iba

ibaPADU-D-8AI-U/-D-8AI-I

Parallel-Analog-Digital-Converter for 8 channels

Manual

Issue 2.0

Measurement Systems for Industry and Energy
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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 web site http://www.iba-ag.com.

Protection note

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 device is certified according to the European standards and directives. This device corresponds to the general safety and health requirements. Further international customary standards and directives have been observed.

$C\epsilon$

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

Issue	Date	Revision	Chapter	Author	Version HW / FW
2.0	09-2023	Scope of delivery			

Table of contents

1   About this manual

This manual describes the construction, the use and the operation of the devices ibaPADU-D-8AI-U and ibaPADU-D-8AI-I.

1.1   Target group

This manual addresses in particular the qualified professionals who are familiar with handling electrical and electronic modules as well as communication and measurement technology. A person is regarded to as professional if he/she is capable of assessing safety and recognizing possible consequences and risks on the basis of his/her specialist training, knowledge and experience and knowledge of the standard regulations.

1.2   Notations

The following designations are used in this manual:

Action	Notations
Menu command	Menu „Logic diagram"
Call of menu command	„Step 1 – Step 2 – Step 3 – Step x" Example: Select menu „Logic diagram – Add – New logic diagram"
Keys	<Key name> Example: <Alt>; <F1>
Press keys simultaneously	<Key name> + <Key name> Example: <Alt> + <Ctrl>
Buttons	<Button name> Example: <OK>; <Cancel>
File names, Paths	„File name", „Path" Example: „Test.doc"

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:

- By an electric shock!

- Due to the improper handling of software products which are coupled to input and output procedures with control function!

If you do not observe the safety instructions regarding the process and the system or machine to be controlled, there is a risk of death or severe injury!

⚠ WARNING

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

⚠ CAUTION

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

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   Introduction

The ibaPADU (Parallel Analog Digital Unit) device family is designed for data acquisition of analog and digital signals. The ibaPADU-**D** devices enhance the device family with models which support the 32Mbit Flex ibaNet protocol.

The device ibaPADU-D-8AI-U offers 8 digital inputs and 8 analog voltage inputs. The measuring range of these inputs is adjustable in several stages: ±2.5 V, ±10 V, ±24 V or ±60 V.

The device ibaPADU-D-8AI-I offers 8 digital inputs and 8 analog current inputs with the following measuring ranges: ±20 mA, 0…20 mA or 4…20 mA.

If no special reference to a device is made in the following text the devices are named as ibaPADU-D-8AI in general and the description applies to both devices.

Each channel of both devices is galvanically isolated and equipped with its own A/D converter in order to measure simultaneously all channels.

Filters limit the bandwidth of the input signal in order to reduce disturbances. A digital antialiasing filter can be activated per channel together with an analog antialiasing filter (Butterworth). The digital antialiasing filter is adjusted automatically to the configured sampling rate.

With 32Mbit Flex, the sampling rate can be freely adjusted up to 40 kHz. The maximum amount of data to be transferred depends on the selected sampling rate: The higher the sampling rate, the smaller is the amount of data to be transferred. ibaPDA determines automatically the maximum possible sampling rate, which is dependent on the desired amount of data and the number of devices in the ring.

With 32Mbit Flex, it is possible to connect up to 15 devices to a ring topology. The signal limitation applies to the entire ring. Thereby, the distance between the devices can be up to 2 km. Other 32Mbit Flex-enabled iba devices can be integrated into the ring as well. For example, it is possible to use an ibaPADU-D device as an extension for an ibaPADU-S modular system, when all slots are already occupied.

The signals are internally converted and are available via the fiber optic cable interface. For the connection to a data acquisition system, such as ibaPDA, an ibaFOB-D card is used with a bidirectional fiber optic cable connection. All signals can be comfortably selected and configured in ibaPDA. The required parameters, like input level, input impedance or filters, can be selected via software for each channel.

In brief:

- ibaPADU-D-8AI-U
  - 8 digital inputs and 8 analog voltage inputs
  - Input level ±2.5 V ,±10 V, ±24 V or ±60 V
  - Input impedance 100 kΩ or 1 MΩ
- ibaPADU-D-8AI-I
  - 8 digital inputs and 8 analog current inputs
  - Input level ±20 mA, 0…20 mA or 4…20 mA
  - Input impedance 50 Ω
- Inputs galvanically isolated, single ended
- 16 bit resolution
- Sampling rate up to 40 kHz, freely adjustable
- Simultaneous data acquisition due to one A/D converter per channel
- Filter: RC low-pass 40 kHz (permanent);
  analog (Butterworth) and digital Antialiasing filter (in addition)
- Debounce filter for digital inputs (in addition)
- ibaNet protocol 32Mbit Flex
- Up to 15 devices can be connected via fiber optics using 32Mbit Flex
- Rugged design, easy mounting (DIN rail)
- Automatic module detection in ibaPDA

Fields of application:

- Process data acquisition
- Commissioning
- Trouble shooting and error detection
- Portable measuring devices

3   Scope of delivery

After unpacking check the completeness and intactness of the delivery.

The scope of delivery includes:

❑ Device ibaPADU-D-8AI-U or ibaPADU-D-8AI-I

❑ 2-pin terminal block with spring terminals (voltage supply)

❑ 2x 16-pin terminal block with spring terminals (analog and digital input channels)

4   Safety instructions

4.1   Designated use

The device is electrical equipment. It may be used only in the following applications:

❑ Automation of industrial systems

❑ Measurement data logging and analysis

❑ Applications of software products (e.g. ibaPDA) or hardware products of the iba AG.

The device is only to be applied as shown in the Technical Data chapter.

4.2   Special advices

Warning!

This is a Class A device. This equipment may cause radio interference in residential areas. In this case, the operator will be required to take appropriate measures.

Important note

Do not open the device!

There are no serviceable parts inside the device.

Opening the device will void the warranty.

Note

Cleaning

To clean the device, use a dry or slightly moistened cloth. A note specifies special requirements or actions to be observed.

5   System requirements

5.1   Hardware

❑ PC with at least:

- 1 free PCI/PCIe slot

- 512 MB RAM

- 4 GB free memory on the hard drive for measurement values

  On our Website http://www.iba-ag.com, you find suitable industry-type and desk-top-type PC systems.

❑ At least one fiber optic card of ibaFOB-D type

- ibaFOB-io-D / ibaFOB-io-Dexp

- ibaFOB-2io-D / ibaFOB-2io-Dexp

- ibaFOB-2i-D / ibaFOB-2i-Dexp optional with extension module ibaFOB-4o-D

- ibaFOB-4i-D / ibaFOB-4i-Dexp optional with extension module ibaFOB-4o-D

- ibaFOB-io-ExpressCard (for notebooks)

❑ An ibaNet fiber optic patch cable (duplex) for a bidirectional connection between the decive and the ibaPDA-PC.

5.2   Software

❑ ibaPDA version 7.3.2 or higher

6   Mounting and dismounting

6.1   Mounting

1. Locate the DIN rail mounting clip on the rear side of the device. Slowly push down and in so that the bottom part of the mounting clips snaps onto the bottom part of the rail and firmly fixes the device to the DIN rail.

2. If there is a rule to ground the device, connect the device to the ground (grounding screw X29).

3. Connect the 24 V DC power supply to the termination shown on the device. Ensure that the polarity is correct prior to applying power. Then connect the device to the ibaPDA system via a bidirectional FO cable.
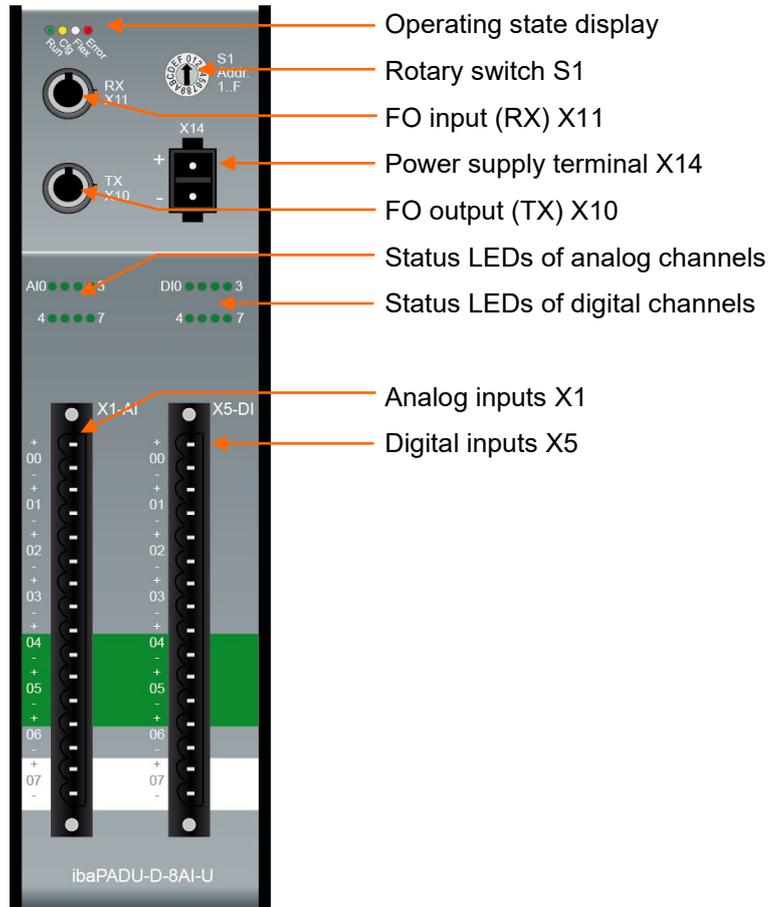
6.2   Dismounting

1. Disconnect all external connections from the device.

2. Grasp the device with one hand firmly on the top side. With your free hand, grasp the bottom of the device and push it lightly down.

3. After that pull the device and lift it up. With this action, the device should free itself from the DIN rail.
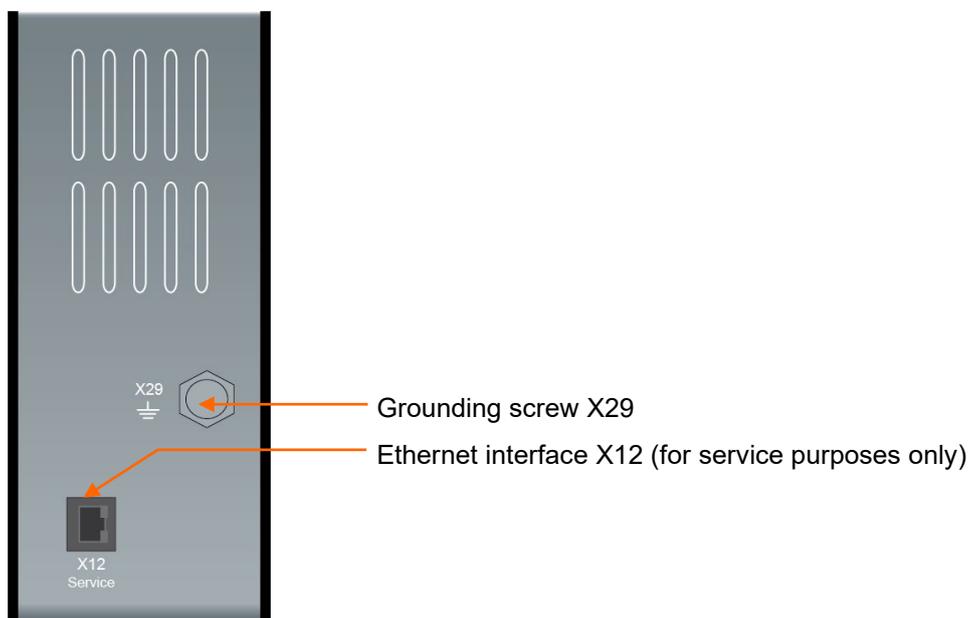
7   Device description

7.1   Device view

7.1.1   Front view

Operating state display

Rotary switch S1

FO input (RX) X11

Power supply terminal X14

FO output (TX) X10

Status LEDs of analog channels

Status LEDs of digital channels

Analog inputs X1

Digital inputs X5

7.1.2   Bottom view

Grounding screw X29

Ethernet interface X12 (for service purposes only)

7.2   Indicating elements

Operating state

LED	Color	Status	Description
Run	Green	Off	No power supply
		Blinking	Ready for operation
		Blinking fast	Firmware update active
		On	Device is booting
Cfg	Yellow	On	Configuration via 32Mbit Flex
Flex	White	Off	No 32Mbit Flex signal detected
		Blinking	32Mbit Flex signal detected, configuration error (e. g. rotary switch S1 = 0)
		On	32Mbit Flex signal detected
Error	Red	Blinking	Configuration error (e. g. rotary switch S1 = 0)
		On	Hardware error

Status of analog inputs ibaPADU-D-8AI-U

LED per chan.	Status[1]	Description (approx. values)			
		Range ±2.5 V	Range ±10 V	Range ±24 V	Range ±60 V
AI 0…7	Off	± (0 V … 0.03 V)	± (0 V … 0.1 V)	± (0 V … 0.3 V)	± (0 V … 0.6 V)
	Green	± (0.03 V… 2.3 V)	± (0.1 V … 9 V)	± (0.3 V …21.6 V)	± (0.6 V … 54 V)
	Yellow	± (2.3 V… 2.5 V)	± (9 V … 10 V)	± (21.6 V … 24 V)	± (54 V … 60 V)
	Red	Out of measuring range	Out of measuring range	Out of measuring range	Out of measuring range

Status of analog inputs ibaPADU-D-8AI-I

LED per chan.	Status[1]	Description (approx. values)		
		Range ±20 mA	Range 0…20 mA	Range 4…20 mA
AI 0…7	Off	± (0 V … 0.2 mA)	-0.1 mA … 0.2 mA	-
	Green	± (0.2 mA … 18 mA)	0.2 mA … 18 mA	4 mA … 18.4 mA
	Yellow	± (18 mA … 20 mA)	18 mA … 20 mA	18.4 mA … 20 mA
	Red	Out of measuring range	Out of measuring range	Out of measuring range

Status of digital inputs

LED per channel	Status	Description
DI 0…7	Off	No signal, logical 0
	Green	Signal ok, logical 1

---

[1] Meaning of the LED colours: off = no signal or signal too low, green = within measuring range, yellow = end of measuring range, red = out of measuring range

7.3   Connections

7.3.1   Fiber optic connections X10 and X11

❑ X11 (RX): FO input

❑ X10 (TX): FO output

The device supports the FO transfer protocol 32Mbit Flex. A bidirectional FO connection is required to connect to an ibaPDA system. A fiber optic card of type ibaFOB-D or ibaFOB-Dexp must be installed in the ibaPDA computer to be able to receive and send the data.

Maximum distance of fiber optic connections

The maximum distance of fiber optic connections between 2 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 10.3.

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 "Technical data" 10.1 under "ibaNet interface".

7.3.2   Power supply X14

The device requires an external DC 24 V ±10% power supply (unregulated). The operating voltage should be run through the provided 2-pin Phoenix threaded coupling connector. If desired, you can order DIN rails or plug-in power supply units from iba.
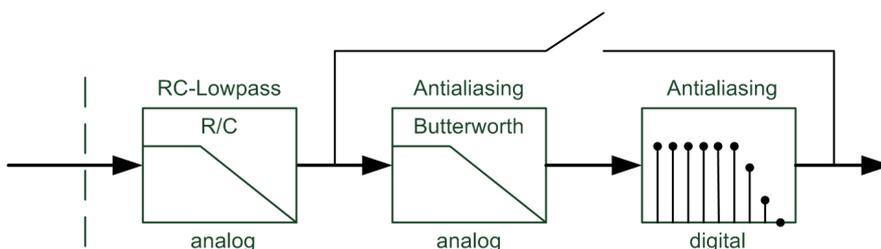
7.3.3   Analog / digital inputs

7.3.3.1   Filter of analog inputs (both devices)

There are the following filters per channel:

Filter type	Order	Cutoff frequency	in addition / permanent
R/C low pass	1.	40 kHz	permanent
Analog antialiasing Butterworth	4.	20 kHz	in addition
Antialiasing digital		1/3 of the adjusted sampling rate	in addition

Filter sections:

> **Note**
>
> The cutoff frequency of the digital antialiasing filter is automatically adjusted to 1/3 of the sampling rate, but only down to a minimum sampling rate of 0.5 kHz (is equal to a sampling time of 2 ms).
>
> Please note, that despite the digital antialiasing filter aliasing effects may occur with sampling times > 2 ms.

7.3.3.2 Operation modes of analog inputs

The different input ranges and input impedances (ibaPADU-D-8AI-U only) are configured for each channel in the I/O Manager of ibaPDA.

ibaPADU-D-8AI-U

❑ Possible input ranges: ±2.5 V, ±10 V, ±24 V or ±60 V

❑ Possible input impedance: 100 kΩ or 1 MΩ

> **Note**
>
> The combination of ±2.5 V input range and 1 MΩ input impedance is not supported. All other combinations are possible.

ibaPADU-D-8AI-I

❑ Possible input ranges: ±20 mA, 0…20 mA or 4…20 mA

7.3.3.3 Debounce filters of digital inputs

For the digital inputs, there are four debounce filters for each. These can be chosen and configured for each signal independently with the I/O Manager of ibaPDA. You have got the following filters at your disposal:

❑ „Off" (without filter)

❑ „Stretch rising edge"

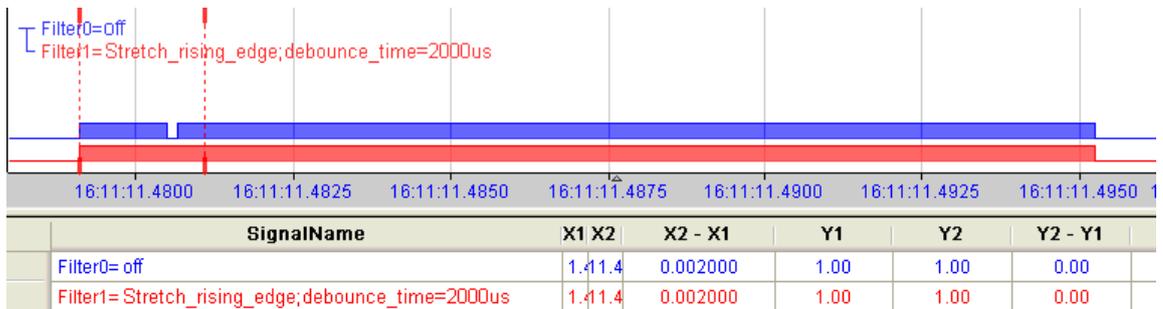❑ „Stretch falling edge"

❑ „Stretch both edges"

❑ „Delay both edges"

For each filter, a debounce time has to be defined in µs. This debounce time can have a value between [1µs…65535µs].

Off

The measured input signal is transferred without filtering.

„Stretch rising edge"

With the first rising edge, the input signal (red) switches to logical 1 and keeps this value for the defined debounce time. Thereafter, the channel is transparent again and waits for the next rising edge.
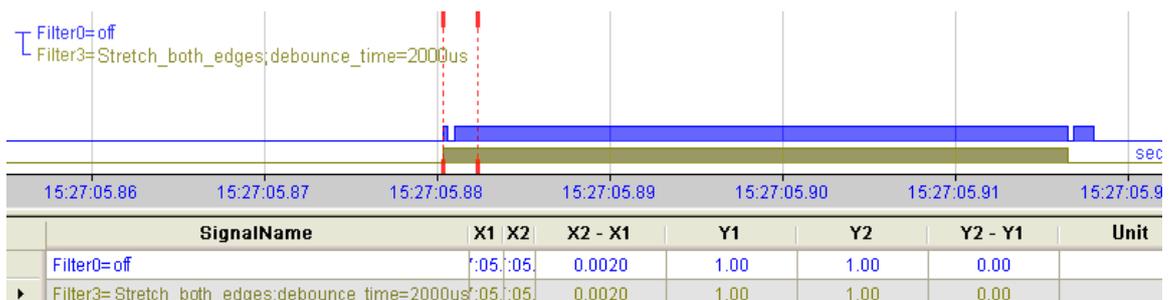
SignalName	X1	X2	X2 - X1	Y1	Y2	Y2 - Y1	
Filter0= off	1.	11.4	0.002000	1.00	1.00	0.00	
Filter1= Stretch_rising_edge;debounce_time=2000us	1.	11.4	0.002000	1.00	1.00	0.00	

„Stretch falling edge"

With the first falling edge, the output signal (green) switches to logical 0 and keeps this value for the defined debounce time. Thereafter, the channel is transparent again and waits for the next falling edge.
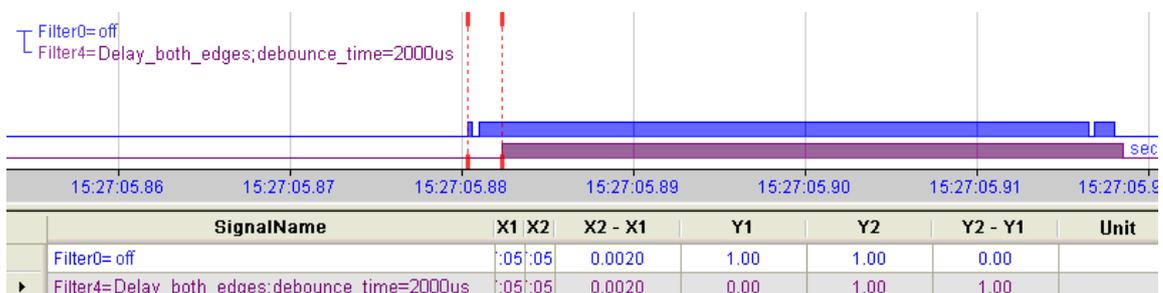

SignalName	X1	X2	X2 - X1	Y1	Y2	Y2 - Y1	
▶	Filter0= off	23.4	23.4	0.002000	0.00	0.00	0.00
Filter2= Stretch_falling_edge;debounce_time=2000us	23.4	23.4	0.002000	0.00	0.00	0.00	

„Stretch both edges"

With the first edge, the output signal (ocher) follows the initial signal (blue) and keeps the logical level for the duration of the defined debounce time. Thereafter, the channel is transparent again and waits for the next edge – be it rising or falling.


SignalName	X1	X2	X2 - X1	Y1	Y2	Y2 - Y1	Unit
Filter0= off	:05.	:05.	0.0020	1.00	1.00	0.00	
▶ Filter3= Stretch_both_edges;debounce_time=2000us	:05.	:05.	0.0020	1.00	1.00	0.00	

„Delay both edges"

Beginning with the first edge, the output signal (purple) blocks the input and keeps the logical value of the edge for the duration of the defined debounce time. Thereafter, the channel is transparent again, directly assumes the logical level of the input signal and waits for the next edge – be it rising or falling.

| SignalName	X1	X2	X2 - X1	Y1	Y2	Y2 - Y1	Unit
Filter0= off	:05	:05	0.0020	1.00	1.00	0.00	
▶ Filter4=Delay_both_edges;debounce_time=2000us	:05	:05	0.0020	0.00	1.00	1.00	

7.3.3.4 Connection diagram / pin assignment

It is possible to connect 8 analog input signals and 8 digital input signals, each bipolar and electrical isolated. Each channel is connected by means of two-wire connection. Due to the reverse polarity protection, the measuring signal is indicated logically correct, even if the connection is polarity-reversed.
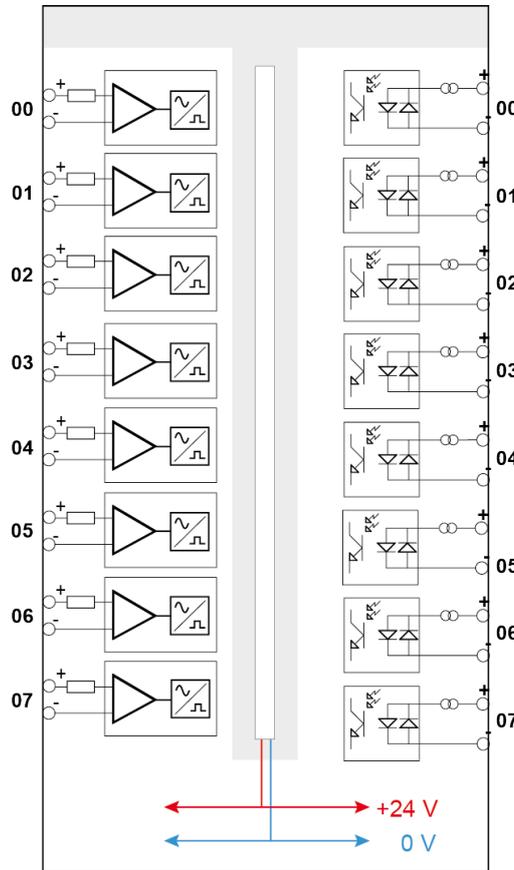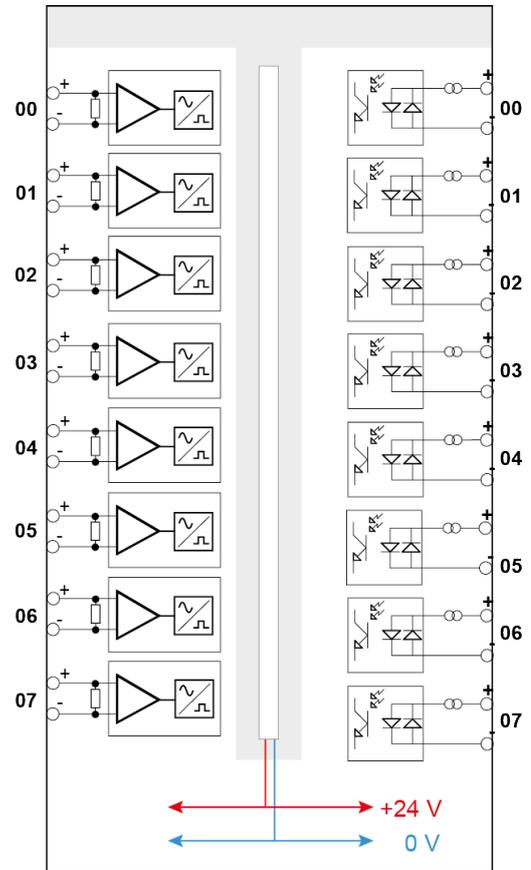
ibaPADU-D-8AI-U   ibaPADU-D-8AI-I

Pin assignment

X1 Pin...	Connection	LED	X5 Pin...	Connection	LED
1	Analog input 00 +	AI0	1	Digital input 00 +	DI0
2	Analog input 00 −		2	Digital input 00 −	
3	Analog input 01 +	AI1	3	Digital input 01 +	DI1
4	Analog input 01 −		4	Digital input 01 −	
5	Analog input 02 +	AI2	5	Digital input 02 +	DI2
6	Analog input 02 −		6	Digital input 02 −	
7	Analog input 03 +	AI3	7	Digital input 03 +	DI3
8	Analog input 03 −		8	Digital input 03 −	
9	Analog input 04 +	AI4	9	Digital input 04 +	DI4
10	Analog input 04 −		10	Digital input 04 −	
11	Analog input 05 +	AI5	11	Digital input 05 +	DI5
12	Analog input 05 −		12	Digital input 05 −	
13	Analog input 06 +	AI6	13	Digital input 06 +	DI6
14	Analog input 06 −		14	Digital input 06 −	
15	Analog input 07 +	AI7	15	Digital input 07 +	DI7
16	Analog input 07 −		16	Digital input 07 −	

7.3.4   Grounding screw X29

Proper connection of cable shielding to the device should be ensured. The shield connector (M6 screw) found on the bottom of the device should be connected with any total shield that serves for all sensor cables. Use a M6 cable lug for the connection.

> **Important note!**
>
> Connect shield on one cable side only to avoid ground loops!
>
> Always ground the DIN rail on which the device is installed!

7.3.5   Ethernet interface X12

An Ethernet interface, found on the bottom side of the device is dedicated to service purposes. The Ethernet interface is set as default to the IP address 192.168.1.1.

> **Important note**
>
> The Ethernet cable must not be connected in normal operation mode.

7.4   Operating elements

7.4.1   Rotary switch S1

With 32Mbit Flex you can group up to 15 modular systems to a ring topology.

The devices are addressed via the S1 rotary switch.

Device number in the cascade	Position of rotary switch S1
Not allowed	0
1st Device	1
2nd Device	2
⋮	⋮
14th Device	E
15th Device	F

❑ State of delivery: rotary switch position 1

8   System integration

8.1   Point-to-point connection

The device is connected to the ibaFOB-D card in the ibaPDA PC via a bidirectional FO cable. Configuration data as well as process data are transmitted using 32Mbit Flex.

With 32Mbit Flex, the sampling rate can be freely adjusted up to 40 kHz. The maximum amount of data to be transferred depends on the selected sampling rate. When connected point-to-point, all signals provided by the device can be transferred without restrictions.
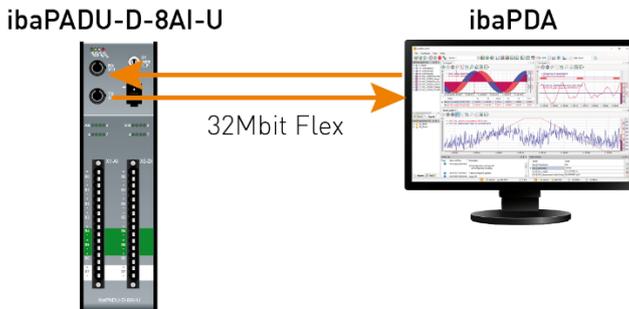
8.2   Ring topology

With 32Mbit Flex, it is possible to connect up to 15 devices to a ring topology. Configuration data and process data are transmitted in the ring.

Other 32Mbit Flex-enabled iba devices can be integrated into the ring as well. For example, it is possible to use an ibaPADU-D device as an extension for an ibaPADU-S modular system, when all slots are already occupied.

The amount of data per participant is allocated dynamically. ibaPDA calculates the amount of data depending on the number of analog and digital signals configured in ibaPDA and the smallest timebase configured in the ring.

The maximum amount of data is determined by the 32Mbit Flex protocol and must be divided by the number of devices and the amount of data per device. A reference value is approx. 3000 bytes per ms. The devices can work with different cycle times, however the cycle time must be an integer multiple of the smallest cycle. Example: PADU #1 samples with 50 µs, PADU #2 with 1 ms, ibaPADU-S-CM with 4 ms, etc. If the maximum data rate is exceeded, ibaPDA displays an error message and recommends increasing the timebase or decreasing the amount of data.
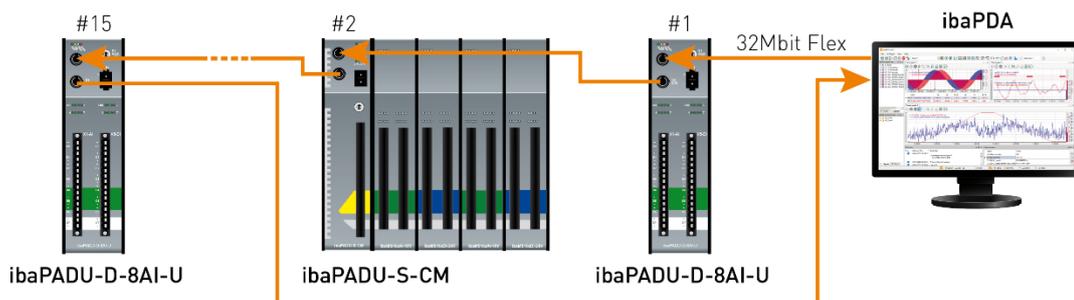
# 9   Configuration in ibaPDA

ibaPDA version 6.33.0 or higher is required for the devices ibaPADU-D-8AI-U and ibaPADU-D-8AI-I. The description of the configuration is based on ibaPADU-D-8AI-U.

9.1   First steps

1. Start the ibaPDA client and open the I/O Manager.

2. Choose the correct ibaFOB-D input card in the signal tree (on the left hand side) and mark the link ibaPADU-D-8AI-U is connected to. Right-click on the link and choose "Autodetect".
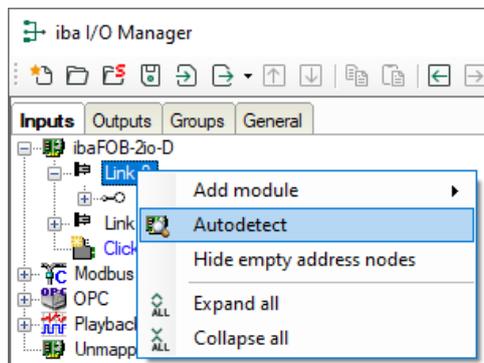
ibaPDA recognizes the device automatically. The device will be listed in the signal tree.
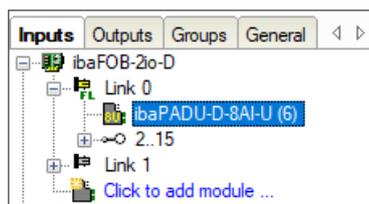
3. Alternatively you can manually add the device. Right-click on the link of the ibaFOB-D card the device should be connected to. Select "Add module…" and then "ibaPADU-D-8AI-U".
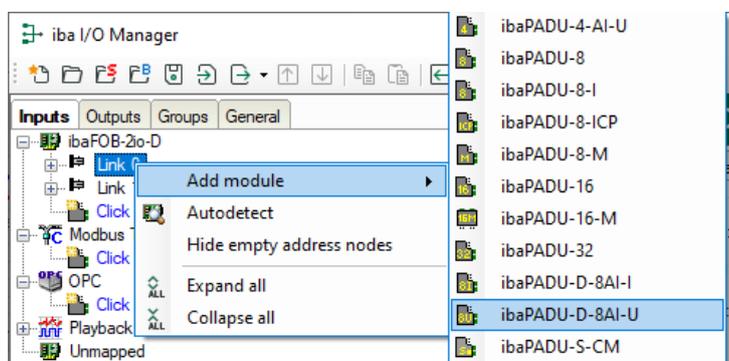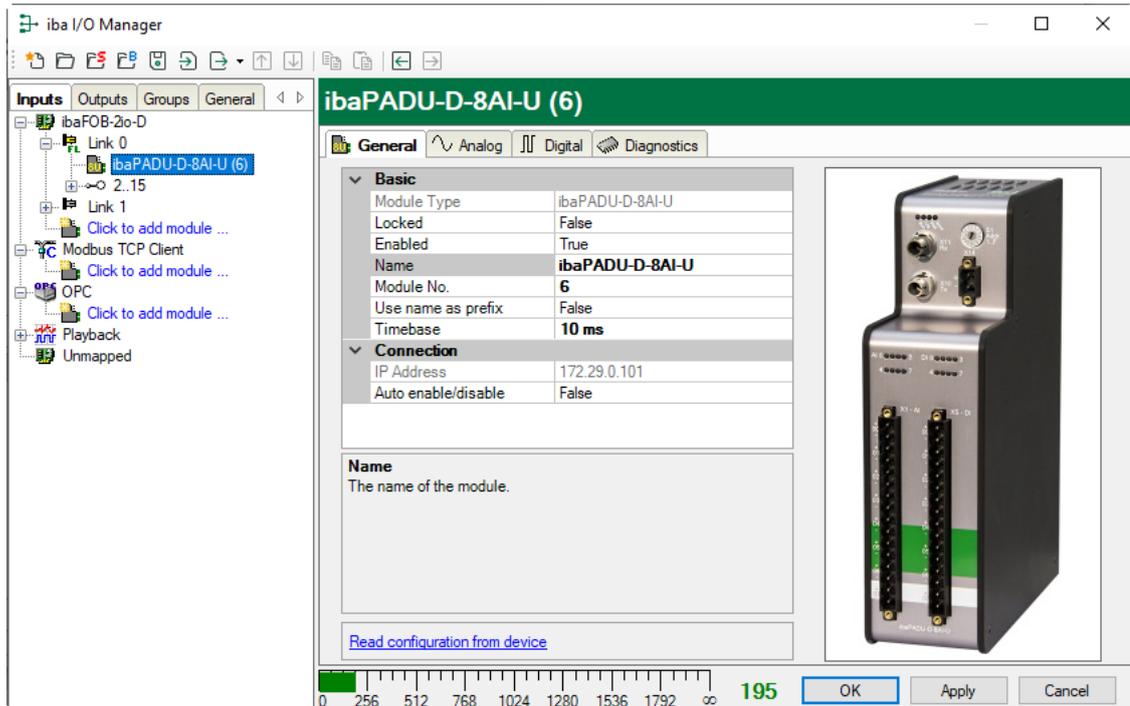

The device will be listed in the signal tree.
Hold down the mouse button and drag the device to the address (link 1 – 15 below the device), the device address switch S1 is set to.

4. Make your settings in the „ibaPADU-D-8AI-U" module of the I/O Manager.

9.1.1 „General" tab

Basic

❑ Module type (information only)
Indicates the type of the current module

❑ Locked
A module can be locked to avoid unintentional or unauthorized changing of the module settings.

❑ Enabled
Disabled modules are excluded from signal acquisition.

❑ Name
The plain text name should be entered here as the module designation.

❑ Module No.
Internal reference number of the module. This number determines the order of the modules in the signal tree of ibaPDA client and ibaAnalyzer.

❑ Use name as prefix
Puts the module name in front of the signal names.

❑ Timebase
Timebase that is used for the device, given in ms. It is possible to define smaller timebases than defined in the general acquisition timebase. Cycle times down to 0.025 ms are possible (depending on the number of signals).

Connection

❑ IP Address
IP address of the device (information only).

❑ Auto enable /disable

When this option is enabled and ibaPDA cannot connect to this device during the start of the acquisition then it will disable this module and start the acquisition without it. During the acquisition it will try to reconnect to the device. When it succeeds it will automatically restart the acquisition with this module enabled. If this option is not enabled then ibaPDA will not start the acquisition when it cannot connect to the device.

Commands for reading the configuration

❑ Read configuration from device

By means of this command, you can read the configuration from the device.

ℹ️	**Note**
	In this case, the I/O Manager does not validate the configuration (Click on <OK> or <Apply>). Therefore, we recommend that you confirm the configuration always by using the operating buttons <OK> or <Apply> of the I/O Manager.

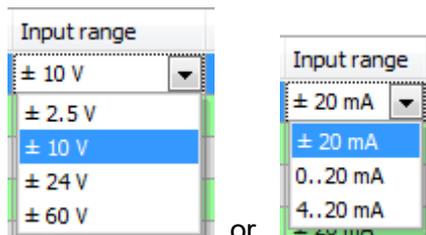### 9.1.2   „Analog" tab
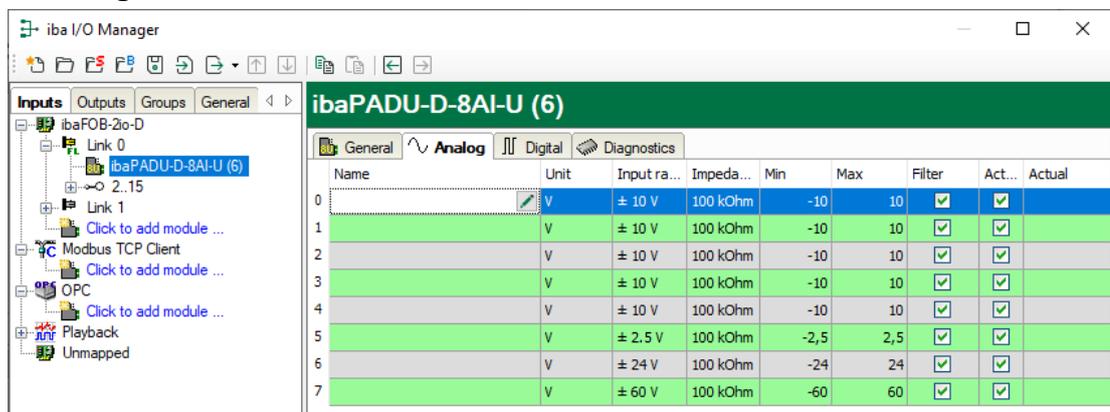
❑ Name

Assign a meaningful name to each signal and you can enter additionally two comments when clicking on the ✏️ symbol in the field "Name".

❑ Unit

Here, you can enter the physical unit of the analog value, default value is "V" (or "mA").
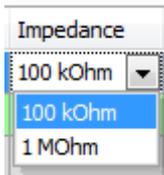
❑ Input range

Select an input range from the drop-down menu for this channel.

❑ Impedance

Select an input impedance from the drop-down menu for this channel.

ℹ️ **Important note**

An impedance of 1 MΩ together with an input range of ±2.5 V is not supported. If this combination is selected, an error message will be displayed while validating the configuration.

❑ Min

You can define a lower limit for the measuring range. The analog normalized value of -10 V is assigned to a physical value, e. g. -100 V.
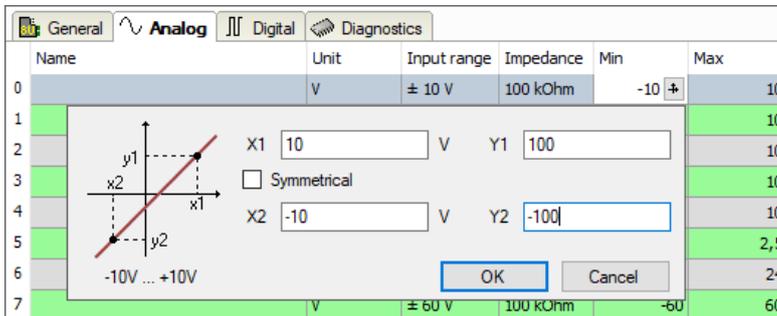
❑ Max

Here, you can define an upper limit for the measuring range. The analog normalized value of +10 V is assigned to a physical value, e. g. +100 V.

❑ Filter

Here you can activate the antialiasing filters (analog and digital).
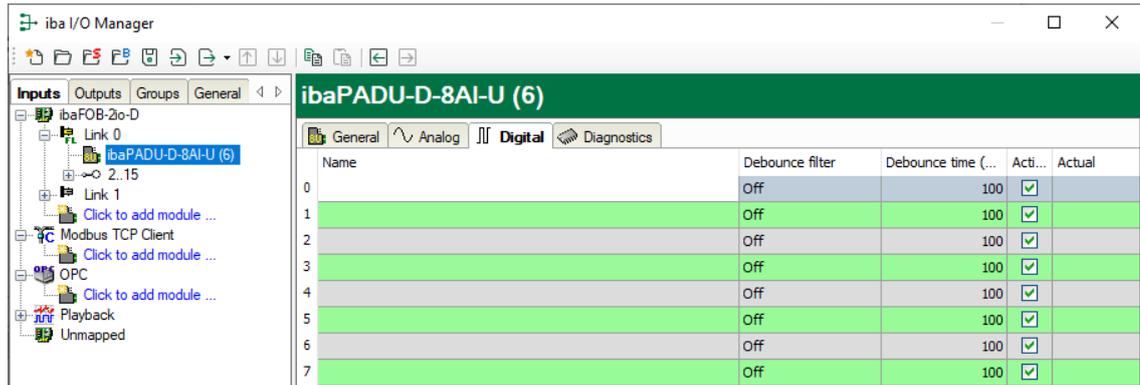
❑ Active

The signal will be measured when active.

❑ Actual

Displays the actual value of the signal (only available when the measurement is already running with the specified configuration).

Further columns can be shown or hidden by using the context menu (right mouse click in the table header).
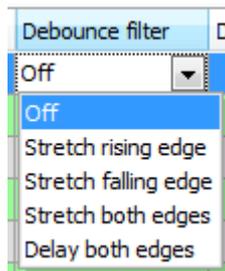
9.1.3   „Digital" tab

❑ Name, Active, Actual, see "Analog" tab.

❑ Debounce filter
In the drop-down menu, you can choose the operating mode for the debounce filter. You have got the following settings at your disposal: Off, stretch rising edge, stretch falling edge, stretch both edges, delay both edges, see chapter 7.3.3.3

❑ Debounce time (µs)
Here, you can define the debounce time in µs

Error signals in ibaPADU-D-8AI-I
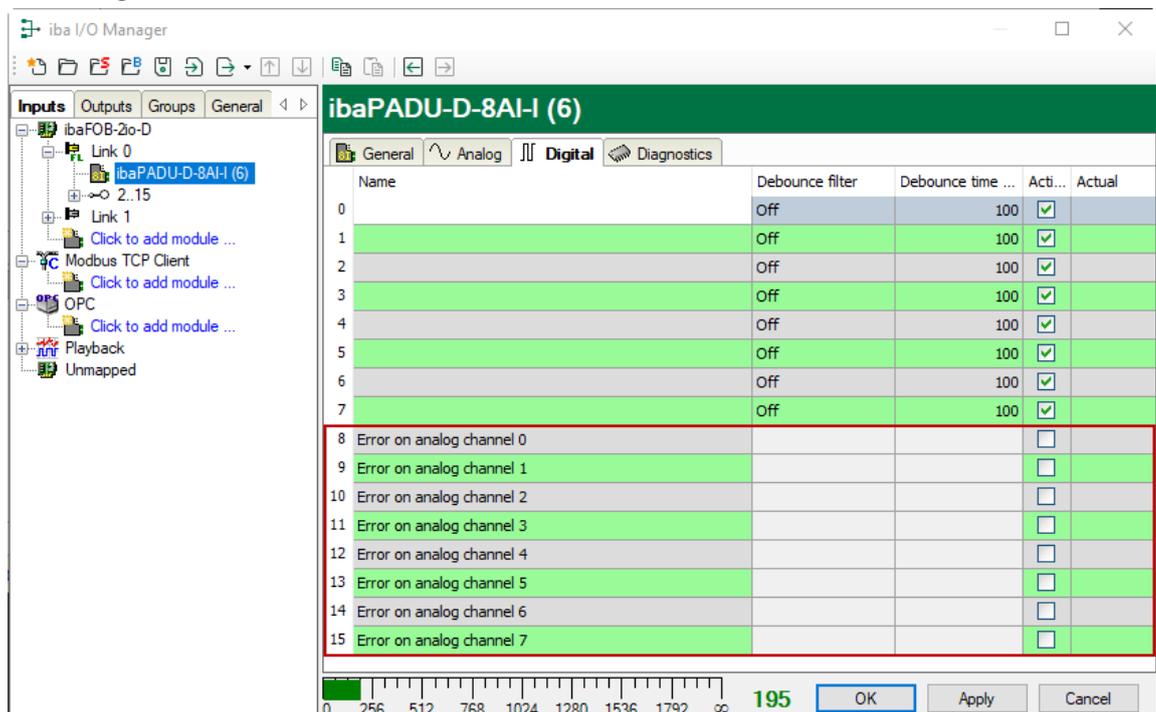
The current module ibaPADU-D-8AI-I detects different errors and provides the opportunity to record an error signal for each channel. The error signals can be activated in the "Digital" tab.

Depending on the measuring range, an error signal is generated (= logical 1) when one of the following errors occur:

❑ ±20 mA:
   - over / under measuring range

❑ 0…20 mA:
   - over / under measuring range
   - reverse polarity

❑ 4…20 mA:
   - over / under measuring range
   - reverse polarity
   - cable break, open circuit

Note

When the measuring range 4…20 mA is selected and a channel is not connected, then 0 mA is measured for this channel and an error is indicated (the corresponding LED turns to red). In order to avoid this error signal, the channel may be deactivated. The error signal will then also be deactivated.

9.1.4   „Diagnostics" tab
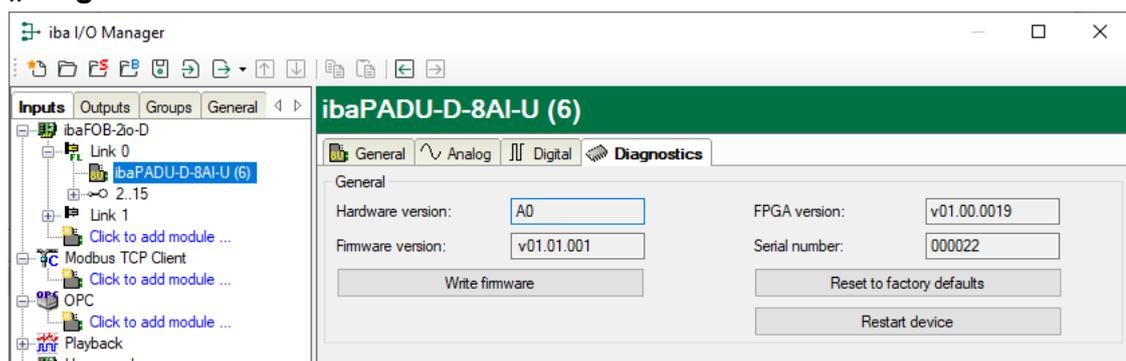
Here, you find information about the hardware version, firmware version, FPGA version and the serial number.

❑ Write firmware
Using this button you can install a firmware update. Select the update file „padud8aiu_v[xx.yy.zzz].iba" or „padud8aii_v[xx.yy.zzz].iba" in the browser and start the update with <OK>.
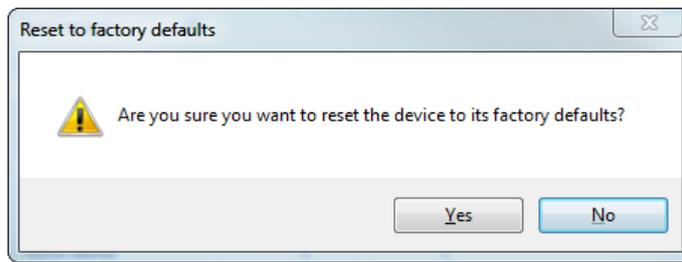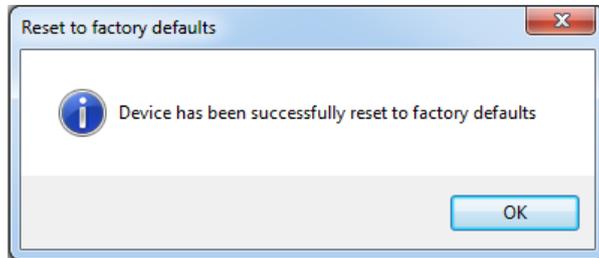

Important note

The update may take several minutes and must not be interrupted.

❑ Reset to factory defaults
Using this button all settings are reset to factory defaults after having confirmed the following request with <Yes>.
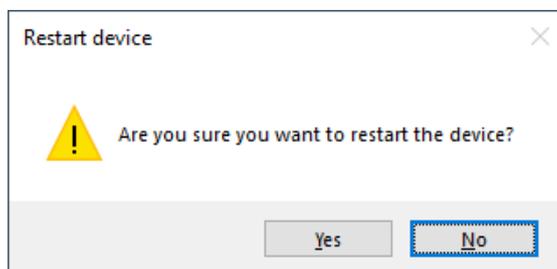

After the reset the following message appears and the device will be automatically re-booted.
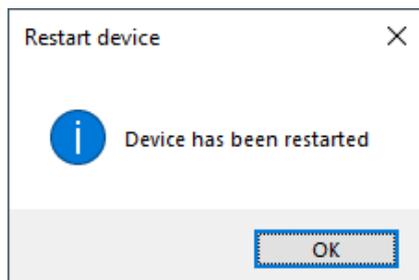

❑ Restart device

Using this button the device is restarted after having confirmed the following request with <Yes>.

Then you will receive the following message:

10 Technical Data

10.1 Main data

Short description		
Name	ibaPADU-D-8AI-U	ibaPADU-D-8AI-I
Description	Input module with 8 digital inputs and 8 analog voltage inputs	Input module with 8 digital inputs and 8 analog current inputs
Order number	10.100100	10.100110
Analog inputs		
Number	8	
Design	Galvanically isolated, single ended	
Resolution	16 bit	
Filter		
permanent	R/C low pass, 1st order, 40 kHz	
in addition	Analog anti-aliasing filter (Butterworth), 4th order, 20 kHz Digital anti-aliasing filter, cutoff frequency 1/3 of the adjusted sampling rate	
Input signal range	±2.5 V; ±10 V; ±24 V; ±60 V	±20 mA; 0…20 mA; 4…20 mA
Input impedance	100 kΩ / 1 MΩ[2]	50 Ω
Sampling rate	Synchronous with ibaNet sampling rate	
Frequency range	0 Hz to 20 kHz	
Accuracy	< 0.1% of total measuring range	
Electrical isolation		
Channel-channel	AC 1.5 kV	
Channel-housing/power supply	AC 1.5 kV	
Connector type	1 x 16-pin multi-pin connector; clamp-type terminal (0.2 mm² to 2.5 mm²), screw connection, included in delivery	
Digital inputs		
Number	8	
Design	Galvanically isolated, single ended, protected against reverse polarity	
Input signal	24 V DC	
Max. input voltage	±60 V permanent	
Signal level		
log. 0	> -6 V; < +6 V	
log. 1	< -10 V; > +10 V	
Input current	1 mA, constant	
Debounce filter	Optional: 4 different operating modes	
Sampling rate	Synchronous with ibaNet sampling rate	

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[2] 1 MΩ is not possible in combination with ±2,5 V

Connector type	1 x 16-pin multi-pin connector; clamp-type terminal (0.2 mm² to 2.5 mm²), screw connection, included in delivery	
ibaNet interface		
Number	1	
Design	Fiber optic cable	
ibaNet protocol	32Mbit Flex	
	Allows the simultaneous connection of up to 15 devices in a fiber optic ring	
	Can be used simultaneously for data, settings and service (e. g. updates)	
Data transmission rate	32 Mbit/s	
Sampling rate	Up to 40 kHz, freely adjustable	
Connector type	2 ST connectors for RX and TX;	
	iba recommends the use of FO with multimode fibers of type 50/125 µm or 62.5/125 µm;	
	For information on cable length, see chapter 10.3	
Transmitting interface (TX)		
Output power	50/125 µm FO cable	-19.8 dBm to -12.8 dBm
	62.5/125 µm FO cable	-16 dBm to -9 dBm
	100/140 µm FO cable	-12.5 dBm to -5.5 dBm
	200 µm FO cable	-8.5 dBm to -1.5 dBm
Temperature range	-40 °F to 185 °F (-40 °C to 85 °C)	
Light wavelength	850 nm	
Receiving interface (RX)		
Sensitivity[3]	62.5/125 µm FO cable	-30 dBm
Temperature	77 °F (25 °C)	
Power supply		
Power supply	24 V DC (±10%)	
Power consumption max.	10 W	
Connector type	1 x 2-pin multi-pin connector; clamp-type terminal (0.2 mm² to 2.5 mm²), screw connection, included in delivery	
Further interfaces, operating and indicating elements		
Ethernet	RJ45 socket (for service purposes only)	
Indicators (LEDs)	4 LEDs for device status	
	8 LEDs for status of analog inputs	
	8 LEDs for status of digital inputs	
Switch	1, address setting	

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[3] Data for other FO cable diameters not specified

Operating and environmental conditions

Temperature ranges	
Operation	32 °F to 122 °F (0 °C to 50 °C)
Storage/transport	-13 °F to 149 °F (-25 °C to 65 °C)
Mounting	DIN rail according to EN 50022 (TS 35, DIN Rail 35)
Free space for air circulation	Min. 2 cm on top and bottom of the device required
Cooling	Passive
Humidity class	F, no condensation
Protection class	IP20
Standards	EMC (EN 61326-1:2006), FCC part 15 class A
Mechanical stability	DIN IEC 60068-2-6 (when installed correctly)
Dimensions (width x height x depth)	2.1 in x 7.9 in x 5.6 in (53 mm x 200 mm x 141 mm)
Weight / incl. box and documentation	1.54 lbs (0.7 kg) / 2.42 lbs (1.1 kg)

Supplier's Declaration of Conformity
47 CFR § 2.1077 Compliance Information

Unique Identifier: 10.100100   ibaPADU-D-8AI-U
                            10.100110   ibaPADU-D-8AI-I

**Responsible Party - U.S. Contact Information**
iba America, LLC
370 Winkler Drive, Suite C
Alpharetta, Georgia
30004

(770) 886-2318-102
www.iba-america.com

FCC Compliance Statement
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.
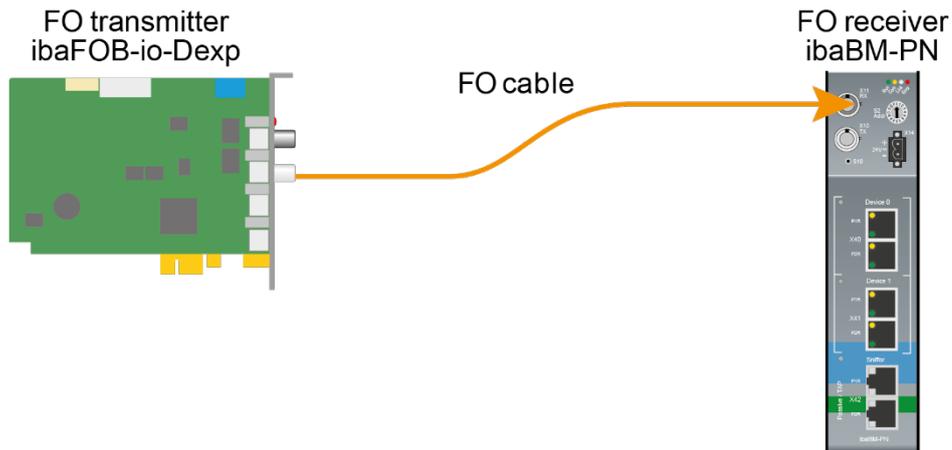
10.2   Dimension sheet
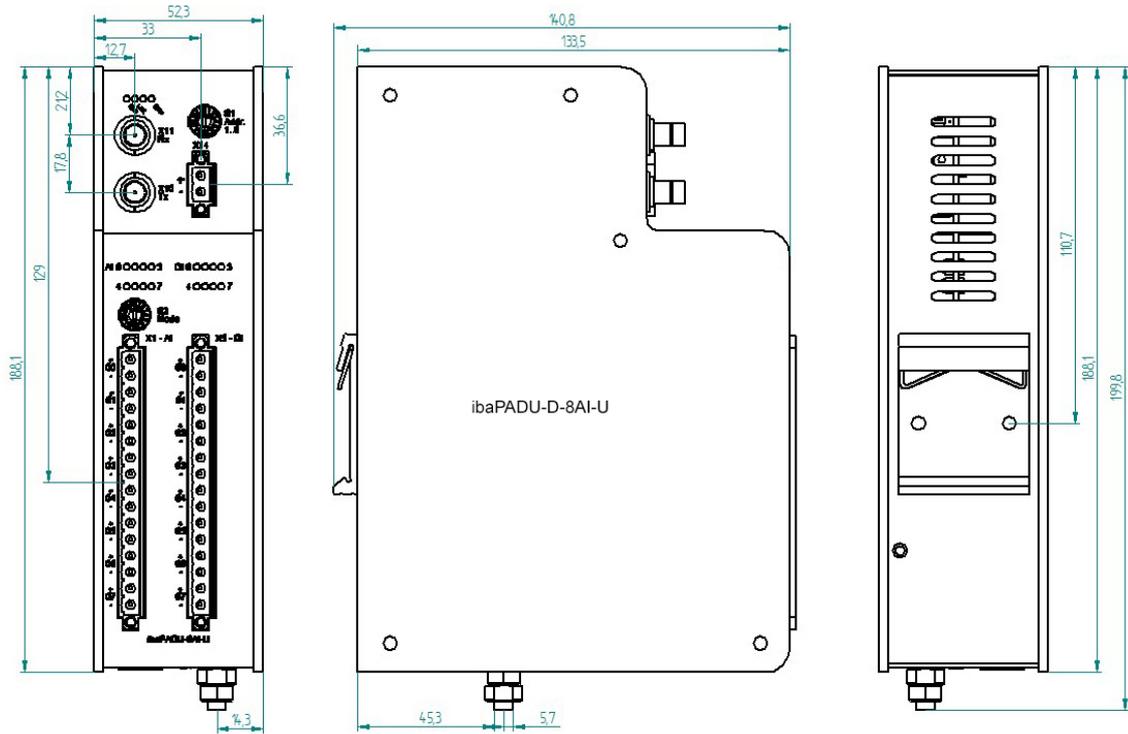
(Dimensions in mm)
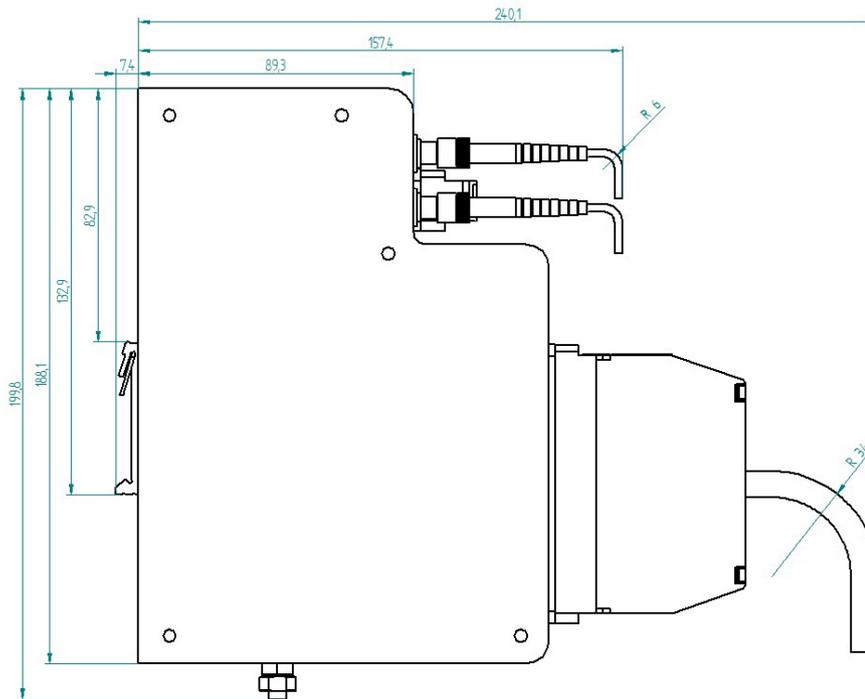
Device with cables (dimensions in mm)

10.3   Example for FO budget calculation

As an example, an FO connection from an ibaFOB-io-Dexp card (FO transmitter) to an ibaBM-PN device (FO receiver) is used.

The example refers to a point-to-point 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 respective device manual in the chapter "Technical data" under "ibaNet interface".

Specification ibaFOB-io-Dexp:

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

Specification ibaBM-PN:

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

Specification FO cable

To be found in the data sheet of 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 ibaFOB-io-Dexp -> ibaBM-PN in the best case:

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

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

Calculation for the example ibaFOB-io-Dexp -> ibaBM-PN in the worst case:

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

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

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i | **Note**
When connecting several devices as daisy chain (e.g. ibaPADU-8x with 3Mbit) or as 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.

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i | **Note**
When using fiber optics of the 50/125 µm type, a distance reduction of approx. 30-40% must be expected.

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11   Support and contact

Support

Phone: +49 911 97282-14

Fax: +49 911 97282-33

E-Mail: support@iba-ag.com

Note

If you require support, specify the serial number (iba-S/N) of the product.

Contact

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For contact data of your regional iba office or representative please refer to our web site

www.iba-ag.com.