ibaMS8xICP

Input module for ICP sensors

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 www.iba-ag.com.

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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.

Further international customary standards and directives have been observed.

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	08-2023	Scope of delivery , ibaPDA GUI			

Table of contents

1   About this manual

In this manual, you learn a lot about the design of the ibaMS8xICP device and how to use and operate it. 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.

Note

The documentation for the iba-modular system is part of the data medium "iba Software & Manuals". The documentation is also available at www.iba-ag.com in the download area.

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

❑ **Central units**
The manuals of the ibaPADU-S-IT-2x16 central units and ibaPADU-S-CM contain the following information:
- Scope of delivery
- System requirements
- Description of the device
- Mounting/Demounting
- Start-up
- Configuration
- Technical data
- Accessories

❑ **Modules**
The manuals for the single modules contain specific information about the module. There are the following information classes:
- Short description
- Scope of delivery
- Product characteristics
- Configuration
- Description of the functions
- Technical data
- Connection diagram

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

In this manual, the following notations are used:

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 ibaMS8xICP module is member 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 ibaMS8xICP module offers 8 analog inputs.

In brief

❑ I/O module for the iba-modular system

❑ 8 analog inputs

❑ 2 galvanically isolated groups of 4 inputs each (2 roots)

❑ Constant current source 4 mA

❑ Typically for ICP Sensors

❑ Input level ±5 V max. (AC coupled)

❑ Gain factors adjustable

❑ Sampling rate up to 40 kHz, freely adjustable

❑ 16 bit resolution

❑ Analog and digital filters per channel

❑ Rugged design, easy mounting

❑ Certification according to CE

Fields of application

Measurement of mechanical vibration by means of ICP accelerometers:

❑ Wind turbines

❑ Condition Monitoring

❑ Test benches

❑ Monitoring of bearings

❑ Mill chatter monitoring

3   Scope of delivery

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

The scope of delivery comprises:

❑ ibaMS8xICP device

❑ 2 x 12-pin multi-pin connector

❑ Data medium „iba Software & Manuals" (only for single delivery)

4   Safety instructions

4.1   Intended use

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

❑ Measurement data acquisition

❑ Automation of industrial plants

❑ Applications with iba products (ibaPDA, ibaLogic etc.)

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

4.2   Special safety instructions

⚠ DANGER

Strictly observe the measuring range (see Technical Data)!

Never use damaged measuring cables!

Measuring cables must NOT be attached or detached to/from the device under voltage!

⚠ WARNING

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.

⚠ 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! Opening the device will void the warranty!

> **Note**
>
> Clean the device only on the outside with a dry or slightly damp and statically discharged cloth.

5 System Requirements

5.1 Hardware

❑ Central unit: ibaPADU-S-IT-2x16 or ibaPADU-S-CM (version 02.10.001 or later)

❑ Backplane unit, e. g. ibaPADU-B4S

5.2 Software

❑ ibaPDA version 6.34.0 or later

❑ ibaLogic-V5 version 5.0.2 or later

> **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, Connecting, Dismounting

⚠ CAUTION

Works on the device must NOT be done when it is under voltage! Always disconnect the central unit from the power supply!

ℹ 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

1. Disconnect the central unit from the power supply.

2. Remove the cover from the backplane bus, to which the module should be attached.

3. Attach the device to the backplane bus and press it firmly against the backplane.

4. Secure the device with the fixing screws.

ℹ Important Note

Always screw tight the device and the modules. Otherwise, plugging or unplugging the connectors for the inputs/outputs can cause damage.

6.2   Connecting

ℹ Note

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

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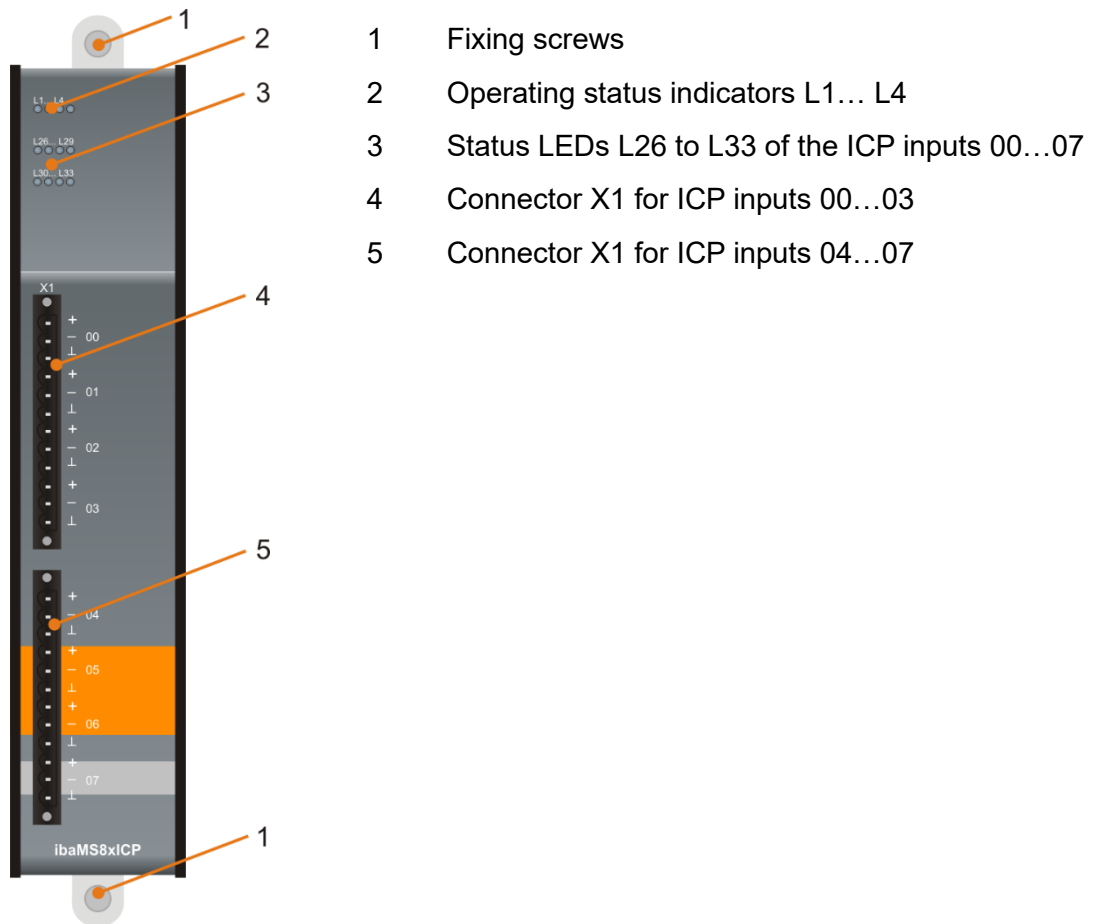
2. If all required cables are connected, connect the central unit to the power supply.

3. Switch on the central unit.

6.3   Dismounting

1. Disconnect the central unit from the power supply.

2. Remove all cables.

3. Remove the both fixing screws on the upper and the lower side of the device.

4. Pull the device straight from the backplane.

5. Put the cover on the backplane bus.

7 Device description

7.1 Views

1	Fixing screws
2	Operating status indicators L1… L4
3	Status LEDs L26 to L33 of the ICP inputs 00…07
4	Connector X1 for ICP inputs 00…03
5	Connector X1 for ICP inputs 04…07

7.2 Indicating elements

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

7.2.1 Operating status

LED	Status	Description
L1: green	Flashing / On	Device is working
	Off	Device is not working (switched off)
L2: yellow	On	Access to the backplane bus
L3: white	-	-
L4: red	Off	Normal status, no faults
	Flashing	Device failure

Important note

When the LED L4 indicates a failure, please contact the iba Support.

7.2.2   Indicators ICP inputs

The LED display is described with a gain of 0 dB by way of an example.

LED per channel	Status/meaning		Description for 0dB (approx. values)
L26 … L33	Off	No signal, signal too low	± (0 V … 0.16 V)
	Green	Within measuring range	± (0.16 V…4 V)
	Yellow	End of measuring range	± (4 V …5 V)
	Red	Out of measuring range	> ± 5 V

7.3   Analog inputs X1

Important note

It is typical for an ICP input, that a channel requires a settling time of about 10 to 50 seconds after the gain factor was changed.

This also applies, if the signal was overdriven for a short time.

7.3.1   Input gain

The channel input gain can be adjusted per channel as follows:

- 0dB
- 6dB
- 12dB
- 20dB

7.3.2   Filter

There are the following filters per channel:

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

* only with ibaPDA
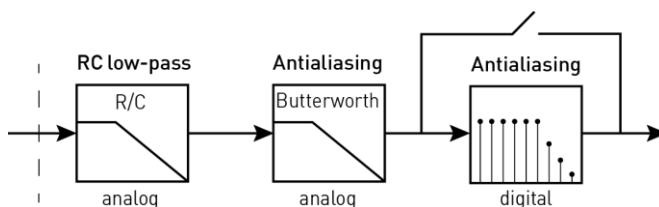
Filter sections

7.3.3   Connection diagram / pin assignment

Here, you can connect 8 input signals (0 ... 7), each bipolar plus grounding. The connector provides 2 groups of 4 input channels with common root each. Each connector /each root is galvanically isolated.
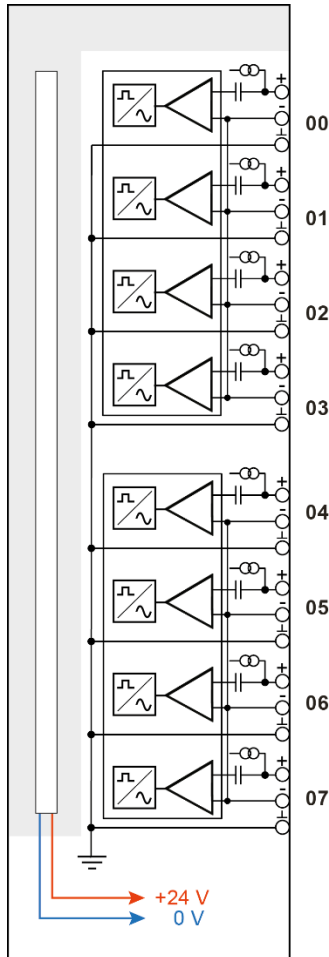
Pin assignment

Pin	Connection	LED	Pin	Connection	LED
1	Analog input 00 +		1	Analog input 04 +	
2	Analog input 00 −	L26	2	Analog input 04 −	L30
3	Analog input 00 ⏚		3	Analog input 04 ⏚	
4	Analog input 01 +		4	Analog input 05 +	
5	Analog input 01 −	L27	5	Analog input 05 −	L31
6	Analog input 01 ⏚		6	Analog input 05 ⏚	
7	Analog input 02 +		7	Analog input 06 +	
8	Analog input 02 −	L28	8	Analog input 06 −	L32
9	Analog input 02 ⏚		9	Analog input 06 ⏚	
10	Analog input 03+		10	Analog input 07 +	
11	Analog input 03 −	L29	11	Analog input 07 −	L33
12	Analog input 03 ⏚		12	Analog input 07 ⏚	

8   Start-up / Update

Important note

Installing an update can take some minutes. Please do not switch off the device when an update is running. This might damage the device.

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. Thereafter, the module is ready to be used.

Important note

The "overall release version" contains all modules developed up to the date of release of this firmware and the corresponding software versions. If a module cannot be detected, yet (i.e. it is more recent than the Firmware version of the CPU), this module is ignored and outlined in red on the web interface.

In this case, a new update file has to be installed for the "overall release version". If you want to get the current update file, please 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.

Important note

If you require support, specify the „overall release version".

8.3   Update

An update can be installed in two different ways.

❑ Web interface (only with ibaPADU-S-IT-2x16)

❑ ibaPDA

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.

> **i** **Important 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 Update via web Interface

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

❑ Start the website of the iba-modular system in your browser and select the central unit.

❑ On the "update" tab, click on the <Browse…> button and choose the <padusit2x16_ v[xx.yy.zzz].iba> update file.

❑ By clicking on <Start Update>, you start the update.

Module 0 : ibaPADU-S-IT-2x16

info	firmware	eventlog	passwords	network	time	backup	update

Note: any ibaLogic application will be aborted on updating firmware.
   ibaLogic might not be compatible to the new firmware release after update
   and therefore might not run properly.
   An update of ibaLogic might be required.

Install software: [   ] [Browse...] [Start Update]

Restart device: [Reset]

8.3.2 Update via ibaPDA

❑ Open the ibaPDA I/O Manager and choose your iba-modular system in the tree structure.

❑ On the "Diagnostics" tab, click on the <Write firmware> button and choose the „padusit2x16_v[xx.yy.zzz].iba" or „paduscm_v[xx.yy.zzz].iba" update file.

❑ You start the update by clicking on <OK>.

PADU-S

General | Analog | Digital | Diagnostics

Version information

Hardware version: A0   Firmware version: v02.10.001

Slot	Type	Hardware version	Firmware version	FPGA version	Serial number
X1	ibaPADU-S-IT-2x16	A0	E2	v00.38.9523	29
X2	ibaMS16xAI-10V	B0	E0	v02.05.0039	999010
X3	ibaMS8xICP	A5	E0	v01.05.0009	60
X4	ibaMS4xUCO	A0	E0	v01.02.0025	5
X5	ibaMS3xAI-1A/100A	B0	E0	v02.04.0015	1000

[Write firmware]   [Reset to factory defaults]

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 (see also the figure above).

8.4.2   Web interface

On the module website, general information about the module is displayed. You cannot change the values.

i **Important 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	000153	
Hardware version	A4	
Firmware version	E1	
Process-IO		
ICP channels	8	
grouping	isolated channels	
resolution	16 bits	
channel parameters		
gain	0 / 6 / 12 / 20 dB	adjustable
analog filter	20 kHz, 4th order	Butterworth

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 in 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.

Read configuration from device

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   "General" tab

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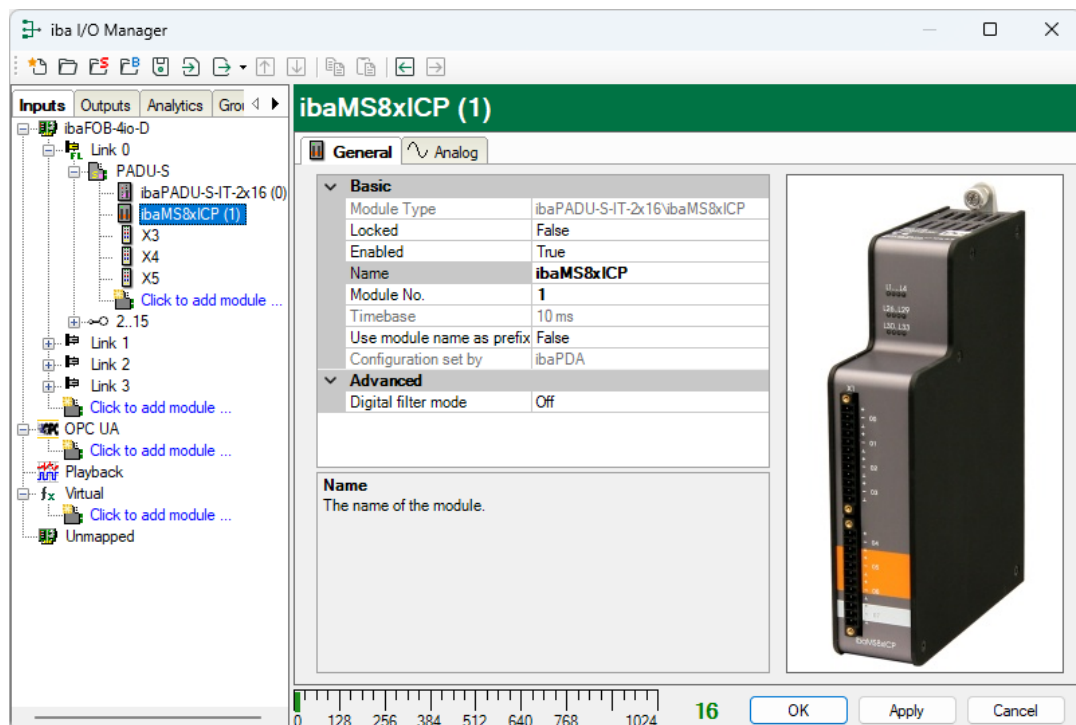
Basic

❑ Module Type
Display of module type (read only)

❑ Locked
True: the module can only be changed by an authorized user.
False: the module can be changed by any user.

❑ Enabled
Data capturing for this module is enabled.

❑ Name
You can enter a name for the module.

❑ Modul No.
Consecutive module number assigned by ibaPDA for clearly referencing the signals, e.g. in expressions or ibaAnalyzer. The number can be changed by the user.

❑ Timebase
Timebase, specified in the PADU-S module.

❑ Use name as prefix
Prefix the signal names of this module with the module name.

❑ 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

When 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

When 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 possible to import user-defined signal names, which are configured in the embedded application, provided that the embedded application supports this function (Import signal names: True).
The modules and signals configured by the embedded application cannot be configured in ibaPDA, they are displayed in gray in the respective fields.
The configuration is read by ibaPDA and used for the acquisition. Modules and signals which are not displayed in gray can be used in ibaPDA.

Advanced

❑ Digital filter mode
When you select „Anti-aliasing" then after the analog anti-aliasing filter an additional digital anti-aliasing filter is applied to the signals. 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 on the "Analog" tab. This means, that the digital anti-aliasing filter can only be activated together with the analog filter by activating the filter option on 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.
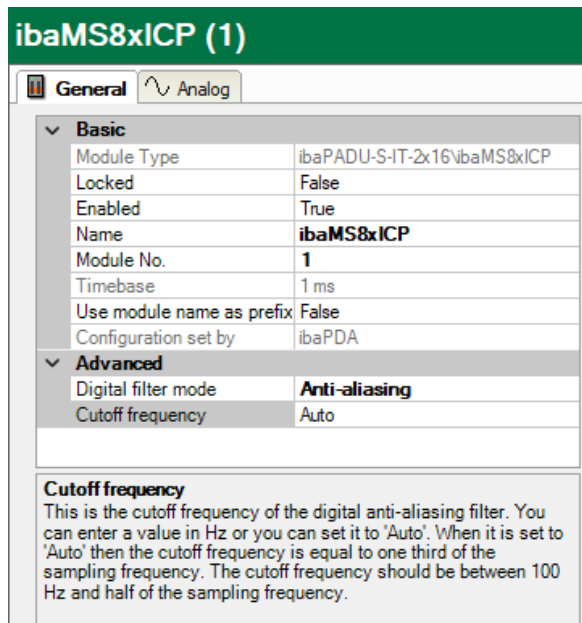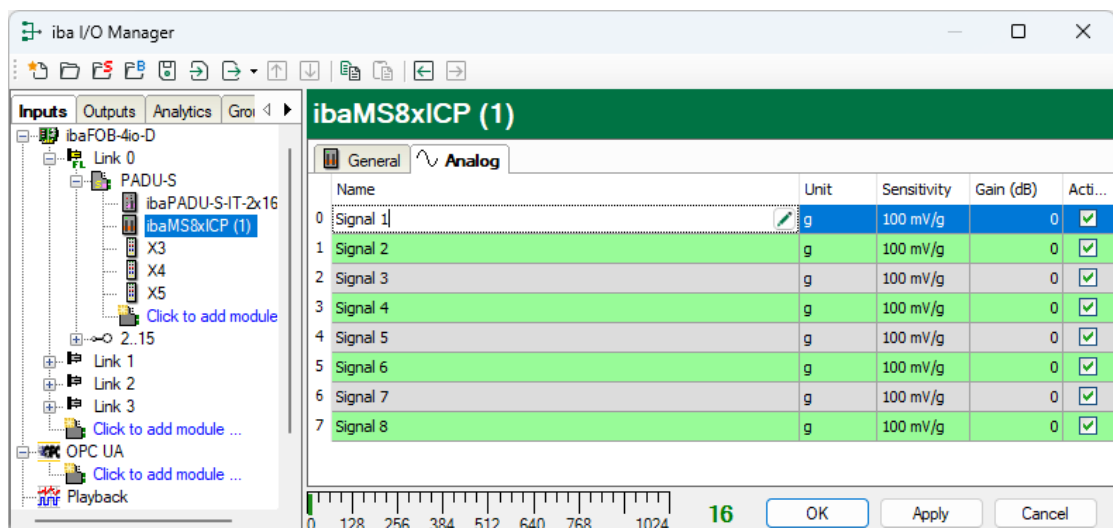

Permissible values: 100 Hz … 0,5*sampling rate
The entry "0" Hz corresponds to the setting "Auto".

9.1.2   "Analog" tab

The following settings apply to the "Analog" tab:

❑ Name

You can enter a name for the signal and two additional comments (click on the ✏ icon in the Name field).

❑ Unit

You can enter a unit, the default setting is „g".

❑ Sensitivity

Enter here the sensitivity according to the used ICP sensor.

❑ Gain

Choose a gain factor from the dropdown menu.

Sensitivity	Gain (dB)	Active
100 mV/g	0 ▾	☑
100 mV/g	0	☑
100 mV/g	6	☑
100 mV/g	12	☑
100 mV/g	20	☑
100 mV/g	0	☑
100 mV/g	0	☑

The gain factor can be selected per channel: 0dB, 6dB, 12dB or 20dB.

❑ 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).

## 9.2   Configuration in ibaLogic-V5

Other documentation

Combined with ibaLogic-V6, an ibaPADU-S-IT-2x16 device can be used to realize individual signal pre-processing or stand-alone applications. You find the basic way of proceeding description in the separate ibaPADU-S-IT-2x16 manual. This manual describes only the signals belonging to this module.

9.2.1   Configuring signals

The signals can be configured in the I/O Configurator of ibaLogic-V5. Open the I/O Configurator in the "Tools – I/O Configurator" menu. When you click on the <Update hardware> button, then ibaLogic detects the module.
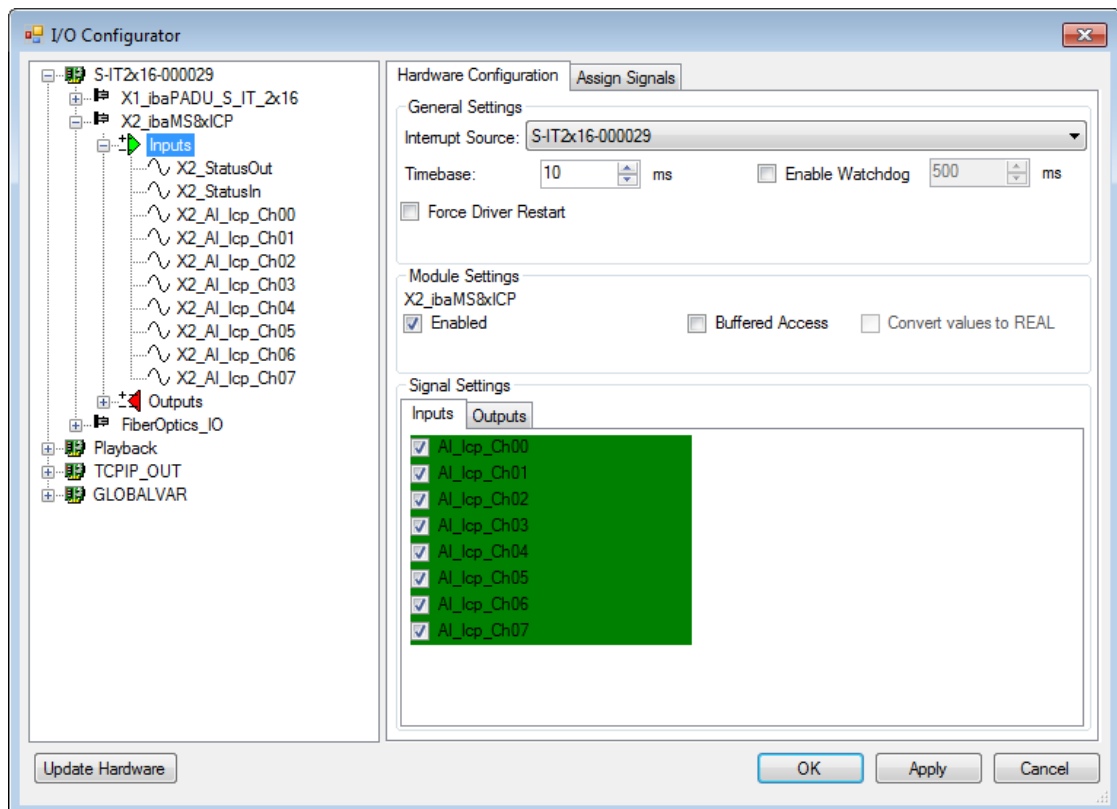
The analog input channels are displayed in the „Inputs" tab.
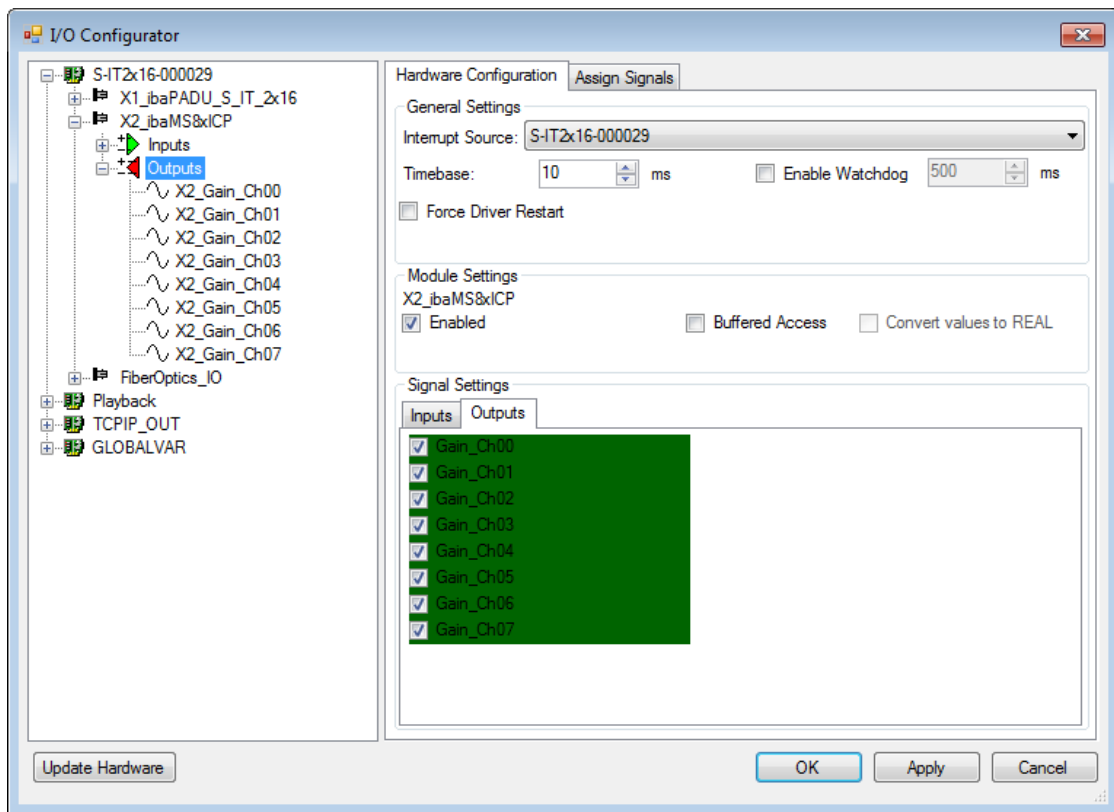
If "Buffered Access" is enabled, you can see additional input and output signals.

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	Description
Inputs	
AI_Icp_Ch[00...07]	Analog input signals
StatusIn	Status information about the plugged input module (for output module without function): 0 = Module not initialized 1 = Module running >1 = Mistake (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 = Mistake (e.g. module cannot be initialized)
Outputs	
Gain_Ch[00...07]	Gain factor per channel
Additional input signals for buffered access	
AI_Icp_Ch[00...07]_buf	Input buffer of analog input signals
BufferFillCount	Counter, when buffer is filled

Signal	Description
BufferOverrun	Counter for Buffer-overrun
Additional output signals for buffered access	
BufferSize	Buffersize
SubSampling	Subsampling of the signals

9.2.2   Configuring input gain

If you want to use gain factors, these are made 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_Gain_Ch00" for the analog input 0.
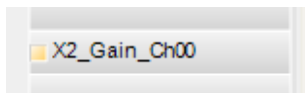
Create a new Off-task connector in the programming window, assign a meaningful name to the connector, e.g. "Gain" and choose "Input" and Data type "UINT" under the Connector type option.

Meaning of the default values for the input gain:

0   gain switched off

6   gain = 6 dB

12   gain = 12 dB

20   gain = 20 dB

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

10   Technical Data

10.1   Main data

Short description	
Name	ibaMS8xICP
Description	Input module with 8 analog inputs for ICP sensors
Order number	10.124300
Power supply	
Power supply	DC 24 V, internal via backplane bus
Power consumption	Up to 12 W
Operating and indicating elements	
Indicators	4 LEDs for device status
	8 LEDs for status of the analog inputs
Operating and environmental conditions	
Temperature ranges	
Operation	32 °F … 122 °F (0 °C … 50 °C)
Storage/transport	-13 °F … 158 °F (-25 °C … 70 °C)
Installation position	Vertical, plugged into backplane bus
Cooling	Passive
Humidity class	F, no condensation
Protection class	IP20
Certification/Standards	EMC: IEC 61326-1
	FCC part 15 class A
Dimensions (Width x height x depth)	1.69 in x 8.43 in x 5.83 in (43 mm x 214 mm x 148 mm)
Weight (incl. packaging and documentation)	approx. 2.43 lbs (1.1 kg)

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

Unique Identifier: 10.124300   ibaMS8xICP

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   Analog inputs

Analog inputs (ICP inputs)	
Number	8
Design	2 galvanically isolated groups of 4 inputs each (2 roots), single ended
	Integrated constant current source 4 mA (24 V DC)
	Direct connection of ICP sensors
Resolution	16 bit
Filters	
permanent	R/C low-pass, 1st order, 40 kHz, Analog anti-aliasing filter (Butterworth), 4th order, 20 kHz
in addition	Digital anti-aliasing filter (Tschebyscheff I)*, 8th order, cutoff frequency can be adjusted
Input signal range	-5.0 V to +5.0 V (0 dB gain)
Gain	adjustable 0 dB, 6 dB, 12 dB or 20 dB, can be configured per channel
Sampling rate	Up to 40 kHz, freely adjustable
Frequency range	0.1 Hz to 20 kHz
Electrical isolation	
Channel - channel	AC 1.5 kV
Channel – housing/power supply	AC 1.5 kV
Connector type	2 x 12-pin multi-pin connector, screw-type terminal (0.14 mm^2 to 1.5 mm^2), screw connection, included in delivery
Sensor cable length	Up to 30 m at 100 pF/m cable capacitance and a bandwidth of used signals up to 20 kHz

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

10.3   Dimensions
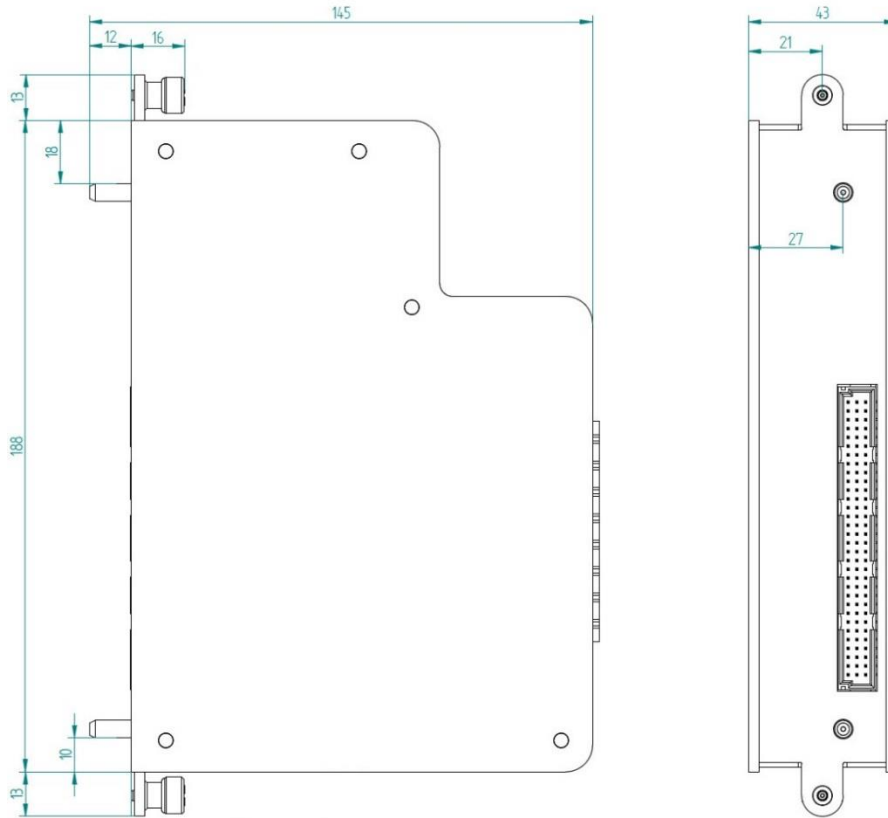
(dimensions in mm)

11   Support and contact

Support

Phone: +49 911 97282-14

Fax: +49 911 97282-33

E-Mail: support@iba-ag.com

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i   **Note**

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

Contact

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