellschaft für Systemautomation mbH: Operating instruction manual, Communication Studio, Tool for configuration and diagnosis, DOC190501OIxxEN, English, 2020-02

Safety standards

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

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

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

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

Errata for ASIX Ax99100

Hilscher Gesellschaft für SystemAutomation mbH: Errata, CIFX M223090AE, Errata, DOC220201ERR01EN, English, 2022-01

9.3 Conventions in this manual

Instructions

1. Operation purpose
2. Operation purpose
 - Instruction

Results

- ↻ Intermediate result
- ⇒ Final result

Signs








Sign	Note	Safety sign	Warning, principle
	General note	  (USA)	Warning of hazardous voltage! Danger to life, risk of injury by electric shock
	Important note that must be followed to prevent malfunctions		Warning of damage due to electrostatic discharge
	Reference to further information		Principle: Disconnect the power plug

Table 26: Signs

Signal words





Signal word	Description
	Indicates a hazardous situation, which if not avoided, will result in death or serious injury.
	Indicates a hazardous situation, which if not avoided, could result in death or serious injury.
	Indicates a hazardous situation, which if not avoided, may result in minor or moderate injury.
	Indicates a property damage message.

Table 27: Signal words

9.4 Legal notes

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Glossary

CANopen	Open standard based on CAN. The standard describes (specifies) the meaning of the message identifier and of the 0 to 8 bytes of user data. The different meanings are: (1.) a standard application layer defined by the CIA (CAN in automation) specifications DS 301. (2.) a network concept and defines which data are to be transmitted with which services and what the data mean on the respective device classes. (3.) provides functions for the network initialization, the network guarding and the network configuration. (4.) offers a large flexibility.
CANopen Master	Device that initiates the data exchange at the bus
CANopen Slave	Device, which is configured by the Master and which then performs the communication
cifX	Communication InterFace based on netX
CIFX M223090AE	Communication interface in M.2 format with A+E key from Hilscher on the basis of the communication controller netX 90
netX	networX on chip, Hilscher network communication controller. High integrated network controller with optimized system architecture for communication and maximum data transfer.
Slave	Type of device that is configured by the Master and which then performs the communication

Contacts

HEADQUARTER

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 9907-990
E-mail: hotline@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.
69800 Saint Priest
Phone: +33 (0) 4 72 37 98 40
E-mail: info@hilscher.fr

Support

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

India

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

Support

Phone: +91 8108884011
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

Republic of Korea

Hilscher Korea Inc.
13494, Seongnam, Gyeonggi
Phone: +82 (0) 31-739-8361
E-mail: info@hilscher.kr

Support

Phone: +82 (0) 31-739-8363
E-mail: kr.support@hilscher.com

Austria

Hilscher Austria GmbH
4020 Linz
Phone: +43 732 931 675-0
E-mail: skuljici@hilscher.com

Support

Phone: +43 732 931 675-0
E-mail: skuljici@hilscher.com

Switzerland

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

Support

Phone: +41 (0) 32 623 6633
E-mail: support.swiss@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