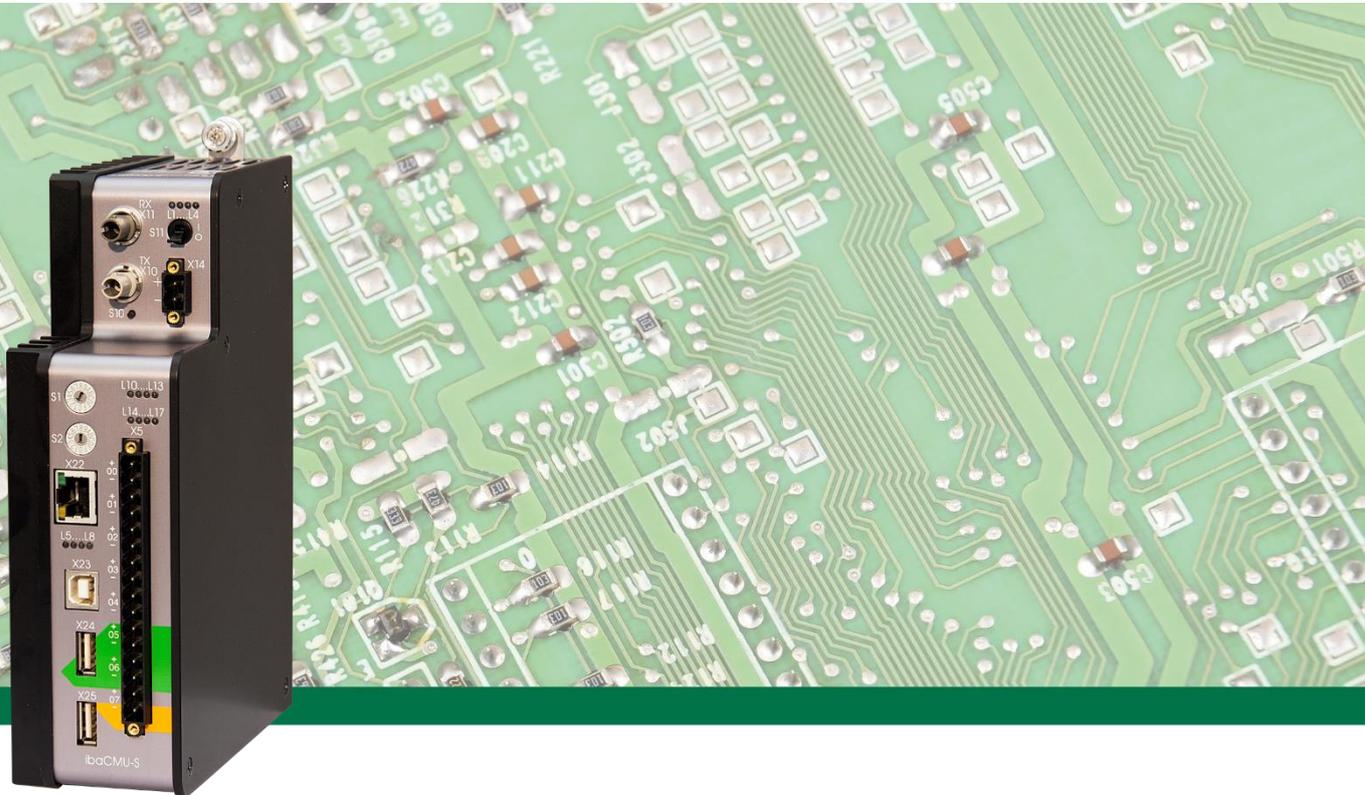




See the Big Picture



ibaCMU-S

Condition Monitoring Unit

Manual

Issue 1.3

**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>.

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.



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	Section	Auhtor	Version HW/FW
1.3	03/12/2019	Firmware update, connection to ibanet750-BM-D	8.7, 8.9.4	Ms, st	

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1 About this manual

In this manual, we describe the design, configuration and operation of the ibaCMU-S device. You find a general description of the modular system and further information about the design and about how to use and operate the modules in separate manuals.



Note

The documentation of the iba Condition Monitoring product family is part of the DVD which is included in delivery.

The documentation of the iba Condition Monitoring product family comprises the following manuals:

□ **Condition Monitoring Center ibaCMC**

Analysis and configuration Backend for ibaCMU-S Condition Monitoring Units.

□ **Condition Monitoring Unit ibaCMU-S**

Manual about the Condition Monitoring Unit ibaCMU-S contains the following information:

- Scope of delivery
- System requirements
- Mounting / Dismounting
- Description of the device
- System integration
- Updates
- Additional functions
- Technical Data
- Accessories

□ **Module**

The manuals of the individual modules contain specific information about the module. These 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 Designations

The following designations are used in this manual:

Action	Designations
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!
-

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.



Important note

Note if some special features must be observed, for example exceptions from the rule.



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 iba Condition Monitoring (CM) system is a comprehensive, flexible and scalable system for condition monitoring of production plants. It can be used in many different applications like wind power, hydropower, metals industry, paper industry, logistics and mining.

The main feature is the early fault detection of drive trains, the clear and easy production data representation and the automatic alarming in case of incidents. To fulfill this functionality data from the production plant is acquired and analyzed automatically. The data can be acquired from sensors (e.g. vibration) mounted during the system installation or from the existing automation environment of the plant.

The iba-CM system consists of the Condition Monitoring Unit ibaCMU-S (also short CMU), which will be addressed in this manual, and the server based Condition Monitoring Center ibaCMC, with a powerful database in the background. Please refer to the specific ibaCMC documentation if you need additional information about it.

The core component of the iba-CM system is the so called Condition Monitoring Unit (ibaCMU-S). It performs the data acquisition, analysis and buffering. The type and number of inputs can be configured to the needs of the application as well as the kind of calculation applied to the measured signals.

This manual explains the steps to configure the ibaCMU-S and its parameters. It is intended to be used by system administrators and it requires basic technical knowledge and experience with network infrastructures.



Figure 1: ibaCMU-S with 4 I/O modules

3 Scope of delivery

After having unpacked the delivery, please check it for completeness and have a look if any parts might be damaged.

The scope of delivery comprises:

- ibaCMU-S device
- Covering caps for FO cables, USB and Ethernet
- 16-pin terminal block with spring terminals (digital input channels)
- 2x 2-pin terminal block with spring terminals (voltage supply)
- Manual (German and English)
- DVD (iba Software & Manuals)

4 Safety instructions

4.1 Proper use

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

- Acquisition of measurement data
- Condition Monitoring
- Applications with iba products (ibaCMC, ibaPDA, ibaLogic etc.)

The device is only to be applied as shown in the Technical Data in chapter 12.

4.2 Special safety instructions

⚠ CAUTION**Strictly observe the operating voltage range!**

Never supply the device with a voltage other than 24 V DC $\pm 10\%$!
A higher voltage may destroy the device or be dangerous to life!

⚠ WARNING

Modules and CPU must NOT be attached or detached to/from the rack under voltage!
Switch off ibaCMU-S or disconnect power supply before attaching/detaching the modules.

**Important note**

Do not open the device! Opening the device leads to a loss of warranty!

⚠ CAUTION

Make sure that the cooling fins get optimal ventilation!

**Note**

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

5 System Requirements

5.1 Hardware

For operation

- Current supply 24 V DC \pm 10 %, 3 A (fully equipped)
- Backplane unit, e.g. ibaPADU-B4S, see chap. 13 *Accessories and related products*
- Supported I/O modules:
 - ibaMS8xICP
 - ibaMS8xIEPE
 - ibaMS16xAI-10V
 - ibaMS16xAI-24V
 - ibaMS16xAI-20mA
 - ibaMS32xDO-24V

For configuration of the device:

- PC with network card

For measuring with ibaPDA (optional):

- PC with the following minimum equipment
 - one free PCI slot, or
 - one free PCI Express slot, or
 - one ExpressCard/54 slot (Notebook).

On the iba homepage <http://www.iba-ag.com> you find suitable computer systems with desktop and industry housing.

- One FO input card of the ibaFOB-D type (firmware version V2.00 build 170 and higher):
 - ibaFOB-io-D / ibaFOB-io-Dexp
 - ibaFOB-2io-D / ibaFOB-2io-Dexp
 - ibaFOB-2i-D / ibaFOB-2i-Dexp with additional module ibaFOB-4o-D
 - ibaFOB-4i-D / ibaFOB-4i-Dexp with additional module ibaFOB-4o-D
 - ibaFOB-io-ExpressCard (for Notebooks)
- FO cable bidirectional and/or Ethernet cable

5.2 Software

- ibaCMC Condition Monitoring Center
- Microsoft® SQL Server 2012 Database server.

For measuring with ibaPDA (optional):

- ibaPDA version 6.39.0 or higher

**Note**

A software license for processing up to 8 vibration inputs is supplied with ibaCMU-S. License upgrades for up to 32 channels are available.

5.3 Firmware

- ibaCMU-S version v02.17.001 or later

6 Mounting, Connecting, Dismounting

6.1 Things needed to get started

To start with a new ibaCMU-S you will need the following things:

- ibaCMU-S central unit
- ibaPADU-S-B4S or B1S backplane (depending on the number of I/O modules you want to connect)
- ibaMS8xICP, ibaMS8xIEPE or ibaMS16xAI I/O modules for data acquisition according to your needs
- ibaCMU-S software license (already preinstalled on the central unit)
- 24V/5A power supply
- RJ45 CAT 5e Ethernet cable
- PC or laptop with Microsoft® Windows 7® operating system (32 or 64 bit)
- Administrator privileges on the PC or laptop

6.2 Mounting

WARNING

Modules and CPU must NOT be attached or detached to/from the rack under voltage!
Switch off ibaCMU-S or disconnect power supply before attaching/detaching the modules.

The ibaCMU-S central unit and the I/O modules first need to be mounted on the backplane.

1. Mount the backplane on an appropriate construction.
2. Connect the ground terminal.
3. Attach the device to the left slot.
Please take into account that the guiding bolts on the rear side of the device have to be inserted into the corresponding holes on the backplane.
4. Press the device firmly against the backplane and secure it with the fixing screws.



Important note

Always screw tight the device and the modules. If you do not screw it tight, connecting or disconnecting the connectors for the inputs and outputs might cause damages.



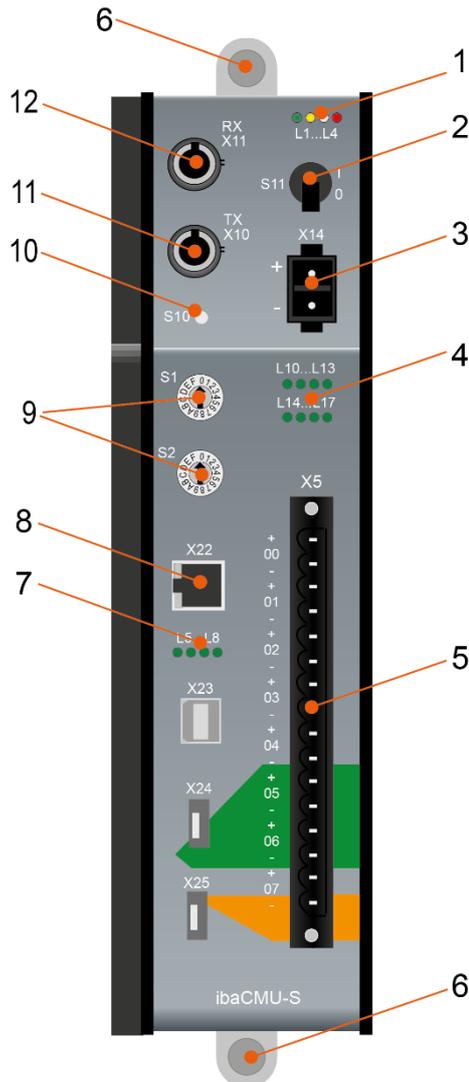
Figure 2: Mounting ibaCMU-S to the backplane

6.3 Dismounting

1. Switch off the device.
2. Remove all cables.
3. Hold tight the device and remove the both fixing screws on the upper and the lower side of the device.
4. Pull the device straight from the backplane.

7 Device description

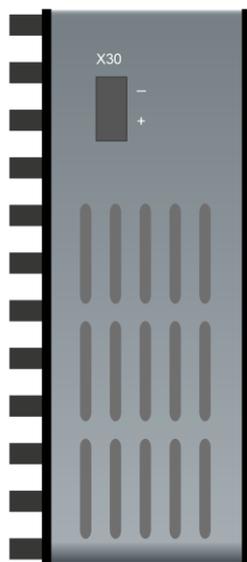
7.1 Views



- 1 Operating status indicators L1...L4
- 2 On/off switch S11
- 3 Connector for voltage supply 24 V X14
- 4 Indicators of digital inputs L10...L17
- 5 Connector for digital inputs X5
- 6 Fixing screws
- 7 Indicators of device functions L5...L8
- 8 Network interface X22
- 9 Rotary switches S1, S2
- 10 System function pushbutton S10
- 11 Connector FO output (TX) X10
- 12 Connector FO input (RX) X11

X23 for service purposes only
 X24, X25 USB host interfaces for upcoming functions

Figure 3: Front view



Connector for buffer voltage 9...15 V DC X30 (HW B3 or higher)

Figure 4: Bottom view

7.2 Indicating elements

7.2.1 Operating status L1...L4

The operating status of the device is shown by colored status LEDs on the device.

LED	Color	Status	Description
L1	Green	Flashing (every 2 s)	Device is working Deviations in the flashing period point out overload or booting of the device. Booting can take up to 90 s.
		On or off	Controller halted, device "crashed", device 100 % processor load (constantly on)
		Flashing fast (appr. every 100 ms)	System programming mode Update mode
L2	Yellow	Off	Not used
L3	White	Off	no input signal on RX
		Flashing	Input signal on RX detected, but protocol mismatch
		On	input signal on RX is ok
L4	Red	Off	Normal status, no faults
		Flashing	Disturbances, internal device applications do not run correctly.
		On	Device failure (Failure during start up)



Important note

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

7.2.2 Device functions L5...L8

The LEDs L5 to L8 indicate the status of the device functions, description see chapter 8.1.

7.2.3 Digital inputs L10...L17

The green LEDs show if the digital input is active or not.

LED	Status	Description
L10...L17	Off	No signal, logical 0
	On	Signal ok, logical 1

7.3 Operating elements

7.3.1 On/off switch S11

Position	Status	Description
0	Off	Switched off, no voltage applied
I	On	Switched on, voltage applied

By switching off and on again, the supply voltage is disconnected or connected and the device is rebooted.

7.3.2 Rotary switch S1 and S2

□ S1

Position	Description
0	virtual channel transmission off, ibaNNet750 switched on
1	virtual channel transmission on, ibaNNet750 switched off
2 to F	not used by ibaCMU-S

The virtual channel setting needs to match the settings in the hardware configuration file (conf.hardware.xml).

□ S2

not used by ibaCMU-S (default value "0")

7.3.3 System function pushbutton S10

Used for advanced settings on the device directly.

7.4 Communication interfaces

7.4.1 FO output (TX) and FO input (RX) X10, X11

Connection	Description
X10 output (TX)	FO send interface
X11 input (RX)	FO receive interface

7.4.2 Network interface X22

You can integrate the device in an Ethernet network via the X22 network interface.

7.5 Digital inputs X5

7.5.1 Connection diagram / Pin assignment

Here, you can connect eight input signals (0...7), each bipolar and electrically 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.

➔ See chapter 12 „Technical Data“

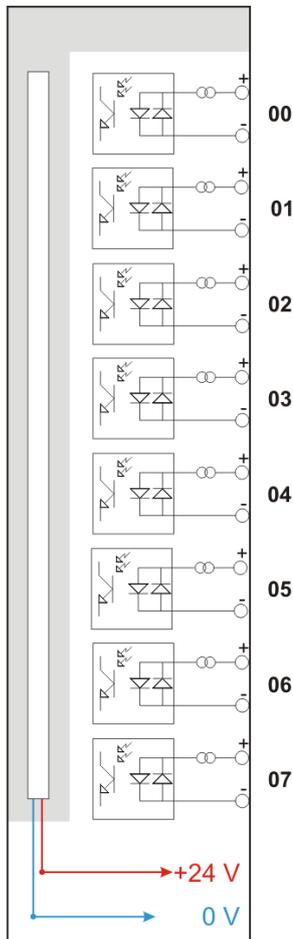


Figure 5: Connection diagram for digital inputs X5

7.5.2 Debounce filters

For the digital inputs, there are four debounce filters for each. These can be chosen and configured for each signal independently. 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 $[1\mu\text{s} \dots 65535\mu\text{s}]$.

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.

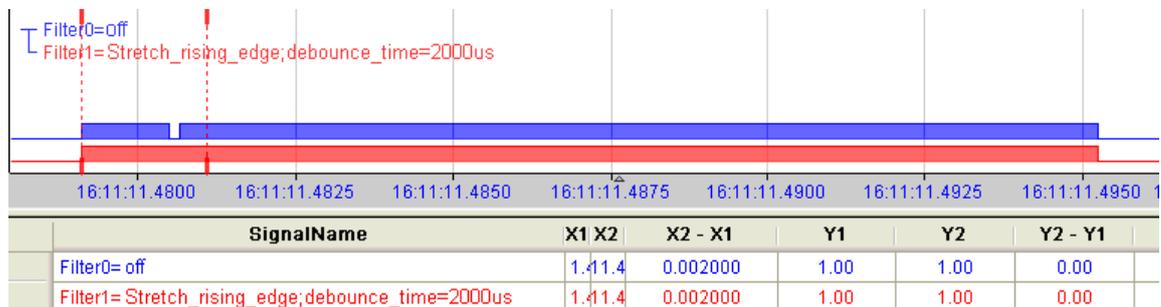


Figure 6: Debounce filter: „Stretch rising edge“

„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.



Figure 7: Debounce filter: „Stretch falling edge“

„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.

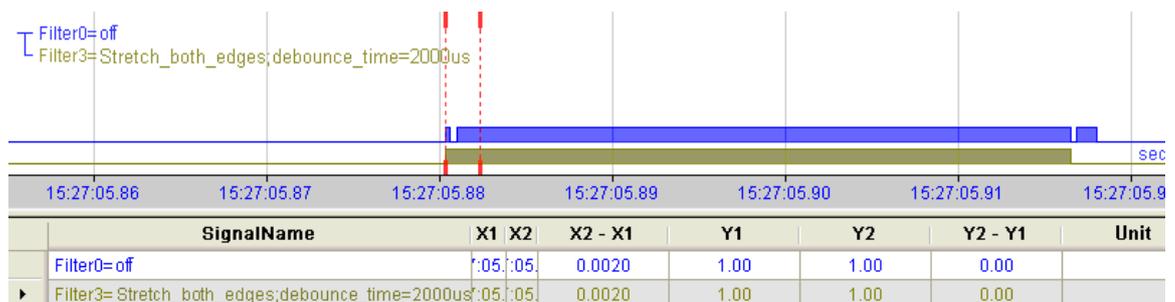


Figure 8: Debounce filter: „Stretch both edges“

„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.

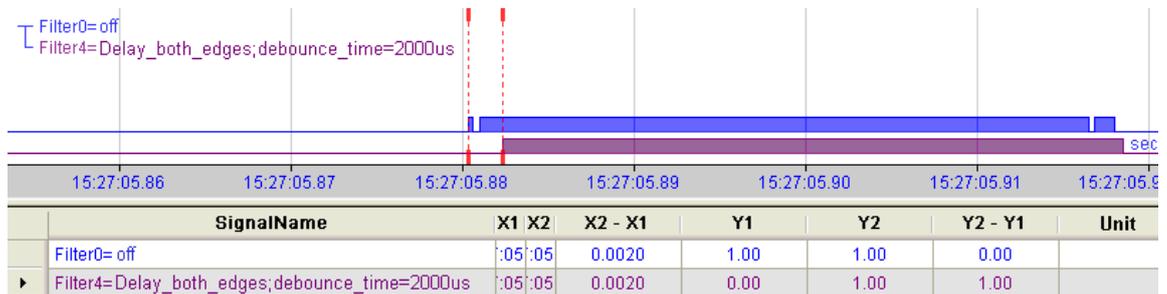


Figure 9: Debounce filter: „Delay both edges“

7.6 Voltage supply

7.6.1 Voltage supply X14

The external voltage supply is connected by a 2-pin connector.



Only connect the device to an external voltage supply 24 V DC (±10 % unregulated)! Pay attention to polarity!

7.6.2 Buffer voltage X30

The connection of a buffer voltage on X30 is supported for hardware version B3 and higher and software version v02.06.001 and higher. The following functions of the device can be buffered when no voltage is applied.

- Time
- FO line: incoming FO telegrams are transmitted, the FO line is not interrupted.

For this purpose, on the X30 connection, a buffer voltage of typ. 12 V DC (9...15 V) is applied. In case of buffering, the current consumption is approx. 70 mA at 12 V.

8 Initial start-up

To start ibaCMU-S you should do the following things:

- ❑ Apply an external 24 V power supply to the X14 connector and triple check the polarity
- ❑ Set rotary switch S1 to “1” if the sending of virtual channels is activated in the hardware configuration file (conf.hardware.xml) and set to “0” otherwise. Set rotary switch S2 to “0”
- ❑ Set the power switch S11 to position “on”

The device start the boot procedure automatically and the LEDs light up.



Important note

The booting procedure of the device can take up to 2 minutes.

8.1 Checking the installed license and configuration

The LEDs L5 to L8 indicate the status of the device functions.

When booting the ibaCMU-S, the LEDs L5 to L8 light up briefly in red, signaling the program start.

The installed license is checked at the beginning of the startup process and visualized in L5. The configuration is then checked and displayed with L6. Booting or SW initialization is now complete.

If the boot procedure was successful (license and configuration check is completed), ibaCMU-S automatically switches to measurement mode and L7 starts flashing green.

Once a valid data acquisition according to the measurement condition has been completed, the analysis is carried out and L8 lights up green. Since no data acquisition is carried out at the same time as the analysis is being performed, L7 is switched off as long as the analysis is active.

LED	Status	Description
L5	Green	License OK and initialization of the software was error-free
	Red	License incorrect
L6	Green	Configuration error-free and corresponds to HW configuration
	Red	Configuration incorrect
L7	Off	No data acquisition
	Green (flashing, every 2s)	Data acquisition is running
L8	Off	No analysis or data storage
	Green	Analysis or data storage active

Note: The data acquisition is only carried out for the calculation of statistical characteristic values (peak to peak, crest factor, min/max, standard deviation/RMS) which can be sent permanently via fiber optic cable or TCP/IP telegram.

After the boot procedure there are 2 valid states (1. measurement and 2. analysis)

Measurement	Analysis
L5 	L5 
L6 	L6 
L7  flashing	L7 
L8 	L8 



Notes

LED L5 (license) lights up red if the licenses are missing.

LED L6 (configuration) lights up red if the configuration set in the software does not match the hardware of ibaCMU-S.

This means that the plug-in modules or ibaCMU-S itself must match the modules configured in the software.

LED L7 (data acquisition) is off when analysis or data storage is active.

LED L8 (analysis) can be active for up to 30 min.

LED L8 is off when data acquisition is running.

If the LEDs L7 and L8 are permanently off, one of the LEDs L5 or L6 should indicate an error. Contact the iba support.



Note

If the license or configuration is incorrect, ibaCMU-S does not perform calculations or data storage!

8.2 Progress indication during firmware update

Status and progress indication of LED L5 .. L8 are different when installing an update (see chapter 8.7) and when booting the device.

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 color and at a slower rate. When the update is finished, the device is rebooted automatically.

This can take up to 5 minutes. As soon as the green system LED L1 is flashing regularly the device can be used again.

8.3 Attaching I/O Modules

CAUTION

Switch off ibaCMU-S with the S11 switch and remove the power supply connector X14 first, before attaching or removing of any I/O module or detaching ibaCMU-S from the backplane!

At the moment the following I/O modules are supported by ibaCMU-S:

- ibaMS8xICP (8 channel vibration input module)
- ibaMS8xIEPE (8 channel vibration input module)
- ibaMS16xAI-10V (16 channel $\pm 10V$ input module)
- ibaMS16xAI-20mA (16 channel $\pm 20mA$ input module)
- ibaMS16xAI-24V (16 channel $\pm 24V$ input module)
- ibaMS32xDO-24V (32 channel 24V digital output module)



Other documentation

Further information on the various I/O modules can be found in the respective manuals.

You can use up to 4 I/O modules, but the number of channels must not exceed 64 including the 8 digital inputs of ibaCMU-S itself.



Important note

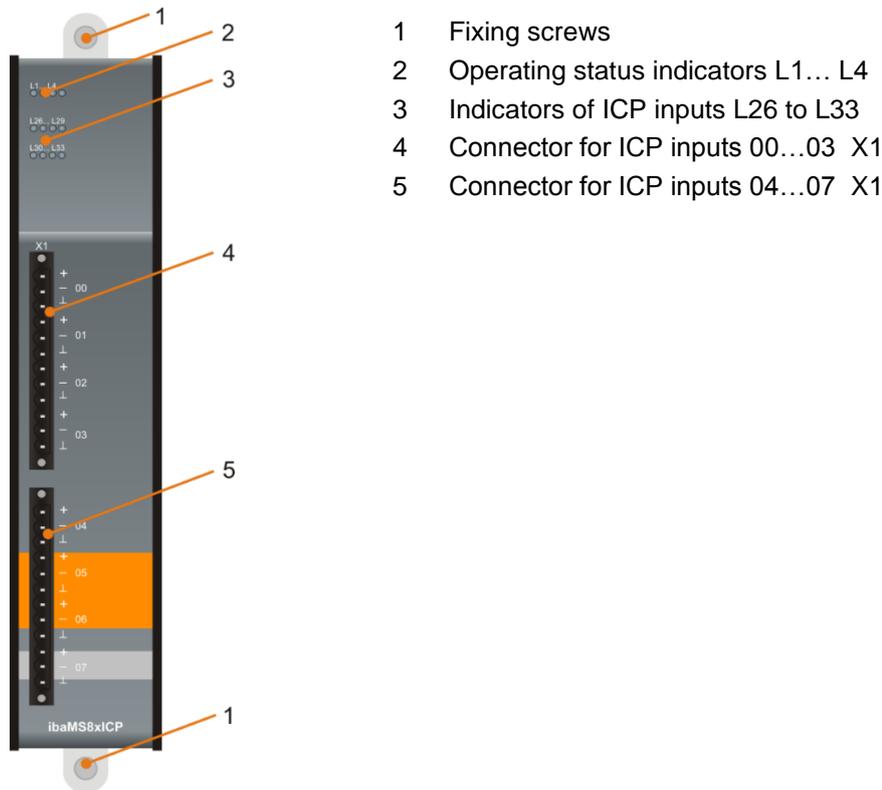
Please note that the license of ibaCMU-S has to match the number of input channels. If you have ibaCMU-S licensed to 8 vibration inputs and you add another ibaMS8xICP or ibaMS8xIEPE module to the backplane, you will get a license mismatch error.

Follow the same procedure as described in chapter 6.2.

8.3.1 Vibration input module (ibaMS8xICP or ibaMS8xIEPE)

You can connect up to 8 IEPE vibration sensors to this module. Other names for IEPE sensors depend on the sensor manufacturer, but the most common are ICP®, Isotron®, Deltatron® and Piezotron®. Nevertheless the principle of the sensors is quite the same. An internal piezoelectric sensing element is used to detect the acceleration of a so called seismic mass. The element is generating an electric charge, which is converted to a voltage by an internal charge amplifier. The whole sensor electronic circuit is powered by a constant current of a few mA provided by the module itself.

8.3.1.1 ibaMS8xICP



- 1 Fixing screws
- 2 Operating status indicators L1... L4
- 3 Indicators of ICP inputs L26 to L33
- 4 Connector for ICP inputs 00...03 X1
- 5 Connector for ICP inputs 04...07 X1

Figure 10: Front view ibaMS8xICP

Operating status indicators L1...L4

LED	Color	Status	Description
L1	Green	Off Flashing / On	Device is not working (switched off) Device is working
L2	Yellow	On	Access to the backplane bus
L3	White	-	-
L4	Red	Off Flashing	Normal status, no faults Device failure

Indicators of ICP inputs L26...L33

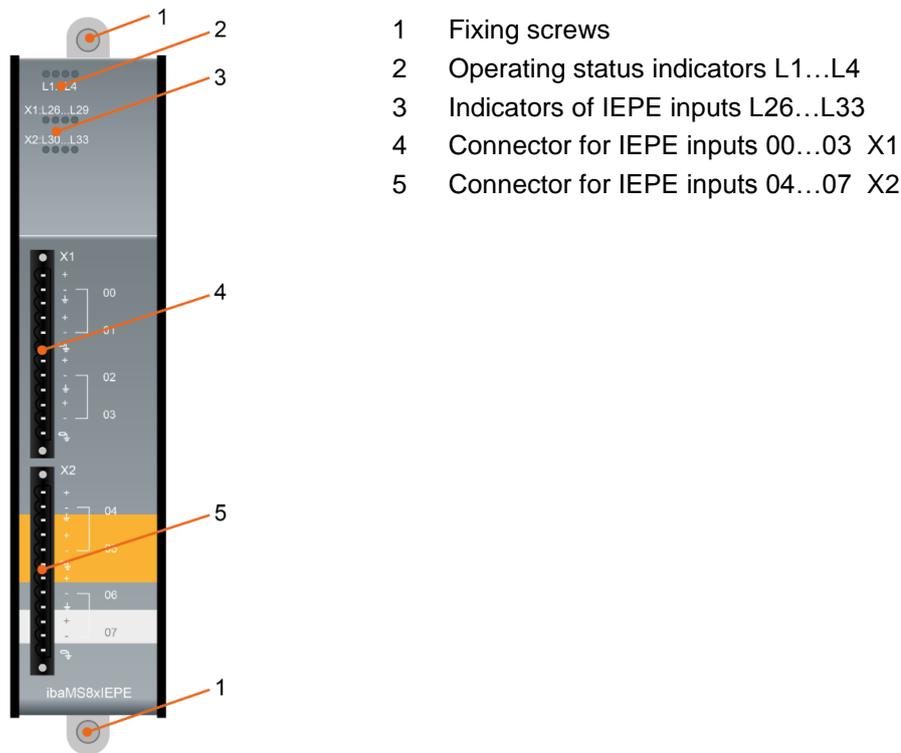
The LED display is described with a gain of 0 dB by as an example.

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

Connector X1

Each sensor can be connected with 3 pins: signal +, signal – and shield.

8.3.1.2 ibaMS8xIEPE



- 1 Fixing screws
- 2 Operating status indicators L1...L4
- 3 Indicators of IEPE inputs L26...L33
- 4 Connector for IEPE inputs 00...03 X1
- 5 Connector for IEPE inputs 04...07 X2

Figure 11: Front view

Operating status indicators L1...L4

LED	Color	Status	Description
L1	Green	Off	Device is not working (switched off)
		Flashing / On	Device is working
L2	Yellow	On	Access to the backplane bus
L3	White	-	-
L4	Red	Off	Normal status, no faults
		Flashing	Device failure

Indicators of IEPE inputs L26...L33

LED per channel	Status	Description
L26 ... L33	Off	Channel not active
	Green	\pm (0 V ... 4.5 V) 0...90% inside measuring range
	Yellow	\pm (4.5 V ... 5.0 V) 90 ... 100% out of measuring range
	Red	Not connected or broken line ($V_{cc} > 20$ V)
	Red flashing	Shorted

Connector X1/X2

Each sensor can be connected with 3 pins: signal +, signal – and shield or shield (50 Ohm).

8.3.2 Analog input module (ibaMS16xAI-10V, 24V, 20mA)

The description for the different 16 channel analog input modules is the same no matter if the input signals are $\pm 10V$, $\pm 24V$ or $\pm 20mA$. The figure below shows the ibaMS16xAI-10V module as an example.

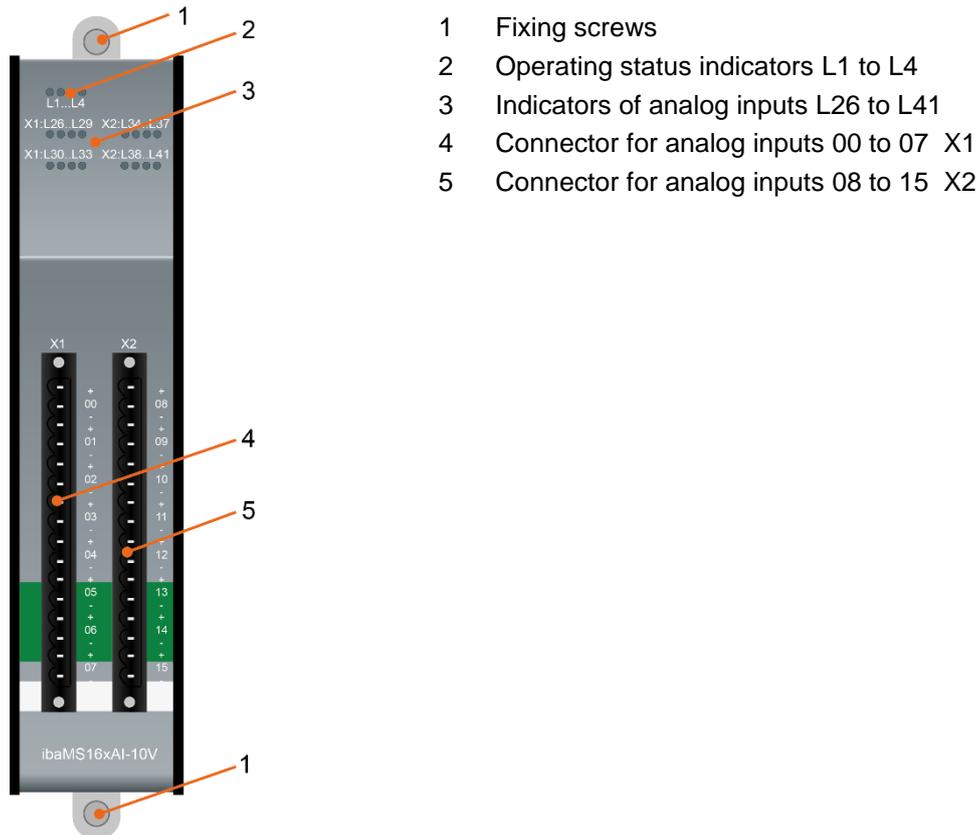


Figure 12: Front view ibaMS16xAI-10V

Operating status indicators L1...L4

LED	Color	Status	Description
L1	Green	Off Flashing / On	Device is not working (switched off) Device is working
L2	Yellow	On	Access to the backplane bus
L3	White	-	-
L4	Red	Off Flashing	Normal status, no faults Device failure

Indicators of analog inputs L26 to L41

LED per channel	Status/Meaning		Description (approx. values)		
			ibaMS16xAI-10V/-10V-HI	ibaMS16xAI-24V/-24V-HI	ibaMS16xAI-20mA
L26 ... L41	Off	No signal, signal too low	$\pm (0 \dots 0.1) \text{ V}$	$\pm (0 \dots 0.3) \text{ V}$	$\pm (0 \dots 0.2) \text{ mA}$
	Green	Within measuring range	$\pm (0.1 \dots 9) \text{ V}$	$\pm (0.3 \dots 21.6) \text{ V}$	$\pm (0.2 \dots 18) \text{ mA}$
	Yellow	End of measuring range	$\pm (9 \dots 10) \text{ V}$	$\pm (21.6 \dots 24) \text{ V}$	$\pm (18 \dots 20) \text{ mA}$
	Red	Out of measuring range	$> \pm 10 \text{ V}$	$> \pm 24 \text{ V}$	$> \pm 20 \text{ mA}$



Note

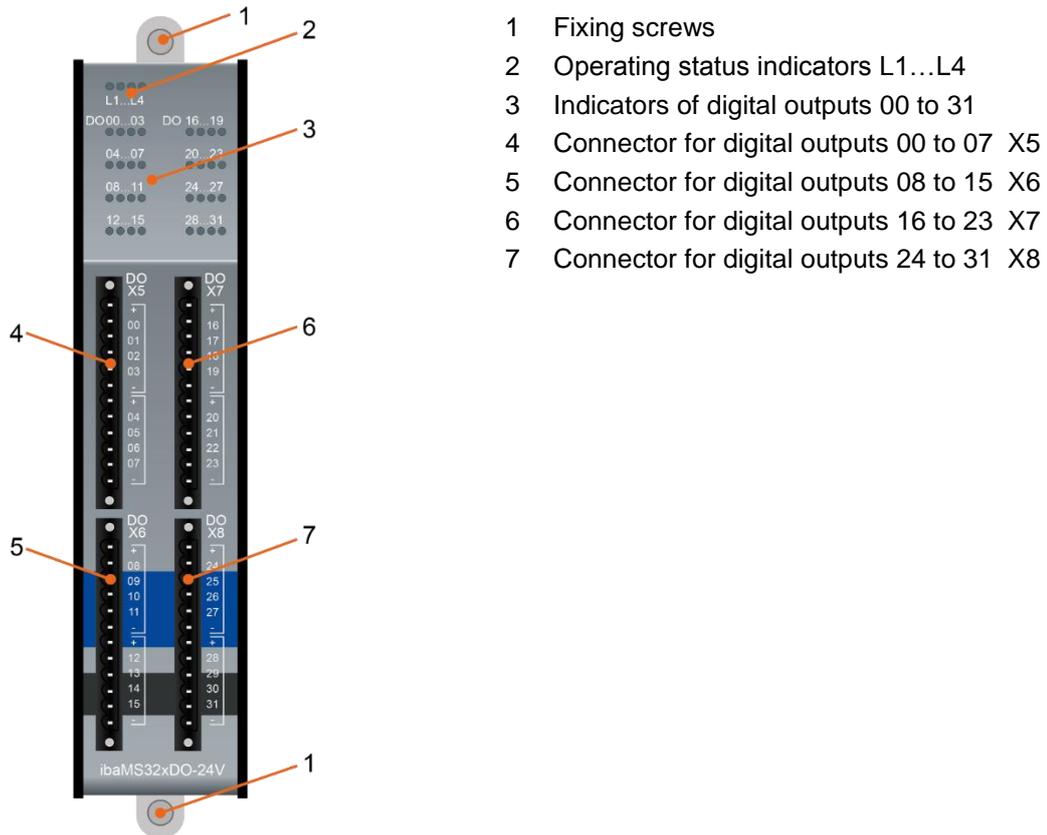
If the input signal level is in the range of the LED changing their colors (e.g. from yellow to red), the LED may display a mixed color tone (e.g. orange).

Connectors X1/X2

Each signal is connected with 2 pins: signal +, and signal – .

8.3.3 Digital output module (ibaMS32xDO-24V)

The ibaMS32xDO-24V module provides up to 32 digital outputs. Every group of 4 digital outputs has its own power supply (channel root), which needs to be connected to an external 24 V power supply unit.



- 1 Fixing screws
- 2 Operating status indicators L1...L4
- 3 Indicators of digital outputs 00 to 31
- 4 Connector for digital outputs 00 to 07 X5
- 5 Connector for digital outputs 08 to 15 X6
- 6 Connector for digital outputs 16 to 23 X7
- 7 Connector for digital outputs 24 to 31 X8

Figure 13: Front view ibaMS32xDO-24V

Operating status indicators L1...L4

LED	Color	Status	Description
L1	Green	Off Flashing / On	Device is not working (switched off) Device is working
L2	Yellow	On	Access to the backplane bus
L3	White	-	-
L4	Red	Off Flashing	Normal status, no faults Device failure

Indicators of digital outputs 00...31

LED per channel*	Status	Description
00...31	Off	No signal, logical 0
	Green	Signal ok, logical 1
	Yellow	Load voltage not present (per root)
	Red	Overcurrent (Channel root switches off)

*If an output is deactivated via ibaPDA, the corresponding channel LED remains off

Connection diagram / Pin assignment

32 output signals (0...31) can be connected.

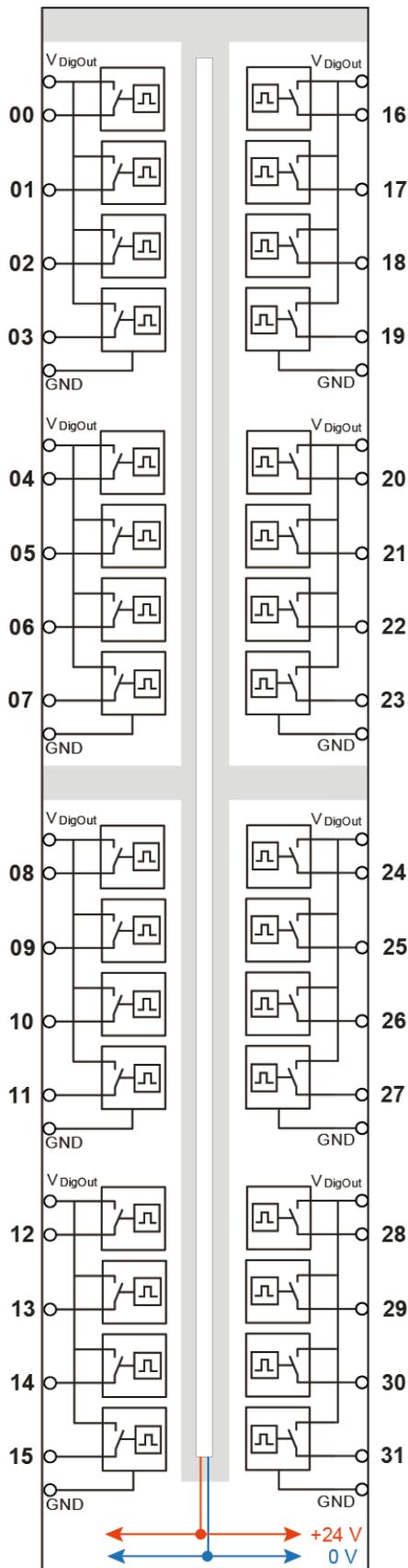


Figure 14: Pin assignment ibaMS32xDO-24V

8.4 User access information

Some of the functions (e. g. FTP access to ibaCMU-S) or the configuration of the ibaCMU-S require user credentials. The factory default settings are described here.

Username	Password (omit “*”)	Telnet Access	FTP Access		HTTP Access
				User home directory	
hac	analysis!	NO	YES	\Hard Disk2	YES
admin	1234 *	NO	YES	\Hard Disk\Application	YES
padu	1234 *	NO	NO	n.a.	YES

Username	IBA WEB SITE ACCESS								
	Info	Firm-ware	Event-log	Pass-words	Net-work	Time	Update	Digital Inputs	Notes
hac	YES	YES	NO	NO	NO	NO	NO	YES	NO
admin	YES	YES	YES	YES	YES	YES	YES	YES	YES
padu	YES	YES	NO	NO	YES **	NO	NO	YES	YES

* Factory default, can be changed by user

** Site is visible, but settings cannot be changed

8.5 Establish an Ethernet connection

To be able to work with ibaCMU-S it needs to be setup for proper TCP/IP communication within the local network. The factory default setting of ibaCMU-S is a fixed IP address at 192.168.1.1 and DHCP is deactivated.

The most convenient and easiest way to change the settings is to use the configuration website of ibaCMU-S. To be able to do that, you will need a peer to peer Ethernet connection between ibaCMU-S and a PC or laptop running a Microsoft® Windows® 7 operating system (Linux or Mac OSX are not supported at the moment) and a Microsoft® Internet Explorer®.

Apply the 24 V power supply to the X14 connector first (pay attention for the correct polarity) and set the power switch S11 to position I. Now connect an Ethernet RJ45 cable to the X22 jack and the network interface of your computer.

You need to set the computer’s network IP address to a value which is in the same subnet as ibaCMU-S. Please note that you don’t use the same IP address 192.168.1.1. You can use all addresses from 192.168.1.2 on. You must also set the subnet mask to 255.255.255.0. See figure below for an example.

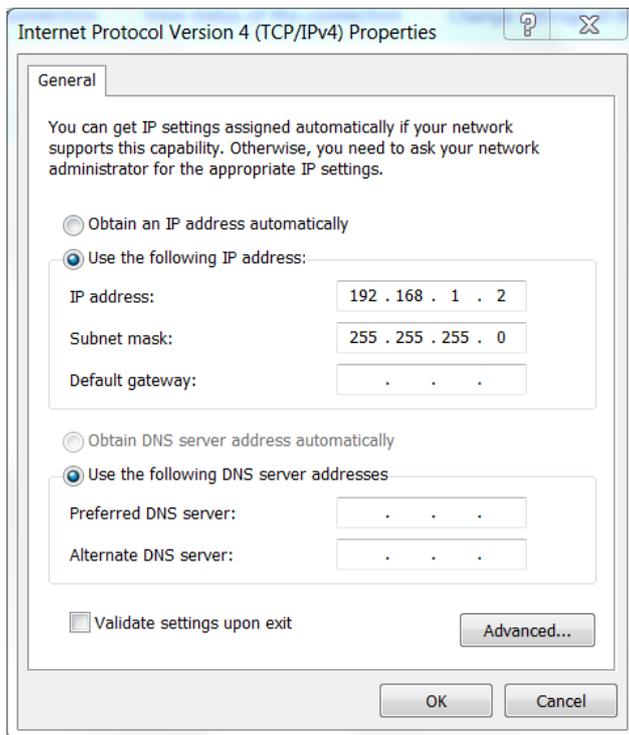


Figure 15: Example of computer IP address settings

After having applied the new network settings you can use the application *ping.exe* to check the connectivity. If everything is ok, you can start Microsoft Internet Explorer and enter the IP address 192.168.1.1 in the address bar, e. g. `http://192.168.1.1` and press the enter key.

You should see the webinterface, like shown in the figure below. Please note that the display looks different depending on connected I/O modules. If you have not connected any IO modules to ibaCMU-S, you will only see ibaCMU-S on the left side.



Figure 16: Main webpage of ibaCMU-S configuration

To change the network settings click on the image of ibaCMU-S and select the *network* tab in the configuration screen.



Note

The *network* tab is password protected to prevent unauthorized changes.

The factory default settings are:

User: **admin**

Password: **1234**

If your computer is a member of a domain or active directory environment, you will need to remove the domain prefix by adding a backslash in front of the user name e.g. “\admin”

You can now set the network parameters according to your local conditions like shown in the figure below. Don't disable the FTP server, because the Condition Monitoring Center ibaCMC will not be able to communicate with ibaCMU-S anymore.

Module 0 : ibaCMU-S

info firmware eventlog passwords **network** time update digital inputs notes

Configuration of Network Interfaces:

WINS Devicename:

X22: RJ45	Enable DHCP	<input type="checkbox"/>
	Static IP Address	<input type="text" value="10.124.251.151"/>
	Static Subnet Mask	<input type="text" value="255.255.255.0"/>
	Static Default Gateway	<input type="text" value="10.124.251.1"/>
	Static WINS Server	<input type="text"/>
		<input type="button" value="submit"/> <input type="button" value="reset entries"/>

Fiberoptic	Static IP Address	<input type="text" value="172.16.0.116"/>
	Static Subnet Mask	<input type="text" value="255.255.255.0"/>

Server settings	FTP enable	<input checked="" type="checkbox"/>	<input type="button" value="set"/>
	Telnet enable	<input checked="" type="checkbox"/>	

Figure 17: ibaCMU-S network configuration settings

If you are using Microsoft® Windows® 7, the above user credentials may not be accepted. In this case just follow the instructions given in chapter 8.9.1.

8.6 Configuration of time settings

It is highly recommended to configure ibaCMU-S to use a time synchronization server (NTP). In this way, the acquired data and calculated values can be stored with the correct timestamps and can be compared with data from other systems. You can change the settings in the *time* tab of the ibaCMU-S configuration. This configuration is also password protected similar to the network settings described earlier.

Module 0 : ibaCMU-S

info	firmware	eventlog	passwords	network	time	update	digital inputs	notes
Select timezone: (local time:19:55:02): W. Europe Standard Time effective time: W. Europe Standard Time		(GMT+01:00) Amsterdam, Berlin, Bern, Rome, Stockholm, Vienna (GMT+01:00) West Central Africa (GMT+02:00) Minsk (GMT+02:00) Cairo (GMT+02:00) Helsinki, Kyiv, Riga, Sofia, Tallinn, Vilnius (GMT+02:00) Athens, Bucharest, Istanbul (GMT+02:00) Jerusalem (GMT+02:00) Harare, Pretoria (GMT+03:00) Moscow, St. Petersburg, Volgograd (GMT+03:00) Kuwait, Riyadh <input checked="" type="checkbox"/> Enable automatic DST <input type="button" value="Set Timezone"/>						
<input type="radio"/> Set local time		Date: YYYY-MM-DD <input type="text" value="2014-10-29"/> Time: HH:MM:SS <input type="text" value="19:55:02"/>						
<input type="radio"/> Set system time (UTC)		Date: YYYY-MM-DD <input type="text" value="2014-10-29"/> Time: HH:MM:SS <input type="text" value="18:55:02"/>						
<input checked="" type="radio"/> Obtain Systemtime from NTP-Server		Server: <input type="text" value="192.168.84.180"/>						
<input type="radio"/> Obtain system time from external signal		input channel: <input type="text" value="0"/> clock polarity: <input type="text" value="high active"/> clock format: <input type="text" value="DCF77"/> offset from UTC (minutes) <input type="text" value="0"/> additional offset for DST (minutes) <input type="text" value="0"/> signal quality: okay: 0 error: 0						
<input type="button" value="Set Method"/>								

Figure 18: CMU time configuration settings

To activate the automatic time synchronization with a NTP server select the option *Obtain Systemtime from NTP-Server* as shown in the figure above and enter the IP address or the network name of a valid NTP server within your network. Click on the <Set Method> button to apply the settings. The current time stamp of the ibaCMU-S will be shown on top of the webpage right below the name of ibaCMU-S. Please note that this timestamp will always be shown in UTC time no matter which timezone is configured at the moment.

8.7 Firmware update

On the update tab, click the <Browse...> button and select the update file <cmus_v0x.yy.zzz.iba>. By clicking on <Start Update>, you start the update process.

Module 0 : ibaCMU-S

info	firmware	eventlog	passwords	network	time	update	digital inputs	notes
<input type="button" value="Set Method"/>								
Install software:		<input type="text"/> <input type="button" value="Durchsuchen..."/> <input type="button" value="Start Update"/>						
Restart device:		<input type="button" value="Reset"/>						

Figure 19: Firmware update

⚠ CAUTION

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

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. This can take several minutes. As soon as the green system LED L1 is flashing regularly the device can be used again.

During the reboot the LEDs L5 ... L8 are flashing as described in chapter 8.1.



Important note

Restore the configuration from ibaCMC to the CMU and check the CMU application after each update.

The status and progress indication of the LEDs L5 ... L8 are different when installing an update and when rebooting a device



Important note

If the software version of a module does not match the version of ibaCMU-S, ibaCMU-S automatically upgrades or downgrades the module. The module is then ready for use.

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 ibaCMU-S. Contact the iba support for this purpose.

8.8 Rebooting via webinterface

Some functions (e.g. manual update of hardware configuration file) require a reboot of ibaCMU-S. This can be done in the *update* tab. Just press the <Reset> button next to *Restart device* and ibaCMU-S will be rebooted automatically. Please note that the reboot can take up to two minutes.

Module 0 : ibaCMU-S

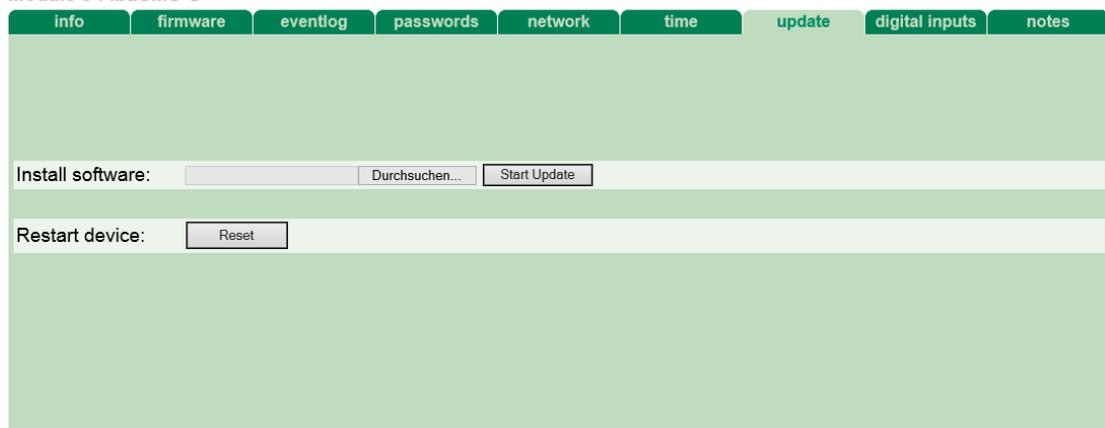


Figure 20: Reboot ibaCMU-S

8.9 Connecting to ibaCMU-S from a PC

There are several ways to connect to ibaCMU-S via network, which are described in this chapter.

8.9.1 User authentication under Microsoft Windows 7

On PCs running Microsoft® Windows 7® it might be possible that the user credentials required to change some ibaCMU-S settings via the web interface are not accepted, even though the data is entered correctly.

To solve this issue, the settings of the local security policy need to be changed via the control panel of Microsoft® Windows 7®. Please note that you need administrator privileges to change the local security policy.

Start the security policy editor via *Control Panel\System and Security\Administrative Tools\Local Security Policy*

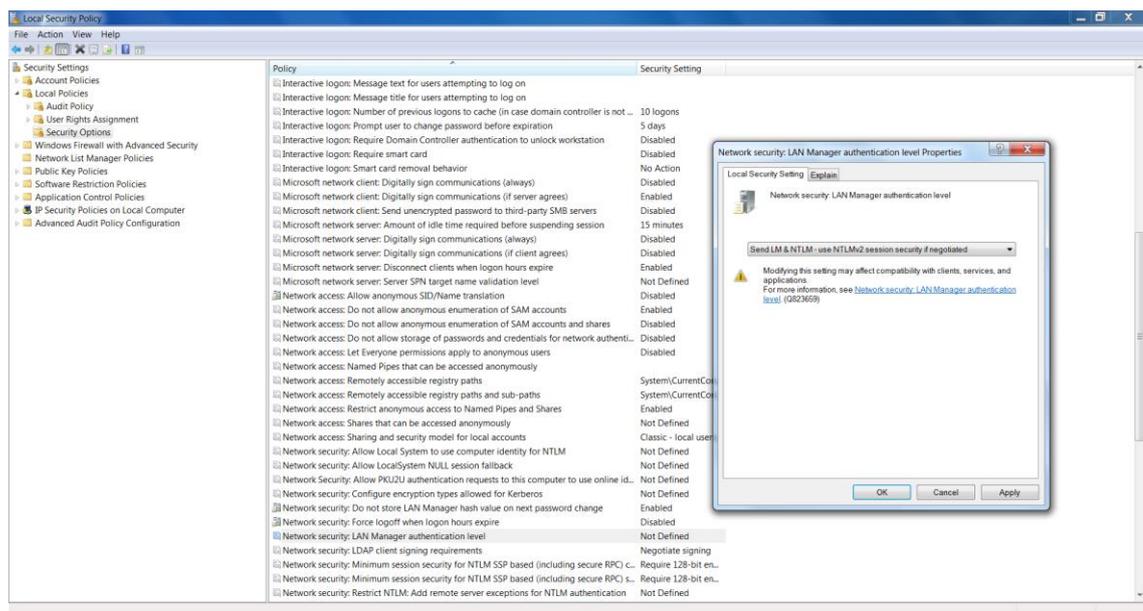


Figure 21: Configure the local security policy

Select *Security Settings - Local Policies- Security Options* and look for the policy *Network security: LAN Manager Authentication level*. Normally the policy value should be set to *Not Defined*. Double click on the policy and change the value to *Send LM & NTLM – use NTLMv2 session security if negotiated*. Apply the new settings with the <OK> or <Apply> button. Restart the Internet Explorer and your user credentials should be accepted now.

8.9.2 Accessing the CMU visualization with runtime viewer

You will need the *logi.VIS Runtime Viewer* to get access to ibaCMU-S' local application web interface. After successful installation of the viewer you can start it by clicking on the  icon, which should be present on your desktop.

If there is no logi.CAD USB dongle present on your PC you will see the information message shown in the figure below. You can just answer yes, to start the viewer in demo mode.

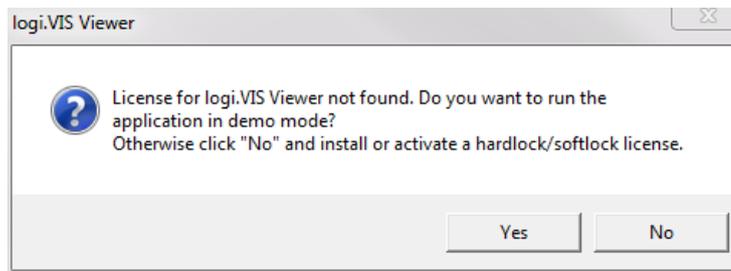


Figure 22: License for logi.VIS not found

Select the menu command *File - Open from URL* to connect to an existing CMU visualization. Enter the IP address of ibaCMU-S you want to connect to in the field *Web server name / IP address*. Please note that you also need to enter the port number 8080 separated by colon.

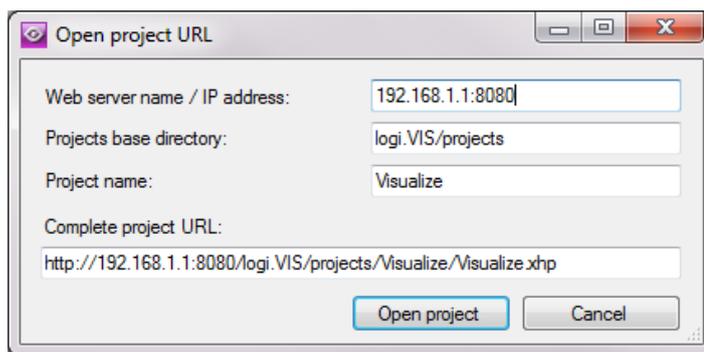


Figure 23: Enter URL of ibaCMU S visualization

Click the <Open project> button to apply your settings and open the CMU visualization. If you have entered the wrong connection data, you might see the following error message. Double check your CMU IP address and try again.

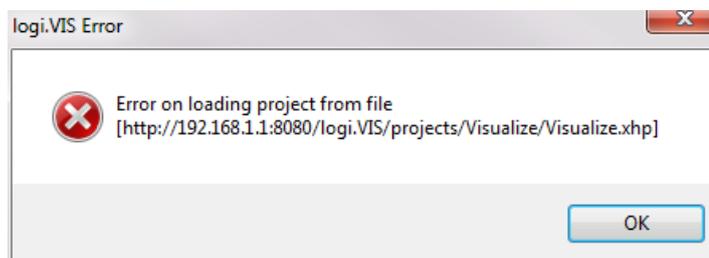


Figure 24: logi.VIS connection error

You can also enter the connection data into a text file, which you can use to launch the CMU visualization more quickly by double clicking on the configuration file.

You will need to create a text file with the extension `.lvr` with your favorite text editor e.g. `CMU_17_Visu.lvr`. Enter the following text and make sure you enter the correct IP address for your ibaCMU-S.

```
<?xml version="1.0"?>
```

```
<ViewerConfiguration xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xmlns:xsd="http://www.w3.org/2001/XMLSchema">
```

```

    <ProjectFile>http://192.168.1.1:8080/logi.VIS/projects/visual-
    ize/Visualize.xhp</ProjectFile>

    <ShowProjectTree>true</ShowProjectTree>

    <FullScreenMode>>false</FullScreenMode>

    <DisableOpenProject>>false</DisableOpenProject>

</ViewerConfiguration>

```

Save the file to a location of your choice. Then you can use the control panel of the operating system to configure that all files with the extension "lvr" should be opened with the program *logi.VIS Runtime Viewer*. Click on the file with your right mouse button and select *Properties* in the context menu shown.

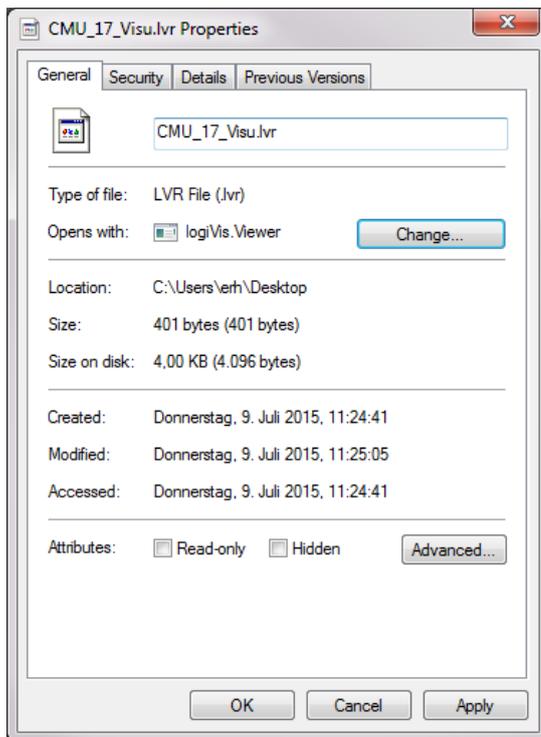


Figure 25: LVR file properties

Click the <Change...> button in the *General* tab and click the <Browse...> button to select the application *logiVis.Viewer.exe*. Exit the dialog with <OK>.

You can now start the viewer via the menu command *File - Open from File* or by double clicking on the lvr file directly.

You should see the starting page of the CMU visualization as shown in the figure below.

Information

Info Channels Signal test Reboot Eventlog License Help

CMU status

Date-Time: 20141030-201403 CMU Id: 5
 Ser Nr. 000020 SW Vers.: 1.1.5.2037

System Disk: 403.0 MB free of 501.0 MB
 Full Data Disk: 74280.0 MB free of 120293.0 MB
 Full Path: Hard Disk2/

S1: 0 S2: 0

L5: Init
 L6: Data Acquire 46
 L7: Calculation 20141030-201133
 L8: Write

Settings

Configuration file OK
 Configuration valid
 Write XML file
 Write DAT file
 Write Day-Statisticals
 Write Day-Orbit
 Chatter Mode
 ibaNet 750
 Virtual channel
 100MB SysDisk min. free
 1000MB DataDisk min. free

TCP/IP Telegram

TCP/IP1 Active
 Server(1)/Client(0)
 IP 10.124.251.80
 Port 5004
 No. 10

TCP/IP2 Active
 Server(1)/Client(0)
 IP 0.0.0.0
 Port 0
 No. 0

HSP Modul configuration

Module Name	Modul no.	Channel no.
	0	0
ibaCMU-S	1	8
ibaMS&xICP	2	8
ibaMS&xICP	3	8
	4	0
	5	0

Infos

Serial number: 000020
 Software Version: 1.1.5.2037

Sample rate 20000
 Samples 262144

IP Address: 10.124.251.155
 Subnet Mask: 255.255.255.0
 Default Gateway: 10.124.251.1

Figure 26: CMU visualization shown in logi.VIS viewer

8.9.3 Accessing measurement data and analysis results

ibaCMU-S generates measurement data and analysis results in DAT format during operation. The data can be accessed via FTP protocol or Microsoft® Windows® network share.

8.9.3.1 Connecting via FTP

ibaCMU-S provides access to the data via an internal FTP server. Please note that the existing users have different FTP privileges (see chapter 8.4 for reference). For access to the measurement data and analysis results use the user “hac”.

You need an FTP client software to access ibaCMU-S via FTP protocol. If you don't have an FTP client available, you can use the free FTP client Filezilla, which is available for download at <http://filezilla-project.org/download.php>.



Note

If ibaCMU-S is connected to an ibaCMC server, the data is downloaded and removed automatically by the server to preserve haddisk space. It might be possible that the data you are interested in has already been removed. In this case you need to use the ibaCMC server for data access.

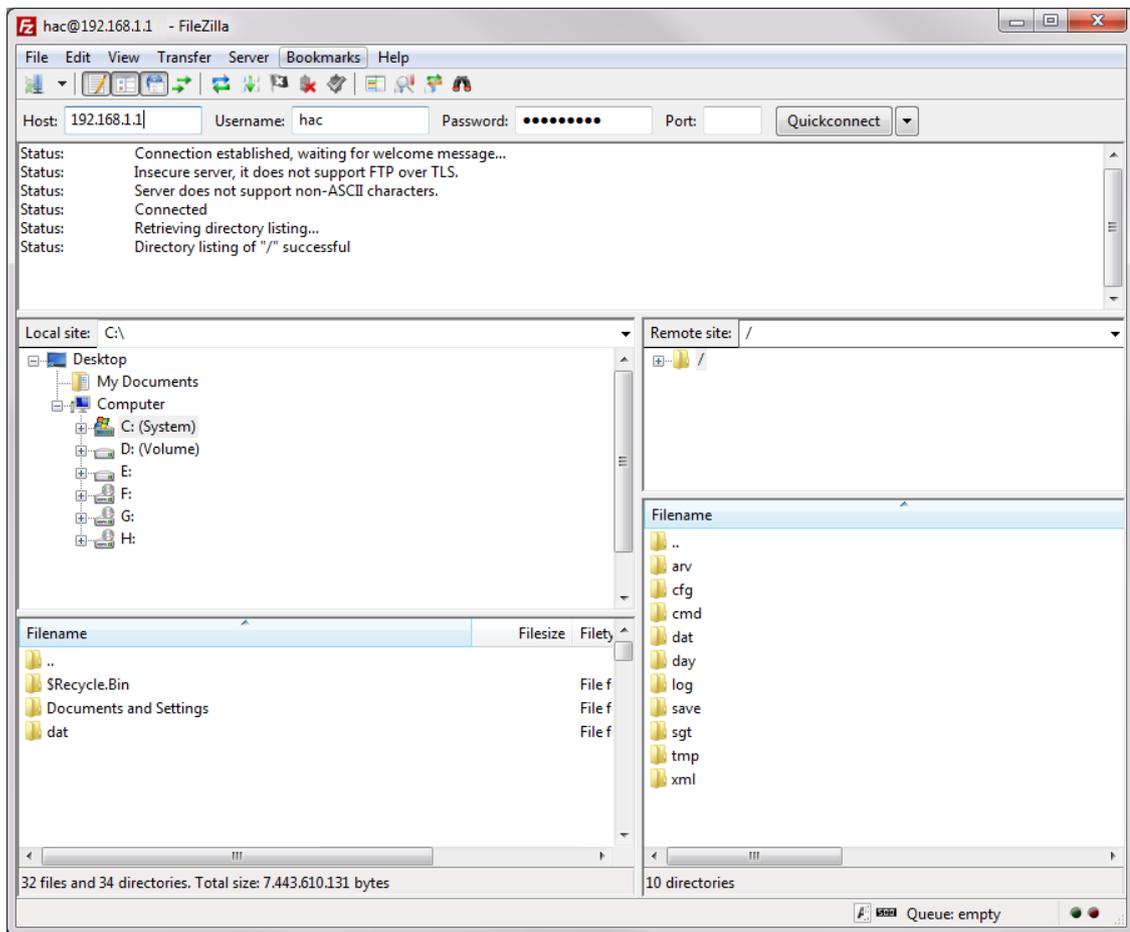


Figure 27: FTP client CMU connection

After successful connection, you will be directed to the right directory of ibaCMU-S and you should see a similar listing as shown in the figure above.

8.9.3.2 Connecting via Microsoft® Windows® network share

The following section explains how to mount a network share with a client running a Microsoft® Windows 7® operating system. The figure below shows the parameters you have to use. You need the IP address of your ibaCMU-S followed by "/hdd2" which is the network share name of the CMU's data partition. You can choose a free drive letter according to your own preference (e.g. Z:). Make sure, that the *Connect using different credentials* option is selected.

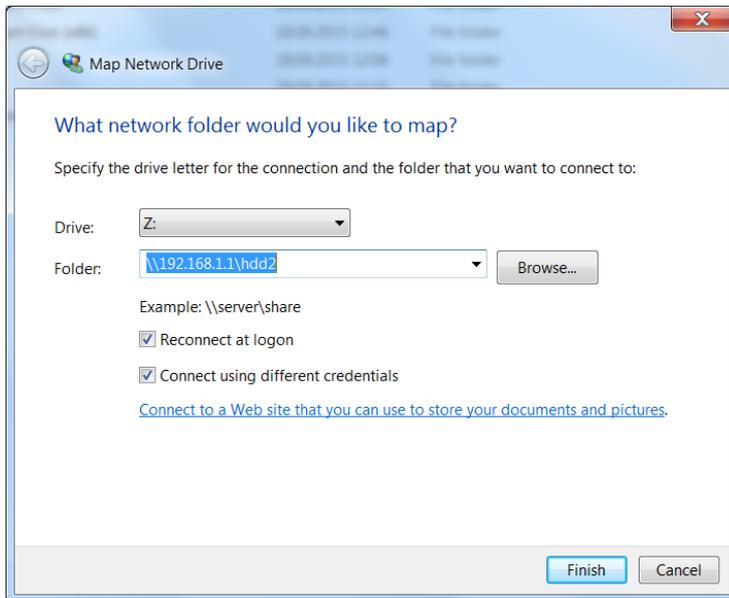


Figure 28: Mapping CMU as a network drive

Press the <Finish> button and you will be prompted to enter the network share access credentials. If your client PC is a member of an active directory or a domain, you need to remove the domain prefix with a leading backslash in front of the user name.

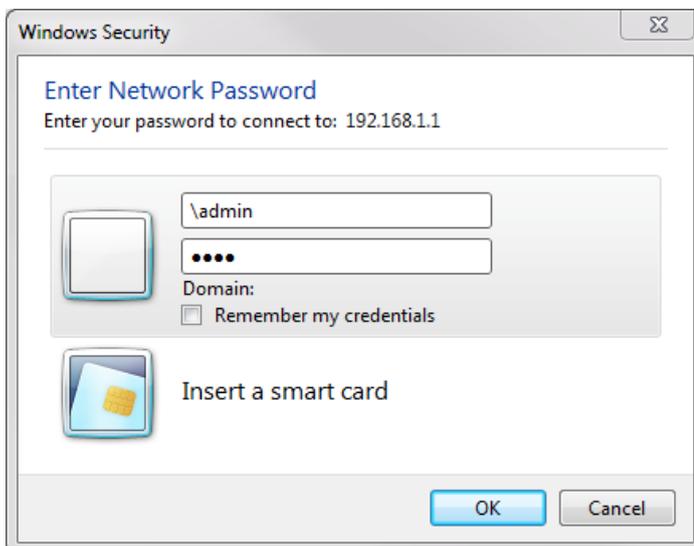


Figure 29: Enter user credentials



Note

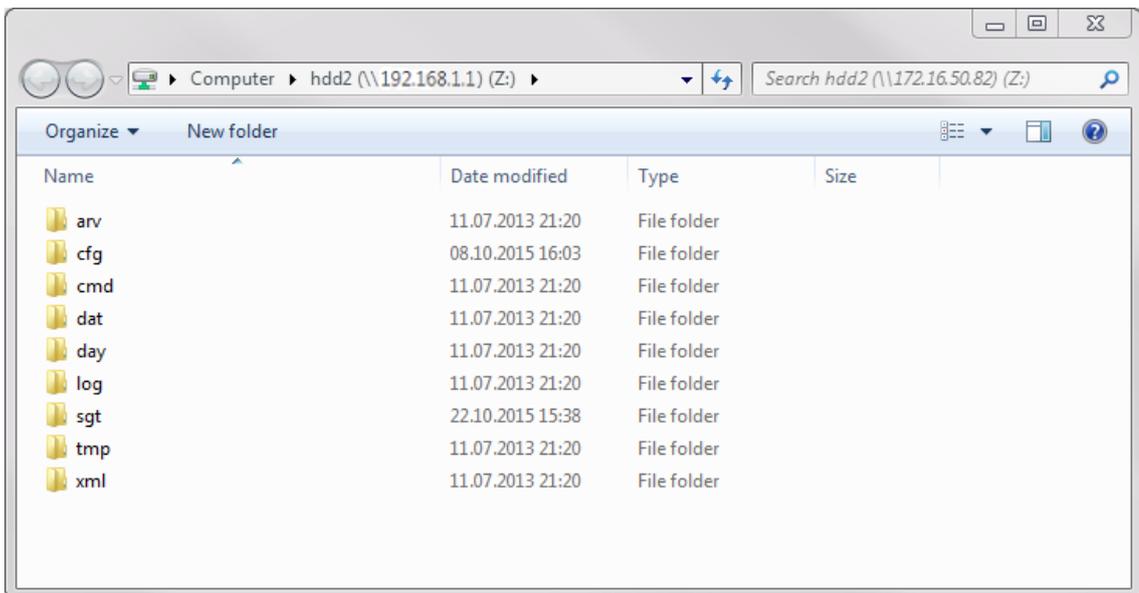
The factory default settings are:

User: **admin**

Password: **1234**

If your computer is a member of a domain or active directory environment, you need to remove the domain prefix by adding a backslash in front of the user name e.g. “\admin”.

You should now see the directory contents of the ibaCMU-S data partition.



8.9.4 Connecting to an ibaNet750-BM-D device

ibaNet750-BM-D is a device designed to extend the range of iba I/O functionalities using the I/O modules of the series 750 produced by WAGO and terminals for the K-bus by Beckhoff. The device acts as a gateway between the serial K-bus and the deterministic fiber optic ibaNet protocol.

The WAGO I/O system is the ideal supplement for the range of the peripheral devices. Digital and analog WAGO/Beckhoff I/O terminals as well as incremental encoders, SSI inputs, resistance thermometers, thermocouples and measuring bridges can be integrated into the system.



Important note

The switch settings S1/S2 have a different meaning or function on the devices ibaNet750-BM and ibaNet750-BM-D.

Before commissioning, refer to the ibaNet750-BM-D manual available at www.iba-ag.com in the download area.

ibaCMU-S can be connected directly to an ibaNet750-BM-D device via G62.5/125 ST multimode fiber optic cable. Connect the TX connector (X10) of the ibaNet750-BM-D with the RX connector (X11) of ibaCMU-S and the RX connector (X11) of ibaNet750-BM-D with the TX connector (X10) of ibaCMU-S. In this way the I/O of ibaCMU-S can be extended to a maximum additional number of 32 analog and 32 digital inputs, depending on the module configuration of the ibaNet750-BM-D. ibaCMU-S can be connected to a single ibaNet750-BM-D device. The device must be operated with the 3Mbit ibaNet protocol. The cycle time of the protocol is 1 ms.

In ibaCMU-S, the first 8 digital input signals (of the 32 DI) are acquired at 1 ms/1000 Hz and further processed at 20 ms/50 Hz. I.e. detection of the rising edge with 1 ms, a calculated speed is further processed at 50 Hz.



Important note

An ibaCMU-S central unit can be connected to a single ibaNet750-BM-D device. The device must be operated with the 3Mbit ibaNet protocol. The sampling rate is 50 Hz.

Front view

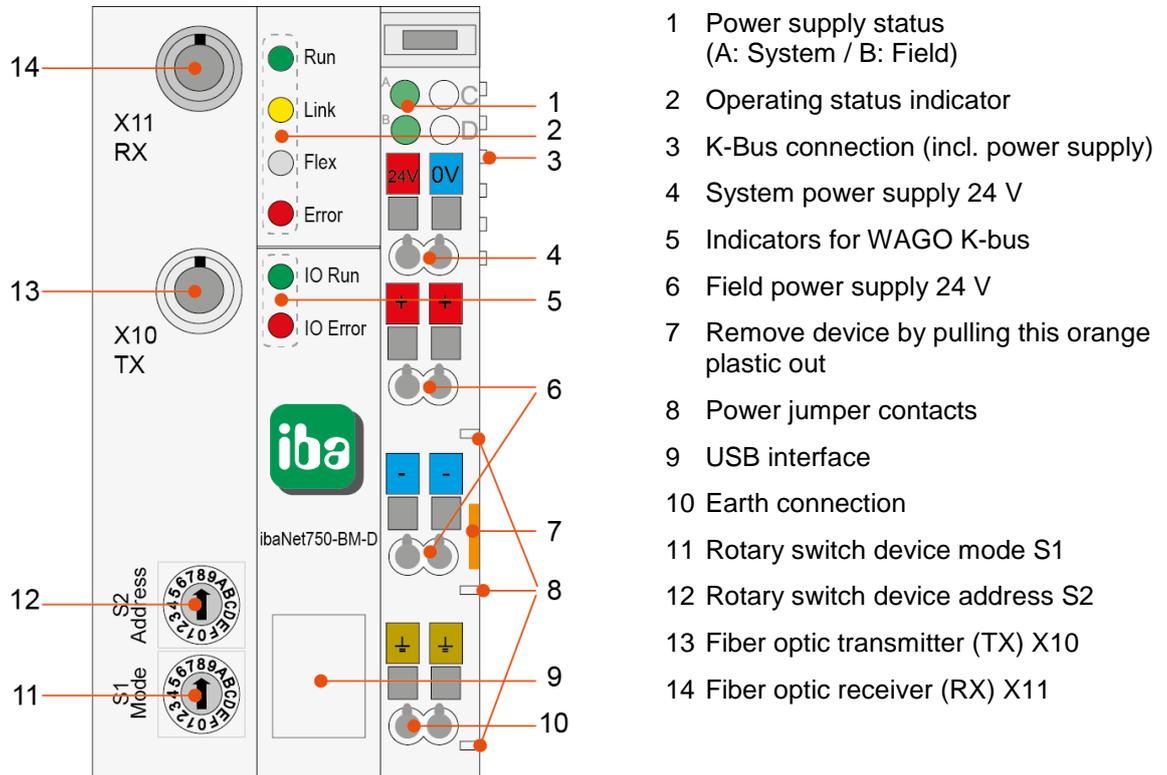


Figure 30: Front view

Rotary switch S1 (device mode)

The rotary switch S1 is used to set the ibaNet protocol and the operating mode. Default setting S1=8.

The following 2 switch positions are allowed in combination with ibaCMU-S.

Invalid switch positions have been removed from the table and can be found in the ibaNet750-BM-D manual.

Position S1	ibaNet protocol	3Mbit mode	Position S2	Function	Description
8	3Mbit	Normal	A	Ring master operation	P2P communication (stand alone)
A	3Mbit	ECO	A	Ring master operation	P2P communication (stand alone), only complex terminals are supported 750-630 (SSI) 750-631 (Incr. encoder)

Rotary switch S2 (device address)

Depending on the set device mode, the rotary switch S2 has different functions. Default setting S2 = A (other switch positions in connection with ibaCMU-S are not permitted).

Address	Device address	Inputs	Outputs	Remark
A	1	32 AI + 32 DI	32 AO + 32 DO	Standard setting to connect ibaNet750 to ibaCMU-S

Operating status indicators

LED	Color	Status	Description
Run	Green	Off	Out of operation, no power supply
		Blinking	Ready for operation
		Blinking fast	Firmware update active
		On	Boot sequence active
Link	Yellow	Off	No 3Mbit FO communication
		Blinking	3Mbit signal detected, configuration error (rotary switch position is wrong) or Configuration via 32Mbit Flex
		On	3Mbit FO communication, signal reception at RX
Flex	White	Off	No 32Mbit / 32Mbit Flex signal detected
		Blinking	32Mbit / 32Mbit Flex signal detected, configuration error (rotary switch position is wrong)
		On	32Mbit / 32Mbit Flex signal detected
Error	Red	Blinking	32Mbit Flex: Difference between ibaPDA configuration and the actual hardware
		On	32Mbit and 3Mbit: rotary switch position is wrong Hardware error

8.9.5 Connecting to an ibaPDA server

ibaCMU-S can be connected to an ibaPDA server directly with G62.5/125 multimode optical cables with ST plugs on both ends. Depending on the configuration, ibaCMU-S can transmit up to 512 analog values of the REAL data type. Which values are transferred here depends on the application.

To establish the connection connect the TX output (X10) of ibaCMU-S to the RX input of the ibaFOB-io-D card of the ibaPDA server with one lead of the optical cable and the RX input (X11) of ibaCMU-S with the TX output of the ibaFOB-io-D card with another lead.



Important note

If you want to connect ibaCMU-S to an ibaPDA system, virtual channels need to be enabled in the hardware configuration file *conf.hardware.xml* and the switches S1 and S2 on ibaCMU-S need to match this setting, too (S1 = 1, S2 = 0).

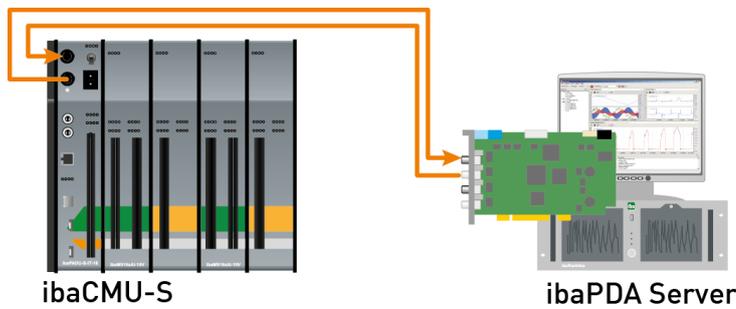


Figure 31: Connecting ibaCMU-S to an ibaPDA system with fiber optics

Open the I/O manager of ibaPDA, select the link of the ibaFOB card ibaCMU-S is connected to and perform an autodetection with the right mouse button.

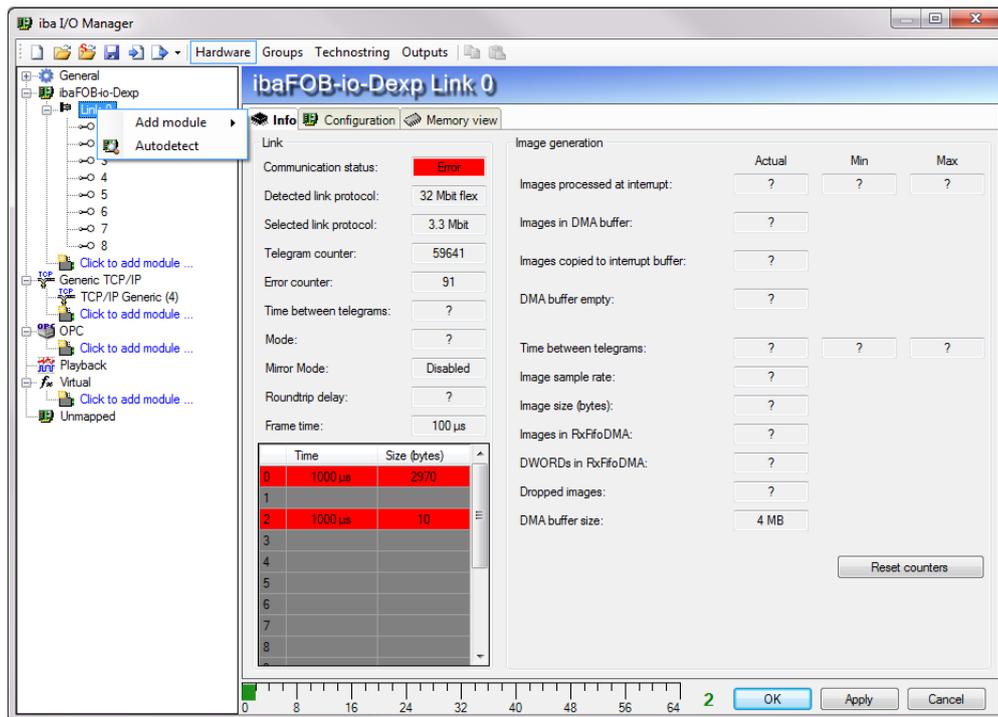


Figure 32: ibaPDA I/O Manager auto detect link

The link protocol of the ibaFOB card uses the 32MBit Flex protocol and after successful detection you should see the following result (see figure below). Please note that the result you will get, depends on the I/O modules attached to ibaCMU-S and the devices connected to the FO link. The figure below shows a single ibaMS8xICP module connected to ibaCMU-S and an ibaNet750-BM-D device, connected to the same FO link.

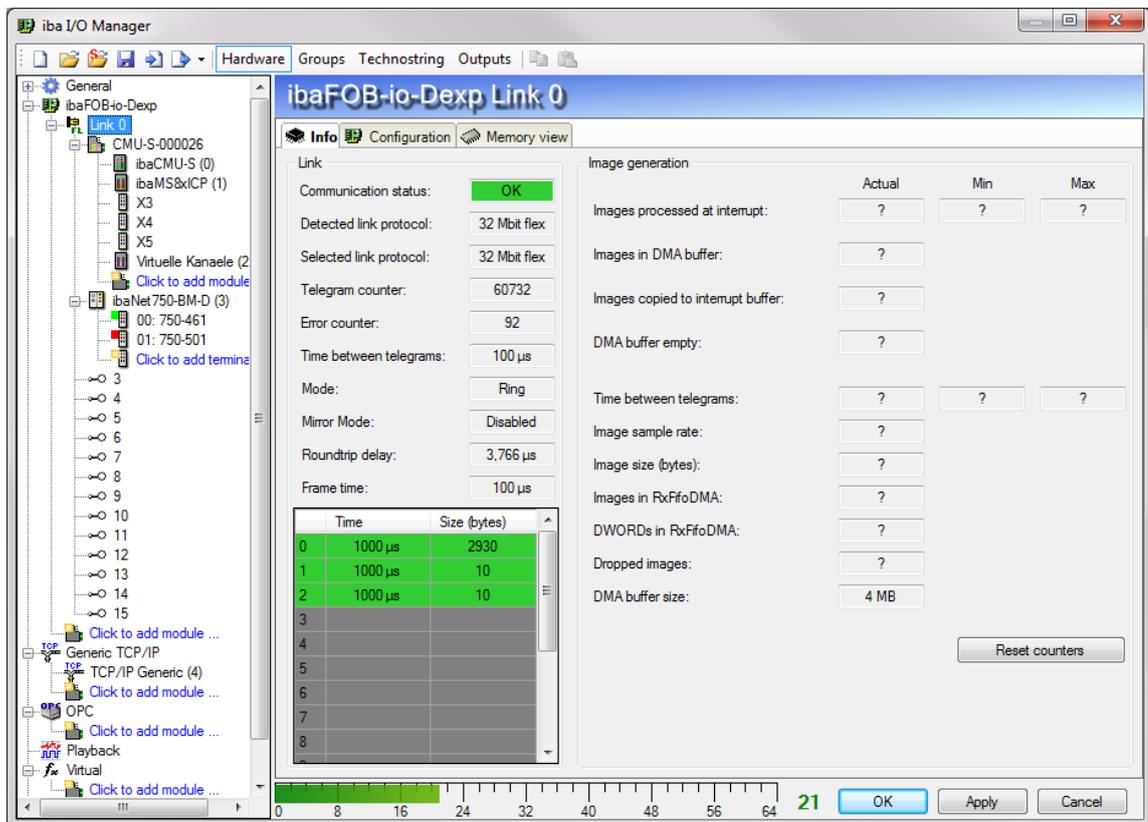


Figure 33: ibaPDA ibaCMU-S connection ok

You can change the channel names or units according to the ibaPDA manual.



Important note

Please note, that the module names like CMU-S-000026 or ibaMS8xICP shown in *Figure 33* must not be changed!

8.10 CMU Visualization

ibaCMU-S provides an onboard visualization, which is meant to be used for diagnostic purpose. It can be accessed with the *logi.RTS Runtime Viewer*. This chapter describes the contents of the visualization and assumes that you have already configured the *logi.VIS Runtime Viewer* according to the description in chapter 8.9.2.

When you start the visualization the screen shown in *Figure 34: CMU Visualization Info* will be shown.

8.10.1 System information

Information

Info Channels Signal test Reboot Eventlog License Help

CMU status

Date-Time: 20140910-110913 CMU Id: 25
 Ser Nr.: 000021 SW Vers.: 1.1.5.2136

System Disk: 384.0 MB free of 501.0 MB
 Full: Data Disk: 120290.0 MB free of 120293.0 MB
 Full: Path: Hard Disk2/

S1: 1 S2: 0

L5: Init
 L6: Data Acquire 300
 L7: Calculation no
 L8: Write

Settings

Configuration file OK
 Configuration valid
 Write XML file
 Write DAT file
 Write Day-Statisticals
 Write Day-Orbit
 Chatter Mode
 ibaNNet 750
 Virtual channel
 SystemDisk min.free 100MB
 DataDisk min.free 1000MB

TCP/IP Telegram

TCP/IP1 Active
 Server(1)/Client(0)
 IP 172.16.50.108
 Port 2001
 No. 59

TCP/IP2 Active
 Server(1)/Client(0)
 IP 172.16.50.108
 Port 2084
 No. 44

HSP Modul configuration

Module Name	Modul no.	Channel no.
Virtuelle Kanäle	0	512
CMU	1	8
ibaMS8xICP	2	8
ibaMS8xICP	3	8
	4	0
	5	0

Infos

Serial number: 000021
 Software Version: 1.1.5.2136

Sample rate: 20000
 Samples: 262144

IP Address: 172.16.50.84
 Subnet Mask: 255.255.255.0
 Default Gateway: 172.15.50.254

Figure 34: CMU Visualization Info

Some important information is displayed here, like the used space of the local disks, the software version running on ibaCMU-S or the modules which are attached to the back-plane, named HSP (High Speed) modules. You also see if TCP/IP communication is currently configured and the optical interface to ibaPDA is enabled (as virtual channels).

The information whether the configuration is valid is very important (*Configuration file OK* and *Configuration valid in the Settings* section of the screen). The checkmarks labeled L5 to L8 indicate the currently active tasks on ibaCMU-S. These conditions are also shown with the front panel LEDs (L5 to L8).

8.10.2 Channel Information

You can switch to the channel information page by clicking the <Channels> button. To get a better overview of the channels, they are grouped into bundles of 16. These groups can be selected and displayed using the corresponding buttons at the bottom of the visualization. Basically, the content of the CMU configuration file *conf.hardware.xml* is displayed here.

The channels originating from modules are called HSP channels or High speed buffer channels and are recorded at the highest sampling rate (40/20/5 kHz). The channels originating from ibaNet750 or a TCP/IP telegram are called LSP channels or low speed buffer channels and are recorded at the highest fixed sampling rate (50 Hz). Calculation results of HSP channels (e.g. if an inductive proximity switch is used to convert a rotation speed) are also stored as LSP channels.

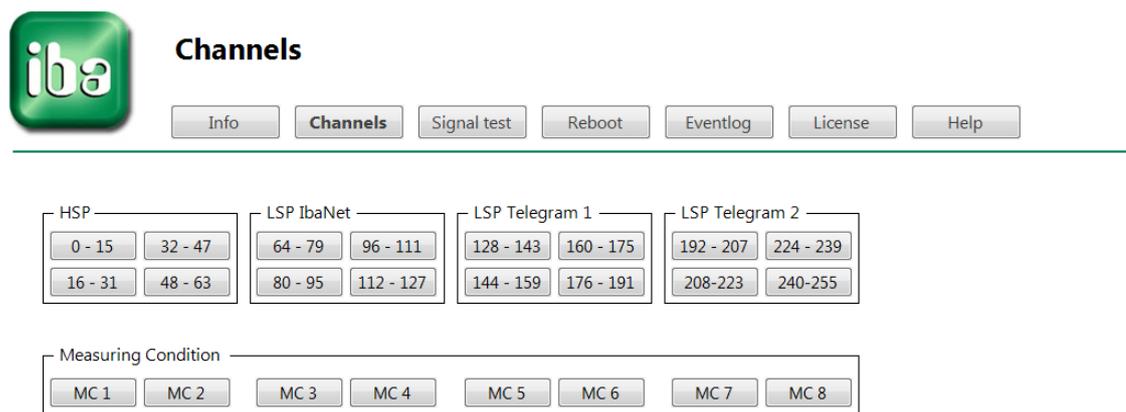


Figure 35: Select CMU channel display

8.10.2.1 Concerning Channel Numbers

ibaCMU-S can process up to 256 channels in total, but there are a few things to keep in mind.

There are two different channel types in general, HSP (high speed channels) and LSP (low speed channels).

HSP channels are always related to a hardware I/O module connected to the backplane and the maximum number of HSP channels is limited to 64.

HSP channel numbers 0 to 7 are reserved for the digital inputs of the ibaCMU-S central unit. HSP channel numbers 08 to 63 are assigned to the I/O modules according to their position on the backplane slots.

For example:

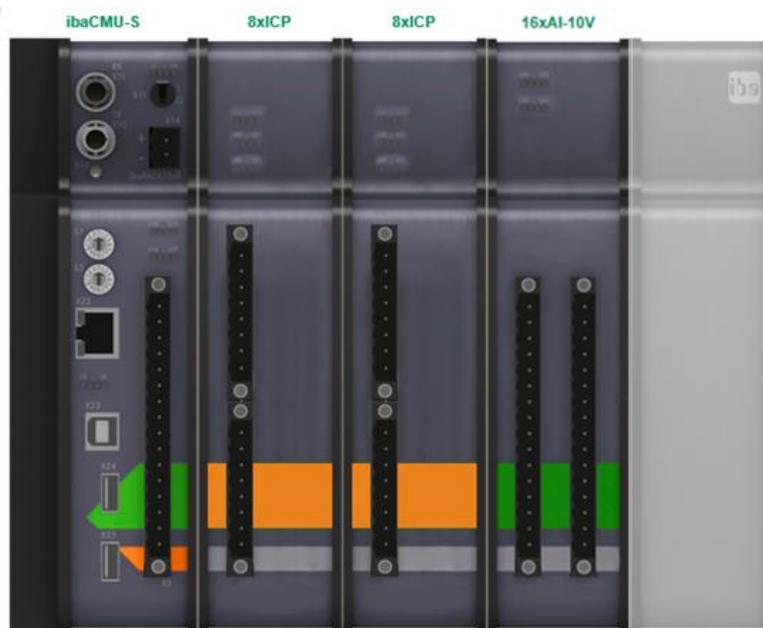


Figure 36: Example Module Configuration

In our example we will use the module configuration shown in the figure above.

The HSP channel numbers are as follows:

- ❑ Slot 0 ibaCMU-S central unit (always needs to be at slot 0)
8 digital inputs with channel numbers 00 to 07
- ❑ Slot 1 ibaMS8xICP vibration sensor module
8 vibration sensor inputs with channel numbers 08 to 15
- ❑ Slot 2 ibaMS8xICP vibration sensor module
8 vibration sensor inputs with channel numbers 16 to 23
- ❑ Slot 3 ibaMS16xAI-10V analog input module
16 analog inputs with channel numbers 24 to 39
- ❑ Slot 4 is not used

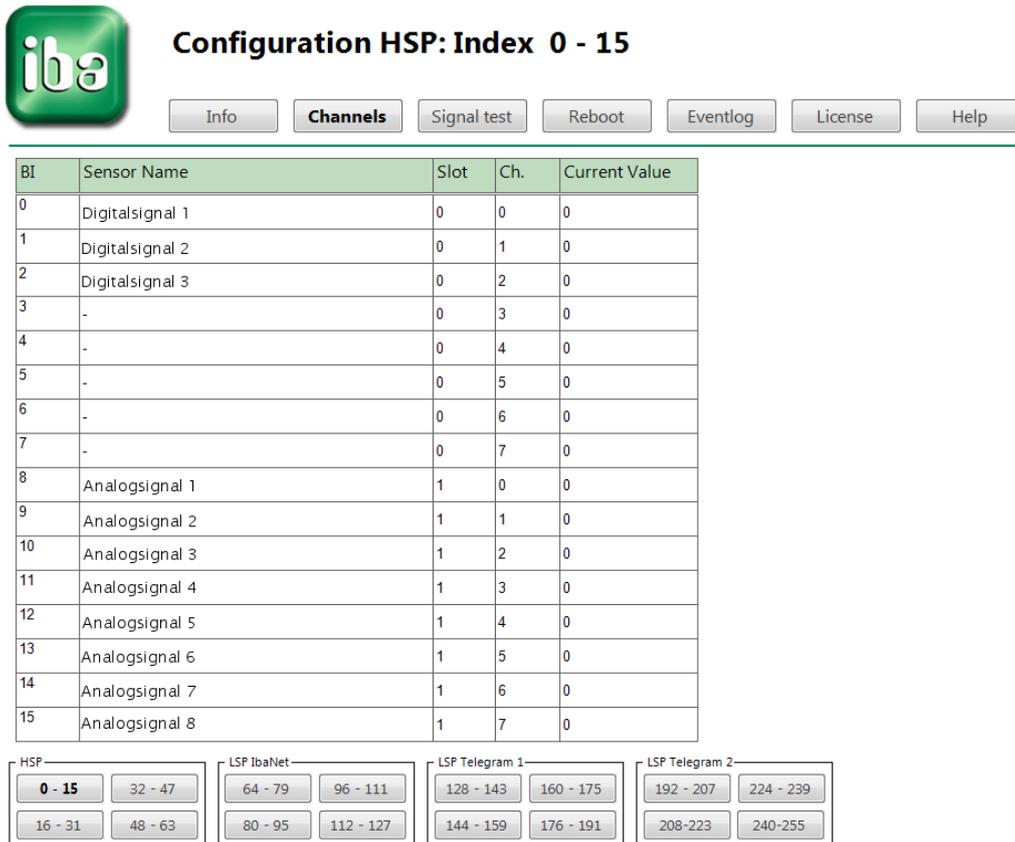
The LSP channels start after the HSP channels (00 to 63).

The first 64 channels (64 to 127) are reserved for an ibaNet750 module, which can be connected to ibaCMU-S via the fiber optic interface. If no ibaNet750 module is connected, the LSP channel numbers 64 to 127 are not used.

The next 128 LSP channels are reserved for TCP/IP communication. If TCP telegrams are configured, their channels will use the channel numbers starting from 128 up to 255. One TCP telegram can use up to 64 channels.

8.10.2.2 Channel Details

The channel details view shows the buffer index (BI), channel name (Sensor Name), slot number (Slot) of the module and the channel number (Ch.) within the module.



Configuration HSP: Index 0 - 15

Info Channels Signal test Reboot Eventlog License Help

BI	Sensor Name	Slot	Ch.	Current Value
0	Digitalsignal 1	0	0	0
1	Digitalsignal 2	0	1	0
2	Digitalsignal 3	0	2	0
3	-	0	3	0
4	-	0	4	0
5	-	0	5	0
6	-	0	6	0
7	-	0	7	0
8	Analogsignal 1	1	0	0
9	Analogsignal 2	1	1	0
10	Analogsignal 3	1	2	0
11	Analogsignal 4	1	3	0
12	Analogsignal 5	1	4	0
13	Analogsignal 6	1	5	0
14	Analogsignal 7	1	6	0
15	Analogsignal 8	1	7	0

HSP: 0 - 15, 32 - 47, 16 - 31, 48 - 63

LSP IbaNet: 64 - 79, 96 - 111, 80 - 95, 112 - 127

LSP Telegram 1: 128 - 143, 160 - 175, 144 - 159, 176 - 191

LSP Telegram 2: 192 - 207, 224 - 239, 208-223, 240-255

Figure 37: CMU channel configuration

You can switch to other channel groups using the buttons below.

8.10.2.3 Measurement Conditions Details

By selecting one of the <MCx> buttons in the channels display, you can view the currently configured measurement conditions.



Measuring condition 1

- Info
- Channels
- Signal test
- Reboot
- Eventlog
- License
- Help

MC Id: 1

MC Active: 1

Signal condition Name	Min	Max	STD	Active
LSP-TCP rpm Motor 1	600	0	10	1
-	0	0	0	0
-	0	0	0	0
-	0	0	0	0

Record Set:

HSP Sensors:
8, 9, 10, 11, 12, 13
-
-
LSP TCP/IP:
130
-
-

- MC 1
- MC 2
- MC 3
- MC 4
- MC 5
- MC 6
- MC 7
- MC 8

Figure 38: Display of measurement condition

By clicking one of the <MCx> buttons, the respective measurement condition can be visualized.

For each measurement condition signal, the name of the signal and the measurement conditions (Min, Max, STD) are displayed in the first table. These three measurement parameters are connected to each other with a logical AND operation. If one of the 3 measurement parameters is "0", this respective value is not taken into account for the AND logic operation. If the measurement condition signal is deactivated with "Active=0", this signal is not considered for the AND operation with other signals. If a measurement condition is active (i.e. all parameters are fulfilled), the respective input signal is recorded.

Figure 38 shows the following condition parameters to check:

- Min = 600: the signal (speed of Motor 1) needs to be at least 600 rpm
- Max = 0: maximum of the speed is set to "0" and is not used
- STD = 10: the maximum standard deviation of the motor speed must not be higher than "10"

In this case the motor speed signal must be higher than 600 rpm AND its standard deviation must not be higher than 10.

A measurement condition will only be checked, if it is set to active (Active = "1").

According to Figure 38 the high speed channels 08, 09, 10, 11, 12, 13 and the low speed channel 130 will be stored and analyzed by ibaCMU-S if the measurement condition above is TRUE.

Please note that a measurement condition can consist of up to 4 signals to check (signal conditions, Figure 38 shows only one of them). These signal conditions will also be combined with a logical AND.

8.10.3 Signal test

The following view will be displayed, when you click on the <Signal test> button. This view is very useful for signal diagnostics.

Figure 39: CMU Signal test

With the button <Set MC=OK> you can trigger a binary DAT file. This button just bypasses the measurement condition settings and stores all active channels, which are configured in the hardware configuration in a single DAT file. The file duration is the same, which is configured in the hardware configuration as well.

See chapter 9.1 Hardware configuration „conf.hardware.xml” for details about the hardware configuration file and chapter 9.2 Measuring condition configuration “conf.measuringcondition.xml for details about measuring conditions.

With the <Set Digital Output> button you can set digital hardware outputs for testing purpose. This option is only valid if an ibaMS32xDO-24V module is attached to ibaCMU-S.

Active output channels can be identified via 'Aktiv DO-Ch'. Only these digital outputs can be set manually using the checkbox for test purposes. *Set Output Error DO-Ch* is active (yellow) if the DO output cannot be set regardless of the active 'Aktiv DO-Ch'. *Volt Error root* shows unsupplied roots. This means that each DO output root (one root = 4 channels = one plug) must be supplied with 24 V. *Curr Error root* indicates overcurrent. <Reset> resets error (e.g. overcurrent). *Time remaining [s]* indicates as countdown how long the digital outputs are manually set for test purposes after <Set Digital Output> has been pressed.

Just check the desired output channels (DO Ch 00 to DO Ch 31) and enter the desired time span in the *Test-Time* field. Now click on the <Set Digital Output> button to start the

test. The field *Time remaining* shows how long the selected output remains in the logical TRUE state before it is automatically reset.

8.10.4 Reboot

With the <Reboot> button, a remote restart of ibaCMU-S can be triggered. This is the same function as described in chapter 8.8 *Rebooting via webinterface*.



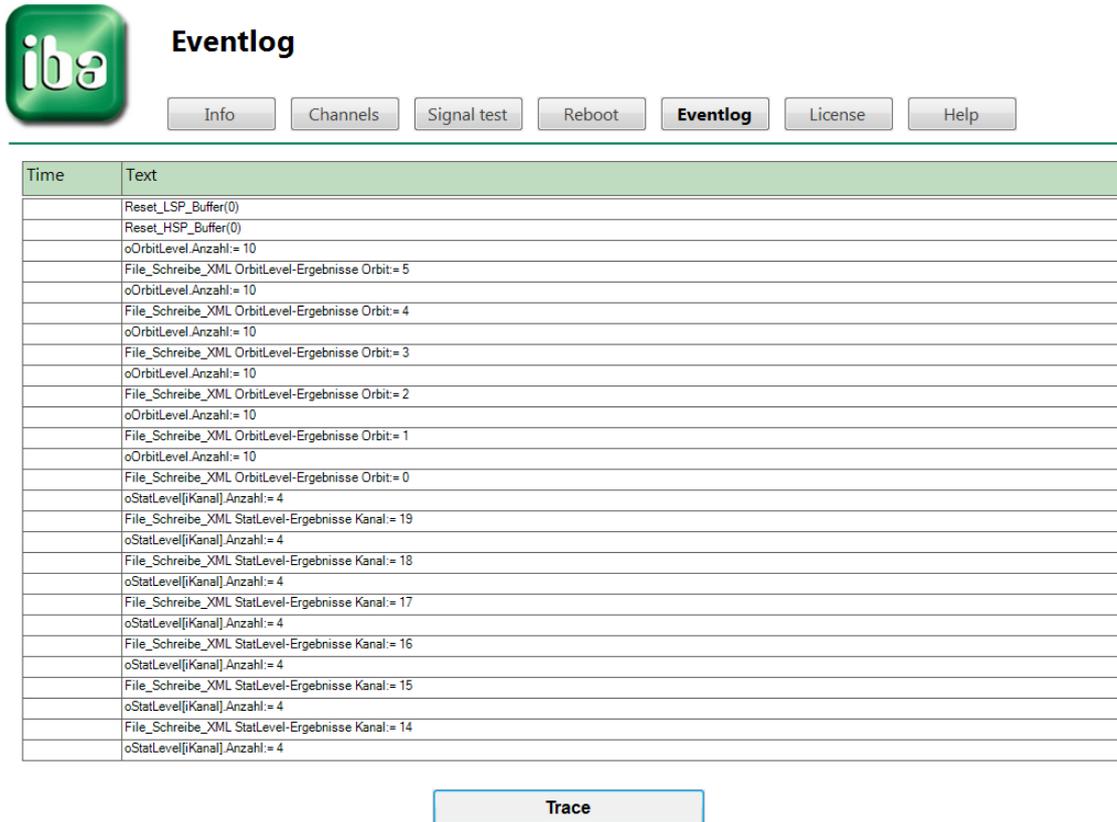
Click on Reboot button to resart the System!

Reboot

Figure 40: Reboot

8.10.5 Eventlog

ibaCMU-S is able to send a trace log via the syslog messaging protocol. Syslog is a de facto standard for message logging. Select the trace log view by clicking on the <Eventlog> button.



Eventlog

Info Channels Signal test Reboot **Eventlog** License Help

Time	Text
	Reset_LSP_Buffer(0)
	Reset_HSP_Buffer(0)
	oOrbitLevel.Anzahl:= 10
	File_Schreibe_XML OrbitLevel-Ergebnisse Orbit:= 5
	oOrbitLevel.Anzahl:= 10
	File_Schreibe_XML OrbitLevel-Ergebnisse Orbit:= 4
	oOrbitLevel.Anzahl:= 10
	File_Schreibe_XML OrbitLevel-Ergebnisse Orbit:= 3
	oOrbitLevel.Anzahl:= 10
	File_Schreibe_XML OrbitLevel-Ergebnisse Orbit:= 2
	oOrbitLevel.Anzahl:= 10
	File_Schreibe_XML OrbitLevel-Ergebnisse Orbit:= 1
	oOrbitLevel.Anzahl:= 10
	File_Schreibe_XML OrbitLevel-Ergebnisse Orbit:= 0
	oStatLevel[iKanal].Anzahl:= 4
	File_Schreibe_XML StatLevel-Ergebnisse Kanal:= 19
	oStatLevel[jiKanal].Anzahl:= 4
	File_Schreibe_XML StatLevel-Ergebnisse Kanal:= 18
	oStatLevel[iKanal].Anzahl:= 4
	File_Schreibe_XML StatLevel-Ergebnisse Kanal:= 17
	oStatLevel[jiKanal].Anzahl:= 4
	File_Schreibe_XML StatLevel-Ergebnisse Kanal:= 16
	oStatLevel[iKanal].Anzahl:= 4
	File_Schreibe_XML StatLevel-Ergebnisse Kanal:= 15
	oStatLevel[jiKanal].Anzahl:= 4
	File_Schreibe_XML StatLevel-Ergebnisse Kanal:= 14
	oStatLevel[iKanal].Anzahl:= 4

Trace

Figure 41: CMU Eventlog view

Since the syslog functionality consumes ibaCMU-S resources, you need to activate the display manually by clicking the <Trace> button. Current messages from ibaCMU-S are then listed for 20 s.

8.10.6 License

By clicking on the <License> button the license details of ibaCMU-S are displayed. The checkmarks show any license mismatch at a glance.



Figure 42: Licensing information

The following information is displayed:

License DAT File

If this checkmark is set, the license for writing iba DAT files is installed properly. *Number of DAT-Channel* shows, how many channels can be written in a single iba DAT file.

License RTS

If this checkmark is set, the license for the runtime system is installed properly. ibaCMU-S is not working if this license is missing.

License HIS

If this checkmark is set, the license for the ibaCMU-S application is installed properly. ibaCMU-S is not working if this license is missing.

License virtual Channels

If this checkmark is set, the optical interface (so called “virtual channels”) to an existing ibaPDA system is licensed and can be used.

License IbaNet

If this checkmark is set, the optical interface to an existing IbaNet750 extension module is licensed and can be used.

License TCP/IP

If this checkmark is set, the TCP/IP communication interface for reading and sending data is licensed and can be used.

Number of DO License

Shows the number of licensed digital hardware outputs (e.g. with an ibaMS32xDO-24V module).

Number of AI License

Shows the number of licensed analog hardware inputs (e.g. with an ibaMS16xAI-10V module).

Vibration inputs from an ibaMS8xICP module will not be counted here, because they are licensed separately.

Number of ICP License

Shows the number of licensed analog vibration inputs (e.g. with an ibaMS8xICP module).

9 Configuration

The configuration of ibaCMU-S can be done in several ways. It is recommended to use an existing ibaCMC server. Please refer to the ibaCMC manual for more details about ibaCMU-S configuration on the server side.

The complete configuration of ibaCMU-S is done with XML files. In general it is also possible to change these XML files manually, but the user should be aware, that manual changes can destroy the configuration and can render ibaCMU-S useless.



Note

The best way is to use a text editor which is capable of the XML syntax. The XML files are much more readable in this way. One possibility is to use the powerful and free editor Notepad++. It can be downloaded at <http://notepad-plus-plus.org/>.

In this chapter the contents of the configuration files are explained in detail.

In general the configuration XML files can be found in the local */Hard Disk2/cfg* directory of ibaCMU-S. Please refer to chapter 8.9.3 *Accessing measurement data and analysis results* for a description of the possibilities to connect to ibaCMU-S and access its file system.

Change into the *cfg* directory to see the configuration files stored on ibaCMU-S.

Possible configuration files are:

- conf.hardware.xml** (standard hardware configuration file, always present)
- conf.measuringcondition.xml** (measurement condition configuration file, always present)
- conf.analysis.xxx.yy.xml** (analysis configuration file, exists per active channel, subfiles are possible)

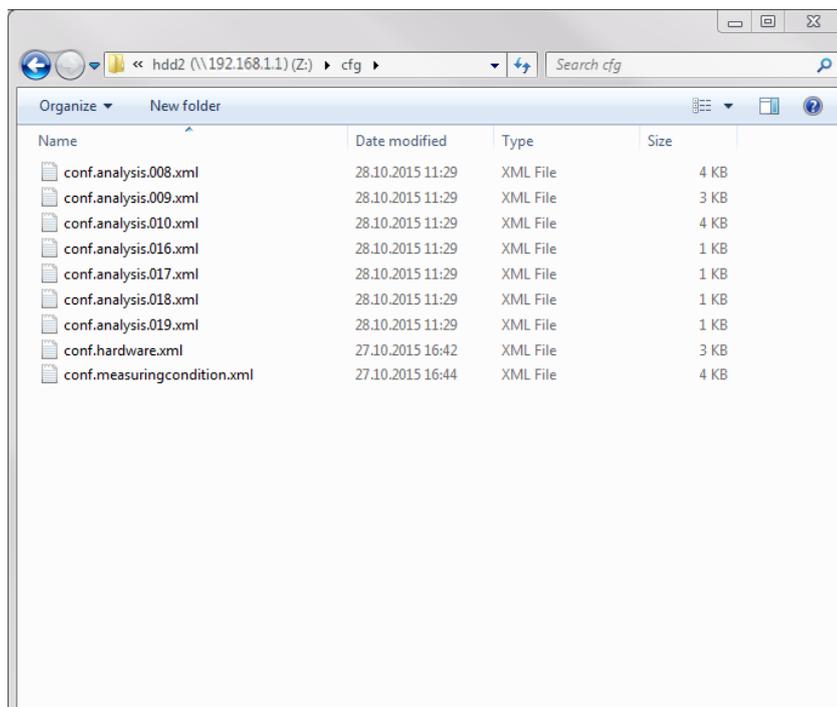


Figure 43: Contents of configuration directory (example)

Figure 43 shows a possible set of configuration files. Please note that there is only a single *conf.hardware.xml* and *conf.measuringcondition.xml* file but multiple *conf.analysis.xxx.xml* files. Every configured input or sensor signal has its own analysis configuration file. The xxx stands for the channel number (see chapter 8.10.2.1. *Concerning Channel Numbers* for details). Depending on the configuration (e.g. not all possible inputs on a module are used) some channel numbers can be missing. If the sensor or input signal belongs to a very complex machine part, the size of the analysis configuration files can be quite large and memory consuming. In this case the *conf.analysis.xxx.xml* file is split into subfiles named *conf.analysis.xxx.01.xml*, *conf.analysis.xxx.02.xml* and so on.

9.1 Hardware configuration „conf.hardware.xml”

No matter in which mode ibaCMU-S is running, there will always be a *conf.hardware.xml* configuration file.

The XML file has a strict layout. The following figure shows the general layout.

```

1  <?xml version="1.0" encoding="utf-8"?>
2  <HardwareKonfiguration>
3  <HACInfo ErstellungsZeit="20150907 183209">
4  <CMU Id="3" Name="Steelworks Crane 17" SerienNr="000011" Abtastrate="20000" SampleAnzahl="262144" ModulAnzahl="7"
5  VirtuelleKanaeleAktiv="0" VirtuelleKanaeleZyklusZeit="1000" IbaNetAktiv="1" TypPrefix="ic1" LogLevel="Warning"
6  MessbedingungZeitIntervall="120" MessbedingungsPruefungsTyp="1">
7  <Modul SlotIndex="1" Name="ibaMSBxICP" KanalAnzahl="8" BufferTyp="HSp">
8  <Kanal BI="8" Nummer="0" Name="IEPE Sensor 0" Aktiv="1" SignalTyp="1" BufferTyp="HSp">
9  <Sensor Name="IEPE Sensor 0" SerienNr="1" Einheit="m/s2" SignalTyp="1">
10 <SensorDaten>
11 </Sensor>
12 <KanalDaten>
13 </Kanal>
14 <Kanal BI="9" Nummer="1" Name="IEPE Sensor 1" Aktiv="1" SignalTyp="1" BufferTyp="HSp">
15 <Kanal BI="10" Nummer="2" Name="IEPE Sensor 2" Aktiv="1" SignalTyp="1" BufferTyp="HSp">
16 <Kanal BI="11" Nummer="3" Name="IEPE Sensor 3" Aktiv="1" SignalTyp="1" BufferTyp="HSp">
17 <Kanal BI="12" Nummer="4" Name="IEPE Sensor 4" Aktiv="1" SignalTyp="1" BufferTyp="HSp">
18 <Kanal BI="13" Nummer="5" Name="IEPE Sensor 5" Aktiv="1" SignalTyp="1" BufferTyp="HSp">
19 <Kanal BI="14" Nummer="6" Name="IEPE Sensor 6" Aktiv="1" SignalTyp="1" BufferTyp="HSp">
20 <Kanal BI="15" Nummer="7" Name="IEPE Sensor 7" Aktiv="1" SignalTyp="1" BufferTyp="HSp">
21 </Modul>
22 <Modul SlotIndex="2" Name="ibaMSBxICP" KanalAnzahl="8" BufferTyp="HSp">
23 <Modul SlotIndex="0" Name="HAICMON CMU" KanalAnzahl="8" BufferTyp="HSp">
24 <Modul SlotIndex="1" Name="ibaNet750-32xAI" KanalAnzahl="32" BufferTyp="LSp">
25 <Modul SlotIndex="2" Name="ibaNet750-32xDI" KanalAnzahl="32" BufferTyp="LSp" />
26 <Modul SlotIndex="1" Name="ibaNet750-32xAO" KanalAnzahl="32" BufferTyp="LSp" />
27 <Modul SlotIndex="2" Name="ibaNet750-32xDO" KanalAnzahl="32" BufferTyp="LSp">
28 </CMU>
29 </HardwareKonfiguration>

```

Figure 44: Structure of conf.hardware.xml

The main node is called *HardwareKonfiguration*. It consists of two children, a single *HACInfo* node and a single *CMU* node. The *HACInfo* node stores the creation time of the *conf.hardware.xml* file in the *ErstellungsZeit* attribute. It also contains a *Version* sub-node, which stores the version of the ibaCMC software used to create the file. This is important because both ibaCMC software version and ibaCMU-S software version need to match. A CMU node can have multiple *Modul* nodes, consisting of *Kanal* nodes and connected *Sensor* nodes.

9.1.1 Contents of the CMU node

The CMU node is defining the hardware configuration in detail. It has several attributes, which are explained here.

```

1  <?xml version="1.0" encoding="utf-8" ?>
2  <HardwareKonfiguration>
3  <@Name="1015907_183289" />
4  </@Name />
5  <@Version="1.2.6.2486" />
6  </@Version />
7  <@Abtastrate="20000" />
8  </@Abtastrate />
9  <@SampleAnzahl="512" />
10 </@SampleAnzahl />
11 <@ModulAnzahl="1" />
12 </@ModulAnzahl />
13 <@VirtuelleKanaeleAktiv="1" />
14 </@VirtuelleKanaeleAktiv />
15 <@IbaNetAktiv="1" />
16 </@IbaNetAktiv />
17 <@VirtuelleKanaeleZyklusZeit="1000" />
18 </@VirtuelleKanaeleZyklusZeit />
19 <@IbaNet750Aktiv="1" />
20 </@IbaNet750Aktiv />
21 <@IbaNet750ModulAnzahl="1" />
22 </@IbaNet750ModulAnzahl />
23 <@IbaNet750ModulName="IbaNet750" />
24 </@IbaNet750ModulName />
25 <@IbaNet750ModulIndex="1" />
26 </@IbaNet750ModulIndex />
27 <@IbaNet750ModulName="IbaNet750" />
28 </@IbaNet750ModulName />
29 <@IbaNet750ModulIndex="1" />
30 </@IbaNet750ModulIndex />
31 <@IbaNet750ModulName="IbaNet750" />
32 </@IbaNet750ModulName />
33 <@IbaNet750ModulIndex="1" />
34 </@IbaNet750ModulIndex />
35 </HardwareKonfiguration>

```

Figure 45: CMU node attributes

Id

Index which is defined in the ibaCMC database

Name

Name of ibaCMU-S

SerienNr

Serial number of ibaCMU-S

Abtastrate

Sampling rate given in Hz (e.g. 20000 Hz). This setting is used for all high speed channels from modules attached to the backplane. Permitted values: 40,000, 20,000, 15,000, 10,000, 7,500, 5,000, 1000 kHz.

SampleAnzahl

Number of measured measured values as power of 2, max. 524288 with 32 channels.

Example:

If you set this value to 262144 (equals 218) and set the sample rate (Abtastrate) above to 20000, you will get a measurement duration of 13.107 seconds.

ModulAnzahl

Number of active modules connected to ibaCMU-S. This can be modules connected to the backplane and ibaNet750 modules connected via fiber optics. An ibaNet750 module can have 4 modules (analog inputs, digital inputs, analog outputs and digital outputs).

VirtuelleKanaeleAktiv

This setting enables or disables the virtual channels, which are sent to an existing ibaPDA process data acquisition system via fiber optics. Please note that this setting needs to match the setting of the rotary switch S1 of ibaCMU-S, otherwise you will get a configuration error (LED L5 lights up red).

"0": virtual channels disabled, S1 = 0

"1": virtual channels enabled, S1 = 1

Please note that you can use either virtual channels or ibaNet750 but not both of them at the same time!

VirtuelleKanaeleZyklusZeit

Cycle time [ms, >100 ms] to write the current values on the virtual channels.

IbaNetAktiv

This setting enables or disables the communication with an external ibaNet750 module, connected via fiber optics.

“0”: ibaNNet750 disabled

“1”: ibaNNet750 enabled, VirtuelleKanaeleAktiv needs to be “0” and therefore S1 needs to be 0 as well.

LogLevel

Defines how detailed messages will be stored by the CMU's logging system.

Possible values are:

- 1 = Error
- 2 = Warning
- 3 = Info
- 4 = Debug

TypPrefix

Defines the CMU type.

Possible values are:

- “ic1”: ibaCMU-S with 128 GB SSD

MessbedingungZeitIntervall

Time interval in which the number of positive measurements to be achieved

MessbedingungsPruefungstyp

Each measuring has 10 buffer zones. If a zone has not valid measurement conditions the measuring can be stopped with a buffer rest at different zones.

- Value=1 = default: reset buffer. as soon as a buffer zone has not valid measurement condition
- Value=2 = reset buffer. at buffer at the last zone (zone 10) if one of the first 9 zones has not valid measurement condition (low speed measuring with inductive proximity switches. e.g. 1st impulse 1st zone and 2nd impulse 10th zone)

ApplikationsTyp

Gives the type of application running on the CMU.

- Value = 1: default is the standard vibration monitoring application

Datenanbindung

Gives the type of data connection to ibaCMC.

- Value = 0: offline data connection
- Value = 1: online data connection (default setting)

9.1.1.1 Module parameters

A CMU node owns several Modul nodes. Each Modul has got the following attributes.

```

1  <?xml version="1.0" encoding="utf-8"?>
2  <HardwareKonfiguration>
3  <HACInfo ErstellungsZeit="20150907 183209">
4  </HACInfo>
5  <CMU Id="3" Name="Steelworks Crane 17" SerienNr="000011" Abtastrate="20000" SampleAnzahl="262144" ModulAnzahl="7">
6  <Modul SlotIndex="1" Name="ibaMS8xICP" KanalAnzahl="8" BufferTyp="HSp">
7  <Kanal BI="8" Nummer="0" Name="IEPE Sensor 0" Aktiv="1" SignalTyp="1" BufferTyp="HSp">
8  <Sensor Name="IEPE Sensor 0" SerienNr="1" Einheit="m/s2" SignalTyp="1">
9  <SensorDaten>
10 </SensorDaten>
11 </Sensor>
12 <KanalDaten>
13 <KanalDaten Name="Resolution Min" Einheit=" " Wert="-32768" />
14 <KanalDaten Name="Resolution Max" Einheit=" " Wert="32767" />
15 <KanalDaten Name="Gain" Einheit="dB" Wert="1" />
16 <KanalDaten Name="Antialiasing Filter" Einheit="Hz" Wert="8000" />
17 </KanalDaten>
18 </Kanal>
19 <Kanal BI="9" Nummer="1" Name="IEPE Sensor 1" Aktiv="1" SignalTyp="1" BufferTyp="HSp">
20 <Kanal BI="10" Nummer="2" Name="IEPE Sensor 2" Aktiv="1" SignalTyp="1" BufferTyp="HSp">
21 <Kanal BI="11" Nummer="3" Name="IEPE Sensor 3" Aktiv="1" SignalTyp="1" BufferTyp="HSp">
22 <Kanal BI="12" Nummer="4" Name="IEPE Sensor 4" Aktiv="1" SignalTyp="1" BufferTyp="HSp">
23 <Kanal BI="13" Nummer="5" Name="IEPE Sensor 5" Aktiv="1" SignalTyp="1" BufferTyp="HSp">
24 <Kanal BI="14" Nummer="6" Name="IEPE Sensor 6" Aktiv="1" SignalTyp="1" BufferTyp="HSp">
25 <Kanal BI="15" Nummer="7" Name="IEPE Sensor 7" Aktiv="1" SignalTyp="1" BufferTyp="HSp">
26 </Modul>
27 <Modul SlotIndex="2" Name="ibaMS8xICP" KanalAnzahl="8" BufferTyp="HSp">
28 <Modul SlotIndex="0" Name="HAICMON CMU" KanalAnzahl="8" BufferTyp="HSp">
29 <Modul SlotIndex="1" Name="ibaNet750-32xAI" KanalAnzahl="32" BufferTyp="LSp">
30 <Modul SlotIndex="2" Name="ibaNet750-32xDI" KanalAnzahl="32" BufferTyp="LSp" />
31 <Modul SlotIndex="1" Name="ibaNet750-32xAO" KanalAnzahl="32" BufferTyp="LSp" />
32 <Modul SlotIndex="2" Name="ibaNet750-32xDO" KanalAnzahl="32" BufferTyp="LSp">
33 </Modul>
34 </CMU>
35 </HardwareKonfiguration>

```

Figure 46: CMU Modul parameters

❑ SlotIndex

Defines the slot of the backplane, where the module is connected in the example shown in Figure 36.

SlotIndex 0:	ibaCMU-S central unit
SlotIndex 1:	ibaMS8xICP vibration input module
SlotIndex 2:	ibaMS8xICP vibration input module
SlotIndex 3:	ibaMS16xAI-20mA analog input module

❑ Name

Name of the module that must exactly match the actual name of the module in the ibaCMU-S firmware. This value must not be changed.

❑ KanalAnzahl

Number of input or output channels of the module

❑ BufferTyp

BufferTyp can be either "HSp" or "LSp" („High Speed“ or „Low Speed“). Modules attached to the backplane always have a BufferTyp "HSp", ibaNet750 or TCP/IP modules always have a BufferTyp "LSp"

9.1.1.2 Channel parameters

The channel (Kanal) is representing an input of a module.

```

1  <?xml version="1.0" encoding="utf-8"?>
2  <HardwareKonfiguration>
3  <HACInfo ErstellungsZeit="20150907 183209">
6  <CMU Id="3" Name="Steelworks Crane 17" SerienNr="000011" AbtasteRate="20000" SampleAnzahl="262144" ModulAnzahl="7"
7  VirtuelleKanaeleAktiv="0" VirtuelleKanaeleZyklusZeit="1000" IbaNetAktiv="1" TypPrefix="ic1" LogLevel="Warning">
8  <Modul SlotIndex="1" Name="ibaMS8xICP" KanalAnzahl="8" BufferTyp="HSp">
9  <Kanal BI="8" Nummer="0" Name="IEPE Sensor 0" Aktiv="1" SignalTyp="1" BufferTyp="HSp">
10 <Sensor Name="IEPE Sensor 0" SerienNr="1" Einheit="m/s2" SignalTyp="1">
11 <SensorDaten>
12 <SensorDaten Name="Range Min" Einheit="" Wert="-500" />
13 <SensorDaten Name="Range Max" Einheit="" Wert="500" />
14 </SensorDaten>
15 </Sensor>
16 <KanalDaten>
17 <KanalDaten Name="Resolution Min" Einheit="" Wert="-32768" />
18 <KanalDaten Name="Resolution Max" Einheit="" Wert="32767" />
19 <KanalDaten Name="Gain" Einheit="dB" Wert="1" />
20 <KanalDaten Name="Antialiasing Filter" Einheit="Hz" Wert="8000" />
21 </KanalDaten>
22 </Kanal>
23 <Kanal BI="9" Nummer="1" Name="IEPE Sensor 1" Aktiv="1" SignalTyp="1" BufferTyp="HSp">
37 <Kanal BI="10" Nummer="2" Name="IEPE Sensor 2" Aktiv="1" SignalTyp="1" BufferTyp="HSp">
51 <Kanal BI="11" Nummer="3" Name="IEPE Sensor 3" Aktiv="1" SignalTyp="1" BufferTyp="HSp">
65 <Kanal BI="12" Nummer="4" Name="IEPE Sensor 4" Aktiv="1" SignalTyp="1" BufferTyp="HSp">
79 <Kanal BI="13" Nummer="5" Name="IEPE Sensor 5" Aktiv="1" SignalTyp="1" BufferTyp="HSp">
93 <Kanal BI="14" Nummer="6" Name="IEPE Sensor 6" Aktiv="1" SignalTyp="1" BufferTyp="HSp">
107 <Kanal BI="15" Nummer="7" Name="IEPE Sensor 7" Aktiv="1" SignalTyp="1" BufferTyp="HSp">
121 </Modul>
122 <Modul SlotIndex="2" Name="ibaMS8xICP" KanalAnzahl="8" BufferTyp="HSp">
236 <Modul SlotIndex="0" Name="HAICMON CMU" KanalAnzahl="8" BufferTyp="HSp">
249 <Modul SlotIndex="1" Name="ibaNet750-32xAI" KanalAnzahl="32" BufferTyp="LSp">
263 <Modul SlotIndex="2" Name="ibaNet750-32xDI" KanalAnzahl="32" BufferTyp="LSp" />
264 <Modul SlotIndex="1" Name="ibaNet750-32xAO" KanalAnzahl="32" BufferTyp="LSp" />
265 <Modul SlotIndex="2" Name="ibaNet750-32xDO" KanalAnzahl="32" BufferTyp="LSp">
491 </CMU>
492 </HardwareKonfiguration>

```

Figure 47: Kanal parameters

□ BI

Internal buffer index which must not be changed. Depending on the slot of the module, each channel is assigned a buffer index (BI). It starts with the 1st channel (Channel 0) of the basic module BI=0. The 8th channel of the basic module is then BI=7. The first channel of the module at the next slot starts with BI=8 and so on. If, in addition to the basic module, the CMU also has an ICP module and then an analog input module, the basic module has buffer index 0 to 7, the ICP module buffer index 8 to 15 and the analog input module buffer index 16 to 31.

□ Nummer

Number of the channel assigned from the module, starting with "0" for the first channel.

□ Name

Name of the channel that is freely selectable. Names longer than 127 characters are automatically truncated.

□ Aktiv

„Aktiv“ can be either "0" or "1". If the value is "0" the channel is inactive and will not be calculated or analyzed.

□ SignalTyp

“SignalTyp” gives the type of the channel or the sensor. The following values are supported:

- Typ "1" analog IEPE (or ICP®) vibration input
- Typ "2" analog voltage input ±10V
- Typ "3" analog current input 0-20mA
- Typ "4" analog ibaNet750, e.g. fieldbus module with PT100 temperature input

- Typ "5" generic analog input unspecified
- Typ "6" analog voltage input $\pm 24V$
- Typ "7" analog current input 4-20mA
- Typ "8" analog voltage input 0-10V
- Typ "11" digital input 0-24V (HTL)
- Typ "12" digital ibaNet750, e.g. fieldbus module with 24V digital inputs
- Typ "13" digital RPM input, e.g. proximity switch with 24V HTL signal
- Typ "14" digital RPM-ibaNet750 input, Speed input inductive proximity switch 24V HTL level measured via ibaNet750
- Typ "21" TCP/IP channel input

The numbers mentioned above are used for input channels. Outputs have the same numbers starting from 100. E.g. a 24V HTL digital output has a Typ number of 111.

BufferTyp

BufferTyp can be either "HSp" or "LSp" („High Speed“ or „Low Speed“). Channels of modules attached to the backplane always have a BufferTyp "HSp", ibaNet750 or TCP/IP modules always have a BufferTyp "LSp".

Channel data and sensor data parameters

Channel data (KanalDaten) and sensor data (SensorDaten) consist of the three attributes called name (Name), unit (Einheit) and value (Wert). The attributes name (Name) and value (Wert) are mandatory, unit (Einheit) is optional. If no parameter is specified for value (Wert), it is automatically interpreted as "0".

The figure above shows the maximum channel resolution limits (for a 16 bit analog-to-digital converter e.g. 32767 for Resolution Max and -32768 for Resolution Min), which are irrelevant in the case of a 24V digital output module. Therefore "1" and "0" are in the file".

Range Min

This value indicates the minimum value of the measured physical unit that the sensor delivers at its minimum output signal. A vibration sensor might deliver a value of -500 m/s², therefore Figure 47 shows a value of -500

Range Max

This value indicates the maximum value of the measured physical unit that the sensor is delivers at its maximum output signal. A vibration sensor might deliver a value of 500 m/s², therefore Figure 47 shows a value of 500.

Resolution Min

Minimum value of the A/D converter delivered with the minimum full scale input level. An A/D converter with a resolution of 16 bit delivers -32768 if the minimum full scale input signal is applied to the channel input. This value is "0" for digital signals.

Resolution Max

Maximum value of the A/D converter delivered at the maximum full scale input level. An A/D converter with a resolution of 16 bit delivers 32767 if the maximum full scale input signal is applied to the channel input. This value is "1" for digital signals.

Gain

Setup value of the modules internal gain amplifier given in Decibel (dB). This parameter is only available, if the module the channel belongs to, has got an internal amplifier (e.g. ibaMS8xICP).

Antialiasing Filter

Setup value of the modules internal antialiasing filter given in Hertz (Hz). This parameter is only available, if the module the channel belongs to, has got an internal antialiasing filter (e.g. ibaMS8xICP).

Switch flag

This parameter is only valid for digital RPM signals (SignalTyp 13, e.g. proximity switch).



Note

Usually, the SignalTyp settings of channel and the connected sensor are the same. However, they also might be different, if it makes sense.

Example:

You can of course connect a sensor delivering a 4-20 mA signal to an input channel with 0-20 mA level. In this case the SignalTyp of the channel will be "3" and the SignalTyp of the sensor will be "7", which is a valid combination.

Please note that you will lose signal resolution if you connect a small scale sensor to a large scale input (e.g. a sensor with 0-10 V output signal to a ± 24 V input channel).

9.1.1.3 TCP/IP telegrams

TCP/IP telegrams are treated as separate modules within the ibaCMU-S hardware configuration. ibaCMU-S can receive two telegrams in parallel and can send one telegram. Each telegram can consist of 64 channels.

```

1  <?xml version="1.0" encoding="utf-8" ?>
2  <HardwareKonfiguration>
3  <HACInfo ErstellungsZeit="20151102_165455">
4  <Version>1.3.0.2666</Version>
5  </HACInfo>
6  <CMD Id="4" Name="CMU ICP 4" SerienNr="000025" Abtastrate="1000" SampleAnzahl="262144" ModulAnzahl="8" VirtuelleKanalektiv="0"
7  VirtuelleKanaleZykluszeit="1000" IbaNetAktiv="0" TypPrefix="i01" LogLevel="1" MessbedingungsZeitintervall="3600" MessbedingungsPruefungstyp="1">
8  <Modul SlotIndex="0" Name="HAICMON CMU" KanalAnzahl="8" BufferTyp="HSp" />
9  <Modul SlotIndex="1" Name="ibaMS8xICP" KanalAnzahl="8" BufferTyp="HSp">
123 <Modul SlotIndex="2" Name="ibaMS8xICP" KanalAnzahl="8" BufferTyp="HSp">
237 <Modul SlotIndex="3" Name="ibaMS8xICP" KanalAnzahl="8" BufferTyp="HSp">
267 <TCP/IPTelegramm>
268 <TCP/IPTelegramm Senden="0" Name="CMU1" IPAdresse="1.1.1.1" Port="5000" KanalAnzahl="6" VerbindungsaufbauAktiv="1" Aktiv="1" IstBigEndian="1" Zykluszeit="20" SendeTypNummer="0">
269 <TCP/IPKanal BI="128" Index="0" BufferTyp="LSp" Name="Byte Length" Typ="11" MV="1" MVE="" Einheit="1" />
270 <TCP/IPKanal BI="129" Index="1" BufferTyp="LSp" Name="Telegram Id" Typ="11" MV="1" MVE="" Einheit="1" />
271 <TCP/IPKanal BI="130" Index="2" BufferTyp="LSp" Name="TCP rpm Motor 1" Typ="18" MV="" MVE="" Einheit="rpm" />
272 <TCP/IPKanal BI="131" Index="3" BufferTyp="LSp" Name="TCP rpm Motor 2" Typ="18" MV="" MVE="" Einheit="rpm" />
273 <TCP/IPKanal BI="132" Index="4" BufferTyp="LSp" Name="TCP rpm Motor 3" Typ="18" MV="" MVE="" Einheit="rpm" />
274 <TCP/IPKanal BI="133" Index="5" BufferTyp="LSp" Name="TCP rpm Motor 4" Typ="18" MV="" MVE="" Einheit="rpm" />
275 </TCP/IPTelegramm>
276 <TCP/IPTelegramm Senden="1" Name="CMU2" IPAdresse="1.1.1.1" Port="5000" KanalAnzahl="1" VerbindungsaufbauAktiv="1" Aktiv="1" IstBigEndian="1" Zykluszeit="1000" SendeTypNummer="0">
277 <TCP/IPKanal Index="0" BufferTyp="LSp" Name="Watchdog" Typ="16" MV="1" MVE="" Einheit="1" />
278 </TCP/IPTelegramm>
279 </TCP/IPTelegramme>
280 </CMD>
281 </HardwareKonfiguration>

```

Figure 48: TCP/IP telegram parameters

The following list explains the TCP/IP telegram header parameters.

Senden

This parameter gives the direction of the telegram

"0": the telegram is received by ibaCMU-S

"1": the telegram is sent by ibaCMU-S

Name

Name of the telegram that is freely selectable. Names longer than 127 characters are automatically truncated.

IPAdresse

IP address of the communication partner

Port

Port number of the communication

 KanalAnzahl

gives the number of TCP/IP channels of this telegram

 VerbindungsaufbauAktiv

Tells if ibaCMU-S should initiate the TCP/IP communication actively.

“0”: ibaCMU-S waits for the communication partner to initiate the connection

“1”: ibaCMU-S initiates the communication

 Aktiv

Indicates whether this telegram is active or not.

“0”: this telegram is not used (disabled)

“1”: this telegram is active and is used

 IstBigEndian

This setting gives the byte order used to transfer multibyte data types.

“0”: the least significant byte is transferred first

“1”: the most significant byte is transferred first (this setting is used in most of the network communications)

 ZyklusZeit

Cycle time given in milliseconds indicates when a telegram is sent. This needs to be a multiple of 100 ms. If the telegram is received by ibaCMU-S (Senden = 0), this setting is ignored.

 SendeTypNummer

Some ibaCMU-S applications might have a fixed hard coded TCP/IP telegram.

“0”: TCP/IP telegram is not hard coded, channel parameters are used as configured in `conf.hardware.xml`

“≥1”: TCP/IP telegram is hard coded in the program code and is activated with a number ≥1. The channel configuration in `conf.hardware.xml` is ignored.

Each channel of the TCP/IP telegram has the following parameters.

 BI

Internal buffer index which must not be changed. This index is only used in telegrams which are sent to ibaCMU-S.

 Index

Index gives the order of the channel within the telegram. Index 0 always has to be the *ByteLength* parameter.

 BufferTyp

TCP/IP channels always have a BufferTyp “LSp” (Low Speed)

 Name

Name of the channel that is freely selectable. Names longer than 127 characters are automatically truncated.

 Typ

Preferred data types to use e.g. INT:=11, REAL:=18

Other possible data types are:

BOOL:=9, SINT:=10, DINT:=12, LINT:=13, USINT:=14

UINT:=15, UDINT:=16, ULINT:=17, LREAL:=19

MV

Manipulation instruction for the channel.

- Abs: MV=1 absolute value calculation (If MVP not equal to 0-> Abs(Mul))
- Add: MV=2 addition
- Mul: MV=3 multiplication
- Sub: MV=4 subtraction
- Div: MV=5 division

MVP

Manipulation instruction parameter (see MV)

If the MV parameter is set to 1 (Abs) and MVP is $\neq 0$, a multiplication will be performed first and then the abs calculation is done.

Einheit

Physical unit of the channel, this is especially important if a speed signal is sent via TCP/IP channel. If the speed is provided in rpm, ibaCMU-S will recalculate to rps, Hz automatically. However, it is better to convert the speed always with MV and MVP parameters into rps or U/s.



Important note

Every TCP/IP telegram, which is received by ibaCMU-S, must have the byte length configured as the first TCP/IP channel.

Example:

REAL data type is 4 bytes on the ibaCMU-S platform

INT data type is 2 bytes on the ibaCMU-S platform

The telegram provides 10 channels of type REAL and 5 channels of type INT.

The communication partner has to send the value 50 as the first two bytes of the telegram.

9.1.2 Manual change of alarming thresholds

The manual change of alarming threshold only needs to be done if ibaCMU-S is operating in standalone mode without an ibaCMC. Nevertheless the recommended way to set the alarming threshold is via an ibaCMC installation.



Important note

Please note that manual changes in the configuration files of ibaCMU-S should be done by skilled employees only. Incorrect configuration files can render ibaCMU-S useless. The basic structure of the XML file must not be changed, only individual parameters (e.g. limit value) may be changed!

Alarms can be triggered via TCP/IP telegram, an ibaMS32xDO-24V module attached to ibaCMU-S directly or an ibaNet750 module connected to ibaCMU-S via optical cable. The following example shows an ibaMS32xDO-24V module, but the other alarming features can be configured in a similar way.



Note

The best way is to use a text editor which is capable of the XML syntax. The XML files are much more readable in this way. One possibility is to use the powerful and free editor Notepad++. It can be downloaded at <http://notepad-plus-plus.org/>.

9.1.2.1 Configuration of digital output module

```
<Modul SlotIndex="2" Name="ibaMS32xDO-24V" Bezeichnung="ibaMS32xDO-24V" KanalAnzahl="32" BufferTyp="HSp" >
  <Kanal Nummer="0" Name="Abhaspel_DE_Alarm" Aktiv="0" SignalTyp="111" BufferTyp="HSp">
    <Sensor Name="Abhaspel_DE_Alarm_Sensor" SerienNr="1" Einheit="1" Typ="111"/>
    <VirtuelleTrends>
      <VTrend Id="11741" Name="Sppmax" MV="6" MVP="300"/>
    </VirtuelleTrends>
    <KanalDaten>
      <KanalDaten Name="Resolution Max" Einheit="" Wert="1" />
      <KanalDaten Name="Resolution Min" Einheit="" Wert="0" />
    </KanalDaten>
  </Kanal>
  <Kanal Nummer="1" Name="Abhaspel_NDE_Alarm" Aktiv="0" SignalTyp="111" BufferTyp="HSp">
    <Sensor Name="Abhaspel_NDE_Alarm_Sensor" SerienNr="1" Einheit="1" Typ="111"/>
    <VirtuelleTrends>
      <VTrend Id="11841" Name="Sppmax" MV="6" MVP="300"/>
    </VirtuelleTrends>
    <KanalDaten>
      <KanalDaten Name="Resolution Max" Einheit="" Wert="1" />
      <KanalDaten Name="Resolution Min" Einheit="" Wert="0" />
    </KanalDaten>
  </Kanal>
  <Kanal Nummer="2" Name="Geruestmotor_DE_Alarm" Aktiv="0" SignalTyp="111" BufferTyp="HSp">
    <Sensor Name="Geruestmotor_DE_Alarm_Sensor" SerienNr="1" Einheit="1" Typ="111"/>
    <VirtuelleTrends>
      <VTrend Id="11941" Name="Sppmax" MV="6" MVP="300"/>
    </VirtuelleTrends>
    <KanalDaten>
      <KanalDaten Name="Resolution Max" Einheit="" Wert="1" />
      <KanalDaten Name="Resolution Min" Einheit="" Wert="0" />
    </KanalDaten>
  </Kanal>
</Modul>
```

Figure 49: conf.hardware.xml contents of digital output module

In case of an output module the *conf.hardware.xml* channel node will have an additional sub node called VirtuelleTrends (virtual trends). Virtual trends are fault trends or a trend of statistical values (e.g. a statistical value like RMS or ISO level, a bearing fault indicator of the inner raceway or an imbalance of a motor shaft).

The virtual trends configured in the *conf.hardware.xml* need to be also configured in a *conf.analysis.xxx.xml* file, otherwise there will be no calculation of the virtual trend. The *conf.analysis.xxx.xml* files are created before delivery or during commissioning. See chapter 10.1.1 *Contents of conf.analysis.xml* for more details about analysis configuration files.

Every virtual trend has the following configuration parameters.

□ Id

Unique ID of the virtual trend, which needs to match the ID given in a *conf.analysis.xxx.xml* file. This ID must not be changed.

Name

Name of the virtual trend which should match the name in the corresponding *conf.analysis.xxx.xml* file. Normally this name doesn't need to be changed.

 MV

Manipulation instruction for the virtual trend. The following instructions or rules are supported:

- 1 Abs, absolute value, if the MVP parameter is $\neq 0$, a multiplication with MVP will be performed before the absolute value calculation.
- 2 Add, addition of the value given by the MVP parameter to the virtual trend
- 3 Mul, multiplication of the virtual trend with the value given by the MVP parameter
- 4 Sub, subtraction of the value given by the MVP parameter from the virtual trend
- 5 Div, division of the virtual trend by the value given by the MVP parameter
- 6 Threshold, the value given by the MVP parameter will be interpreted as a threshold. If the virtual trend value exceeds the given MVP value, a digital output will be set to TRUE for instance.
- 7 VT Treshold, this instruction refers to a threshold, which is preset by ibaCMC
- 8 Shortfall, the value given by the MVP parameter will be interpreted as a threshold. If the virtual trend value is below the given MVP value, a digital output will be set to TRUE for instance.
- 9 VT Shortfall, this instruction refers to a shortfall threshold, which is preset by ibaCMC
- 10 Threshold 3, the same meaning as MV=6, but an average over three trend values is carried out before the result is compared to the MVP parameter.
- 11 Threshold 5, the same meaning as MV=6, but an average over five trend values is carried out before the result is compared to the MVP parameter.
- 12 Threshold 10, the same meaning as MV=6, but an average over ten trend values is carried out before the result is compared to the MVP parameter.
- 13 Shortfall 3, the same meaning as MV=8, but an average over three trend values is carried out before the result is compared to the MVP parameter.
- 14 Shortfall 5, the same meaning as MV=8, but an average over five trend values is carried out before the result is compared to the MVP parameter.
- 15 Shortfall 10, the same meaning as MV=8, but an average over ten trend values is carried out before the result is compared to the MVP parameter.
- 16 Avg 3, averaging of 3 consecutive virtual trend values
- 17 Avg 5, averaging of 5 consecutive virtual trend values
- 18 Avg 10, averaging of 10 consecutive virtual trend values

 MVP

Manipulation instruction parameter (see description of MV)

9.1.2.2 Changing the threshold value

```

<Modul SlotIndex="2" Name="ibaMS32xDO-24V" Bezeichnung="ibaMS32xDO-24V" KanalAnzahl="32" BufferTyp="HSp" >
  <Kanal Nummer="0" Name="Abhaspel_DE_Alarm" Aktiv="0" SignalTyp="111" BufferTyp="HSp">
    <Sensor Name="Abhaspel_DE_Alarm_Sensor" SerienNr="1" Einheit="1" Typ="111"/>
    <VirtuelleTrends>
      <VTrend Id="11741" Name="Sppmax" MV="6" MVP="300"/>
    </VirtuelleTrends>
    <KanalDaten>
      <KanalDaten Name="Resolution Max" Einheit="" Wert="1" />
      <KanalDaten Name="Resolution Min" Einheit="" Wert="0" />
    </KanalDaten>
  </Kanal>
  <Kanal Nummer="1" Name="Abhaspel_NDE_Alarm" Aktiv="0" SignalTyp="111" BufferTyp="HSp">
    <Sensor Name="Abhaspel_NDE_Alarm_Sensor" SerienNr="1" Einheit="1" Typ="111"/>
    <VirtuelleTrends>
      <VTrend Id="11841" Name="Sppmax" MV="6" MVP="300"/>
    </VirtuelleTrends>
    <KanalDaten>
      <KanalDaten Name="Resolution Max" Einheit="" Wert="1" />
      <KanalDaten Name="Resolution Min" Einheit="" Wert="0" />
    </KanalDaten>
  </Kanal>
  <Kanal Nummer="2" Name="Geruestmotor_DE_Alarm" Aktiv="0" SignalTyp="111" BufferTyp="HSp">
    <Sensor Name="Geruestmotor_DE_Alarm_Sensor" SerienNr="1" Einheit="1" Typ="111"/>
    <VirtuelleTrends>
      <VTrend Id="11941" Name="Sppmax" MV="6" MVP="300"/>
    </VirtuelleTrends>
    <KanalDaten>
      <KanalDaten Name="Resolution Max" Einheit="" Wert="1" />
      <KanalDaten Name="Resolution Min" Einheit="" Wert="0" />
    </KanalDaten>
  </Kanal>

```

Figure 50: Changing the threshold value (MVP)

Open the *conf.hardware.xml* file with a text editor of your choice (we recommend to use the free editor Notepad++). Change the MVP value of the desired virtual trend to a value of your choice. (Figure 50: *Changing the threshold value (MVP)* shows a value of 300)

Please note that you need to use a colon as the decimal delimiter. Save the XML file and close the editor. Don't forget to upload the new file to ibaCMU-S and overwrite the existing one.



Important note

Changes in the *conf.hardware.xml* file will only take effect after a reboot. You can trigger a reboot via the ibaCMU-S website.

9.2 Measuring condition configuration “conf.measuringcondition.xml”

The XML file *conf.measuringcondition.xml* controls the data acquisition and storage according to valid conditions. Especially in vibration monitoring it is very important to have constant and comparable operation conditions of the monitored equipment. This constancy can be checked with the help of the measuring conditions.

9.2.1 Contents of conf.measuringcondition.xml

```

1  <?xml version="1.0" encoding="UTF-8"?>
2  <MessbedingungKonfiguration>
3  <HACInfo ErstellungsZeit="20140909 144910">
4  <Messbedingungen Anzahl="5">
5  <Messbedingung Index="0" MessbedingungId="1" Name="MC Blower 1" MaximaleMessAnzahlProZeitIntervall="100" Aktiv="1">
6  <SensorenZumAufzeichnen>
7  <Sensor BI="8" BufferTyp="HSp" />
8  <Sensor BI="0" BufferTyp="HSp" />
9  <Sensor BI="13" BufferTyp="HSp" />
10 </SensorenZumAufzeichnen>
11 <TCPIPKanaleZumAufzeichnen />
12 </Messbedingung>
13 <Messbedingung Index="1" MessbedingungId="2" Name="MC Pump 1" MaximaleMessAnzahlProZeitIntervall="100" Aktiv="1">
14 <Messbedingung Index="2" MessbedingungId="3" Name="MB W1 ZL" MaximaleMessAnzahlProZeitIntervall="0" Aktiv="1">
15 <Messbedingung Index="3" MessbedingungId="4" Name="MB W2 ZL" MaximaleMessAnzahlProZeitIntervall="0" Aktiv="1">
16 <Messbedingung Index="4" MessbedingungId="5" Name="MB W2 AL" MaximaleMessAnzahlProZeitIntervall="0" Aktiv="1">
17 </Messbedingungen>
18 <CMU Id="2" Name="CMU Lackiererei" MessbedingungZeitIntervall="3600">
19 <Modul SlotIndex="2" />
20 <Modul SlotIndex="1" />
21 <Modul SlotIndex="0">
22 <Kanal BI="4" BufferTyp="HSp">
23 <Kanal BI="3" BufferTyp="HSp">
24 <Kanal BI="2" BufferTyp="HSp">
25 <Kanal BI="1" BufferTyp="HSp">
26 <Kanal BI="0" BufferTyp="HSp">
27 <Sensor Name="Speed Blower 1" SerienNr="1019226">
28 <MessbedingungsParameter>
29 <MessbedingungsParameter MessbedingungId="1" MaxWert="0,1" MinWert="0,2" SDWert="0,3" Pruefe="1" />
30 </MessbedingungsParameter>
31 </Sensor>
32 </Kanal>
33 </Modul>
34 <Modul SlotIndex="1">
35 </Modul>
36 </CMU>
37 </MessbedingungKonfiguration>

```

Figure 51: Contents of conf.measuringcondition.xml

The following list explains the parameters of the measurement condition node of the XML file.

□ Index

Index of the measurement condition starting with 0.

□ Name

Name of the measurement condition for better understanding

□ Aktiv

“0” measurement condition disabled and will not be evaluated

“1” measurement condition enabled

□ MessbedingungId

ID of the measurement condition for cross referencing the check conditions of the measurement channels

□ MaximaleMessAnzahlProZeitIntervall

Maximum number of measurements, which should be achieved in the given time interval (parameter *MessbedingungZeitIntervall* of CMU node) If the number of measurements has been reached, the next measurement will be done, when the time interval has elapsed.

SensorenZumAufzeichnen

Sensors with buffer index and buffer type that should be recorded in a DAT file if the measurement condition is TRUE.

 TCPIPKanaeleZumAufzeichnen

TCPIP channels with buffer index and buffer type that should be recorded in the same DAT file together with the sensors, if the measurement condition is TRUE.

The file *conf.measuringcondition.xml* also contains a subset of the ibaCMU-S configuration similar to the *conf.hardware.xml* file. This is used to define which sensors or TCP/IP channels are used to test the measurement conditions. Figure 51 shows an example of a speed sensor. The following list explains the parameters of the measurement conditions.

 MessbedingungParameter

The following parameters are defined for each test channel of a measurement condition: MaxWert, MinWert, SDWert

 MessbedingungId

Index of the measurement condition the checking parameter belongs to

 MaxWert

Maximum value the channel should have.

If the current value is smaller, the condition is TRUE.

If MaxWert is "0" the condition is treated as "not set".

 MinWert

Minimum value the channel should have.

If the current value is larger, the condition is TRUE.

If MinWert is "0" the condition is treated as "not set".

 SDWert

Maximum allowed standard deviation value

If the current value of the standard deviation is smaller, the condition is TRUE.

If SDWert is "0" the condition is treated as "not set".

 Pruefe

"0" the channel conditions above are ignored, and the condition check is always TRUE

"1" the condition check is active and the AND operation of MaxValue, MinValue and SDValue applies.



Note

If multiple conditions are configured (e.g. MaxWert and MinWert), they are linked with a logical AND operation. All configured conditions must be TRUE for a valid measurement condition.

10 Application specific configuration and visualization

The presence of the following configuration files depends on the ibaCMU-S operating mode.

10.1 CMS application (standard)

The CMS application is the ibaCMU-S standard. In this case ibaCMU-S is performing mechanical fault detection with vibration measurement and signal analysis. It is configured with an ibaCMC and can be operated in standalone mode or in combination with the ibaCMC.

The entire evaluation performed by ibaCMU-S is parameterized in the analysis configuration files. Depending on the hardware configuration, different files may exist. If a measurement channel is used for an analysis, ibaCMC automatically generates a file *conf.analysis.xxx.xml* whose name contains the buffer index of the corresponding measurement channels. The xxx is the buffer index (BI) of the sensor. This corresponds to the channel number of the ibaCMU-S, which provides the data for the analysis. Refer also to chapter 8.10.2.1.

Example:

If the first input of the first (leftmost) ibaMS8xICP module should be used for the analysis the file name will be *conf.analysis.008.xml*, because the first 8 digital input channels (counting starts at "0") are from 000 to 007.

If the machine part, the sensor is mounted to, is very complex and a lot of analysis calculations need to be performed by ibaCMU-S, subfiles are possible, too. They will be named *conf.analysis.008.01.xml*, *conf.analysis.008.02.xml* and so on.

10.1.1 Contents of *conf.analysis.xml*

The configuration of the analysis distinguishes between multiple calculation types:

- statistical fault levels and other levels, which are calculated from the time signal without any additional bandwidth limitation
- statistical fault levels and other levels, which are calculated from the time signal with additional bandwidth limitation
- component-specific fault levels, which are calculated in the frequency domain

The source for the analysis is always a measurement channel (channel node), which is identified by its buffer index (BI). A *conf.analysis.xxx.xml* file always contains a single channel.

BI

Buffer index of the measurement channel, according to the CMU hardware configuration (*conf.hardware.xml*)

The individual virtual trends (VTrend) to be calculated are then assigned to the channel. Within the analysis configuration file, the statistical characteristic values with bandwidth limitation are listed first, followed by those without bandwidth limitation and the component-specific virtual trends.

```

1  <?xml version="1.0" encoding="utf-8"?>
2  <AnalyseKonfiguration>
3    <HACInfo ErstellungsZeit="20141001_154329">
4      <Version>1.1.35.2160</Version>
5    </HACInfo>
6    <Kanal BI="8">
7      <VTrend Index="1" Id="829" Name="RMS 10-2000" SiT="4" SdT="11" Gw="100" KorrbId="1" KorrbI="101" KorrrPar1="201" KorrrPar2="301">
8        <CMUB Kz="RMS" Bid="4" Mul="1">
9          <BP Key="UntereGrenzfrequenz" Arg="10" />
10         <BP Key="ObereGrenzfrequenz" Arg="2000" />
11         <BP Key="Ordnungsanalyse" Arg="0" />
12         <BP Key="OrdnungsVielfache" Arg="1" />
13       </CMUB>
14     </VTrend>
15     <VTrend Index="2" Id="830" Name="RMS 1-10" SiT="4" SdT="11" Gw="100" KorrbId="2" KorrbI="102" KorrrPar1="202" KorrrPar2="302">
23     <VTrend Index="3" Id="831" Name="RMS 2000-20000" SiT="4" SdT="11" Gw="100" KorrbId="3" KorrbI="103" KorrrPar1="203" KorrrPar2="303">
31     <VTrend Index="4" Id="832" Name="ISO 3-1000" SiT="5" SdT="11" Gw="100" KorrbId="4" KorrbI="104" KorrrPar1="204" KorrrPar2="304">
39     <VTrend Index="5" Id="833" Name="ISO 10-1000" SiT="5" SdT="11" Gw="100" KorrbId="5" KorrbI="105" KorrrPar1="205" KorrrPar2="305">
47     <VTrend Index="6" Id="822" Name="Min" SiT="4" SdT="11" Gw="" KorrbId="6" KorrbI="106" KorrrPar1="206" KorrrPar2="306">
50     <VTrend Index="7" Id="823" Name="Max" SiT="4" SdT="11" Gw="100" KorrbId="7" KorrbI="107" KorrrPar1="207" KorrrPar2="307">

```

Figure 52: VTrend node statistical level with bandwidth limitation

All virtual trend nodes (no matter which calculation type) have the same attributes, which are explained in the following list.

Index

Increasing unique index starting from “1”. This index is used to keep track of the VTrend nodes over multiple subfiles.

Id

Unique ID of the virtual trend, generated by the database.

Name

Name of the virtual trend

SiT

Gives the input signal type required to calculate this virtual trend. SiT can have the following values:

- 1: spectrum of the vibration acceleration signal
- 2: spectrum of the vibration velocity signal (will be calculated by integration of the acceleration signal)
- 3: envelope spectrum of the vibration acceleration signal
- 4: time signal of the vibration acceleration signal
- 5: time signal of the vibration velocity signal (will be calculated by integration of the acceleration signal)
- 7: spectrum of a displacement signal
- 8: common time signal

SdT

Gives the type of damage or fault. SdT can have the following values:

- 1: inner raceway fault of a roller bearing
- 2: outer raceway fault of a roller bearing
- 3: fault of rolling elements of a roller bearing
- 4: cage fault of a roller bearing
- 5: shaft level
- 6: shaft imbalance
- 7: gear fault
- 9: displacement spectrum problem
- 11: statistical level problem

- 12: fault of a belt drive
- 13: fault of a roll of a rolling mill stand
- 14: roll imbalance of a rolling mill stand
- 15: rotor blade problem of a wind turbine generator
- 16: fault of a blower
- 17: fault of a pump

Gw

Threshold value of a virtual trend

KorrBId

Gives the ID of a calculation type, which should be used to do a correlation calculation (optional)

At the moment *KorrBId* = 101 for linear regression calculation is supported. Selectable correlation signals: IEPE sensor, Digital RPS sensor, TCP channel.

KorrBI

Gives the buffer index of a signal which should be used as an input for the correlation calculation (optional)

KorrPar1

Gradient for *KorrBI* channel (gradient of the regression line determined)

KorrPar2

Channel Maximum value of the correlation signal (*KorrBI*) in the calculation period. The virtual trends are converted to this value

Every VTrend node (virtual Trend) consists of CMU calculation subnodes (CMUB), which can have calculation parameter subnodes themselves.

Kz

Name to identify the CMU calculation

BId

ID of the calculation implementation. The following values are permitted for BId:

The following values can be used for BId:

- 1: calculation of the maximum value (Max)
- 2: calculation of the minimum value (Min)
- 3: calculation of the average value (Avg)
- 4: calculation of the root mean square value (RMS)
- 5: calculation of the vibration intensity value according to DIN ISO 10816
- 6: calculation of the peak to peak value
- 7: calculation of the peak factor also known as crest factor
- 8: calculation of the standard deviation (SD)
- 9: calculation of the median
- 10: calculation of a value, indicating the use of the measurement range of the sensor (Used Range)
- 11: calculation of a value indicating the quality of the measured signal (SQ)

- 12: calculation of the revolution frequency of a shaft from a digital signal coming from an inductive proximity switch or an endoder (RPS)
- 13: calculation of the S(p-p)max value of a kinetic shaft track according to DIN ISO 7919-1
- 14: calculation of the Smax value of a kinetic shaft track according to DIN ISO 7919-1
- 15: calculation of the angle φ of the occurrence of S(p-p)max according to DIN ISO 7919-1
- 16: calculation of the angle φ of the occurrence of Smax according to DIN ISO 7919-1
- 17: calculation of the current alarming zone in dependence of S(p-p)max according to DIN ISO 7919-1
- 18: calculation of a value for imbalance of a shaft
- 19: calculation of a value for misalignment
- 20: calculation of a value for rubbing (e.g. blower blades at the housing)
- 21: calculation of a value for „Oil Whip“ phenomena of sleeve bearings
- 38: calculation of a K(t) value
- 39: calculation of a value indicating a local damage of a part
- 101: calculation of a linear regression
- 102: calculation of a exponential regression

Mul

Gives a multiplication factor to achieve a special weighting after the calculation above

Calculation parameter

Depending on the selected calculation ID described above, the CMUB node might also have calculation parameter subnodes called BP. These are always specified as pairs of key and argument (arg).

Example:

The RMS value might be calculated with a bandwidth limitation, which needs to be set with calculation parameters. The CMUB node with the attribute Bid="4" will therefore have BP subnodes giving the cut off frequencies of the band pass filter.

The AVG value does not need any additional parameters. Therefore the CMUB node with the attribute Bid="3" won't have BP subnodes.

Every BP node has a Key attribute, which is naming the parameter and an Arg attribute giving the value. The following Keys are supported at the moment:

„UntereGrenzfrequenz“

Gives the lower cut off frequency of the bandpass filter. This parameter is mostly used for the calculation of statistical values with a bandwidth limitation.

Example: if you want to calculate a RMS value between 10 Hz und 1 kHz, the Arg attribute will have a value of 10

An Arg value of 0 means, that this calculation parameter is ignored

„ObereGrenzfrequenz“

Gives the upper cut off frequency of the bandpass filter. This parameter is mostly used for the calculation of statistical values with a bandwidth limitation.

Example: if you want to calculate a RMS value between 10 Hz und 1 kHz, the Arg attribute will have a value of 1000

An Arg value of 0 means, that this calculation parameter is ignored

 „Ordnungsanalyse“

This calculation parameter key activates an order analysis. The Arg attribute has two possible values:

0 order analysis is disabled

1 order analysis is enabled

 „OrdnungsVielfache“

Gives the number of harmonics, which should be used for the order analysis. It is only used if the order analysis is active with the parameter above.

Arg gives the number of harmonics which should be used for the calculation.

11 System integration

11.1 Application examples

The figures below show examples of ibaCMU-S combined with ibaCMC Condition Monitoring Center and ibaPDA.

11.1.1 iba Condition Monitoring System

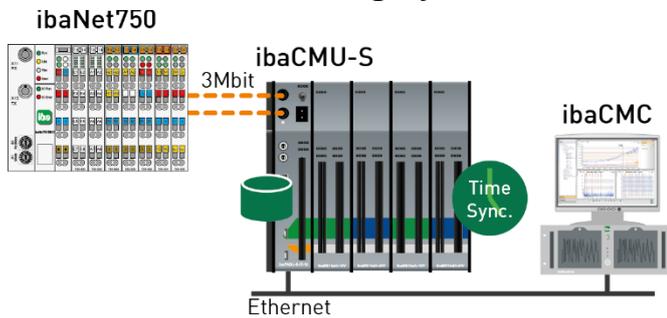


Figure 53: Condition Monitoring with ibaCMU-S and ibaCMC

- Central monitoring of production plants with ibaCMC Condition Monitoring Center and decentralized ibaCMU-S systems.
- I/O expansion via ibaNet750 (3Mbit ibaNet) possible, S1 must be set to 0

11.1.2 iba Condition Monitoring and Process Analysis

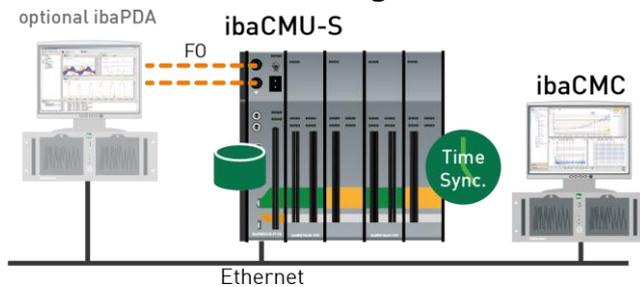


Figure 54: Cross-plant monitoring with ibaPDA, ibaCMU-S and ibaCMC

- Monitoring in the context of a complex plant
- Centralized acquisition of all relevant machine, process, material and quality data

12 Technical Data

12.1 Main data

Short description	
Name	ibaCMU-S
Description	CPU for Condition Monitoring applications
Order number	10.125010
Processor unit	
Processor	1.6 GHz Atom processor, single CPU
Operating system	Windows CE® 5.0
RAM	512 MB
Clock	Unbuffered / optional external buffering via X30 synchronization by DCF77 (digital input) or NTP
Supply, operating and indicating elements	
Voltage supply	24 V DC, ± 10 % not stabilized, 1 A (without I/O modules), 3 A (with I/O modules)
Power consumption	Up to 20 W
Displays	4 LEDs for operating status of the device 8 LEDs for status of the digital inputs 4 LEDs for device functions
Operating and environmental conditions	
Cooling	Passive
Operating temperature	32° F ... 122° F (0°C ... 50 °C)
Storage and transport temperature	-13° F ... 158° F (-25°C ... 70°C)
Installation position	Vertical, plugged into the backplane bus
Humidity class acc. to DIN 40040	F, no condensation
Protection class	IP20
Certification, standards	CE FCC part 15 class A
Dimensions and weight	
Dimensions (Width x height x depth)	2.20 in x 8.43 in x 5.83 in (56 mm x 214 mm x 148 mm) with installation rack: 9.02 in x 8.62 in x 6.14 in (229 mm x 219 mm x 156 mm)
Weight (incl. packaging and documentation)	1.5 kg

12.2 Interfaces

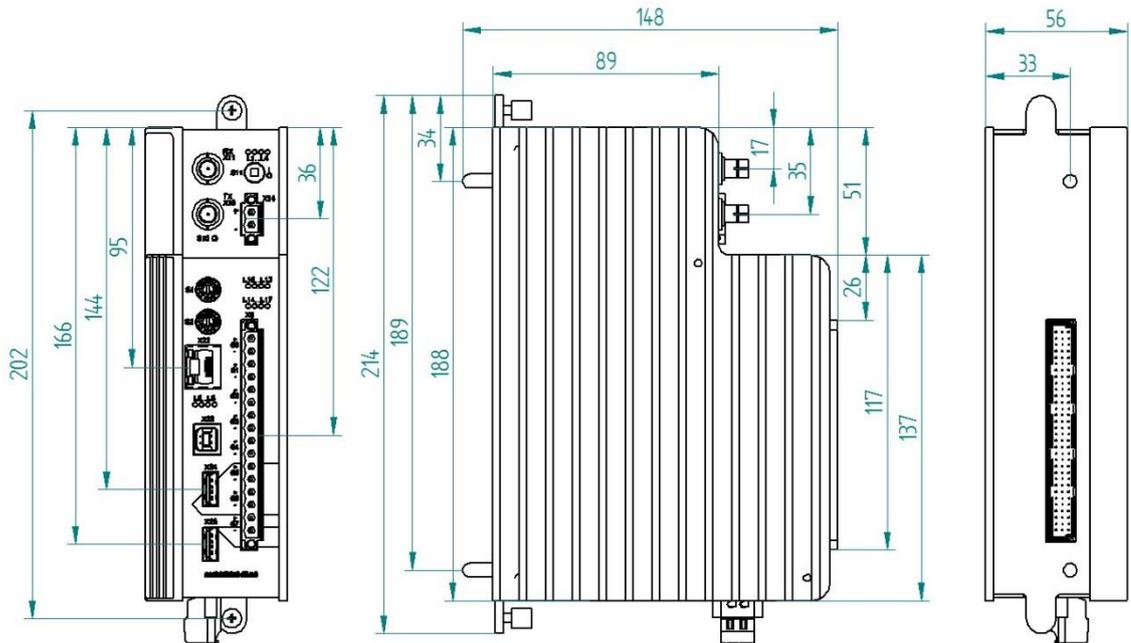
ibaNet	
ibaNet protocols	32Mbit Flex (bidirectional) 3Mbit
FO cable	2 ST connector (62.5/125 µm) for RX and TX max. cable length 500 m (32Mbit); 2000 m (3Mbit)
Further interfaces	
Ethernet	10/100 Mbit/s
USB	for service purposes only

12.3 Digital inputs

Digital inputs	
Number	8
Design	Electrically isolated, protected against reverse polarity, single ended
Input signal	24 V DC
Max. signal voltage	±60 V permanent
Signal level log. 0	> -6 V; < +6 V
Signal level log. 1	< -10 V; > +10 V
Input current	1 mA, constant
Debounce filter	optional, 4 different settings
Sampling rate	Up to 40 kHz, freely adjustable
Delay	Typ. 10 µs
Electrical isolation	
	Channel-channel 2.5 kV AC
	Channel-housing 2.5 kV AC
Connector type	16-pin terminal block, connector with clamp-type terminal, screw connection (0.2 mm ² to 2.5 mm ²), included in delivery

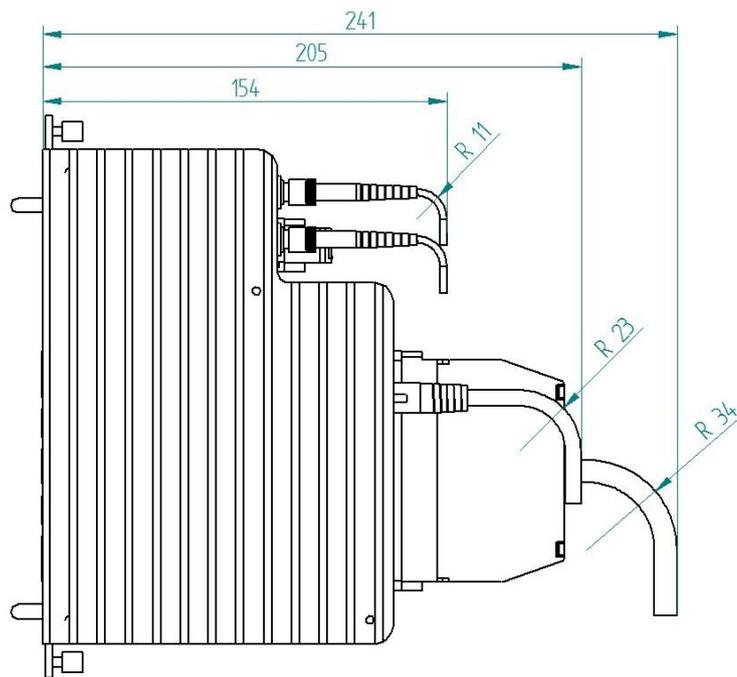
12.4 Dimensions

ibaCMU-S



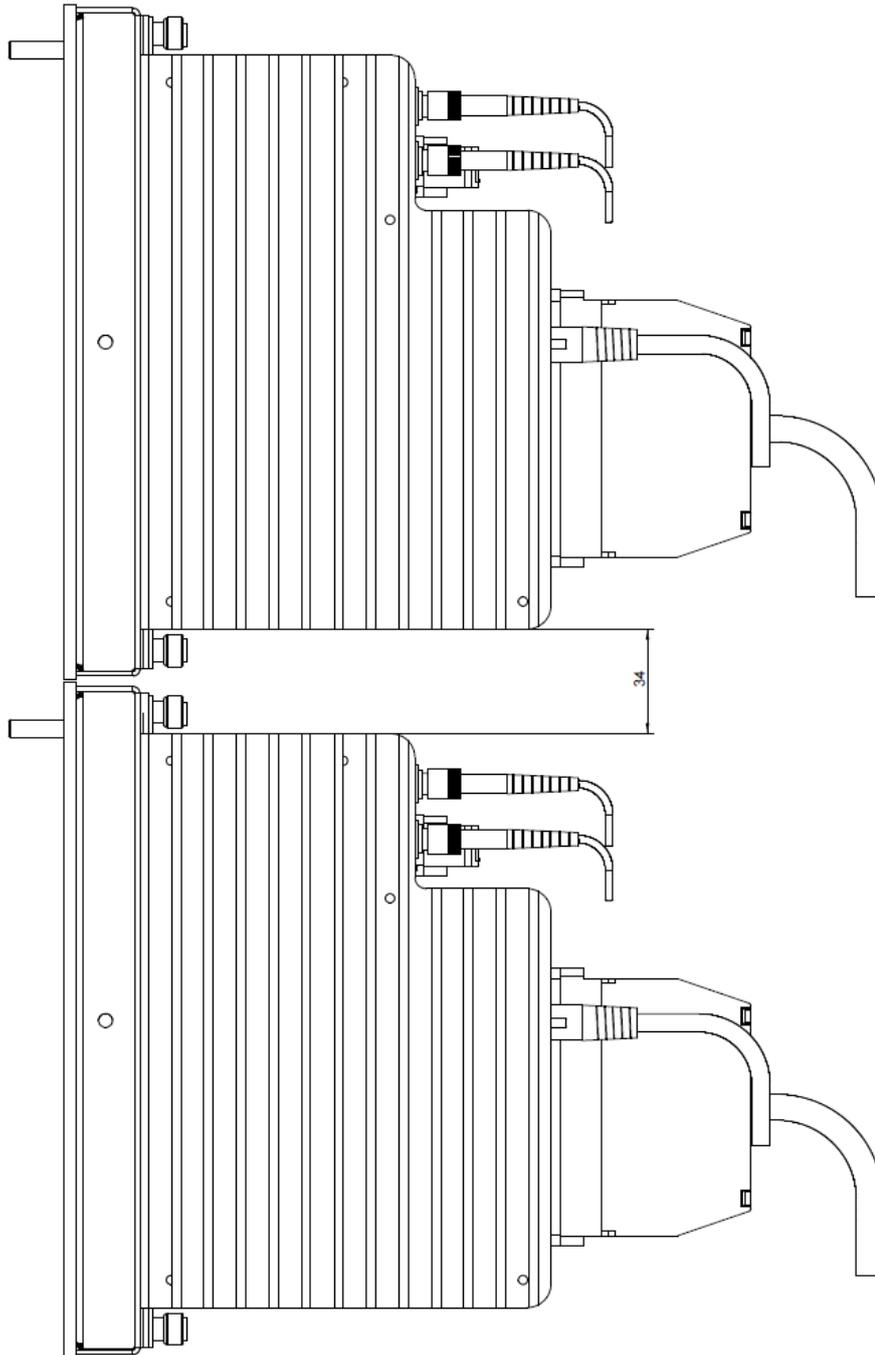
(Dimensions in mm)

Figure 55: Dimensions ibaCMU-S



(Dimensions in mm)

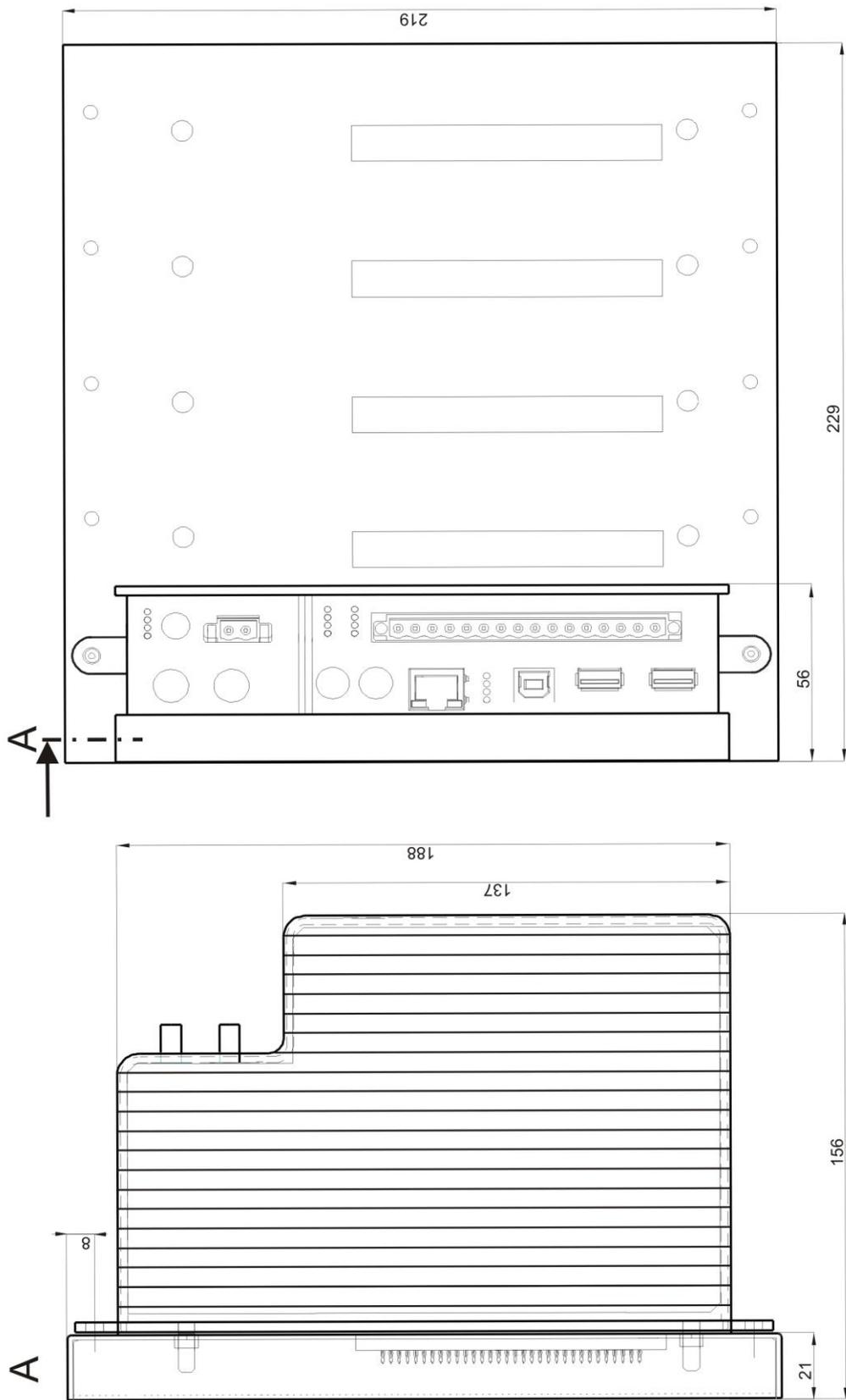
Figure 56: Dimensions ibaCMU-S with cables

Distance between 2 ibaCMU-S systems

(Dimensions in mm)

Figure 57: Minimum distance between 2 ibaCMU-S systems

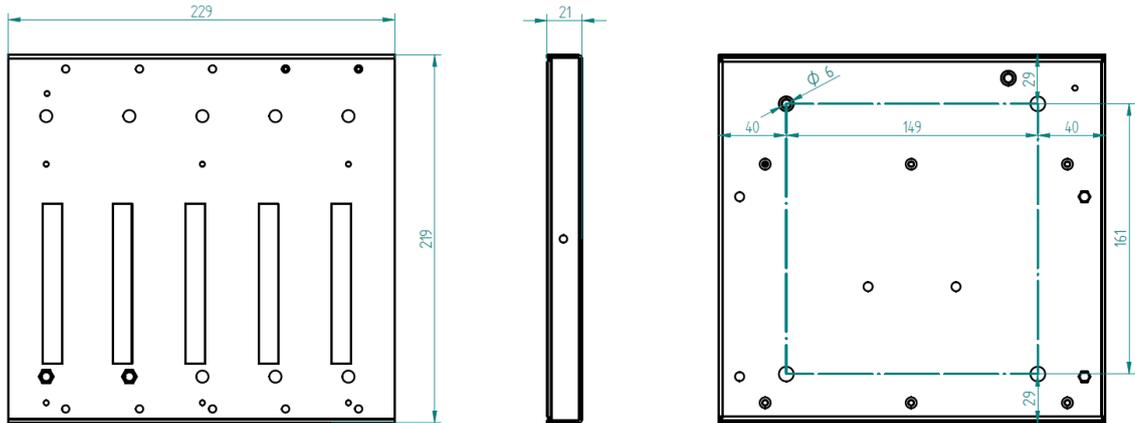
ibaCMU-S and backplane



(Dimensions in mm)

Figure 58: Dimensions ibaCMU-S with backplane

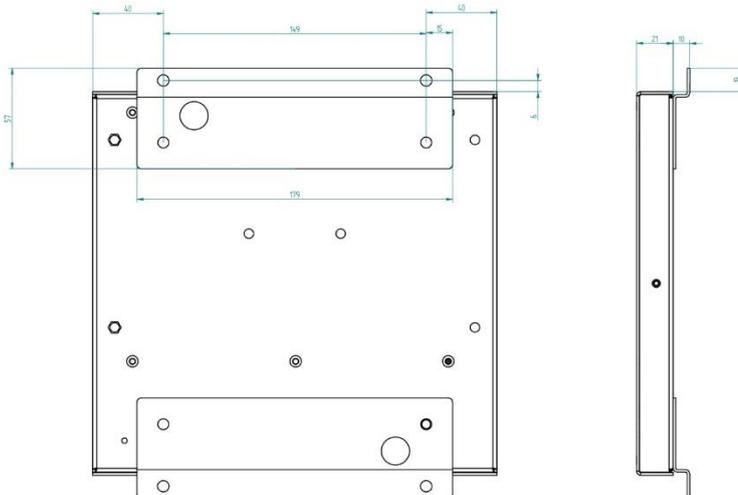
Backplane ibaPADU-S-B4S



(Dimensions in mm)

Figure 60: Dimensions ibaPADU-S-B4S

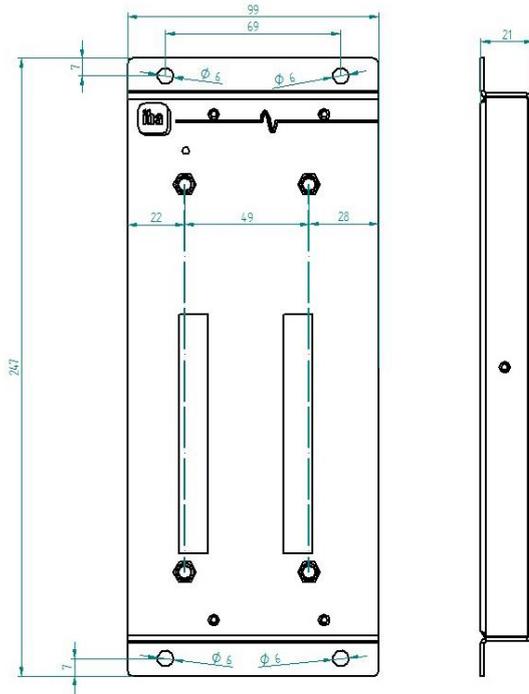
Backplane panel ibaPADU-S-B4S with mounting angles



(Dimensions in mm)

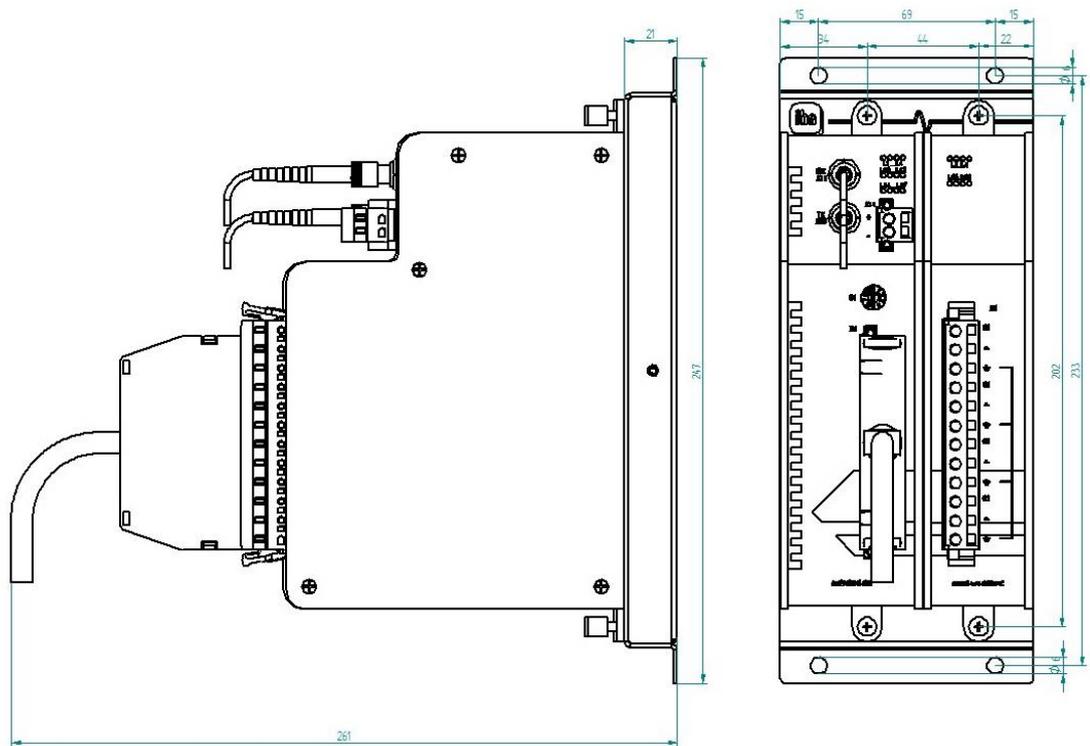
Figure 61: Dimensions backplane panel with ibaPADU-S-B4S

Backplane unit ibaPADU-S-B1S for one central unit and one module



(Dimensions in mm)

Figure 62: Dimensions ibaPADU-S-B1S



(Dimensions in mm)

Figure 63: Dimensions ibaPADU-S-B1S equipped

12.5 Connection diagrams

12.5.1 Pin assignment voltage supply X14

Pin	Connection
1	DC + 24 V
2	0 V



12.5.2 Pin assignment digital inputs X5

Pin	Connection
1	Digital input 00 +
2	Digital input 00 -
3	Digital input 01 +
4	Digital input 01 -
5	Digital input 02 +
6	Digital input 02 -
7	Digital input 03 +
8	Digital input 03 -
9	Digital input 04 +
10	Digital input 04 -
11	Digital input 05 +
12	Digital input 05 -
13	Digital input 06 +
14	Digital input 06 -
15	Digital input 07 +
16	Digital input 07 -



13 Accessories and related products

Backplanes

ibaPADU-S-B4S

Order number	10.124000
--------------	-----------

Backplane panel (for carrying components) for 1 central unit and up to 4 I/O modules
 w x h x d: 9.02 in x 8.62 in x 0.83 in
 (229 mm x 219 mm x 21 mm)
 Installation equipment included in delivery



ibaPADU-S-B1S

Order number	10.124002
--------------	-----------

Backplane with mounting angle for 1 central unit with 1 I/O module
 w x h x d: 3.90 in x 9.72 in x 0.83 in
 (99 mm x 247 mm x 21 mm)



ibaPADU-S-B

Order number	10.124001
--------------	-----------

Mounting plate with DIN rail clip for 1 central unit (without I/O modules)
 w x h x d: 2.20 in x 8.62 in x 1.10 in
 (56 mm x 219 mm x 28 mm)



Mounting systems

Set of mounting angles for ibaCMU-S system

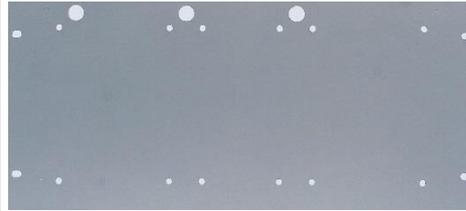
Order No.	10.124006
-----------	-----------

Set of 2 angles, fitting for ibaPADU-S-B4S (10.124000)
 For each backplane one set of angles (2) is needed.
 w x h x d: 57 mm x 179 mm x 10 mm



Mounting panel 19" for PADU-S modular

Order number	10.124005
Mounting panel (483 mm/19") for up to two ibaPADU-S-B4S backplanes	
Mounting 1 ibaPADU-S-B4S centered or 2 ibaPADU-S-B4S left and right	
Mounting equipment included	

**Module Carrier for ibaPADU-S modular system**

Order number	10.124007
Module carrier to accommodate 1 back-plane module ibaPADU-S-B4S	

**Terminal blocks****16 Pin RM 5.08 Terminal Block WAGO**

Order number	52.000023
--------------	-----------

**12 Pin RM 3.81 Terminal Block PHOENIX**

Order number	52.000024
--------------	-----------

**2 Pin RM 5.08 Terminal Block WAGO**

Order number	52.000022
--------------	-----------



FO cards

Product	Order No.	Note
ibaFOB-io-Dexp	11.118020	PCI-Express card (1 input, 1 output)
ibaFOB-2i-Dexp	11.118030	PCI-Express card (2 outputs)
ibaFOB-2io-Dexp	11.118010	PCI-Express card (2 inputs, 2 outputs)
ibaFOB-4i-Dexp	11.118000	PCI-Express card (4 inputs)
ibaFOB-4o-D		Add-on module (4 outputs)
- For PCI-Slot (long)	11.116201	For all ibaFOB-D cards as output module as output module or for mirroring the inputs
- For Rackline-Slot (short)	11.116200	
ibaFOB-io-ExpressCard	11.117000	For measuring with the Notebook
iba FO/p2-5	50.102050	5 m Duplex FO cable for connecting 1 ibaCMU-S device

iba software

Product	Order No.	Note
ibaPDA-V6-1024	30.610240	Online data acquisition system
ibaPDA-V6-2048	30.620480	For up to 1024 signals For up to 2048 signals
ibaCMC Condition Monitoring Center Ultimate	30.681229	Condition Monitoring Center, Analysis and Configuration Backend for ibaCMU-S systems
ibaAnalyzer	33.010400	Offline and online analysis software with license free of charge when used for analyzing dat files, which had been generated using a licensed iba software

For further accessories, please see our online catalog under [/www.iba-ag.com](http://www.iba-ag.com).

14 Appendix

14.1 Abbreviations

DHCP	Dynamic Host Configuration Protocol
DST	Daylight Saving Time
GMT	Greenwich Mean Time
FO	Fiber optic conductor
NTP	Network Time Protocol
PMAC	Programmable Measurement and Automation Controller
RTC	Real Clock Time
TCP/IP	Transmission Control Protocol / Internet Protocol
UTC	Universal Time Coordinated
WINS	Windows Internet Name Service

15 Support and Contact

Support

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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.

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