



ibaMS4xADIO

Input and output module for analog and digital signals

Manual
Issue 2.1

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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 |
|-------|---------|-----------------|--------|------------------|
| 2.1 | 03-2026 | Circuit diagram | st | A1 |

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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.

Contents

- 1 About this documentation 6**
 - 1.1 Target group and previous knowledge 7
 - 1.2 Notations 7
 - 1.3 Used symbols 8
- 2 About ibaMS4xADIO 9**
- 3 Scope of delivery 10**
- 4 Safety instructions 11**
 - 4.1 Intended use 11
 - 4.2 Special safety instructions 11
- 5 System requirements 13**
- 6 Mounting and dismantling 14**
 - 6.1 Mounting 14
 - 6.2 Connecting 14
 - 6.3 Dismounting 15
- 7 Device description 16**
 - 7.1 Views 16
 - 7.2 Indicating elements 16
 - 7.2.1 Operating state 17
 - 7.2.2 Indicators analog inputs 17
 - 7.2.3 Indicators digital inputs 17
 - 7.2.4 Indicators analog outputs 17
 - 7.2.5 Indicators digital outputs 18
 - 7.3 Connection diagram 19
 - 7.4 Analog inputs 20
 - 7.4.1 Filter 20
 - 7.4.2 Power frequency measurement 20
 - 7.4.3 Pin assignment 21
 - 7.4.4 Circuit diagram 21
 - 7.5 Digital inputs 22
 - 7.5.1 Pin assignment X5 22

| | | |
|-----------|--|-----------|
| 7.5.2 | Debounce filter inputs | 22 |
| 7.6 | Analog outputs | 24 |
| 7.6.1 | Filter..... | 24 |
| 7.6.2 | Protective function | 24 |
| 7.6.3 | Pin assignment..... | 24 |
| 7.7 | Digital outputs | 25 |
| 7.7.1 | Protective function | 25 |
| 7.7.2 | Pin assignment X6..... | 25 |
| 7.7.3 | Circuit diagram | 25 |
| 8 | Start-up and Update..... | 26 |
| 8.1 | Auto-Update | 26 |
| 8.2 | Overall release version | 26 |
| 8.3 | Update | 27 |
| 8.3.1 | Perform update via web interface | 27 |
| 8.3.2 | Perform update via ibaPDA | 28 |
| 8.4 | Module information/diagnostics | 28 |
| 8.4.1 | Diagnostics..... | 28 |
| 8.4.2 | Web interface | 29 |
| 9 | iba Applications | 30 |
| 9.1 | Configuration with ibaPDA | 30 |
| 9.1.1 | ibaMS4xAIDO – General Settings..... | 30 |
| 9.1.2 | Configuring inputs | 33 |
| 9.1.3 | Configuring outputs..... | 36 |
| 9.1.4 | Reset channel errors..... | 37 |
| 9.2 | Configuration with ibaLogic-V5 | 39 |
| 9.2.1 | Configuring signals..... | 39 |
| 9.2.2 | Additional functions | 41 |
| 10 | Technical data | 44 |
| 10.1 | Main data..... | 44 |
| 10.2 | Analog inputs..... | 45 |
| 10.3 | Digital inputs..... | 46 |
| 10.4 | Analog outputs | 46 |

| | | |
|-----------|----------------------------------|-----------|
| 10.5 | Digital outputs | 47 |
| 10.6 | Decalaration of conformity | 48 |
| 10.7 | Dimensions | 49 |
| 11 | Support and contact..... | 50 |

1 About this documentation

This documentation describes the construction, the use and the operation of the device *ibaMS4xADIO*. You can find a general description of the iba modular system and further information about the design of the central units and how to use and operate them in separate manuals.

Other documentation



For a general description of the iba modular system and additional information about layout, application and operation of the modules, please refer to the dedicated documentations.

The documentation of the iba modular system is part of the data medium "iba Software & Manuals".

The documentation of the iba modular system comprises the following manuals:

■ Central units

The manuals of the central units contain information about:

- Scope of delivery
- System requirements
- Device description
- Mounting/dismounting
- Start-up
- Configuration
- Technical data
- Accessories

■ Modules

The manuals of the single modules contain specific information on the individual module. For example:

- Short description
- Scope of delivery
- Product characteristics
- Configuration
- Description of the functions
- Technical data
- Connection diagram

1.1 Target group and previous knowledge

This documentation is aimed at qualified professionals who are familiar with handling electrical and electronic modules as well as communication and measurement technology. A person is regarded as professional if they are capable of assessing safety and recognizing possible consequences and risks on the basis of their specialist training, knowledge and experience and knowledge of the standard 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 | Filename, Path Example: Test.docx |

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 ibaMS4xADIO

The ibaMS4xADIO module is part of the iba-modular system. The modular concept of the iba-modular system is designed on the basis of a backplane. You can plug on this backplane not only the CPU, but also up to 4 input/output modules. The power supply of the I/O modules is provided by the backplane bus.

The ibaMS4xADIO module offers 4 analog and 4 digital inputs and 4 analog and 4 digital outputs.

At a glance

- I/O module for the iba-modular system
- 4 analog inputs ± 10 V or ± 20 mA, can be configured
 - Galvanically isolated
 - 16 bit resolution
- 4 digital inputs DC 24 V (± 60 V permanent)
 - Galvanically isolated
 - Debounce filter
 - Input current 1 mA
- 4 analog outputs ± 10 V
 - One root with 4 signals
 - 16 bit resolution
 - Load ≥ 1 k Ω
- 4 digital outputs
 - Load voltage range +10 V...+30 V
 - One root with 4 signals
 - Short-circuit proof
- Rugged design, easy mounting
- Certification according to CE

Fields of application

- Power generation and distribution
- Test benches
- Power factor compensation plants
- Condition Monitoring

3 Scope of delivery

After unpacking, check the delivery for completeness and possible damages.

The scope of delivery comprises:

- *ibaMS4xADIO* device
- 1x 12-multi-pin connector,
1x 10-multi-pin connector,
1x 8-multi-pin connector,
1x 6-multi-pin connector
- Data medium "iba Software & Manuals" (only for single delivery)

4 Safety instructions

Observe the following safety instructions for *ibaMS4xADIO*.

4.1 Intended use

The device is an electrical equipment. It is only allowed to use the device for the following applications:

- Automation of industrial plants
- Measurement data acquisition and measurement data analysis
- Applications of software products (*ibaPDA*, *ibaLogic*, etc.) and hardware products of iba AG.

The device may only be operated in conditions as specified in the technical data, see ↗ *Technical data*, page 44.

4.2 Special safety instructions

Danger!



Risk of electric shock!

- The device is only designed for electrical measuring currents as specified in the "Technical data" chapter.
 - Never use damaged measuring cables!
 - Measuring cables must NOT be attached or detached to/from the device under voltage!
-

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.

Caution!



Modules must NOT be attached or detached to/from the rack under voltage. Switch off the central unit or disconnect power supply before attaching or detaching the modules.

Note



Do not open the device! Opening the device will void the warranty!

Note

To clean the device, use a dry or slightly moistened cloth.

5 System requirements

Hardware

- Central unit: *ibaPADU-S-IT-2x16* or *ibaPADU-S-CM* (version 02.10.001 or higher)
- Backplane unit, e. g. *ibaPADU-B4S*

Software

- *ibaPDA* version 6.34.0 or higher
- *ibaLogic-V5* version 5.0.2 or higher

Note



The use of *ibaLogic-V5* requires the central unit *ibaPADU-S-IT-2x16*. If the module is used with the predecessor *ibaPADU-S-IT-16*, only *ibaLogic-V4* can be used.

6 Mounting and dismantling

In the following, you will learn how to install, connect and dismantle the modules *ibaMS4xADIO*. Also refer to the notes in chapter ↗ *Safety instructions*, page 11.

Caution!



Before working on or dismantling the device, disconnect it from the power supply.

Note



Mount one or more modules on the right next to the central unit (slot X2 to X5 can be freely selected).

6.1 Mounting

To mount the module *ibaMS4xADIO*, proceed as follows.

1. Disconnect the central unit from the power supply.
2. Remove the cover from the backplane bus onto which you want to attach the module.
3. Attach the module to the backplane bus and press it firmly against the module rack.
4. Screw the module to the top and bottom of the module rack using the fastening screws.

Caution!



Always screw the device and the modules tightly. Plugging or unplugging the connectors for the inputs/outputs can otherwise cause damage.

-
5. Connect the grounding screw on the bottom of the housing to the protective ground / grounding shield.

6.2 Connecting

Note



The backplane unit and the device must be connected to a protective conductor.

-
1. Connect all cables
 2. If all required cables are connected, connect the central unit to the power supply.
 3. Switch on the central unit.

Note

When switching on/off the power supply or the central unit, incorrect intermediate values may occur at the analog outputs for approx. 60 seconds within the output signal range.

6.3 Dismounting

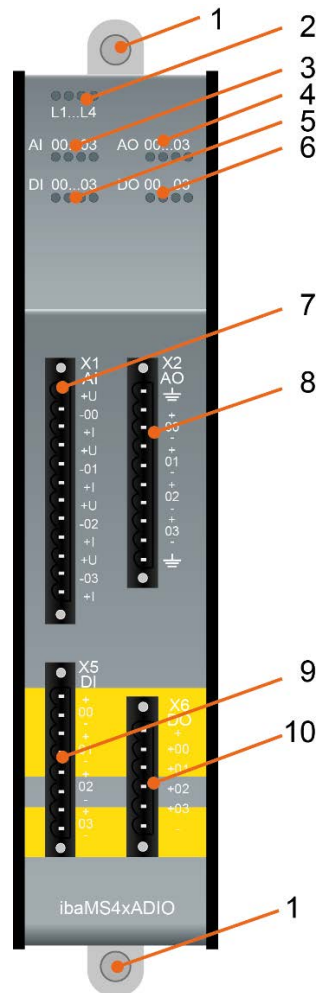
To dismount the module, proceed as follows.

1. Disconnect the central unit from the power supply.
2. Remove all cables.
3. Loosen the upper and lower fixing screws that secure the module to the module rack.
4. Pull the device straight from the backplane.
5. Put the cover on the backplane bus.

7 Device description

Here you will find views and descriptions of the device *ibaMS4xADIO*.

7.1 Views



| | | | |
|---|--|----|---|
| 1 | Fixing screws | 6 | Status LEDs of digital outputs 00 to 03 |
| 2 | Operating status indicators L1 to L4 | 7 | Connector X1 for analog inputs 00 to 03 |
| 3 | Status LEDs of analog inputs 00 to 03 | 8 | Connector X2 for analog outputs 00 to 03 |
| 4 | Status LEDs of analog outputs 00 to 03 | 9 | Connector X5 for digital inputs 00 to 03 |
| 5 | Status LEDs of analog outputs 00 to 03 | 10 | Connector X6 for digital outputs 00 to 03 |

7.2 Indicating elements

The operating status of the device and the status of the digital outputs and inputs are shown by colored status LEDs.

7.2.1 Operating state

The following overview shows the possible operating states of the module *ibaMS4xADIO*.

| LED | Color | State | Description |
|-----|--------|----------|---|
| L1 | green | flashing | device ready for operation |
| | | off | device not ready for operation (switched off) |
| L2 | yellow | on | access to the backplane bus |
| L3 | white | - | - |
| L4 | red | off | normal status, no errors |
| | | flashing | failure/error |

Note



If an error is displayed on LED L4, contact iba support.

7.2.2 Indicators analog inputs

| LED per channel | Status/Meaning | | Description (approx. values) | |
|-----------------|----------------|---------------------------|------------------------------|-------------------|
| | | | ± 10 V | ±20 mA |
| AI 00...03 | off | no signal, signal too low | ± (0 ... 0,1) V | ± (0 ... 0,2) mA |
| | green | within measuring range | ± (0.1 ... 9) V | ± (0.2 ... 18) mA |
| | yellow | end of measuring range | ± (9 ... 10) V | ± (18 ... 20) mA |
| | red | out of measuring range | > ± 10 V | > ± 20 mA |

7.2.3 Indicators digital inputs

| LED per channel | Status | Description |
|-----------------|--------|----------------------|
| DI 00... 03 | off | no signal, logical 0 |
| | green | signal ok, logical 1 |

7.2.4 Indicators analog outputs

| LED per channel ¹⁾ | status | Description (approx. values) |
|-------------------------------|--------|------------------------------|
| AO 00... 03 | off | = 0 V |
| | green | ≠ 0 V |
| | red | hardware error |

¹⁾ If an output is disabled in ibaPDA, the corresponding LED remains off.

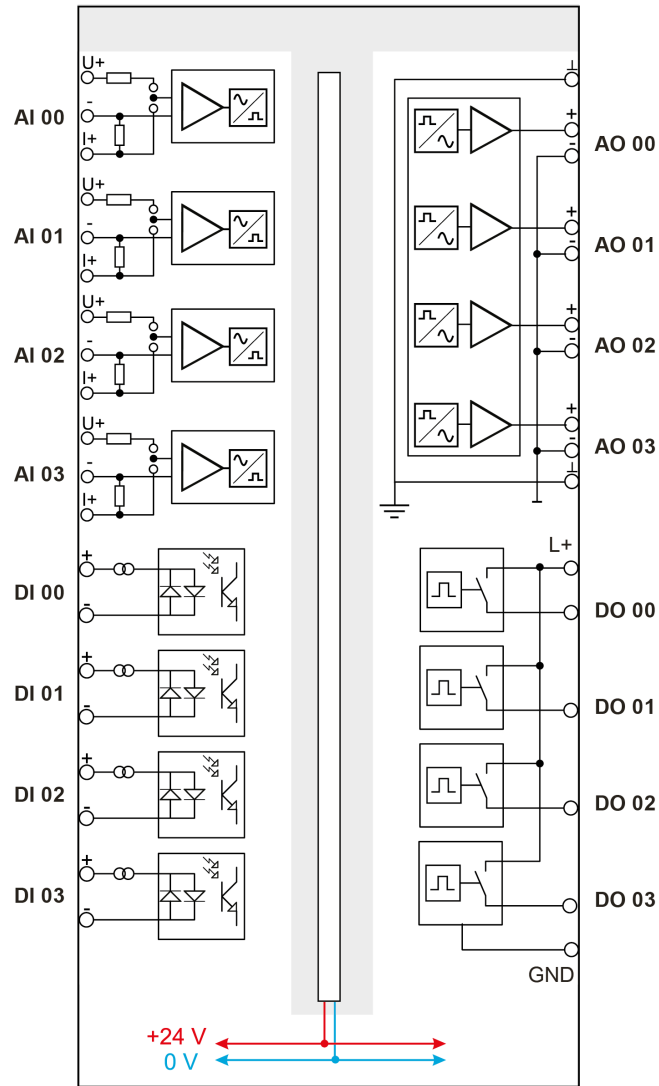
7.2.5 Indicators digital outputs

| LED per channel ²⁾ | Status | Description |
|-------------------------------|--------|--|
| DO 00... 03 | off | no signal, logical 0 |
| | green | signal ok, logical 1 |
| | yellow | load voltage is missing (per channel root) |
| | red | overcurrent (channel root switched off) |

²⁾ If an output is disabled in ibaPDA, the corresponding LED remains off.

7.3 Connection diagram

Here, you can connect 4 analog and 4 digital input signals, and 4 analog and 4 digital output signals.



7.4 Analog inputs

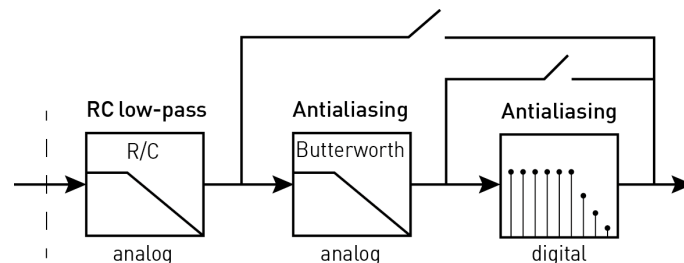
Here you will find technical information about the analog inputs.

7.4.1 Filter

There are the following filters per channel:

| Filter type | Order | Cut-off frequency | in addition / permanent |
|--|-------|---|---|
| R/C low-pass | 1. | 40 kHz | permanent |
| Analog anti-aliasing Butterworth | 4. | 20 kHz | in addition |
| Digital anti-aliasing filter (Tschebyscheff I) | 8. | can be adjusted (100 Hz ... 0.5*sampling rate) | in addition (sampling rate > 500 Hz) |

Filter principle:



7.4.2 Power frequency measurement

Each channel provides power frequency measurement.

Note



The power frequency signals are available as virtual signals in the signal tree in addition to the actual measured values and can be displayed, recorded, and used for further calculations like any other signal. For configuration, see chapter [↗ ibaMS4xADIO – Power frequency \[10Hz..80Hz\] tab, page 35.](#)

Properties

Frequency

Frequencies between 10 Hz and 80 Hz are supported.

Measuring interval

| Measuring interval | Standard conformity | Accuracy |
|--------------------|--------------------------------|-----------|
| 1 s | - | ± 5 mHz |
| 10 s | according to DIN EN 61000-4-30 | ± 0.5 mHz |

7.4.3 Pin assignment

Note

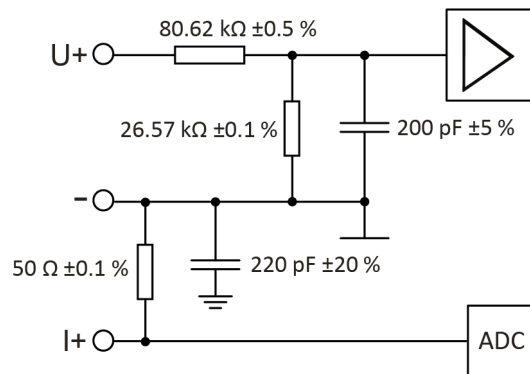


Each analog input channel can be configured as voltage or current input. Therefore the positive connector of each channel is designed separately for voltage and current measurement. The negative connector is used with both modes.

| Pin | Connection | LED |
|-----|--------------------|-------|
| 1 | Analog input 00 +U | AI 00 |
| 2 | Analog input 00 - | |
| 3 | Analog input 00 +I | |
| 4 | Analog input 01 +U | AI 01 |
| 5 | Analog input 01 - | |
| 6 | Analog input 01 +I | |
| 7 | Analog input 02 +U | AI 02 |
| 8 | Analog input 02 - | |
| 9 | Analog input 02 +I | |
| 10 | Analog input 03 +U | AI 03 |
| 11 | Analog input 03 - | |
| 12 | Analog input 03 +I | |

7.4.4 Circuit diagram

The input circuit diagram of one channel is shown here as an example.



7.5 Digital inputs

Here you will find technical information about the digital inputs.

7.5.1 Pin assignment X5

| Pin | Connection | LED |
|-----|--------------------|-------|
| 1 | Digital input 00 + | DI 00 |
| 2 | Digital input 00- | |
| 3 | Digital input 01 + | DI 01 |
| 4 | Digital input 01- | |
| 5 | Digital input 02 + | DI 02 |
| 6 | Digital input 02- | |
| 7 | Digital input 03 + | DI 03 |
| 8 | Digital input 03- | |

7.5.2 Debounce filter inputs

Four debounce filters are available for each of the digital inputs. These can be chosen and configured for each signal independently with the I/O Manager of *ibaPDA*. The following filters can be selected:

- Off (no filter)
- Stretch rising edge
- Stretch falling edge
- Stretch both edges
- Delay both edges

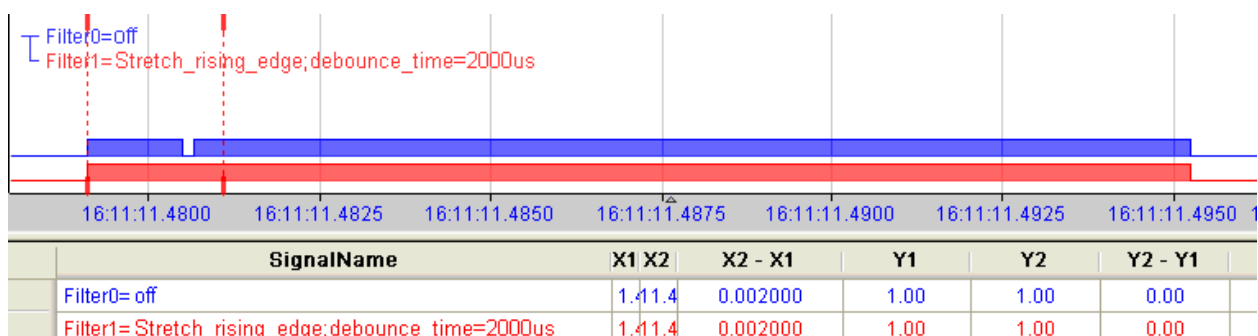
For each filter, a debounce time has to be defined in μs . This debounce time can have a value between [1 μs ... 65,535 μs].

Off

The measured input signal is forwarded directly without filtering.

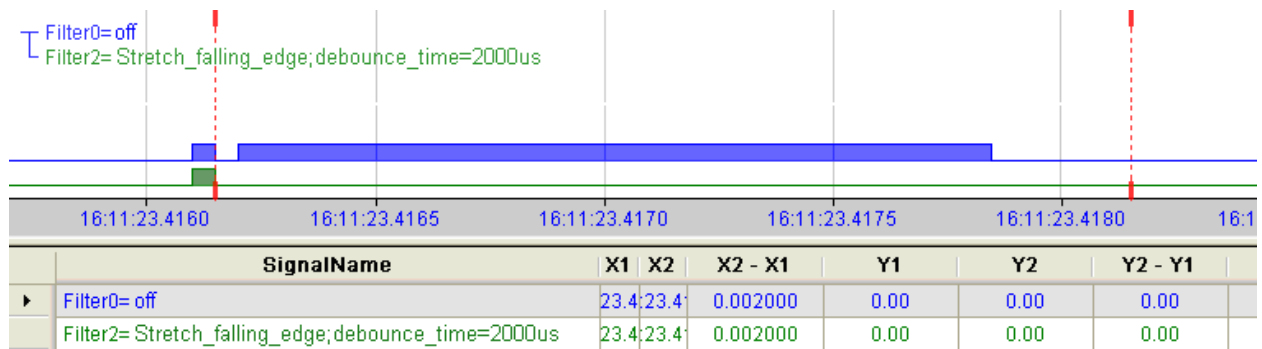
Stretch rising edge

The first rising edge sets the output signal (red) to logical 1 and it remains logical 1 for the set debounce time. Subsequently, the channel is transparent again and waits for the next rising edge.



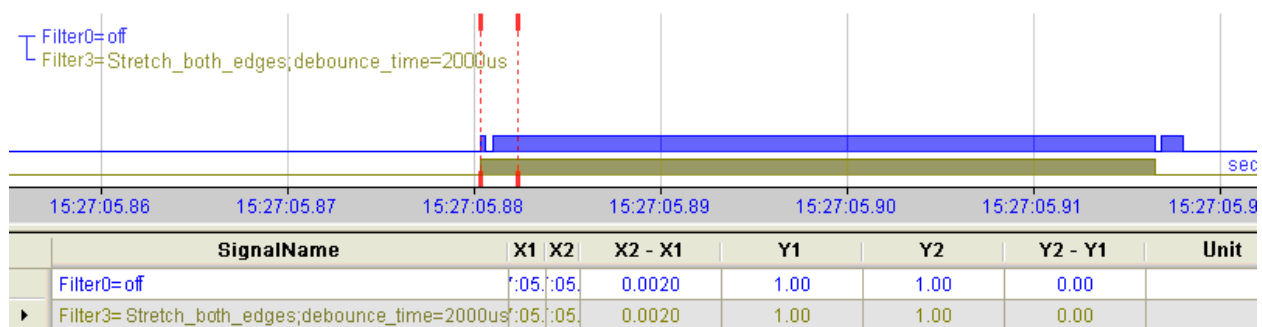
Stretch falling edge

The first falling edge sets the output signal (green) to logical 0 and it remains logical 0 for the set debounce time. Subsequently, the channel is transparent again and waits for the next falling edge.



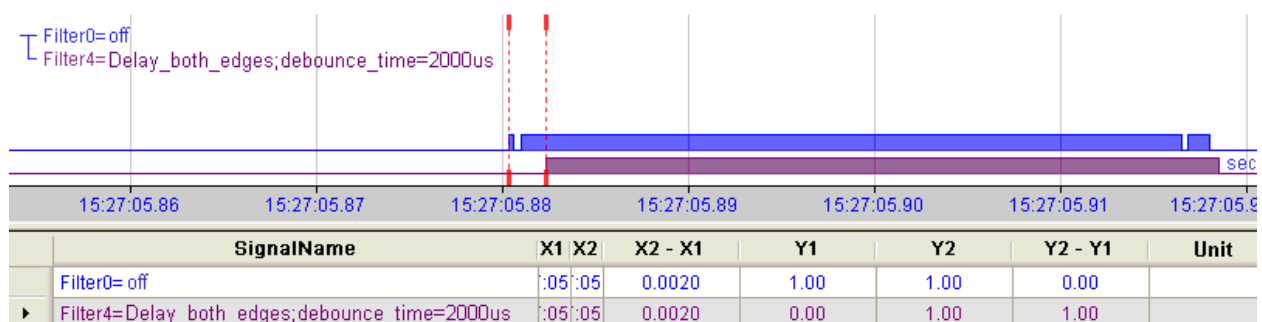
Stretch both edges

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



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. After the debounce time has elapsed, the channel is transparent again, directly assumes the logical level of the input signal and waits for the next (rising or falling) edge.



7.6 Analog outputs

Here you will find technical information about the analog outputs.

7.6.1 Filter

There are the following filters per channel:



| Filter type | Order | Cut-off frequency | in addition / permanent |
|--------------|-------|-------------------|-------------------------|
| R/C low-pass | 1. | 40 kHz | permanent |

7.6.2 Protective function

The outputs are protected against short circuits. Nevertheless a hardware error may occur, e. g. when the wiring is not correct.

When there is a hardware error, e. g. overtemperature, all channels of this signal root are set to "safe state" (0 V). You need to reset it by (ResetError_Ch[00..03]).

7.6.3 Pin assignment

| Pin | Connection | LED |
|-----|---|-------|
| 1 |  | |
| 2 | Analog output 00+ | AO 00 |
| 3 | Analog output 00 - | |
| 4 | Analog output 01+ | AO 01 |
| 5 | Analog output 01 - | |
| 6 | Analog output 02+ | AO 02 |
| 7 | Analog output 02 - | |
| 8 | Analog output 03+ | AO 03 |
| 9 | Analog output 03 - | |
| 10 |  | |

7.7 Digital outputs

Here you will find technical information about the digital outputs.

7.7.1 Protective function

The output channels provide a self-protection function in order to avoid damages to the device under fault conditions in the load circuit as far as possible. Each load current of all 4 channels per channel root is monitored. The protected range begins when the value is higher than approx. 0.6 A per channel. It may happen, that the channel is already switched-off at this value. This means, that all output signals of this root are set to logical 0.

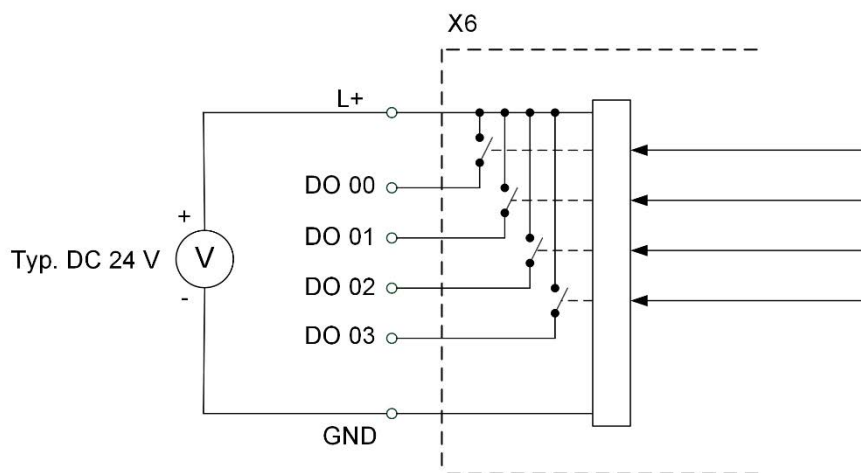
In this case, status signals report the error status to the iba applications. The errors can be reset by the application, but only when the error does not physically exist any longer.

7.7.2 Pin assignment X6

| Pin | Connection | LED |
|-----|-------------------|-------|
| 1 | Load voltage L+ | |
| 2 | Digital output 00 | DO 00 |
| 3 | Digital output 01 | DO 01 |
| 4 | Digital output 02 | DO 02 |
| 5 | Digital output 03 | DO 03 |
| 6 | Load voltage GND | |

7.7.3 Circuit diagram

The digital outputs of the module serve as pure high or P switches between the applied load voltage L+ and the four rooted digital outputs [0..3].



8 Start-up and Update

Note



Do not switch off the device during an update as you may damage the device. Installing an update can take some minutes.

8.1 Auto-Update

After having mounted the module and applied the voltage to the central unit, the central unit detects the modules and checks the software version.

The central unit has a so called “overall release version“. This version contains the current software version of the central unit as well as the software versions of the modules. You can find the “overall release version“ on the website of the central unit on the *firmware* tab.

When the software version of a module does not match the “overall release version“ of the central unit, the central unit does an automatic up- or downgrade of the module. After that the module is ready for use.

Note



The “overall release version“ contains all modules developed up to the date of release of this firmware and the corresponding software versions. If the module is not yet known (i.e. newer than the firmware version of the central unit), it is ignored and framed in red in the web interface.

In this case, a new update file has to be installed for the "overall release version", see [➤ Update, page 27](#). Therefore, contact the iba support.

8.2 Overall release version

The “overall release version“ provides information about the software version of the entire iba modular system. You can find it on the website of the central unit or in the I/O Manager of *ibaPDA*.

Note



Specify the "overall release version" for support cases.

8.3 Update

An update can be installed in two different ways:

- Web interface (only with *ibaPADU-S-IT-2x16*)
see ↗ *Perform update via web interface, page 27*
- *ibaPDA*
see ↗ *Perform update via ibaPDA, page 28*

No matter which of the both ways you choose to install an update: the progress of the update is shown by the LEDs L5 ... L8. Beginning with L5, the LEDs are flashing one after another, at first in orange and then in green and at a slower rate. When the update is finished, the device will be rebooted.

Note



When updating the iba-modular system, a possible autostart of the *ibaLogic* PMAC is deactivated and the existing *ibaLogic-V5* application deleted. Furthermore, an update of the *ibaLogic-V5* software (*ibaLogic* Clients) might be necessary.

8.3.1 Perform update via web interface

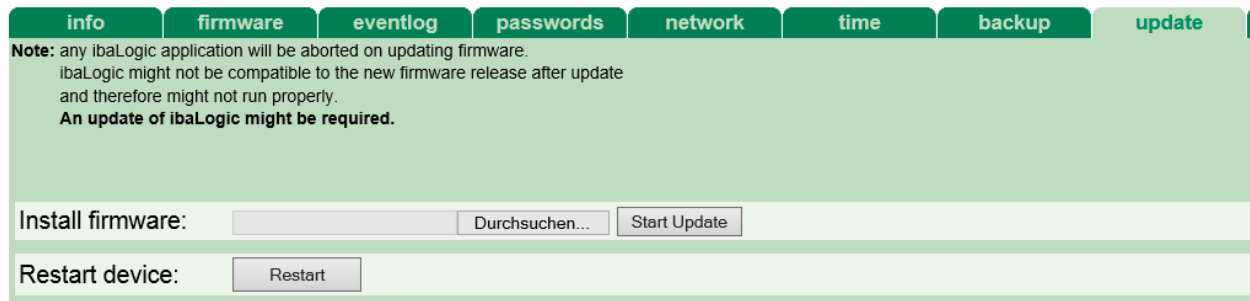
Note



The web interface is available only with the central unit *ibaPADU-S-IT-2x16*.

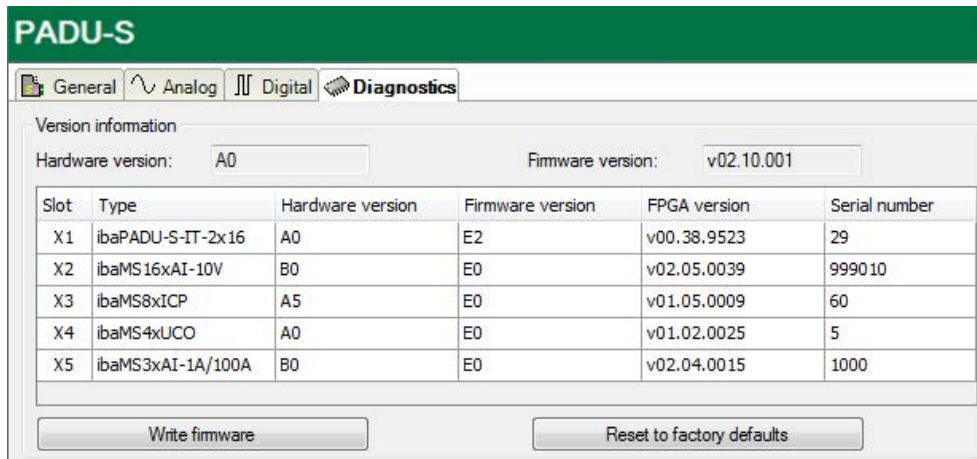
1. Open the website of the iba modular system in your browser and select the central unit.
2. On the *update* tab, click on the <Browse...> button and choose the [padusit2x16_v\[xx.yy.zzz\].iba](#) update file.
3. By clicking on <Start Update>, you start the update.

Module 0 : ibaPADU-S-IT-2x16



8.3.2 Perform update via ibaPDA

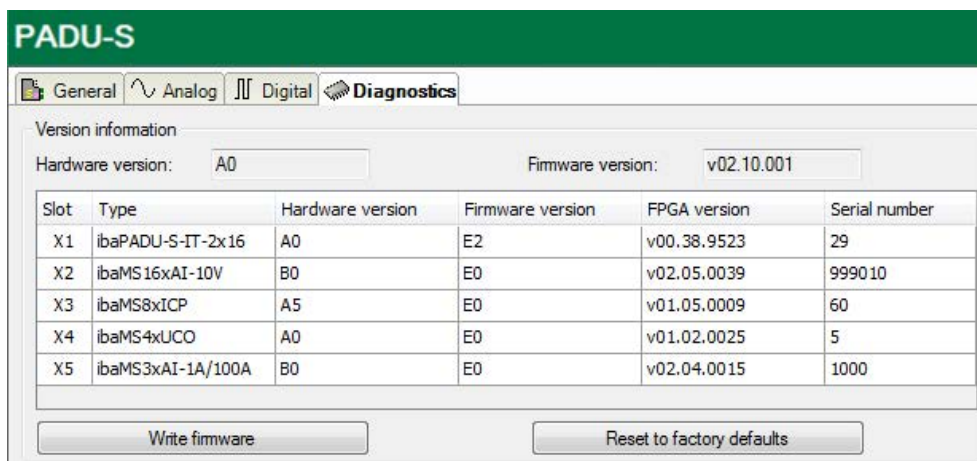
1. Open the *ibaPDA* I/O Manager and navigate to your iba modular system in the tree structure.
2. On the *Diagnostics* tab, click on the <Write firmware> button and select the [padusit2x-16_v\[xx.yy.zzz\].iba](#) or [paduscm_v\[xx.yy.zzz\].iba](#) update file.
3. You start the update by clicking on <OK>.



8.4 Module information/diagnostics

8.4.1 Diagnostics

Important information about the iba modular system, like hardware version, firmware version, FPGA version and serial number is displayed in the *Diagnostics* tab. Open the *ibaPDA* I/O Manager and choose your iba modular system in the tree structure.



8.4.2 Web interface

Only information on status and parameters is displayed on the module website. You cannot change the values.

Note



The web interface is available only with the central unit *ibaPADU-S-IT-2x16*.

8.4.2.1 Info tab

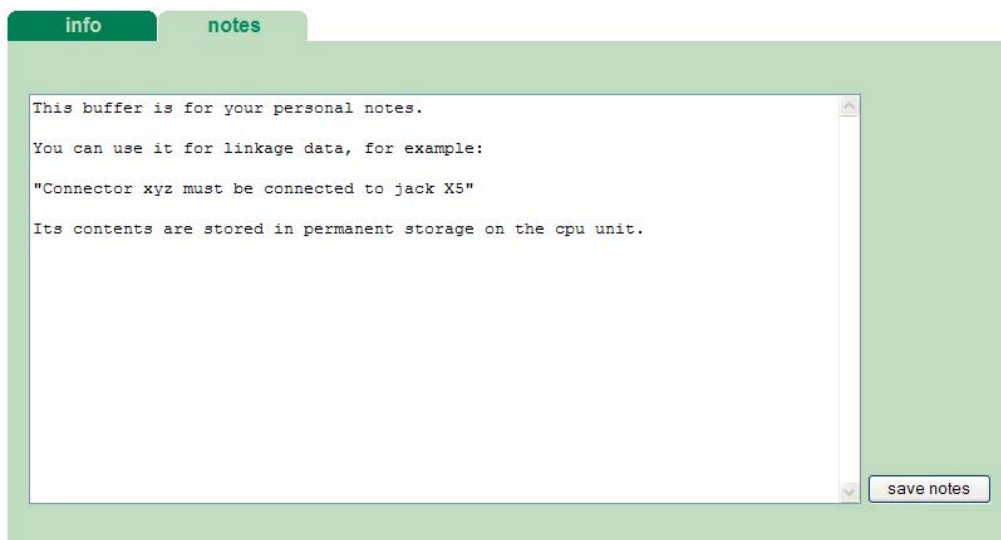
The *info* tab displays general information and technical specifications of the I/O module.

| info | | notes |
|--------------------------|---|---------|
| Serial number | 000002 | |
| Hardware version | A0 | |
| Firmware version | E1 | |
| Process-IO | | |
| analog input channels | 4 | |
| design | isolated channels, input range switchable | |
| input voltage | +/-10 | V DC |
| input current | +/-20 | mA |
| resolution | 16 | bits |
| accuracy | < 0.1 | % |
| input impedance (on/off) | V: 140/110 A: 50 | kΩ Ω |
| sampling rate | max. 40 | kHz |
| frequency range | 0 ... 20 | kHz |

8.4.2.2 notes tab

On the *notes* tab, you can enter notes, e.g. for notes on wiring or on recording of changes.

By clicking on <save notes>, the notes are permanently stored on the device.



9 iba Applications

9.1 Configuration with ibaPDA

You can configure the signals with the I/O Manager of *ibaPDA*. If the iba modular system is already installed and you want to add a new module, click on “Read configuration from device”. The module will be detected automatically.



Note



The automatic detection requires a bidirectional FO connection from the *ibaPDA* computer to the central unit.

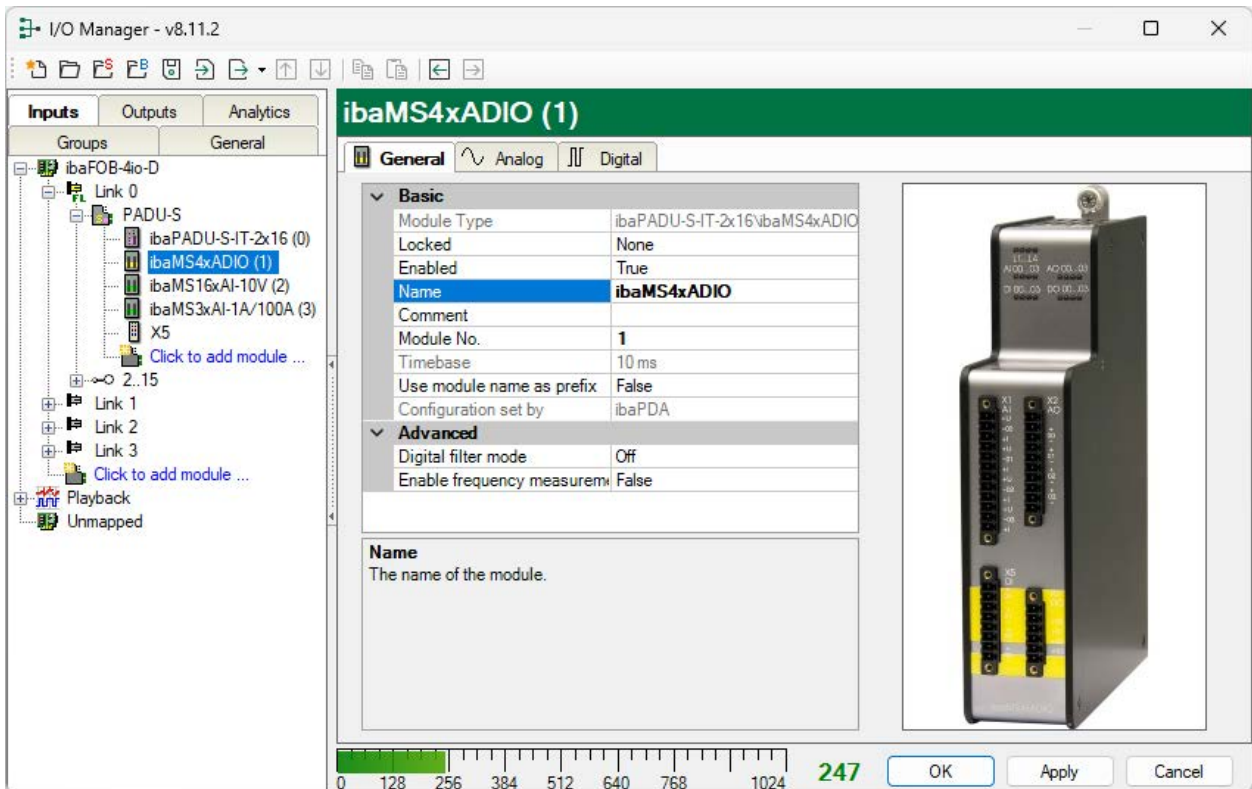
Other documentation



If you want to install the iba modular system at first, refer to the manual of the central unit, chapter “Configuration with ibaPDA”.

9.1.1 ibaMS4xAID0 – General Settings

If the module is detected, click on the module in the signal tree and the *General* tab appears.



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.

Use module name as prefix

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

Configuration set by

This item is only visible when *ibaPADU-S-IT-2x16* is used as central unit. When an embedded application has been started on *ibaPADU-S-IT-2x16* (e.g. *ibaLogic*), then *ibaPDA* cannot modify the configuration of the modules and signals. In this case the configuration is set by the embedded application. The following entries can be displayed:

■ *ibaPDA*

| | |
|----------------------|--------|
| Configuration set by | ibaPDA |
|----------------------|--------|

If *ibaPDA* is displayed, an embedded application has not been started and the configuration can be set by *ibaPDA*.

■ Embedded application

| | |
|----------------------|----------------------|
| Configuration set by | Embedded application |
| Import signal names | False |

If embedded application is displayed, the configuration of the modules and signals is set by the embedded application on the device. In this case, it is also possible to import user-defined signal names - assigned by the runtime configuration - into *ibaPDA* (Import signal names: True), if the embedded application supports this function.

The modules and signals configured by the embedded application cannot be configured in *ibaPDA*, they are displayed in gray in the respective fields.

ibaPDA reads out this configuration and uses it for acquisition in *ibaPDA*. Modules and signals which are not displayed in gray can be used in *ibaPDA*.

Advanced

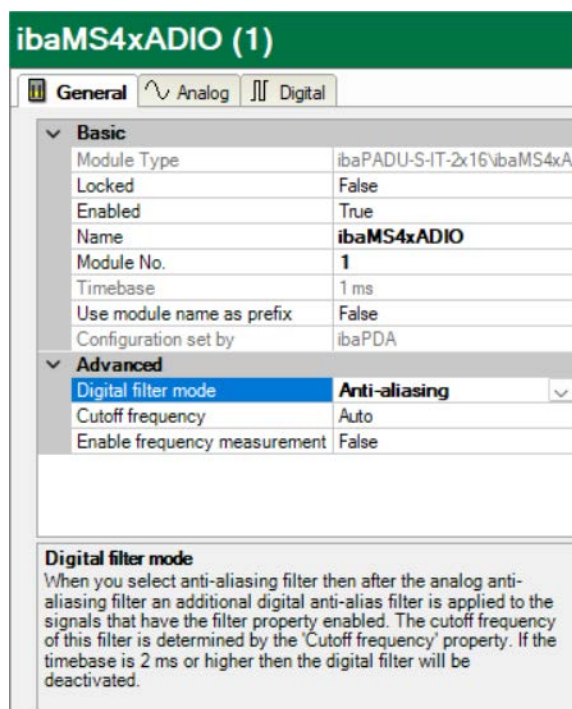
Digital filter mode

Select *Anti-aliasing* if you want to enable a digital anti-aliasing filter in addition to the analog anti-aliasing filter. This digital anti-aliasing filter can be enabled only once per module and is then applied to all signals, that have the filter property enabled in the *Analog* tab.

For this reason, it can only be enabled in conjunction with the analog filter via the filter option in the *Analog* tab. The digital anti-aliasing filter can only be enabled, when the sampling rate > 500 Hz (= timebase < 2 ms). When the digital filter is enabled, an additional field *Cutoff frequency* appears.

Cutoff frequency

You can enter a value in Hz or you can set it to *Auto*. When it is set to *Auto* the cutoff frequency is equal to one third of the sampling frequency.



Permissible values: 100 Hz ... 0.5**sampling rate*

The entry "0" Hz corresponds to the setting *Auto*.

Enable frequency measurement

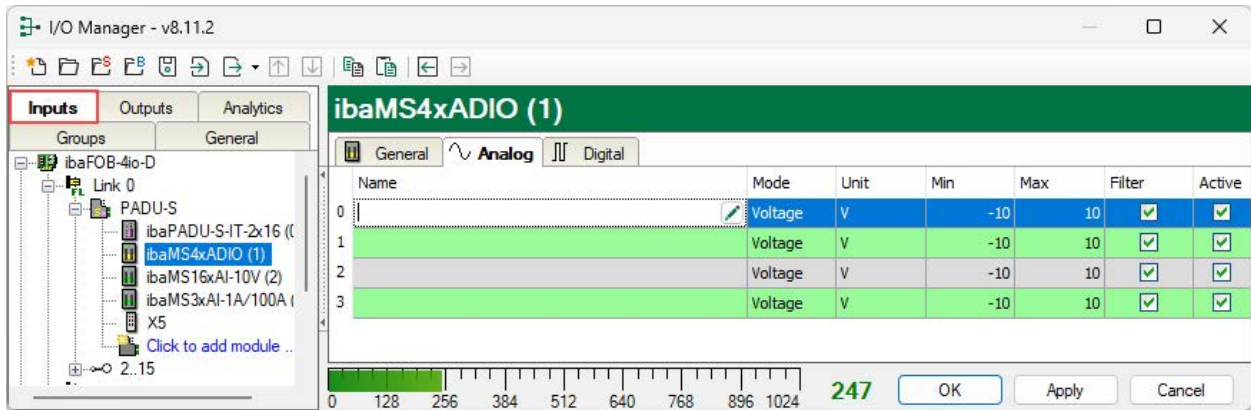
Select *True* to enable the measurement of the power frequency of the connected signals. The *Power frequency [10Hz..80Hz]* tab appears additionally.

9.1.2 Configuring inputs


Select the *Inputs* tab in the I/O Manager to configure the input signals.

9.1.2.1 ibaMS4xADIO - Analog tab

The following settings apply to the *Analog* tab:

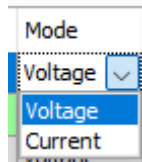


Name

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

Mode

In the drop-down menu you can select between voltage or current input.

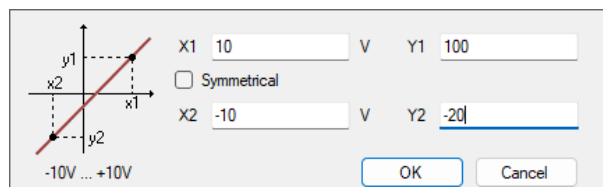


Unit

The unit is automatically set according to the mode selection.

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. -20 °C.



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 °C.

Filter

You can select the anti-aliasing filter: Butterworth 4th order 20 kHz, see chapter [↗ Filter](#), page 20.

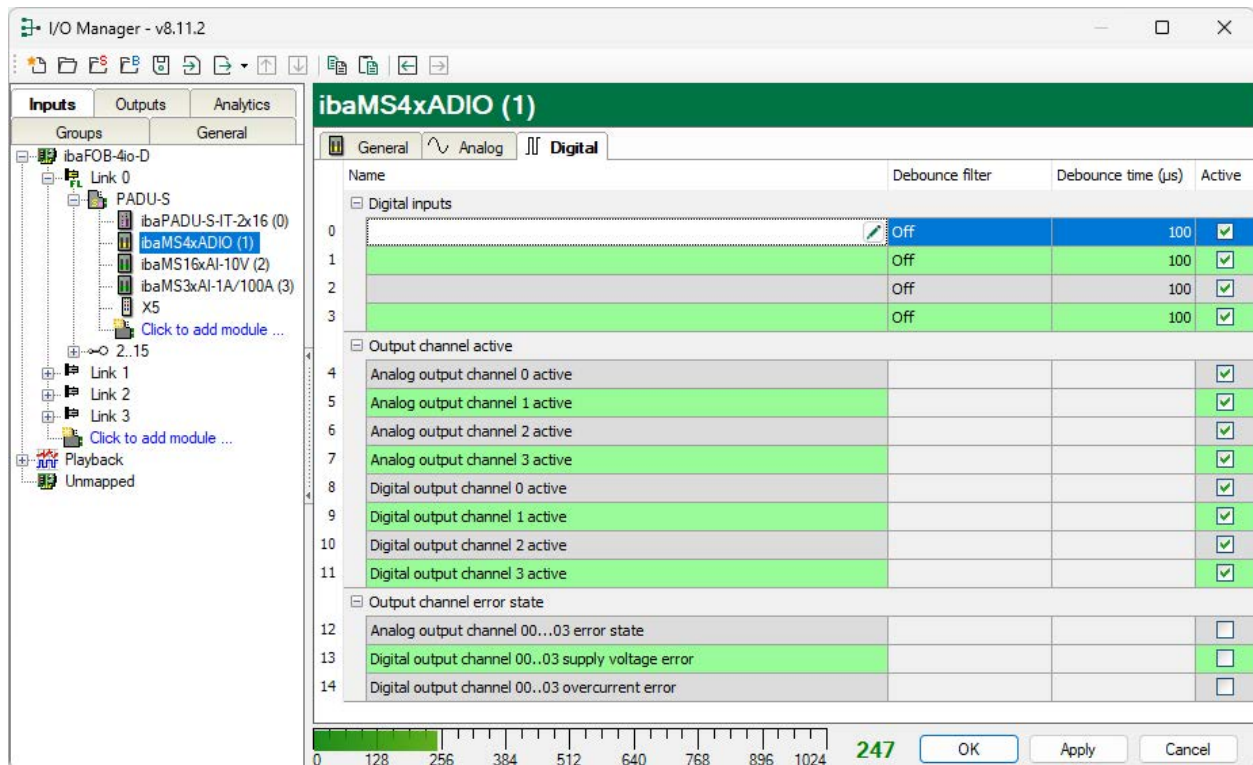
Active

Enabling/disabling the signal.


You can show or hide more columns via the context menu (click with the right mouse button in the headline).

9.1.2.2 ibaMS4xADIO - Analog tab

Make the following settings in the *Digital* tab:

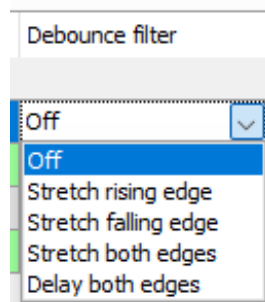


Name

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

Debounce filter

In the drop-down menu, you can choose the operating mode for the debounce filter. The following settings are available: Off, Stretch rising edge, Stretch falling edge, Stretch both edges, Delay both edges



See chapter [↗ Debounce filter inputs](#), page 22

Debounce time

Here you can set the time in μs during which a change of the signal value is not acquired.


Active

Enabling/disabling the signal.

Diagnostics channels

In the same *Digital* tab, you can enable status and error information:

Name

The signals have default names. You can edit the names and enter two additional comments when clicking the icon  in the *Name* field.

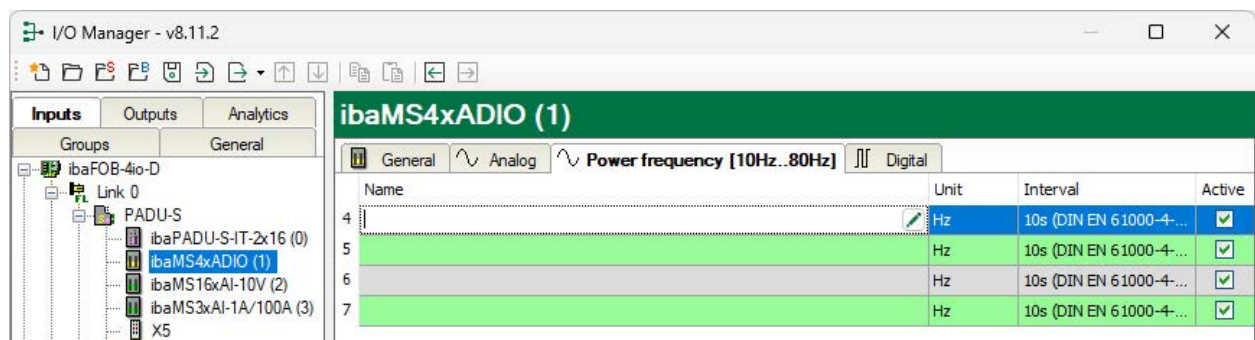
- Analog output channel [0...3] active
status signal that indicates whether the analog output is active.
- Digital output channel [0...3] active
status signal that indicates whether the digital output is active
- Analog output channel 00...03 error state
status signal that indicates whether the 4 analog outputs of a root are in error state due to an overcurrent.
- Digital output channel 00...03 load voltage error
status signal that indicates whether there is a load voltage error on the 4 output channels of the root (at a time).
- Digital output channel 00...03 overcurrent error
status signal that indicates whether there is an overcurrent error on the 4 output channels of the root (at a time).

Active


Enabling/disabling the signal

9.1.2.3 ibaMS4xADIO – Power frequency [10Hz..80Hz] tab

When frequency measurement is enabled, this tab appears additionally.



Name

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

Unit

Default value is "Hz".

Interval

You can select the measuring interval via a drop-down menu: 1s or 10s (according to DIN EN 61000-4-30).

Active

Enabling/disabling the signal

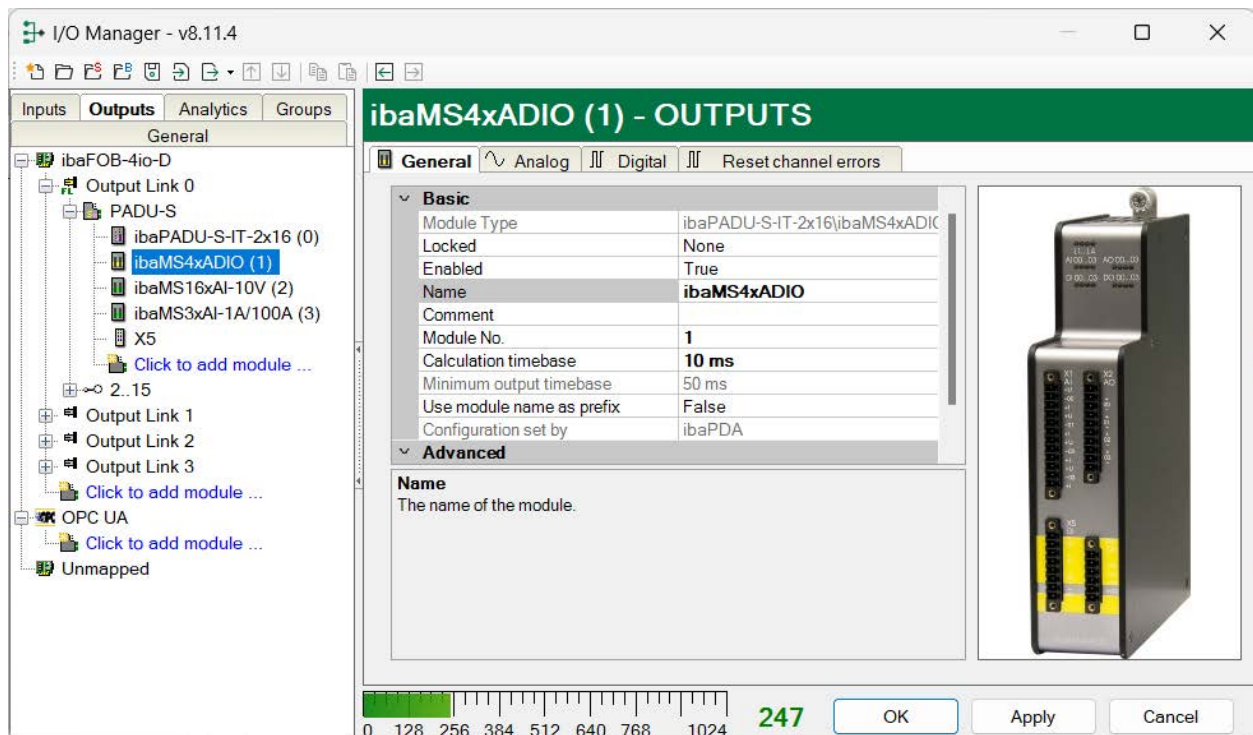
You can show or hide more columns via the context menu (click with the right mouse button in the headline).

9.1.3 Configuring outputs

Select the *Outputs* tab to configure the settings and signals at the output side.

General tab

Most of the basic settings apply to the input and output module. The *Calculation timebase* and *Minimum output timebase* settings are only available for the output module.



Calculation timebase

Timebase (in ms) used for the calculation of the output values.

The calculation timebase is not the same as the output timebase with which the values are output!

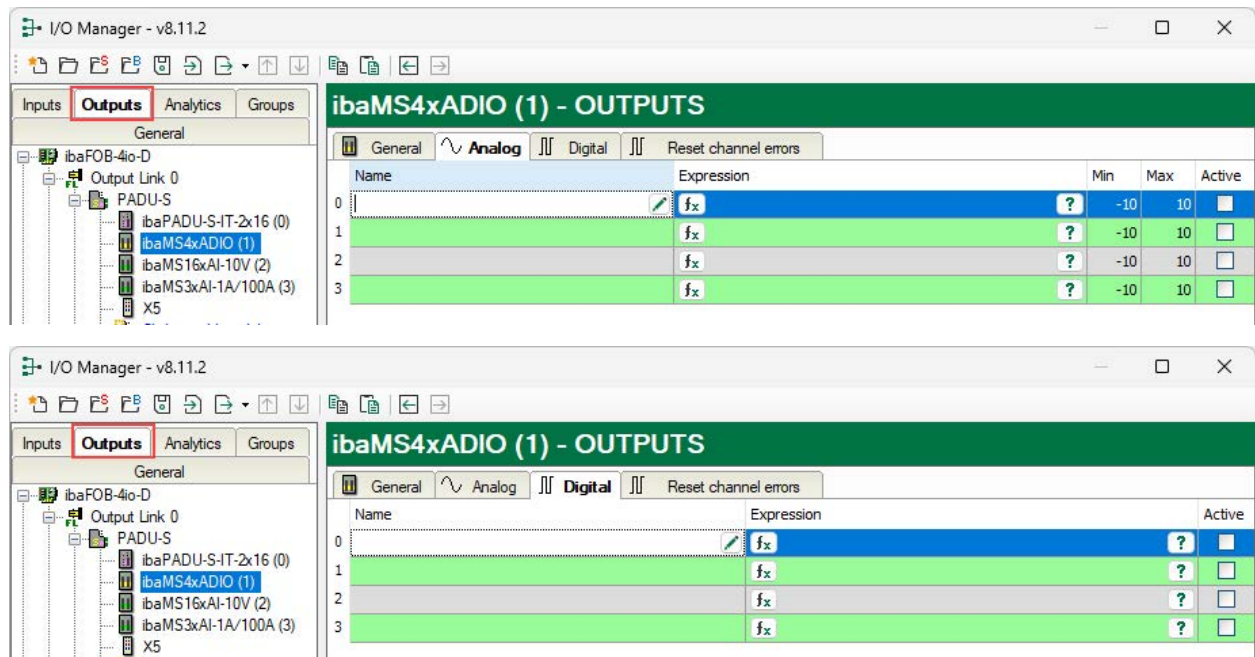
Minimum output timebase

Timebase with which the outputs can be updated as quickly as possible.


The value is acquired automatically by the system based on the current I/O configuration and is only displayed here. The output timebase results from the smallest common multiple of all module timebases or is at least 50 ms.

Analog and Digital tab


The *Analog* and *Digital* tabs have the same structure. The following parameters can be set:



Name

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

Expression

For each output you can specify a signal using the expression builder . Signals can be linked mathematically or logically.

Active

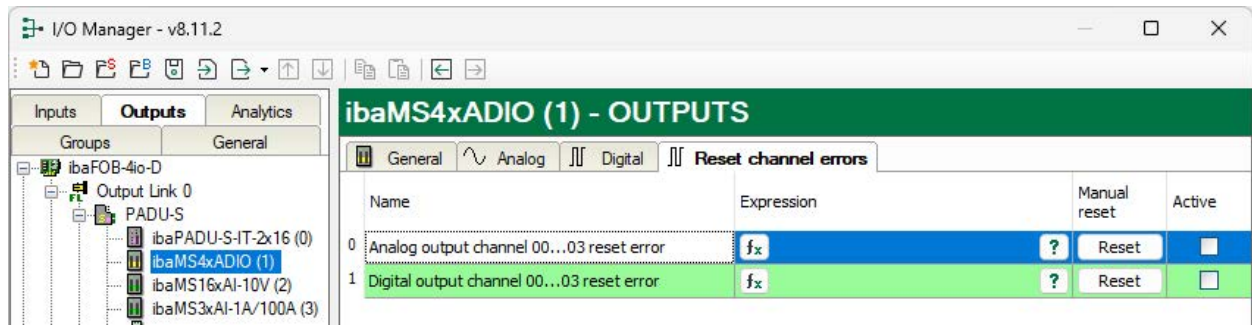
Enabling/disabling the signal.

9.1.4 Reset channel errors


In the *Outputs* section, under the *Reset channel errors* tab, hardware errors in the square root of the analog and digital outputs can be reset in two ways:

- Manual reset using the <Reset> button
- Automatic reset with an output signal


Make the following settings in the *Reset channel errors* tab:



Name

The signal name is already preset. You can add two comments when clicking the icon  in the *Name* field.

Expression

Using the expression builder  you can define an output signal for resetting a hardware error.

Active

Enabling/disabling the signal

9.2 Configuration with ibaLogic-V5

Combined with *ibaLogic-V5*, an *ibaPADU-S-IT-2x16* device can be used to realize individual signal preprocessing or stand-alone applications.

Other documentation

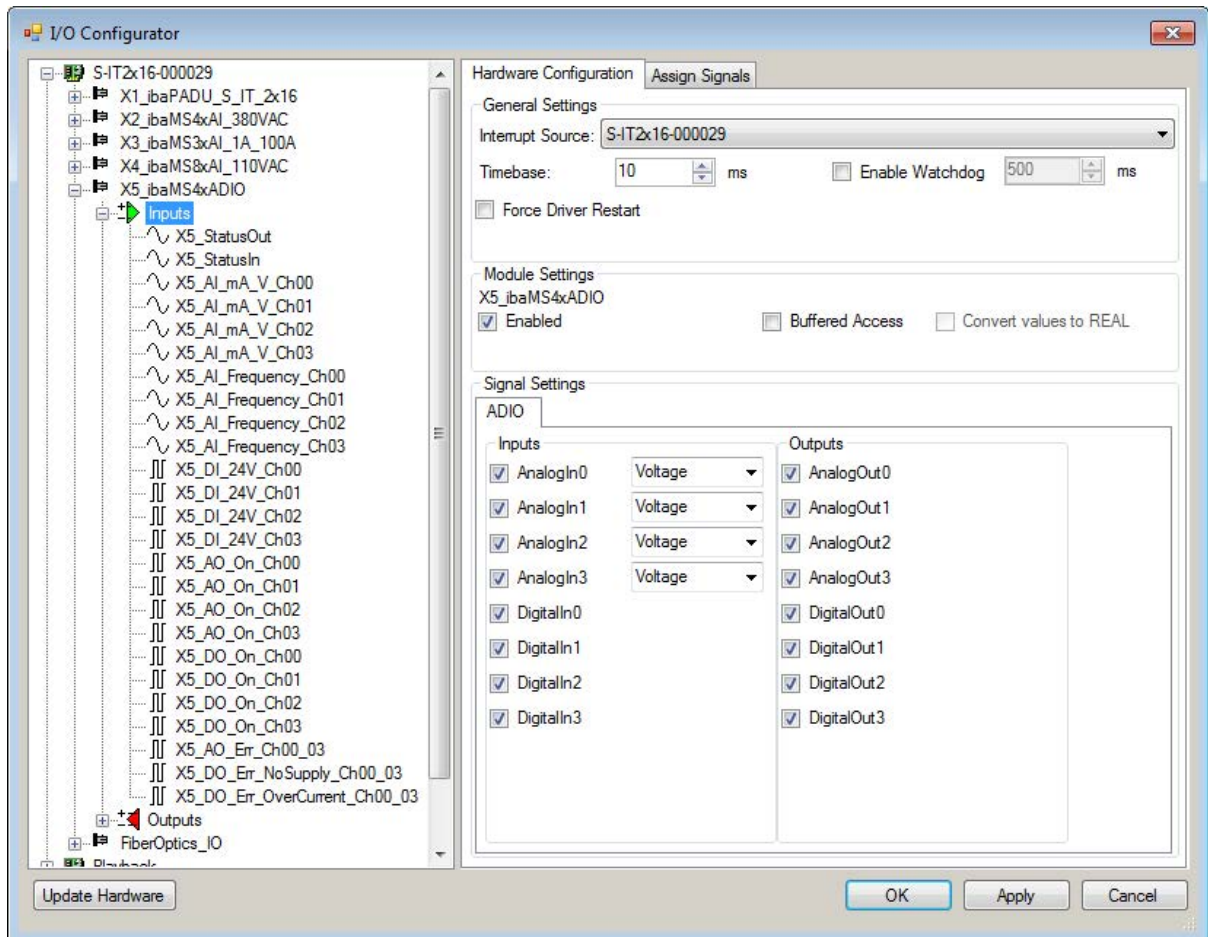


The basic procedure with *ibaLogic-V5* is described in the manual for the *ibaPADU-S-IT-2x16* central unit. This manual only describes the signals belonging to this module.

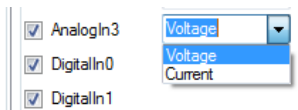
9.2.1 Configuring signals

The signals can be configured in the I/O Configurator of ibaLogic-V5.

1. Open the I/O Configurator in the *Tools – I/O Configurator* menu.
 2. First, click on the <Update Hardware> button.
- *ibaLogic* detects the module.



3. In the drop-down menu you can select between voltage or current input.



If *Buffered Access* is enabled, you can see additional input and output signals.

Note



You need to apply the *Buffered Access* by clicking on the <Apply> button. Only then, you will see additional signals in the signal tree that can be configured as output or input resources.

| Signal | Meaning |
|-----------------------------|---|
| Inputs | |
| AI_mA_V_Ch[00...03] | Analog input signals |
| AI_Frequency_Ch[00...03] | Calculated power frequencies |
| AO_On_Ch[00...03] | Analog output active |
| DI_24V_Ch[00... 03] | Digital input signals |
| DO_On_Ch[00...03] | Digital output active |
| AO_Err_Ch00...03 | Error of the quad root of analog outputs |
| DO_Err_NoSupply_Ch00_03 | Load voltage error of a quad root of digital outputs |
| DO_Err_OverCurrent_Ch00_03 | Quad root of the digital outputs is in error state due to overcurrent |
| StatusIn | Status information about the plugged input module (for output module without function): 0 = Module not initialized 1 = Module running >1 = Error (e.g. module cannot be initialized) |
| StatusOut | Status information about the plugged module (for input module without function): 0 = Module not initialized 1 = Module running >1 = Error (e.g. module cannot be initialized) |
| Outputs | |
| AO_10V_Ch[00... 03] | Analog output signals |
| AI_DigitalFilterMode | Enables the digital anti-aliasing filter in addition to the analog anti-aliasing filter (if enabled) |
| AI_AntiAliasingFrequency | Setting of the cut-off frequency of the digital anti-aliasing filter |
| AI_PwrFreqMode_Ch[00...03] | Setting of the measuring interval for power frequency measurement (per channel) |
| AI_EnableFilter_Ch[00...03] | Enables the analog anti-aliasing filters (per channel) |
| AO_ResetError_Ch00...03 | Output signal for resetting a hardware error |
| DO_24V_Ch[00... 03] | Digital output signals |

| Signal | Meaning |
|--|---|
| DO_ResetError_Ch00_03 | Output signal for resetting a hardware error |
| DI_DebType_Ch[00...03] | Debounce filter for digital signals |
| DI_DebTime_Ch[00...03] | Debounce time for the respective digital signal |
| Additional input signals for buffered access | |
| AI_mA_V_Ch[00...03]_buf | Input buffer of analog input signals |
| AI_Frequency_Ch[00...03]_buf | Input buffer of calculated power frequencies |
| DI_24V_Ch[00...03]_buf | Input buffer of digital input signals |
| AO_On_Ch[00...03]_buf | Input buffer for analog outputs “active” |
| DO_On_Ch[00...03]_buf | Input buffer for digital outputs “active” |
| AO_Err_Ch00... 03_buf | Input buffer for error signals when quad root of analog outputs is in error state |
| DO_Err_NoSupply_Ch00_03_buf | Input buffer for error signals when error in the load voltage of a quad root of digital outputs |
| DO_Err_OverCurrent_Ch00_03_buf | Input buffer for error signals when quad root of the digital outputs is in error state due to overcurrent |
| BufferFillCount | Counter, when buffer is filled |
| BufferOverrun | Counter for buffer overrun |
| Additional output signals for buffered access | |
| BufferSize | Buffersize |
| SubSampling | Subsampling of the signals |

9.2.2 Additional functions

Configuring the debounce filter

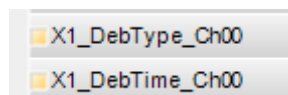
If you want to use debounce filters, these are made as configuration output and configured as Off-task connector (OTK) or function block.

Meaning of the outputs:

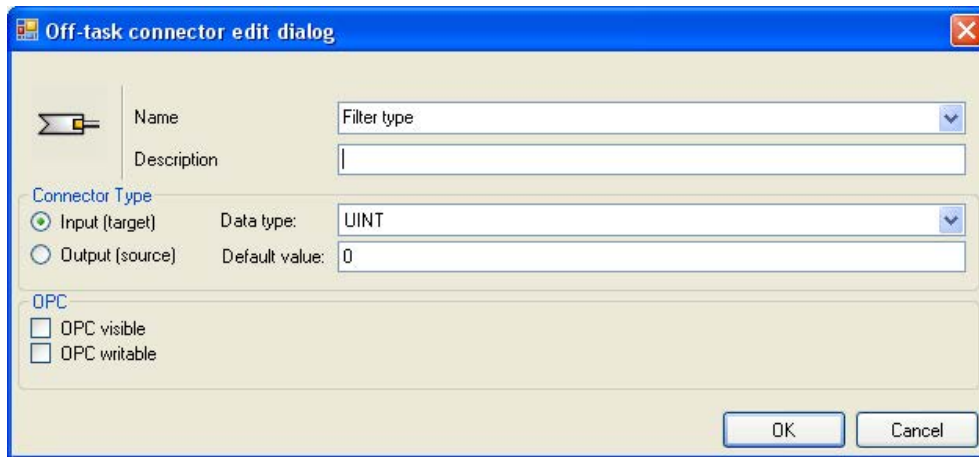
DebounceType_Ch[00...03]: Debounce filter for digital signals

DebounceTime_Ch[00...03]: Debounce time for the respective digital signal

First, drag the output signals defined in the I/O configurator to the margin of the programming surface, in this example “X1_DebType_Ch00” and “X1_DebTime_Ch00” for the digital input 0.



Create a new Off-task connector in the programming window, assign a meaningful name to the connector, e.g. “Filter type” and choose “Input” and Data type “UINT” under the Connector type option.



Meaning of the default values for the debounce filter:

- 0: Debounce filter switched off
- 1: Stretch rising edge
- 2: Stretch falling edge
- 3: Stretch both edges
- 4: Delay both edges

You find the explanations of the settings in chapter ↗ *Debounce filter inputs*, page 22.

Now, connect the OTK and the signal on the margin of the programming surface.

Create a new OTK, assign a meaningful name, e.g. debounce time and choose “Input” as type. Enter the debounce time in μs in the *Default value* field. The value can be 65535 at max.

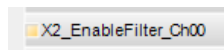
Now, connect the OTK and the signal on the margin of the programming surface.



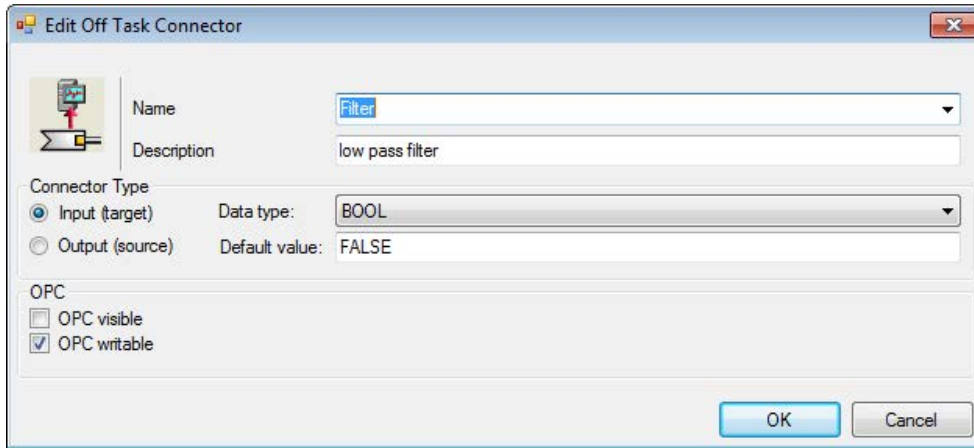
Enable analog filters

If you want to use debounce filters, these are created as configuration output and configured as Off-task connector (OTC) or function block.

First, drag the output signals defined in the I/O configurator to the margin of the programming surface, in this example “X2_EnableFilter_Ch00” for the analog input 0.



Create a new Off-task connector in the programming window, assign a meaningful name to the connector, e.g. “Filter” and choose “Input” under the *Connector type* option. The data type must be defined as BOOL.



Meaning of the default values for the anti-aliasing filter:

FALSE: switched off

TRUE: switched on

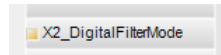
Now, connect the OTC and the signal on the margin of the programming surface.



The configuration of the following functions is similar to that of the analog filter described above. The meaning of the parameters in detail:

Digital anti-aliasing filter (DigitalFilterMode)

The digital anti-aliasing filter can only be enabled when sampling rate > 500 Hz.

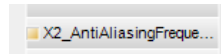


0: off (default setting)

2: Digital anti-aliasing filter enabled (once for all channels)

Data type: DINT

Cutoff frequency of the digital anti-aliasing filter (AntiAliasingFrequency)

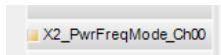


≤0: Auto = 1/3 of the sampling rate (default setting)

>0: cutoff frequency in Hz (permissible values: 100 Hz ... 0,5*sampling rate)

Data type: LREAL

Setting of the interval for power frequency measurement (PwrFrwqMode)



1: Measuring interval 1s

2: Measuring interval 10s (according to DIN EN 61000-4-30):

Data type: USINT

10 Technical data

In the following you will find the technical data and dimensions for *ibaMS4xADIO*.

10.1 Main data

Short description

| | |
|--------------|--|
| Description | ibaMS4xADIO |
| Description | Combi module with 4 analog and 4 digital inputs and 4 analog and 4 digital outputs |
| Order number | 10.124120 |

Supply

| | |
|------------------------|-------------------------------------|
| Power supply | 24 V DC, internal via backplane bus |
| Power consumption max. | 12 W |

Interfaces, operating and indicating elements

| | |
|-------------------|---|
| Indicators (LEDs) | 4 LEDs for operating status of the device 4 LEDs for status of the analog inputs 4 LEDs for status of the digital inputs 4 LEDs for status of the analog outputs 4 LEDs for status of the digital outputs |
|-------------------|---|

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 70 °C) |
| Mounting | Vertical, plugged into backplane |
| Cooling | passive |
| Humidity class | F, no condensation |
| Protection class | IP20 |
| Standards | EMC: IEC 61326- 1 FCC part 15 class A |
| Dimensions (width x height x depth) | 43 mm x 214 mm x 148 mm |
| Weight / incl. packaging | 0.7 kg / 1.1 kg |

10.2 Analog inputs

| | |
|--------------------------------|--|
| Number | 4 |
| Design | galvanically isolated, single ended can be configured: voltage (10 V) or current (20 mA) |
| Input signal range | |
| 10 V | -10 V ...+10 V |
| 20 mA | -20 mA ...+20 mA |
| Max. input voltage | ±60 V permanent |
| Resolution | 16 bit |
| Sampling rate | max. 40 kHz, freely adjustable ³⁾ |
| 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 (Tschebyscheff I) ⁴⁾ , 8th order, cutoff frequency can be adjusted |
| Input resistance | |
| voltage (U) | |
| device switched off | 80.6 kΩ |
| device switched on | 107.2 kΩ |
| current (I) | |
| device switched off | 50 kΩ |
| device switched on | 50 kΩ |
| Input capacity | |
| voltage (U) | 4.5 pF |
| current (I) | n/a |
| Frequency range | 0 Hz... 20 kHz |
| Accuracy | < 0.1 % of total measuring range |
| Electrical isolation | |
| Channel-channel | 1.5 kV AC |
| Channel - housing/power supply | 1.5 kV AC |
| Connector type | 1x 12-pin multi-pin connector; screw-type terminal (0.14 mm ² to 1.5 mm ²), screw connection, included in delivery |
| Additional functions | |
| Power frequency measurement | interval |
| 10 Hz... 80 Hz | 1 s / 10 s (according to DIN EN 61000-4-30) |

³⁾ sampling rate applies to the entire system

⁴⁾ can only be enabled when sampling rate > 500 Hz, cutoff frequency can be adjusted from 100 Hz to 0,5*sampling rate

10.3 Digital inputs

| | |
|--------------------------------|--|
| Number | 4 |
| 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 |
| Signal level log. 1 | < -10 V; > +10 V |
| Hysteresis | none |
| Input current | 1 mA, constant |
| Sampling rate | up to 40 kHz, freely adjustable* |
| Frequency range | 0 Hz... 20 kHz |
| Delay | Typ. 10 µs |
| Debounce filter | Optional: 4 different operating modes |
| Electrical isolation | |
| Channel-channel | 1.5 kV AC |
| Channel - housing/power supply | 1.5 kV AC |
| Connection type | 1x 8-pin multi-pin connector screw-type terminal (0.14 mm ² to 1.5 mm ²), screw connection, included in delivery |

10.4 Analog outputs

| | |
|--------------------------------|---|
| Number | 4 |
| Design | 1 root with 4 outputs |
| Resolution | 16 bit |
| Filter | R/C low-pass 40 kHz, permanent |
| Output signal range | -10 V ... +10 V |
| Load | ≥ 1 kΩ |
| R/C low-pass 40 kHz, permanent | max. 40 kHz ⁵⁾ , freely adjustable |
| Delay | 8 µs + 12 µs (12µs = settling time until 90 % of the output value is reached) |
| Accuracy | < 0.1 % of total measuring range |
| Electrical isolation | |
| Root-root | 1.5 kV AC |
| Root - housing/power supply | 1.5 kV AC |
| Connection type | 1x 10-pin multi-pin connector screw-type terminal (0.14 mm ² to 1.5 mm ²), screw connection, included in delivery |

⁵⁾ deviating output frequency with ibaLogic (up to 1 kHz) and ibaPDA (up to 20 Hz)

| Protective functions | |
|--|---|
| Safe state | channel root switched off |
| Current limitation | short circuit protection |
| Hardware error (e. g. overtemperature) | The root switches to „safe state“, when connection is incorrect (resettable via software) |

10.5 Digital outputs

| Number | 4 |
|---------------------------------------|--|
| Design | 1 root with 4 outputs, P switch |
| Load voltage | 24 V DC, external per root, protected against reverse polarity |
| Load voltage range | +10 V ... +30 V |
| Switching voltage (per channel) | = load voltage |
| Switching current (per channel) | 250 mA |
| Switching current range (per channel) | 10 mA ...500 mA |
| Inductive load | max. 200 mJ |
| Switching frequency | max. 40 kHz ⁶⁾ , freely adjustable |
| Switching delay | |
| Switch-on delay (90% to 10%) | < 10 µs |
| Switch-off delay (10% to 90%) | < 10 µs at 24 V DC switching voltage with 100 Ω |
| Electrical isolation | |
| Root-root | 1.5 kV AC |
| Root - housing/power supply | 1.5 kV AC |
| Connection type | 1x 6-pin multi-pin connector screw-type terminal (0.14 mm ² to 1.5 mm ²), screw connection, included in delivery |
| Protective functions | |
| Safe state | channel root switched off |
| Current limitation | from approx. 0.6 A per channel The root switches to „safe state“, when connection is incorrect (resettable via software) |

⁶⁾ deviating output/switching frequency with ibaLogic (up to 1 kHz) and ibaPDA (up to 20 Hz)

10.6 Decalaration of conformity

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

Unique Identifier: 10.124120 ibaMS4x-ADIO

Responsible Party - U.S. Contact Information

iba America, LLC

370 Winkler Drive, Suite C

Alpharetta, Georgia

30004

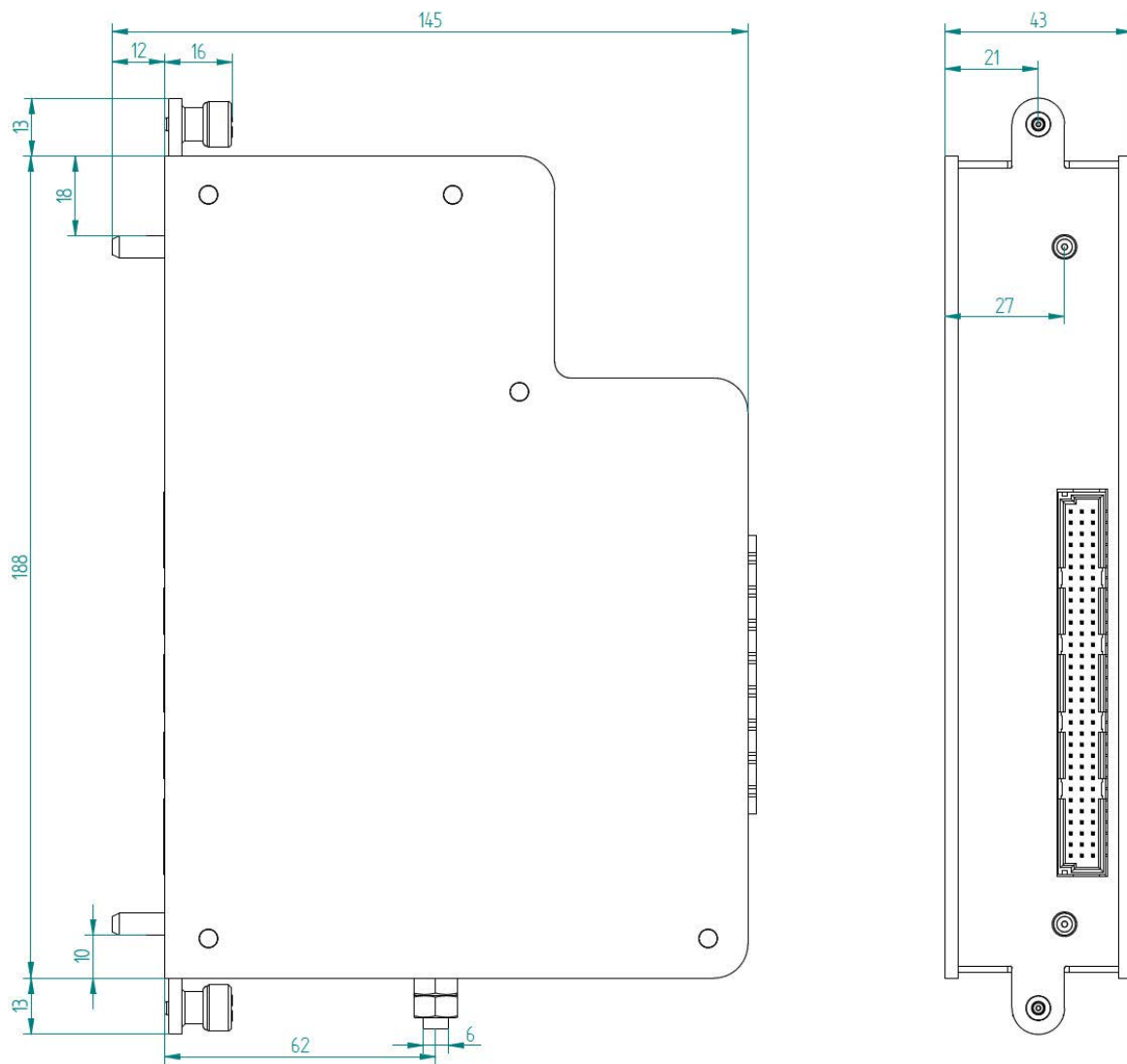
(770) 886-2318-102

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.

10.7 Dimensions



(dimensions in mm)

11 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.

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