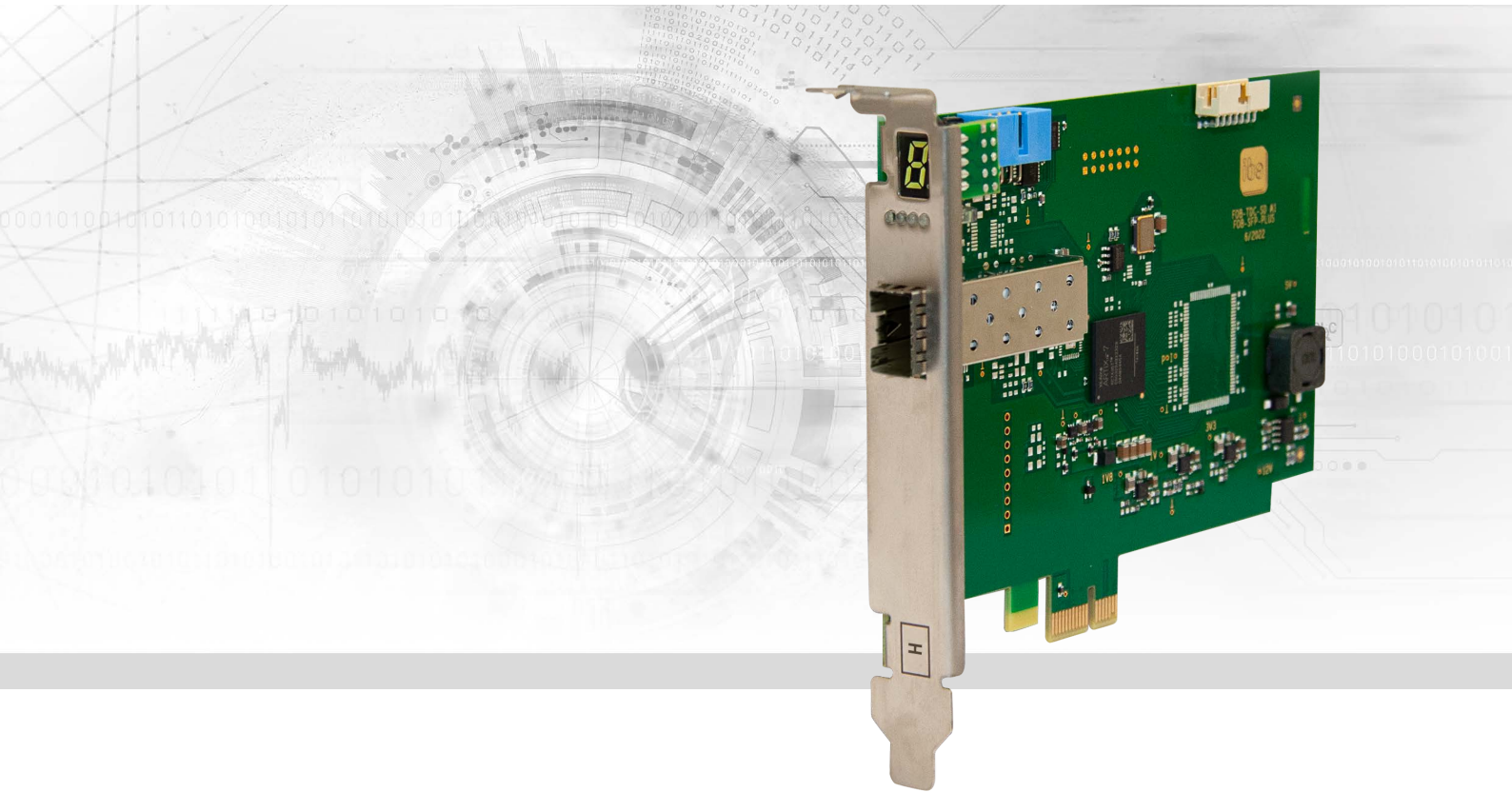




ibaFOB-H

Interface card for Hitachi MACH systems

Manual

Issue 1.0

Measurement Systems for Industry and Energy

www.iba-ag.com

Manufacturer

iba AG
Gebhardtstrasse 10-20
90762 Fuerth
Germany

Contacts

Headquarters +49 911 97282-0
Support +49 911 97282-14
Engineering +49 911 97282-13
Email iba@iba-ag.com
Web www.iba-ag.com

This manual must not be circulated or copied, or its contents utilized and disseminated, without our express written permission. Any breach or infringement of this provision will result in liability for damages.

©iba AG 2026, All rights reserved

The content of this publication has been checked for compliance with the described hardware and software. Nevertheless, deviations cannot be excluded completely so that the full compliance is not guaranteed. However, the information in this publication is updated regularly. Required corrections are contained in the following regulations or can be downloaded on the Internet.

The current version is available for download on our website www.iba-ag.com and can be found in the iba Help center docs.iba-ag.com.

Issue	Date	Revision	Author	Version HW/FW
1.0	10-2026	First issue	st	A1 / A2

Windows® is a label and registered trademark of the Microsoft Corporation. Other product and company names mentioned in this manual can be labels or registered trademarks of the corresponding owners.

Certification

The product is certified according to the European standards and directives. This product meets the general safety and health requirements.

Other international and national standards were observed.

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 residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Contents

1	About this documentation	6
1.1	Target group.....	6
1.2	Notations	6
1.3	Used symbols.....	7
2	About ibaFOB-H	8
3	Scope of delivery.....	9
4	Safety instructions	10
5	System requirements	11
6	Description	12
6.1	Front view.....	12
6.2	Card connectors.....	13
6.3	Indicating elements	13
6.4	Fiber-optic connections	14
7	Installing and removing the card	15
7.1	Installing the card	15
7.2	Removing the card.....	15
8	System integration	16
9	Synchronization of more than one card	17
10	Configuration in ibaPDA	18
10.1	General card settings	18
10.2	Card configuration	19
10.3	Link configuration	19
10.4	Configuration of standard modules	20
10.5	Signal configuration	23
11	Diagnostics.....	25
11.1	Card diagnostics.....	25
11.2	Connection diagnostics.....	26
12	Technical data	29
12.1	Main data.....	29

12.2	Example for FO budget calculation	31
13	Accessories	33
14	Support and contact.....	34

1 About this documentation

This documentation describes the structure, application and operation of the card *ibaFOB-H*.

1.1 Target group

This documentation addresses qualified professionals, who are familiar with handling electrical and electronic modules as well as communication and measurement technology. A person is regarded as trained specialist personnel if they are capable of assessing the work assigned to them and identifying possible risks based on their specialist training, knowledge, experience and awareness of the applicable regulations.

1.2 Notations

In this manual, the following notations are used:

Action	Notation
Menu command	Menu <i>Logic diagram</i>
Calling the menu command	<i>Step 1 – Step 2 – Step 3 – Step x</i> Example: Select the menu <i>Logic diagram – Add – New function block</i> .
Keys	<Key name> Example: <Alt>; <F1>
Press the keys simultaneously	<Key name> + <Key name> Example: <Alt> + <Ctrl>
Buttons	<Key name> Example: <OK>; <Cancel>
Filenames, paths	<i>Filename, Path</i> Example: <i>Test.docx</i>

1.3 Used symbols

If safety instructions or other notes are used in this manual, they mean:

Danger!



The non-observance of this safety information may result in an imminent risk of death or severe injury!

Observe the specified measures.

Warning!



The non-observance of this safety information may result in a potential risk of death or severe injury!

Observe the specified measures.

Caution!



The non-observance of this safety information may result in a potential risk of injury or material damage!

Observe the specified measures.

Note



A note specifies special requirements or actions to be observed.

Tip



Tip or example as a helpful note or insider tip to make the work a little bit easier.

Other documentation



Reference to additional documentation or further reading.

2 About ibaFOB-H

The *ibaFOB-H* card couples the iba process data acquisition system *ibaPDA* with Hitachi MACH systems.

Hitachi MACH systems (Modular Advanced Control for HVDC) are used for control, protection, and monitoring tasks in HVDC power grid monitoring.

To do this, the *ibaFOB-H* card is connected via fiber-optic cable to a port on a PS935 digital signal processor (DSP) integrated in the system. This allows variables or data preconfigured on the DSP to be acquired in *ibaPDA* using a convenient symbol selection.

At a glance

The card has the following characteristics:

- PCI Express card for 1.0-x1 compatible slot
- Firmware update without dismounting the card
- Bidirectional fiber-optic connection using SFP technology and an (additional) SFP module with a duplex LC connector
- Data transfer rate according to PS935
- *ibaPDA* sampling time base up to 10 μ s, freely adjustable
- Absolutely noise-free transmission of process variables and data
- Display of card ID, processor and link status via 7 segment display and LEDs
- Up to 3 PCIe cards can be installed per PC (depending on performance load, a smaller number may also be possible)
- Plug & play installation

3 Scope of delivery

After unpacking, check that the delivery is complete and undamaged.

The scope of delivery includes:

- *ibaFOB-H* card
- Synchronization cable (sync cable)

For more accessories not included in delivery, please see www.iba-ag.com.

4 Safety instructions

Please note when installing the card:

Danger from electric shock!



Disconnect the power supply from the computer before opening the device to avoid an electric shock!

Do not install or remove the card while the power supply is switched on.

Caution!



Electrostatic discharges can damage the board! To avoid electrostatic ESD damage, discharge your body electrically before touching the electronic board.

You can discharge your body by touching a conductive, grounded object immediately before working with the board (e.g. metal cabinet components, socket protective conductor contact).

5 System requirements

Hardware

PC with the following minimum configuration (depending on application):

- PC Multicore 2 GHz or higher
- 8 GB of RAM or more
- 512 GB HDD or more
- At least one free PCIe slot (PCIe 1.0-x1-compatible slot)

For more information about iba PC, please see www.iba-ag.com.

Software

- *ibaPDA* v8.15.0 or higher

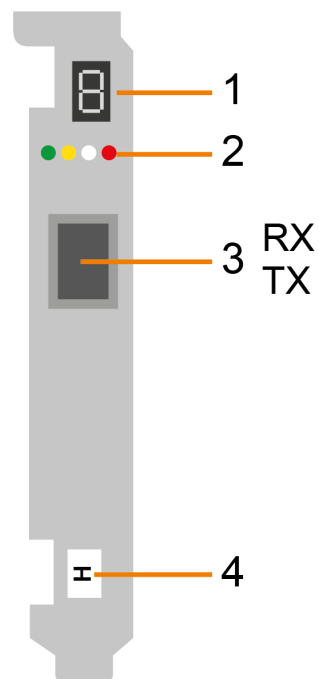
ibaFOB-H

- Firmware version A2 or higher
- Hardware version A1 or higher

6 Description

Here you will find views and descriptions of the *ibaFOB-H* card.

6.1 Front view



1	7 segment display
2	operating status indicator
3	SFP cage
4	identifier for cards of the ibaFOB family

The identifier is used to distinguish the individual ibaFOB card types. The following identifier stands for the following card types:

D: *ibaFOB-D* and *ibaFOB-Dexp*

TDC: *ibaFOB-TDC* and *ibaFOB-TDCexp*

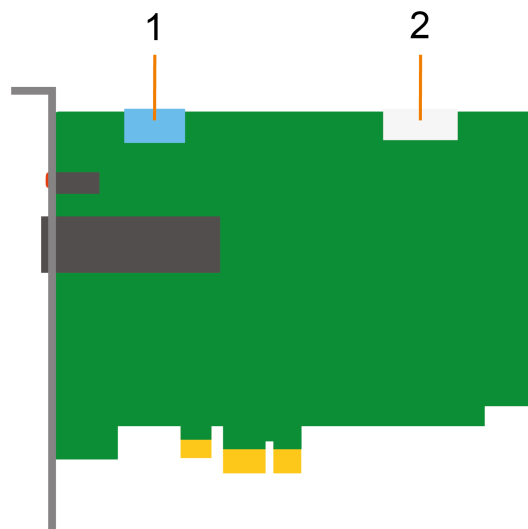
SD: *ibaFOB-SD* and *ibaFOB-SDexp*

PC: *ibaFOB-PlusControl*

R: *ibaFOB-R*

H: *ibaFOB-H*

6.2 Card connectors



1	SYNC interface, for synchronizing several cards via sync cable
2	JTAG interface, for service purposes only

6.3 Indicating elements

Operating status indicator (LEDs)

LEDs indicate the operational state of the card and fiber optic channels. When switching on, all LEDs light up briefly to prove their proper function.

LED	Status	Description
Green	off	card without power or defective
	flashing	normal operation
Yellow	off	no connection, fiber optics not connected or MACH system switched off
	flashing	connection to MACH system is OK, but system not ready
	on	connection to MACH system is OK, system ready
White	off	no data transfer
	on	data transfer in progress
Red	off	normal state, no error
	flashing	running in FPGA factory rescue mode
	on	hardware error (FPGA not configured)

7 segment display



The 7 segment display shows the following information:

- Horizontal segment: After switching on, until the initialization by *ibaPDA* is finished.
- Numbers 0 through 3: Ident number, card is initialized

The decimal point shows how the card is configured:

- Always lit: configured as internal interrupt master
- Off: configured as interrupt slave

6.4 Fiber-optic connections

The *ibaFOB-H* card is delivered without an SFP module. Before operating, install an SFP module in the SFP cage. Use only Broadcom HFBR-57E5APZ SFP modules.

The SFP module with an LC connector (duplex) provides an optical transmitter (TX) and receiver (RX).

Maximum distance of fiber optic connections

The maximum range of fiber-optic connections between two devices depends on various influencing factors. This includes, for example, the specification of the fiber (e.g. 50/125 μm , 62.5/125 μm , etc.), or the attenuation of other components in the fiber-optic cable plant such as couplers or patch panels.

However, the maximum distance can be estimated on the basis of the output power of the transmitting interface (TX) or the sensitivity of the receiving interface (RX). A model calculation can be found in chapter [➤ Example for FO budget calculation, page 31](#).

The specification of the transmitter's output power and the receiver's sensitivity of the fiber-optic components installed in the device can be found in chapter [➤ Main data, page 29](#) "Technical data" under "ibaNet interface".

7 Installing and removing the card

The cards may be used in every PCIe 1.0-x1 compatible slot. Observe the following warnings when working with the cards.

Danger from electric shock!



Disconnect the power supply from the computer before opening the device to avoid an electric shock!

Do not install or remove the card while the power supply is switched on.

Caution!



Electrostatic discharges can damage the board! To avoid electrostatic ESD damage, discharge your body electrically before touching the electronic board.

You can discharge your body by touching a conductive, grounded object immediately before working with the board (e.g. metal cabinet components, socket protective conductor contact).

7.1 Installing the card

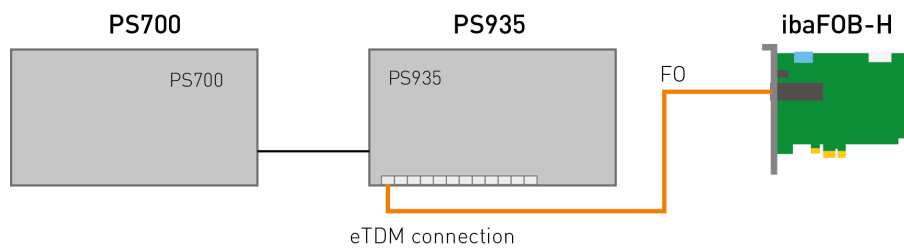
1. Shut down the PC.
2. Unplug the mains power line and open the computer so you can reach the PCIe slots.
3. Carefully remove the card from its packaging. Use a grounding cable or discharge any electrostatic charge before taking the card. No wiring or jumpering is necessary.
4. Grab the card at the front plate and the rear upper corner. Do not touch the contacts.
5. Carefully plug the card into a free PCIe slot on the computer and fix it to the housing using the fixing screw.
6. If you install more than one card, connect them with a flat ribbon cable (sync cable).
7. Close the computer.
8. Plug in the power line and start the computer.

7.2 Removing the card

1. Shut down the computer.
2. Unplug the mains power line and open the PC so you can reach the card.
3. Disconnect all external connecting cables from the card.
4. Release the fixing screw.
5. Unplug the card carefully out of the slot. Store the card in a conductive plastic bag.

8 System integration

The *ibaFOB-H* card is used to connect Hitachi MACH systems. The MACH control and protection unit PS700 communicates with other I/O devices via a PS935 digital signal processor. The *ibaFOB-H* card is connected to the PS935 digital signal processor via an eTDM connection.



9 Synchronization of more than one card

Observe the following notes when synchronizing several cards.

Note



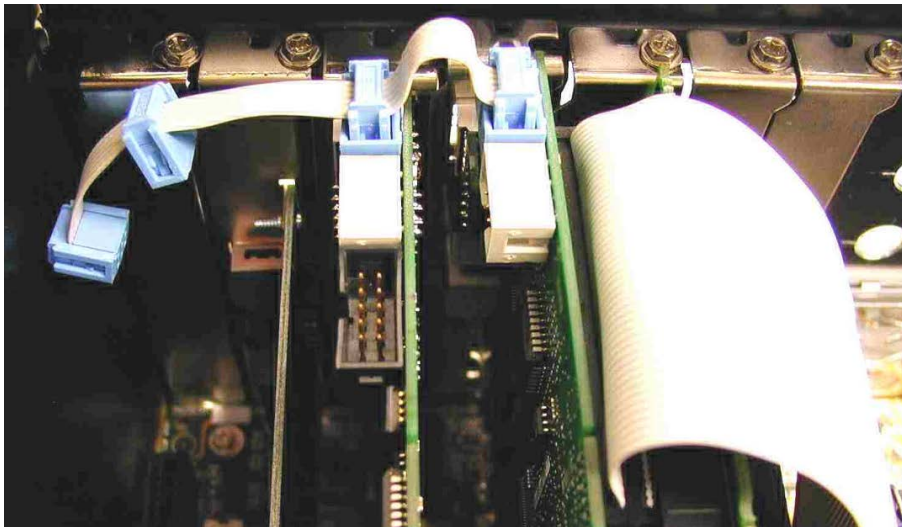
A bad or missing synchronization can lead to inconsistent or contradictory data blocks. This can affect the signal correlation!

Each card is delivered with a synchronization cable (flat ribbon cable) for connecting up to 6 cards. Unused connections of the synchronization cable can remain unused and must not be terminated.

If you plug in or unplug PCI/PCIe cards this may change the PCI/PCIe configuration of the PC. This may also have an effect on the signals or the I/O configuration of the system, as the module ID may change. Plug the fiber optic cables into the corresponding card after making changes. Always save your system configuration before making any hardware changes.

Prerequisite: The cards are installed in the computer.

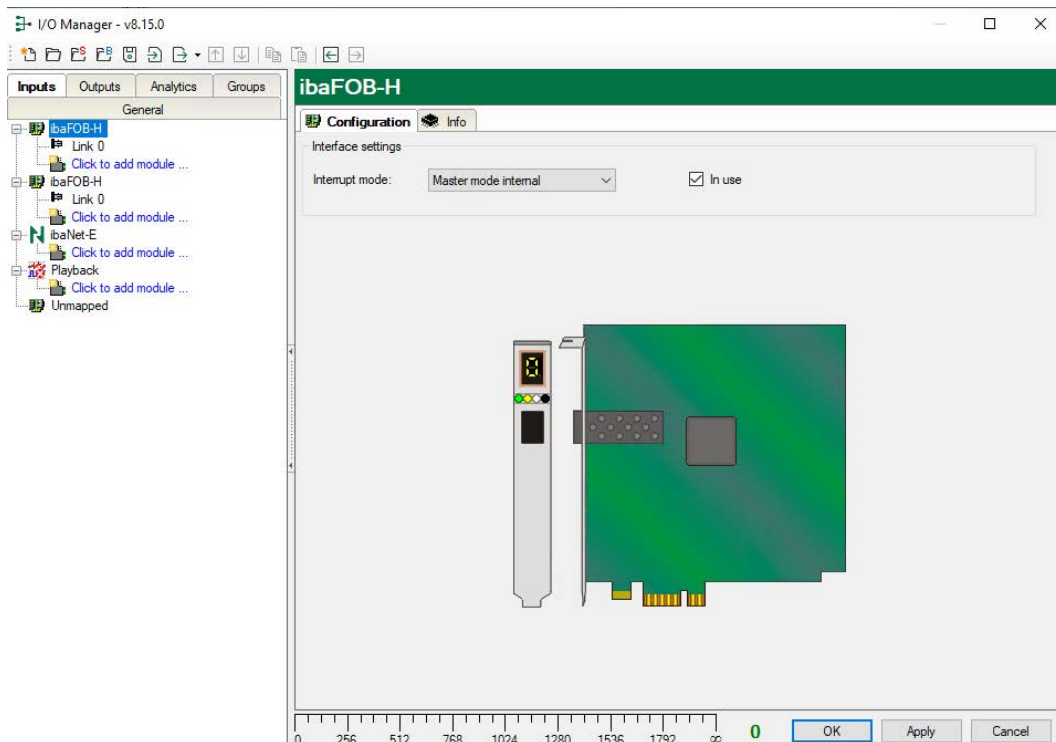
1. Connect the synchronization cable to all cards that are to be synchronized with each other (light blue plug SYNC).



2. Close the computer.
3. Insert the mains plug into the earthed socket.
4. Switch on the power supply of the computer.
5. Start the computer.

10 Configuration in ibaPDA

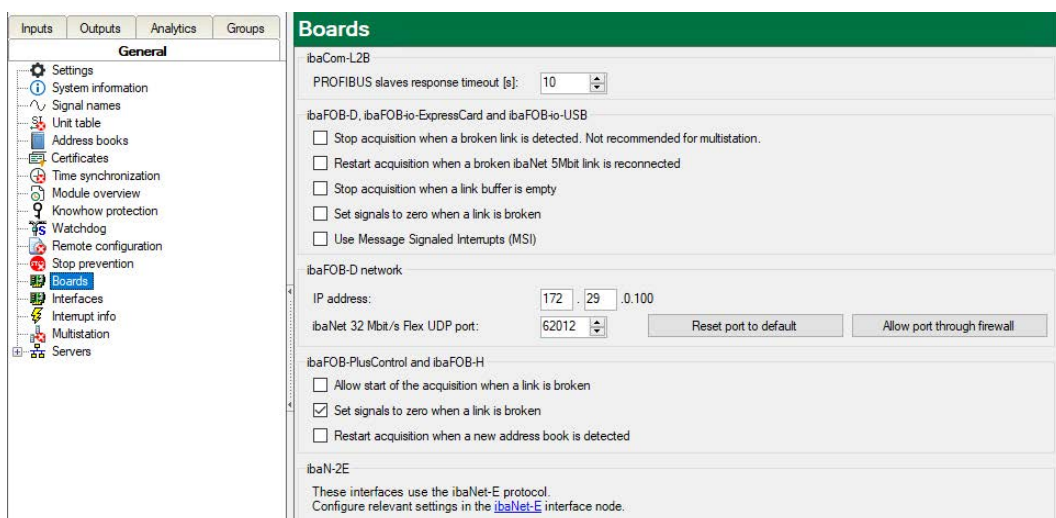
If the card has been installed correctly, it is displayed as an interface in the tree structure of the I/O Manager.



10.1 General card settings

In order to configure general settings of the *ibaFOB-H* card, select the *General* tab in the I/O Manager and select the *Boards* node.

You can enable the following options in the section *ibaFOB-PlusControl* and *ibaFOB-H*.



Allow start of the acquisition when a link is broken.

If one or more connections to the Hitachi MACH system cannot be established at the start of the acquisition, the acquisition will start anyway.

Set signals to zero when a link is broken

If you enable this option, all measurement signals of the connection will be set to zero if the link is broken. Otherwise the signal values would display the last value at the time the connection was broken.

Restart acquisition when a new address book is detected

If this option is enabled, *ibaPDA* checks regularly every 10 s whether the address book has changed.

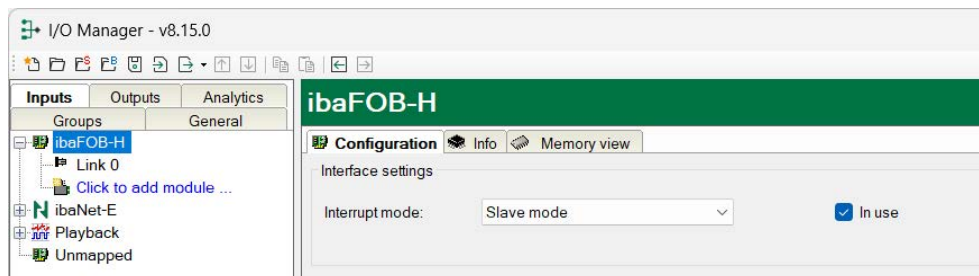
If a new address book is detected, then the acquisition is stopped and restarted. When the acquisition is restarted, the address book is read.

10.2 Card configuration

If you click on the interface icon 2 tabs appear on the right side of the dialog displaying the card's properties. Select the *Configuration* tab.

The interrupt mode is automatically generated by *ibaPDA*: as soon as other iba-cards are plugged in, *slave mode* is enabled. In case no other card types are used, but only several *ibaFOB-H* cards, it is possible to specify which card is set to *interrupt master internal*. This card will generate the interrupt for the other cards. The interrupt will be transmitted to these iba cards via the synchronization cable (sync cable is included in delivery).

Check the option *In use* if the card is being used by *ibaPDA*.



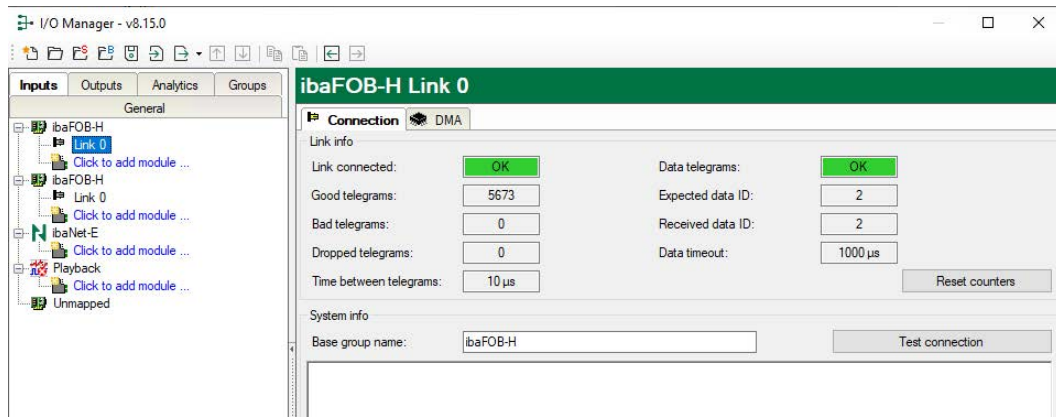
You can find a further description of the information and the other tabs in the chapter [↗ Card diagnostics, page 25](#).

10.3 Link configuration

If the card is displayed correctly in the I/O Manager, mark the *Link* node under the interface. 2 tabs appear on the right side displaying connection information.

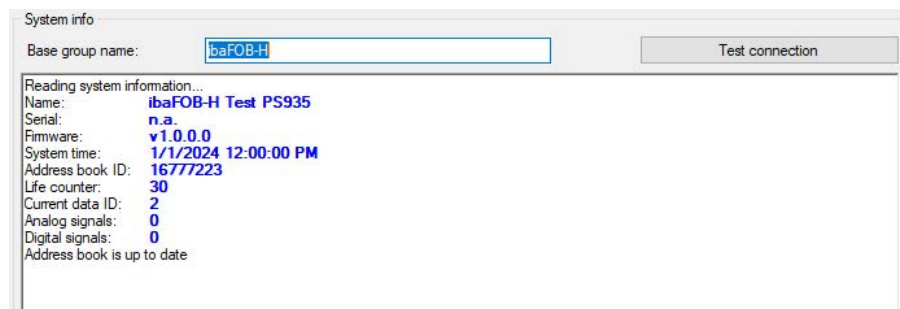
For description of diagnostics information and other tabs please refer to chapter [↗ Connection diagnostics, page 26](#).

The connection to a Hitachi MACH system is being established by clicking the <Test connection> button in the *Connection* tab.



If the connection to the Hitachi MACH system has been successfully established, the following actions are performed:

1. The system information of the connected Hitachi MACH system is read and displayed in the *Connection* tab.
2. The address book is read and evaluated. The address book contains all available variables.

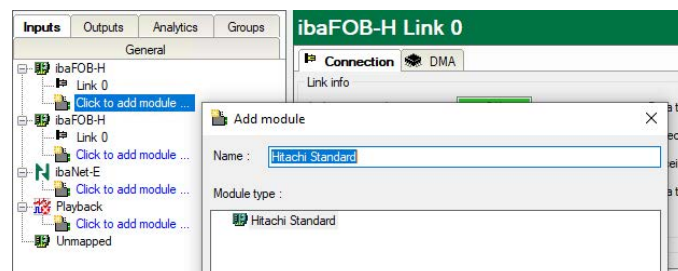


In *ibaPDA*, you can create groups for the signals, see the chapter [Configuration of standard modules](#), page 20. In the *Base group name* field, you can enter a name that will be used for this group. The default value is *ibaFOB-H*.

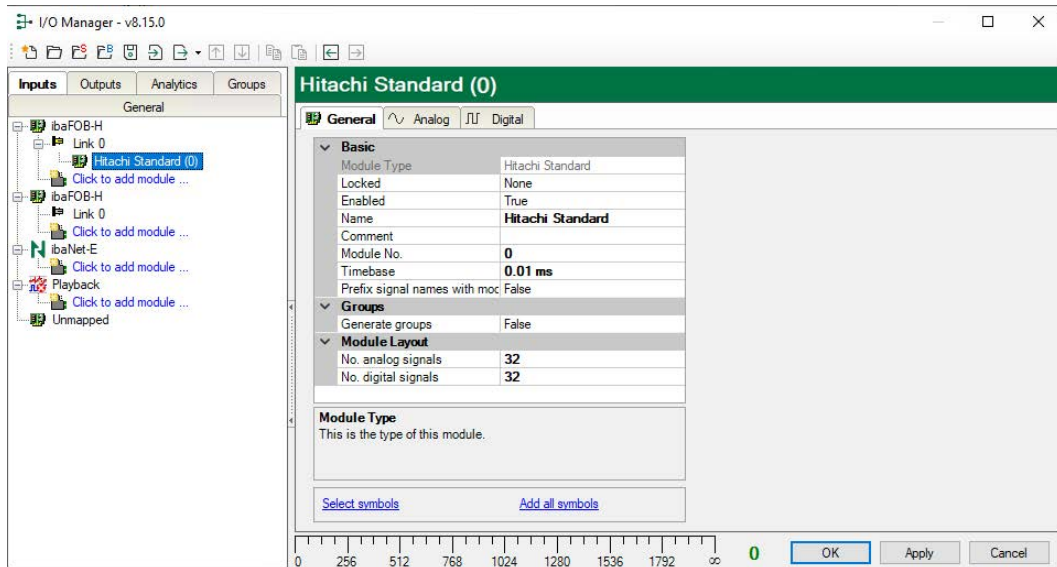
10.4 Configuration of standard modules

Add module

1. Add manually a standard module by right-clicking the link *Click to add module* under the *ibaFOB-H* card.
2. Select *Hitachi Standard* and assign a name via the input field if required.
3. Confirm the selection with <OK>.



General tab



Basic

Module Type (information only)

Indicates the type of the current module.

Locked

You can lock a module to avoid unintentional or unauthorized changing of the module settings.

Enabled

Enable the module to record signals.

Name

You can enter a name for the module here.

Comment

You can enter a comment or description of the module here. This will be displayed as a tooltip in the signal tree.

Module No.

This internal reference number of the module determines the order of the modules in the signal tree of *ibaPDA* client and *ibaAnalyzer*.

Timebase

All signals of the module are sampled on this timebase.

Prefix signal names with module name

This option puts the module name in front of the signal names.

Groups

Generate groups

If *True* is selected, the symbols are entered in the I/O Manager groups according to the structure in the address book. The default setting is *False*.

Module Layout

No. analog signals

Defining the number of analog signals in this module.

No. digital signals

Defining the number of digital signals in this module.

Note

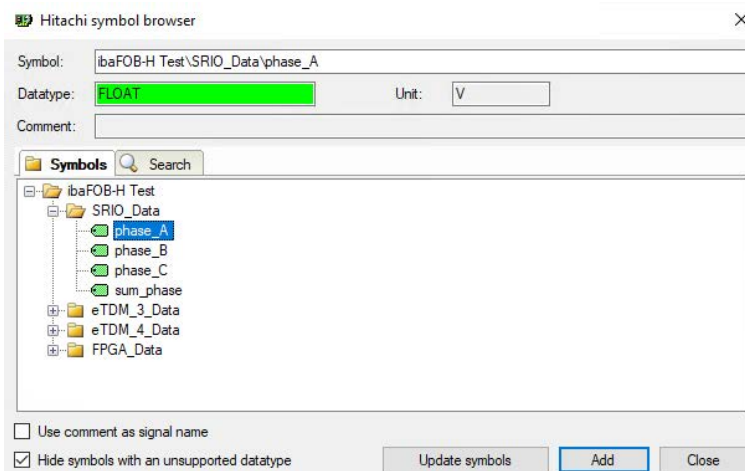


When clicking in a field the corresponding description will be displayed in the text field below the input fields.

For a detailed parameter description please refer to the *ibaPDA* manual.

Select symbols

Measured values for this standard module can be selected using the Hitachi symbol browser. A click on the blue link *Select symbols* opens the symbol browser.



In the symbol browser, you have the following options:

Use comment as signal name

The signal comment from the symbol table is used as signal name.

Hide symbols with unsupported data type

A symbol whose data type is not supported, will not be displayed. In order to add symbols to the recording, mark the desired symbols and click the <Add> button. The marked symbols will be inserted in the corresponding *Analog* or *Digital* tab.

Tip



While pressing the keys <Shift> or <Ctrl> several symbols can be marked at once and then be added together.

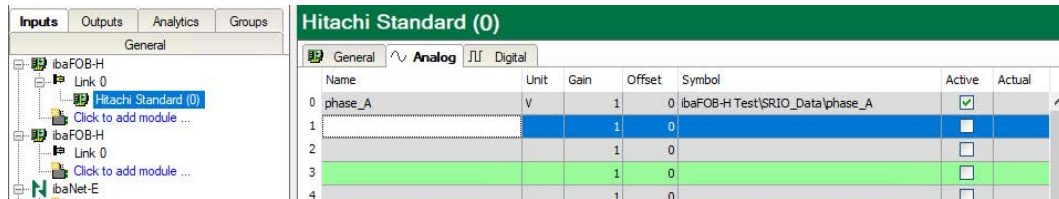
Add all symbols

If you click the *Add all symbols* link, all available symbols will be inserted into the corresponding *Analog* and *Digital* tabs. The symbol browser will not open at that time.

10.5 Signal configuration

You can configure the analog and digital signals received by the Hitachi MACH system in the *Analog* and *Digital* tabs.

Analog tab



	Name	Unit	Gain	Offset	Symbol	Active	Actual
0	phase_A	V	1	0	ibaFOB-H Test\SRIO_Data\phase_A	☒	
1			1	0		☐	
2			1	0		☐	
3			1	0		☐	
4			1	0		☐	

The columns in the *Analog* tab have the following meanings:

Name

Here, you can enter a signal name and additionally two comments when clicking the  icon in the *Name* field.

Unit

Here, you can enter the physical unit of the analog value.

Gain / Offset

Gradient (Gain) and y axis intercept (Offset) of a linear equation. You can convert a standardized and unitless transmitted value into a physical value.

Symbol

Name of the displayed value provided by the address book. This field cannot be changed.

Active

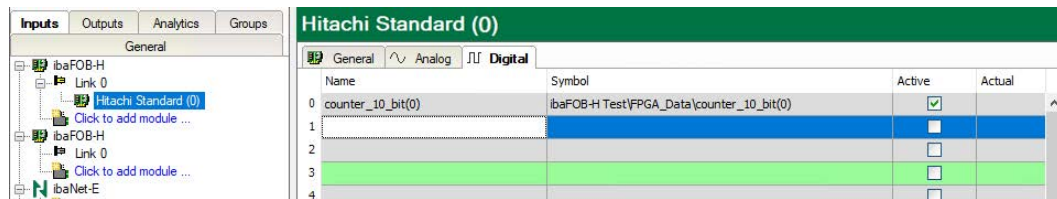
Only enabled signals are acquired.

Actual

Display of the currently acquired value (only available when acquisition is running).

It is also possible to open the symbol browser and enter variables by clicking the <...> button directly in an empty row in the *Symbol* column.

Digital tab



The columns in the *Digital* tab have the following meanings:

Name

Here, you can enter a signal name and additionally two comments, if you click on the  icon on the *Name* field.

Symbol

Name of the displayed value provided by the address book. This field cannot be changed.

Active

Only enabled signals are acquired.

Actual

Display of the currently acquired value (only available when acquisition is running).

It is also possible to open the symbol browser and enter variables by clicking the <...> button directly in an empty row in the *Symbol* column.

11 Diagnostics

The essential tools for diagnostics are integrated in the I/O Manager of *ibaPDA*.

11.1 Card diagnostics

When you select the *ibaFOB-H* interface in the tree structure of the I/O Manager, 2 tabs appear in the right part of the dialog window showing the card properties.

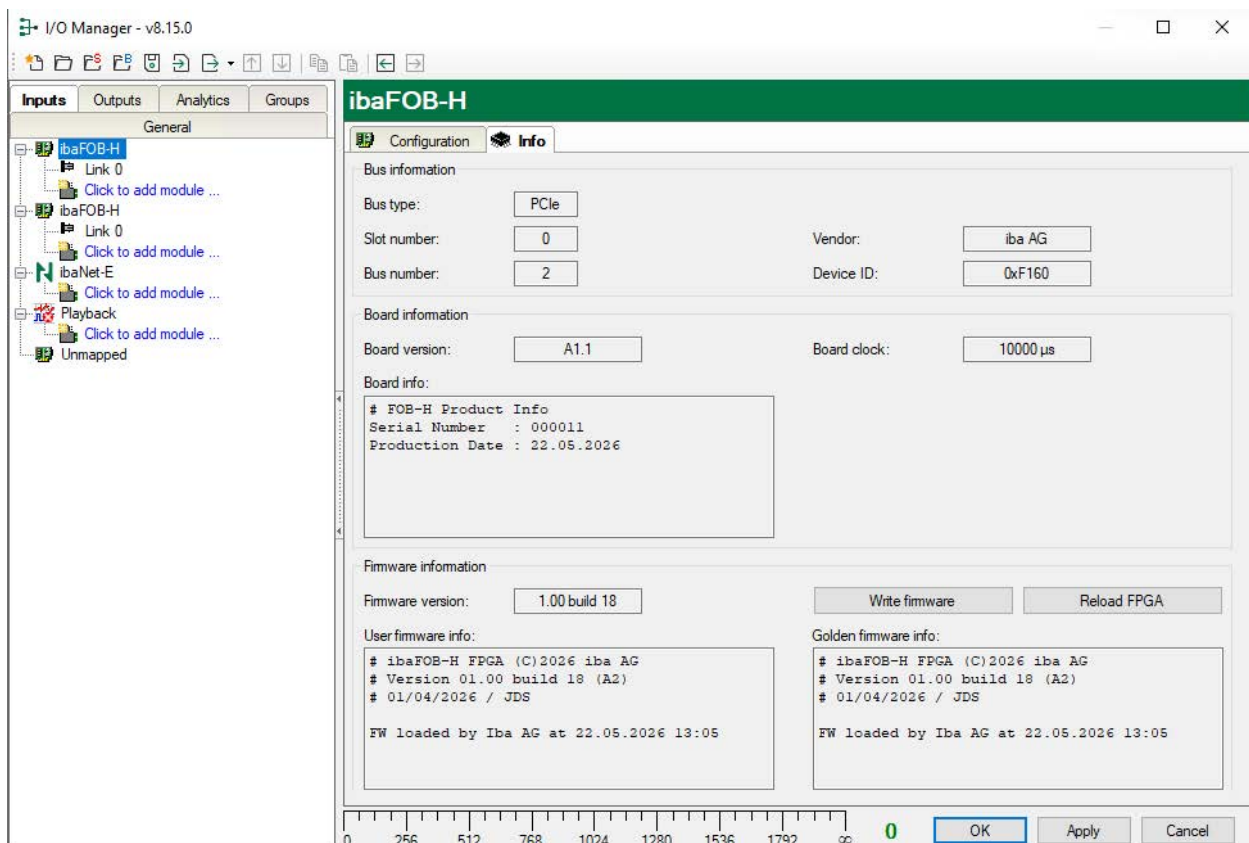
Configuration tab

In addition to the graphical illustration of the card, the interrupt mode is displayed here.

The graphical illustration of the card is dynamic, i.e. the 7 segment display with the card number and the LEDs for the connection status reflect the same status that can be seen on the card itself. See chapter [↗ Card configuration](#), page 19.

The displays and their meanings are described in chapter [↗ Indicating elements](#), page 13.

Info tab



You can find information about the card and the loaded firmware on the *Info* tab. Functions for service and support, such as reloading the FPGA and updating the firmware are available on this tab.

Note

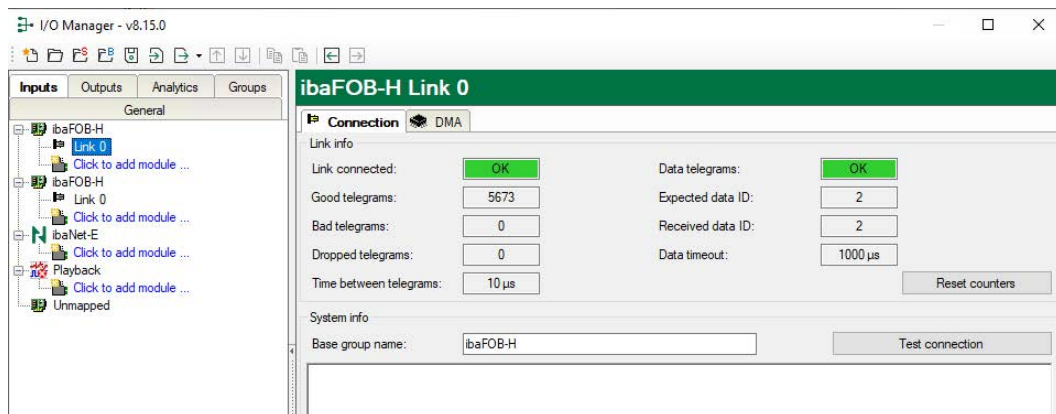


A firmware update should only be performed after consulting the iba support. The respective file can be selected and loaded via the *Write firmware* dialog.

11.2 Connection diagnostics

Connection tab

The *Connection* tab shows information about the connection status and the connected system.



In addition to the display of the connection status and telegram status several counters are available:

Good telegrams

Counter for correctly received telegrams

Bad telegrams

Counter of faulty telegrams

Dropped telegrams

Counter of dropped telegrams

Time between telegrams

The time interval between the last 2 correctly received telegrams.

Expected data ID, received data ID

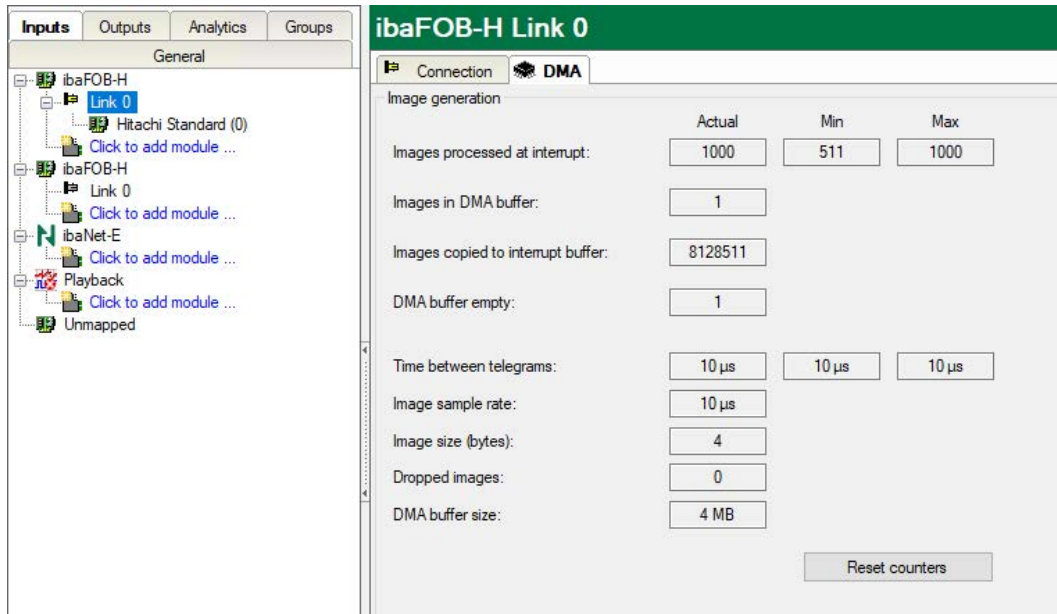
The IDs are used to identify the received data in *ibaPDA*. The ID is incremented by every request. The ID in the measurement data telegram must match the ID of the request telegram. Otherwise the data will be dropped.

Data timeout

ibaPDA monitors the telegram counter of the measurement data telegrams. If the counter does not change within the timeout calculated according to the cycle time, the data is set to 0.

The <Reset counter> button resets the contents of the fields that contain a counter value.

DMA tab



The tab gives information about the image generation (process image). An image is a dataset that the card writes into the PC system memory via DMA. This image contains all data of the measured signals within a sample on that link.

The following list explains the information regarding image generation:

Images processed at interrupt

These counters indicate how many images were present in the DMA buffer at the time of the last interrupt. This value should normally correspond with the interrupt time divided by the image sampling rate.

Images in DMA buffer

This is the number of images that are in the DMA buffer. The number should remain constant. If this number increases, the system does not work properly. This may happen if e.g. an interrupt is missed.

Images copied to interrupt buffer

This counter shows how many images have been retrieved from the DMA buffer and have been processed by *ibaPDA*. This counter should count up continuously.

DMA buffer empty

This counter increments each time the DMA buffer is empty at the time of the interrupt. If this is the case, the driver sets all signal values of the respective link to zero (0). This may happen, for example, if the fiber optic link is disconnected.

Time between telegrams

Time interval between the last 2 correctly received telegrams. This is the same value as in the *Connection* tab, but with the additional specification of the maximum and minimum distances. There shouldn't be much difference between the minimum and maximum values.

Image sample rate

The rate at which the board writes images to the DMA buffer. This should be faster than or equal to the fastest sampling rate of the modules connected to this link.

Image size

This is the size of the image in bytes. If you multiply the image size with the image sample rate then you know how many bytes per second are transferred by this link over the PCIe bus.

Dropped images

A value >0 indicates an overload on the PCIe bus.

DMA buffer size

Fixed value of the card

The <Reset counter> button resets the contents of the fields that contain a counter value.

12 Technical data

In the following you will find the technical data and dimensions for *ibaFOB-H*.

12.1 Main data

Short description

Name	ibaFOB-H
Description	PCI Express card for Hitachi MACH systems connections (via PS935)
Order no.	11.112610

Hitachi PS935 interface

Number	1
Design	SFP / fiber-optic cable
Data transfer rate	according to Hitachi PS935
Sampling rate	max. 100 kHz
ibaPDA time base (update time)	min. 10 µs; freely adjustable
Data volume	
at a 10 µs clock rate on PS935	1,024 bits
at a 100 µs clock rate on PS935	12,288 bits
Connection technology	SFP cage

SFP module

Type	Broadcom HFBR-57E5APZ
Note	required; not included in delivery
Connection technology	duplex LC connectors
Fiber-optic cable	multimode fibers (MMF) of the 50/125 µm or 62.5/125 µm type; for information on cable length, see chapter ↗ Example for FO budget calculation, page 31
Transmitting interface (TX)	
Output power	
50/125 µm MMF	-23.5 dBm ... -14.0 dBm
62.5/125 µm MMF	-20.0 dBm ... -14.0 dBm
Temperature range	-40 °C to +85 °C
Light wavelength	1310 nm
Laser class	Class 1

Receiving interface (RX)	
Sensitivity	-14 dBm

ibaPDA computer

Number of <i>ibaFOB-H</i> cards	max. 3
---------------------------------	--------

Supply

Power supply	via PCIe bus
--------------	--------------

Further interfaces, operating and indicating elements

Indicators	LEDs for operation and errors; 7 segment display
------------	--

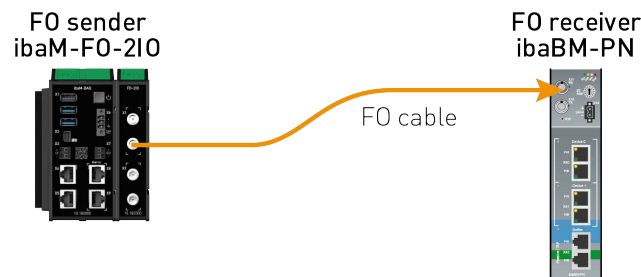
Operating and environmental conditions

Temperature range	
Operation	32 °F to 122 °F (0 °C to +50 °C)
Storage	-13 °F to 158 °F (-25 °C to +70 °C)
Mounting	
PCIe slot	lane x1 or higher
PCIe Gen	Gen1
Cooling	passive
Relative humidity	15 % ... 95 % (indoor), no condensation
Operating altitude	0 m ... 2000 m above sea level
Protection type	according to IP20; without test certificate according to IEC 60529
Certifications / standards	CE, C-Tick, UKCA, FCC, KC
MTBF (+25 °C)	23,715,364 hours / 2,707 years
Dimensions (width x height x depth)	21.6 mm x 120.8 mm x 143.4 mm
Weight, incl. packaging	0.20 kg

12.2 Example for FO budget calculation

A fiber optic link from an *ibaM-FO-2IO* module (FO transmitter) to an *ibaBM-PN* device (FO receiver) is used as an example.

The example only considers the transmission direction from the *ibaM-FO-2IO* module to the *ibaBM-PN* device. In actual operation, a connection from the *ibaBM-PN* device to the *ibaM-FO-2IO* module is also required.



The example refers to a P2P connection with an FO cable of type 62.5/125 μm . The light wavelength used is 850 nm.

The range of the minimum and maximum values of the output power or receiver sensitivity depends on the component and, among other things, on temperature and aging.

For the calculation, the specified output power of the transmitting device and, on the other side, the specified sensitivity of the receiving device must be used in each case. You will find the corresponding values in the relevant device manual in the chapter "Technical data" under "ibaNet interface".

ibaM-FO-2IO specification

Output power of FO transmitting interface		
FO cable in μm	Min.	Max.
62.5/125	-16 dBm	-9 dBm

ibaBM-PN specification

Sensitivity of FO receiving interface		
FO cable in μm	Min.	Max.
62.5/125	-30 dBm	

Specification FO cable

Refer to the data sheet for the fiber optic cable used:

FO cable	62.5/125 μm
Connector loss	0.5 dB connector
Cable attenuation at 850 nm wavelength	3.5 dB / km

Equation for calculating the FO budget (A_{Budget}):

$$A_{Budget} = |(P_{Receiver} - P_{Sender})|$$

$P_{Receiver}$ = sensitivity of FO receiving interface

P_{Sender} = output power of FO transmitting interface

Equation for calculating the fiber optic cable length (l_{Max}):

$$l_{Max} = \frac{A_{Budget} - (2 \cdot A_{Connector})}{A_{Fiberoptic}}$$

$A_{Connector}$ = connector loss

$A_{Fiberoptic}$ = cable attenuation

Calculation for the example ibaM-FO-2IO -> ibaBM-PN in the best case:

$$A_{Budget} = |(-30 \text{ dBm} - (-9 \text{ dBm}))| = 21 \text{ dB}$$

$$l_{Max} = \frac{21 \text{ dB} - (2 \cdot 0.5 \text{ dB})}{3.5 \frac{\text{dB}}{\text{km}}} = 5.71 \text{ km}$$

Calculation for the example ibaM-FO-2IO -> ibaBM-PN in the worst case:

$$A_{Budget} = |-30 \text{ dBm} - (-16 \text{ dBm})| = 14 \text{ dB}$$

$$l_{Max} = \frac{14 \text{ dB} - (2 \cdot 0.5 \text{ dB})}{3.5 \frac{\text{dB}}{\text{km}}} = 3.71 \text{ km}$$

Note

When connecting several devices as a daisy chain or as a ring (e.g., *ibaPADU-S-CM* with 32Mbit Flex), the maximum distance applies to the section between two devices. The FO signals are re-amplified in each device.

Note

When using fiber optics of the 50/125 μm type, a reduced distance (by approx. 30–40%) must be expected.

Note

In addition to conventional multimode cable types OM1 (62.5/125 μm) and OM2 (50/125 μm), the other cable types OM3, OM4 and OM5 of the 50/125 μm fiber can also be used.

13 Accessories

SFP module



Short description	
Name	SFP Optical Transceiver LC 1310
Description	Broadcom HFBR-57E5APZ SFP module
Order no.	11.112614

14 Support and contact

Support

Phone: +49 911 97282-14

Email: support@iba-ag.com

Note



If you need support for software products, please state the number of the license container. For hardware products, please have the serial number of the device ready.

Product Security Incident Response Team (PSIRT)

Current advisories: www.iba-ag.com/en/security

Email: psirt@iba-ag.com

Contact

Headquarters

iba AG
Gebhardtstrasse 10–20
90762 Fuerth
Germany

Phone: +49 911 97282-0

Email: iba@iba-ag.com

Mailing address

iba AG
Postbox 1828
D-90708 Fuerth, Germany

Delivery address

iba AG
Gebhardtstrasse 10
90762 Fuerth, Germany

Regional and worldwide

For contact data of your regional iba office or representative please refer to our website:

www.iba-ag.com