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The iba Modular System

Intelligent Central Units and I/O Modules with suitable Interfaces

ibaPADU-S-CM
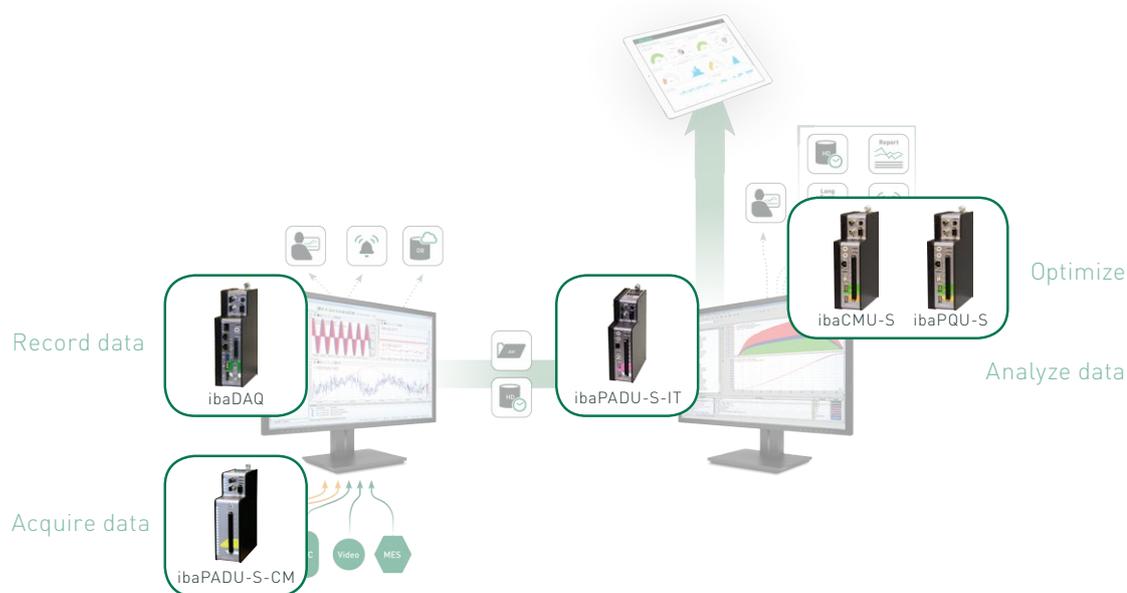Data Acquisition

ibaPADU-S-IT
Acquiring and Processing Data

ibaCMU-S
Condition Monitoring

ibaPQU-S
Power Quality Monitoring

ibaDAQ
Stand-alone Data Acquisition

Measurement Systems for Industry and Energy
www.iba-ag.com

The central units of the iba modular system in the iba system

Record data — ibaDAQ

Acquire data — ibaPADU-S-CM

ibaPADU-S-IT

Optimize — ibaCMU-S   ibaPQU-S

Analyze data

iba Modular System

The iba modular system acquires and processes measurement signals and, with the appropriate signal output modules, is perfectly suited for control applications. The decisive advantage of the system is the freely configurable concept: a central unit can be combined with up to four additional input/output modules.

Modular concept

The modular concept is based on a module rack with backplane bus for one central unit and up to 4 input and output modules.

With user-specific central units, various applications can be implemented:

Central units for each application

› ibaPADU-S-CM is a pure communication unit for the input and output of different signals.
› ibaPADU-S-IT has an integrated processor and an internal memory and is suitable not only for the fast acquisition of measurement values but also for intelligent processing of signals and system controls.
› ibaCMU-S is the metrological core for condition monitoring applications.
› ibaPQU-S is a Power Quality Unit for monitoring the grid quality according to standards with the highest precision.
› ibaDAQ is equipped with an integrated ibaPDA system and can be used as stand-alone data acquisition device

Broad range of modules

The system includes several I/O modules for analog and digital inputs and outputs as well as for SSI and pulse transmitters. All I/O modules work with sampling rates of up to 40 kHz absolutely time-synchronously. Due to the modular technology and the broad range of I/O modules, the iba modular system can be flexibly adapted to the respective requirements.

Areas of application

The areas of application depend on the central unit that is used, the plugged modules and the used iba applications.

Typical examples are:

› Acquisition of measurement values with and without pre-processing
› Signal management
› Controlling
› Fast drive and position control
› Condition monitoring
› Data logger (Transient Fault Recorder)
› Mill chatter monitoring and eccentricity analysis

At a glance

› Modular system for acquiring and processing measurement signals
› Suitable for measurement and control applications
› Central units for interfacing to ibaPDA and ibaLogic
› Application-specific central units with integrated special functions
› Intelligent processing of signals
› I/O modules for input/output of analog and digital signals
› Modules with special functions, e.g. counter module
› Up to 4 input/output modules that can be combined as required

› Power Quality Monitoring
› Stand-alone data logger for local applications
› Mobile measuring

The central units

ibaPADU-S-CM

> › Modular data acquisition system
> › Data acquisition with ibaPDA
> › FO connection to ibaPDA required
> › No pre-processing of signals
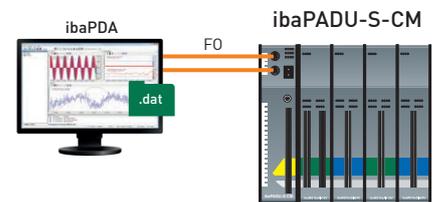
Sample-synchronous acquisition
In an iba modular system, the signals of all connected modules are acquired absolutely time synchronously. If several systems are connected in an FO ring topology, the run time is taken into account in the FO conductor and the data are acquired sample-precisely on the ibaFOB card in the ibaPDA system. This means that all channels which are acquired by means of an ibaFOB card, are also recorded sample-synchronously in ibaPDA. A prerequisite for the data acquisition in the ring topology is the ibaNet protocol 32Mbit Flex.

ibaPADU-S-IT-2x16

> › Modular data acquisition and control system
> › Graphical programming by the user (IEC61131)
> › Stand-alone system with ibaLogic onboard
> › Optional acquisition of raw data and values calculated with ibaPDA
> › Control system, Soft PLC
> › Time-synchronization possible (NTP, DCF77)
> › Data storage in the device (110 GB SSD)
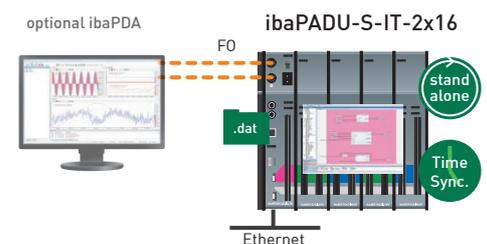
Autonomous central unit with a cycle of up to 1 ms
Due to the integrated processor and the large RAM, the ibaLogic control programs can be loaded in ibaPADU-S-IT and executed in a temporally deterministic way with a cycle of 1 ms. After having been programmed with ibaLogic, an iba modular system with ibaPADU-S-IT as central unit can work autonomously without a connection to the ibaLogic development computer. In case of an autonomous measurement data acquisition, the measurement data can be stored as files in the .dat format on the local hard disk and then downloaded via the network.

Online calculation of characteristic values
Moreover, ibaPADU-S-IT can transfer in parallel raw data and characteristic values calculated from the measurement data in real-time to the ibaPDA system. Thus, e.g. a local pre-processing of the signals like e.g. digital filtering or FFT calculations can be done with an ibaLogic application in the central unit.

Universal system interfaces
In addition to the ibaMS-modules, a huge number of different peripherals can be connected and acquired and processed with ibaPADU-S-IT. This includes process data from external systems, that are fed in e.g. with ibaNet periphery over FO cable. The internal ibaLogic application allows the selection of all raw data and user-specific processing of these data with freely programmable function blocks. Moreover, an Ethernet connection provides access to internal signals and allows control applications to run.
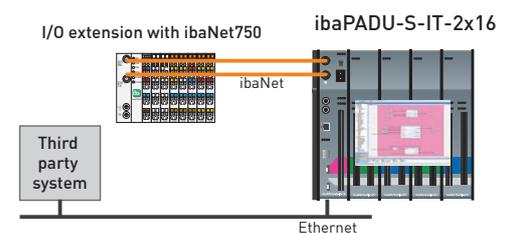
ibaCMU-S

- ‣ Modular Condition Monitoring Unit (CMU) with integrated calculation of CM characteristic values
- ‣ Cross-plant solution with decentralized CMUs and centralized Condition Monitoring Center ibaCMC for configuration, long-term trends and alarms
- ‣ Complex spectrum analysis functions that can be configured particularly for the measurement location and the part of the plant that has to be monitored
- ‣ Configuration with ibaCMC (Condition Monitoring Center)
- ‣ Optional acquisition of raw data with ibaPDA via FO outputs
- ‣ Data storage in the device (110 GB SSD)
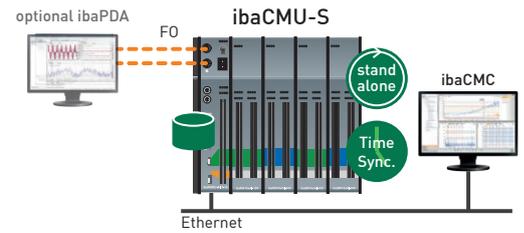
Flexible, decentralized measuring units

ibaCMU-S is the metrological core of an iba modular system for condition monitoring applications. The central unit is extended by I/O modules which are suited for condition monitoring purposes, especially with analog current and voltage inputs and modules for IEPE sensors.

Central configuration and analysis with ibaCMC

The system is configured by means of the Condition Monitoring Center ibaCMC. ibaCMC is a web-based application which serves as analysis and configuration backend for ibaCMU-S systems. In ibaCMC, the user can configure the plant that is to be monitored, specify analyses and define alarm functions as well as report generation. For larger plants or a cross-plant solution, several CMUs can be used, that are configured in a centralized Condition Monitoring Center. ibaCMC is not only used

for configuration but also for the visualization of long-term trends.

But ibaCMC is not necessary for the measuring process itself. Measuring can be carried out autonomously with ibaCMU-S, for example in the measuring case ibaMBox.

Scalable through decentralized calculation of characteristic values

ibaCMU-S acquires the raw data of the connected sensors time-synchronously with up to 40 kHz and processes them in real-time. The central unit exchanges data with the automation environment and carries out internally a major part of the

signal analysis. The calculation results and raw data are stored in the internal memory and optionally transferred to an ibaPDA system via FO conductor. The outputs can be used for warning and alarm messages, but also for an automatic adaptation of parameters in the plant control.

Autonomous operation

ibaCMU-S can also be operated without an ibaPDA system. On the central unit, a web interface is available which offers comprehensive diagnostic functions.

Optionally, slower process signals can be interfaced using ibaNet750 modules.
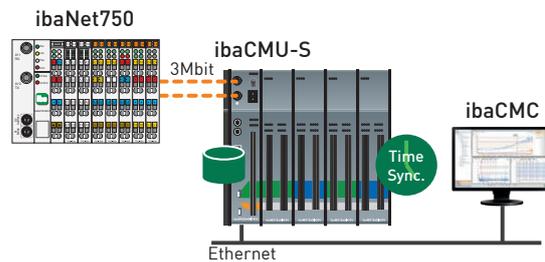
ibaPQU-S

- › Modular Power Quality Monitoring System for monitoring the grid quality according to standards
- › Grid-synchronous measurement
- › Internal calculation of grid quality parameters according to IEC 61000-4-30, class A
- › Data acquisition and calculation of statistical and long-term grid quality parameters with ibaPDA (FO connection required)
- › Raw values available for drill-down in ibaPDA
- › All calculated parameters are available as individual values in ibaPDA and can be monitored
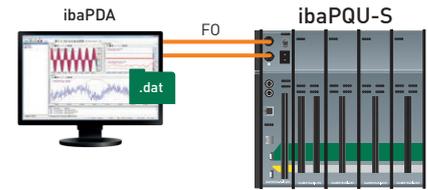
Acquire and prove power quality according to standards

An essential basis for improving the grid quality and the availability of the grid is the precise knowledge and analysis of all decisive quality parameters. ibaPQU-S is a compact system for monitoring the grid quality and for analyzing failures. It realizes all measurement tasks that are relevant therefore. On the basis of the determined characteristic values, grid failures can be analyzed in detail and the grid operation can be managed more efficiently.

ibaPQU-S is suited for DC grids, for grids with 50 Hz and 60 Hz as well as for special grids like e.g. the railway grid with 16.7 Hz.

The system measures raw values like current and voltage grid-synchronously and calcu-lates internally the characteristic values which are relevant for the grid quality according to e. g. IEC 61000-4-30, class A.

The raw values are available for the drill-down in ibaPDA. Harmonics and interharmonics are calculated up to the 50th.

For the Power Quality function, selected input modules are suitable, please see overview table on page 11.

Power quality analysis and transient fault recording in one system

In ibaPDA, any triggers can be configured for triggering event-related measurements and acquiring failures. For a detailed analysis, the data are acquired at a high resolution with pre- and post-trigger time. All calculated parameters are available as individual values in ibaPDA and can thus be monitored, e.g. the xth harmonic. Moreover, failures can be indicated by means of an alarm function.

With ibaAnalyzer, long-term trendings and comprehensive reports can be created, that prove e.g. the compliance with the EN 50160 standard.

Calculation	Calculation period						Grid type		
	Half period	10/12	150/180	10 s	10 min	2 h	1	3	3+N
RMS	●	●	●	●	●	●	●	●	●
Peak	●	●	●	●	●	●	●	●	●
Rectified	●	●	●	●	●	●	●	●	●
Form factor	-	●	●	●	●	●	●	●	●
Crest factor	-	●	●	●	●	●	●	●	●
Frequency	●	●	●	●	●	●	●	●	●
Phase	-	●	●	●	●	●	●	●	●
Harmonics	-	●	●	●	●	●	●	●	●
Interharmonics	-	●	●	●	●	●	●	●	●
THD	-	●	●	●	●	●	●	●	●
TIF	-	●	●	●	●	●	●	●	●
Mains signalling	-	●	●	●	●	●	●	●	●
Power/energy	-	●	●	●	●	●	●	●	●
Power/energy VA	-	●	●	●	●	●	●	●	●
Power/energy VAr	-	●	●	●	●	●	●	●	●
Fundamental reactive power/ energy	-	●	●	●	●	●	●	●	●
Power factor	-	●	●	●	●	●	●	●	●
Cos φ	-	●	●	●	●	●	●	●	●
Positive/negative/zero sequence component	-	●	●	●	●	●	-	-	●
Unbalance	-	●	●	●	●	●	-	●	●
Flicker (Pinst, Pst, Plt)	●	-	-	-	●	●	●	●	●
Events	-	●	-	-	-	-	●	●	●
Commutation notches	●	-	-	-	-	-	●	●	●

ibaDAQ

- › Intelligent central unit for stand-alone data acquisition
- › Integrated, complete ibaPDA system
- › Can be combined with I/O modules from the iba modular system
- › Data storage in the device
- › More iba devices can be connected via FO
- › DisplayPort for connecting a monitor
- › USB interfaces for USB devices like mouse, keyboard, WLAN stick, etc.
- › ibaPDA basic license for 64 signals included in delivery, can be upgraded
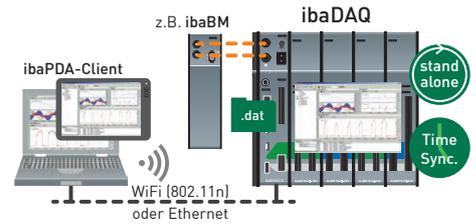
Measuring with high precision - in an autonomous and flexible way

ibaDAQ is an intelligent central unit providing a complete integrated ibaPDA system and an internal Solid State Disk (SSD). Thus, it can acquire and record data as stand-alone device.

With the 2 independent 1Gbit/s-Ethernet interfaces, ibaDAQ can operate in two networks and thus enable the separation of IT and process networks. This separation allows, for example, databases and storage systems to be connected to ibaDAQ, which are located in the IT network.
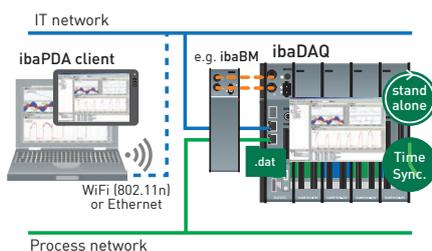
The central unit is perfect for the use in the ibaMBox measurement case. This combination provides an autonomous, powerful measurement system that can be easily transported and can be used as mobile solution for commissioning purposes and troubleshooting.

Operation and configuration as on the PC

Monitor, mouse, and keyboard can be connected to ibaDAQ. The device can be operated as conveniently as an ibaPDA system running on a PC. Moreover, it can also be operated with an ibaPDA client that is connected via network.

External devices are not required for data acquisition. The measurement process can start automatically after the configuration or can be controlled by a trigger signal.

In case a notebook or tablet is used, it can be connected to ibaDAQ by using an USB-WLAN stick.

Storing data on the device

An internal SSD offers sufficient space for the measurement data. The storage capacity can be extended with an external hard disk on the USB interface, if required. After the measurement process, the measurement data can be collected via an Ethernet connection or WLAN. The data can be processed and analyzed as usual in ibaAnalyzer.

Time synchronization

All time sources supported by ibaPDA (DCF77, PTP, ibaClock) can be used for synchronizing

the time. The time is buffered with an internal battery.

Monitoring and alarm

Two digital inputs and two digital outputs, which can be configured for user-specific functions, are available on the central unit. If the Watchdog function is configured in ibaPDA, one output can function as alarm output. In case a trigger signal reports an interruption of the voltage supply on a digital input, the device will be shut down and switched off in a save way.

Connection via ibaNet

The FO input and output offers the functionality of an ibaFOB-io card and supports all ibaNet protocols. Here, more iba devices can be connected, like e.g. the ibaPADU family, iba bus monitors, or system connections.

Basic license

ibaDAQ is available by default with the ibaPDA basic license for up to 64 signals. If required, the license can be extended anytime by more signals, additional data stores, or Ethernet based interfaces.

ibaMBox

- › Based on the proven iba modular system
- › Central unit can be freely configured with up to 4 input modules
- › Clear connections in practical connection system (BNC, banana, Phoenix connectors) on the connector panel
- › Compact, stable aluminium case with a modern design
- › Suitable for industrial use in harsh environments
- › Can be declared as carry-on luggage
- › Ideally suited for commissioning, troubleshooting, service and maintenance

iba modular system for mobile use

Portability - this is an increasingly important requirement for measuring systems, especially in the fields of commissioning, troubleshooting, service and maintenance. With ibaMBox, iba offers a mobile, robust system to capture highly precise data, regardless of physical location. Thanks to the modular concept, the data collection equipment in ibaMBox can be individually customized to meet various application requirements.

Central units with different functions

Integrated in a compact, stable aluminium case, one central unit can be individually combined with up to 4 input modules. The use of ibaDAQ as a central unit has the advantage that due to the integrated ibaPDA system,

stand-alone data acquisition is possible without a notebook.

The use of the central units ibaPADU-S-CM and ibaPQU-S requires an external ibaPDA system, running on a notebook for example. The notebook is connected to the central unit via an ibaFOB-io-ExpressCard or ibaFOB-io-USB adapter and a bidirectional fiber optic cable.

When using the central unit ibaCMU-S, the Condition Monitoring Center ibaCMC is required for configuration and visualization. However, measuring can be carried out autonomously with ibaCMU-S.

Clear arrangement of connections

All terminals and interfaces of the integrated modules are clearly labeled and lead out to a connector panel as BNC, banana jacks, or

Phoenix connectors. The different module types are labeled with the same color code that is used for the common iba modular system. The allocation of the connectors to the modules is clearly visible for the user. ibaMBox is pre-configured based on customer's application prior to delivery and can be used immediately on arrival.

Modern design for industrial use

The case combines modern, attractive design with a stable construction and is suited for industrial use in harsh environments. The aluminum case can remain closed during the measurement process, since the cables are lead out through two side openings. A fan mounted on the side prevents heat accumulation. The lid has a non-slip surface for working with a laptop.

Central units	I/O modules	
ibaPADU-S-CM	ibaMS3xAI-1A	ibaMS16xDI-220V
ibaPQU-S	ibaMS3xAI-5A	ibaMS16xDI-24V
ibaCMU-S	ibaMS3xAI1A/100A	ibaMS32xDI-24V
ibaDAQ	ibaMS4xAI-380VAC	ibaMS16xDIO-24V
	ibaMS8xAI-110VAC	ibaMS4xADIO
	ibaMS16xAI-10V (-HI)	ibaMS8xIEPE
	ibaMS16xAI-24V (-HI)	ibaMS4xUCO
	ibaMS16xAI-20mA	

Overview of central units and I/O modules usable in ibaMBox

Technical data ibaMBox

Short description	
Name	**ibaMBox**
Description	Measuring case for iba modular system
Order number	10.124800
Power supply and connections	
Power supply	100 V / 240 V AC; 3,0 A / 1,5 A; 50 Hz – 60 Hz
Fuse	Fine-wire fuse 1,6 A / AC 250 V, time-lag
Power output Socket 2-pin terminal block (central unit)	Power out max. 250 W 24 V, max. 20 W
Connectors	BNC, banana or Phoenix connector
Indicators	LEDs of the built-in central unit and BNC connectors of IEPE connector panels
Operating and environmental conditions	
Cooling	Fan
Operating temperature	32 °F … 122 °F (0 °C … 50 °C)
Storage and transport temperature	-13 °F … 158 °F (-25 °C … 70 °C)
Humidity class (IEC 40040) (Operation, storage, transport)	F (5% - 95%), no condensation
Protection class	IP20
Certification	EN 61010-2-030:2010. Measurement category CAT II
Dimensions and weight	
Dimensions (width x depth x height)	20.5 in x 17.7 in x 8.5 in (520 mm x 450 mm x 215 mm)
Weight	Approx. 13,5 kg with 1 central unit + 4 I/O modules

The module's connectors in ibaMBox are designed as BNC or banana sockets or
Phoenix connectors. Hence, different connector panels are available for the modules:

Order no.	Name	Order no.	Name
10.124803	ibaMBoxCP-BlankCover	10.124829	ibaMBoxCP-MS16xDI-24V-Banana
10.124805	ibaMBoxCP-S-CM-Phoenix	10.124830	ibaMBoxCP-MS16xAI-10V-Banana
10.124806	ibaMBoxCP-PQU-S-Phoenix	10.124831	ibaMBoxCP-MS16xAI-10V-HI-Banana
10.124807	ibaMBoxCP-CMU-S-Phoenix	10.124832	ibaMBoxCP-MS16xAI-24V-Banana
10.124808	ibaMBoxCP-DAQ-(S)-Phoenix	10.124833	ibaMBoxCP-MS16xAI-24V-HI-Banana
10.124810	ibaMBoxCP-MS16xAI-10V-Phoenix	10.124834	ibaMBoxCP-MS16xAI-20mA-Banana
10.124811	ibaMBoxCP-MS16xAI-10V-HI-Phoenix	10.124835	ibaMBoxCP-MS3xAI-1A-Banana
10.124812	ibaMBoxCP-MS16xAI-24V-Phoenix	10.124836	ibaMBoxCP-MS3xAI-5A-Banana
10.124813	ibaMBoxCP-MS16xAI-24V-HI-Phoenix	10.124837	ibaMBoxCP-MS3xAI-1A/100A-Banana
10.124814	ibaMBoxCP-MS16xAI-20mA-Phoenix	10.124838	ibaMBoxCP-MS4xAI-380V-Banana
10.124816	ibaMBoxCP-MS8xIEPE-Phoenix	10.124839	ibaMBoxCP-MS8xAI-110V-Banana
10.124817	ibaMBoxCP-MS4xUCO-Phoenix	10.124840	ibaMBoxCP-MS16xAI-10V-BNC
10.124818	ibaMBoxCP-MS16xDI-220V-Phoenix	10.124841	ibaMBoxCP-MS16xAI-10V-HI-BNC
10.124819	ibaMBoxCP-MS16xDI-24V-Phoenix	10.124842	ibaMBoxCP-MS16xAI-24V-BNC
10.124820	ibaMBoxCP-MS32xDI-24V-Phoenix	10.124843	ibaMBoxCP-MS16xAI-24V-HI-BNC
10.124821	ibaMBoxCP-MS16xDIO-24V-Phoenix	10.124844	ibaMBoxCP-MS16xAI-20mA-BNC
10.124828	ibaMBoxCP-ibaMS4xADIO-Phoenix	10.124846	ibaMBoxCP-MS8xIEPE-BNC

I/O modules

The I/O modules are detected automatically by the central unit. The iba modular system can be configured by means of the I/O Manager in the ibaPDA application or the I/O Configurator in the ibaLogic application.

The central unit requires a power supply of 24 V DC. The power supply of I/O devices is provided internally by the backplane bus. A synchronization channel on the backplane guarantees isochronous sampling of all I/O modules.

The following table gives an overview over the current I/O modules and how they may be combined with the different central units.

			ibaPADU-S-CM	ibaPADU-S-IT	ibaCMU-S	ibaPQU-S	ibaDAQ
Inputs	ibaMS3xAI-1A	3 analog inputs, 1 A AC	●	●	-	●	●
	ibaMS3xAI-5A	3 analog inputs, 5 A AC	●	●	-	●	●
	ibaMS3xAI-1A/100A	3 analog inputs, 1 A AC/100 A DC	●	●	-	●	●
	ibaMS4xAI-380VAC	4 analog inputs, 380 V AC	●	●	-	●	●
	ibaMS8xAI-110VAC	8 analog inputs, 110 V AC	●	●	-	●	●
	ibaMS16xAI-10V	16 analog inputs, ±10 V	●	●	●	●	●
	ibaMS16xAI-10V-HI	16 analog inputs, ±10 V (high impedance)	●	●	-	●	●
	ibaMS16xAI-24V	16 analog inputs, ±24 V	●	●	●	●	●
	ibaMS16xAI-24V-HI	16 analog inputs, ±24 V (high impedance)	●	●	-	●	●
	ibaMS16xAI-20mA	16 analog inputs, ±20 mA	●	●	●	●	●
	ibaMS16xDI-220V	16 digital inputs, ±220 V	●	●	-	○	●
	ibaMS16xDI-24V	16 digital inputs, ±24 V	●	●	-	○	●
	ibaMS32xDI-24V	32 digital inputs, ±24 V	●	●	-	○	●
	ibaMS8xIEPE	8 inputs for IEPE vibration sensors	●	●	●	-	●
	ibaMS4xUCO	Counter module, 4 inputs	●	●	-	○	●
Outputs	ibaMS16xAO-10V	16 analog outputs, ±10 V	●	●	-	○	●
	ibaMS16xAO-20mA	16 analog outputs, ±20 mA	●	●	-	○	●
	ibaMS16xDO-2A	16 digital outputs, 2 A	●	●	●	○	●
	ibaMS32xDO-24V	32 digital outputs, 24 V	●	●	●	○	●
Combi	ibaMS16xDIO-24V	16 digital inputs and 16 digital outputs, 24 V	●	●	-	○	●
	ibaMS4xADIO	4 analog inputs, 4 analog outputs, 4 digital inputs, 4 digital outputs	●	●	-	◑	●

● Module supports the function of the central unit
○ Module can be used, but signals are only transmitted as raw values
◑ The analog inputs can be used for the cental unit's function

Backplane panels and mounting accessories

Several backplane panels with backplane bus are available for mounting as well as the corresponding accessories for the installation in 19″ racks. Up to two separated backplane panels fit in a 19″ rack side by side.

ibaPADU-S-B4S   Module Carrier

Name	Order no.	Description
ibaPADU-S-B4S	10.124000	Backplane panel for a central unit and 4 modules w x h x d: 229 mm x 219 mm x 21 mm
ibaPADU-S-B1S	10.124002	Backplane panel for a central unit and 1 module w x h x d: 99 mm x 247 mm x 21 mm
ibaPADU-S-B	10.124001	Backplane panel for a central unit w x h x d: 56 mm x 219 mm x 28 mm
Mounting panel 19″ for iba modular system	10.124005	19″ mounting panel for up to two ibaPADU-S-B4S backplane panels incl. mounting accessories w x h: 483 mm x 221 mm
Mounting angle for iba modular system	10.124006	2 mounting angles for mounting an iba modular system backplane in a cabinet w x h x d: 57 mm x 179 mm x 10 mm
Module Carrier	10.124007	Module carrier for an iba modular system

ibaNet protocols

All central units can send and receive the ibaNet protocol 32Mbit Flex bidirectionally. The signal acquisition can be done with up to 40 kHz and can be selected variably for each modular system. Moreover, some central units support the previous 3Mbit and 32Mbit ibaNet protocols, see table below.

In the ring topology with 32Mbit Flex, all modules in the different modular systems work sample synchronously.

32Mbit Flex protocol

With 32Mbit Flex, the measurement data and the configuration data are transferred bidirectionally via 2 FO cables. A LAN connection for transferring the configuration data - as for the previous ibaNet protocols - is not required.

32Mbit Flex works with a data transfer rate of 32 Mbit/s and supports up to 15 „flex-capable" devices connected in a ring topology. The size of the data telegrams is flexible, as long as the overall data volume of 4060 Byte is not exceeded.

The sampling rate can be set flexibly for the modular systems at up to 40 kHz. Every system can work with its own sampling rate. The sampling rates only have to be a multiple of the basic sampling rate and the whole volume in the FO conductor must not be exceeded. In principle, the following rule applies: The less data is transmitted, the higher the possible sampling rate.

	32Mbit Flex	32Mbit	5Mbit	3Mbit
ibaPADU-S-CM	●	-	-	-
ibaPADU-S-IT	●	●	-	●
ibaCMU-S	●	-	-	●
ibaPQU-S	●	-	-	-
ibaDAQ	●	●	●	●

Technical data central units

Short description			
Name	**ibaPADU-S-CM**	**ibaPADU-S-IT-2x16**	**ibaCMU-S**
Description	CPU for modular data acquisition system	CPU for control applications	CPU for condition monitoring applications
Order number	10.124030	10.124021	10.125010
Processor units			
Processor	–	1.6 GHz Atom processor, dual core CPU	1.6 GHz Atom processor, single CPU
Operating system	–	Windows Embedded Compact 7	Windows CE® 5.0
Main memory	–	2 GB	512 MB
Flash memory	–	Solid State Drive 110 GB	Solid State Drive 110 GB
RAM	–	RAM-Drive 128 MB	RAM-Drive 128 MB
Clock (RTC)	–	Unbuffered; optional external buffering via X30, synchronization by DCF77 (digital input) or NTP	Unbuffered; optional external buffering via X30, synchronization by DCF77 (digital input) or NTP
Interfaces			
ibaNet	32Mbit Flex 2 ST coupling (50/125 µm and 62.5/125 µm) for RX and TX	3Mbit, 32Mbit, 32Mbit Flex 2 ST coupling (50/125 µm and 62.5/125 µm) for RX and TX	3Mbit, 32Mbit Flex 2 ST coupling (50/125 µm and 62.5/125 µm) for RX and TX
Ethernet	–	10/100 Mbit/s	10/100 Mbit/s
USB	for service purposes only	2x host, 1x device for service purposes	for service purposes only
Digital inputs			
Number	8	8	8
Design	Galvanically isolated, protected against reverse polarity, single ended	Galvanically isolated, protected against reverse polarity, single ended	Galvanically isolated, protected against reverse polarity, single ended
Input signal	24 V DC	24 V DC	24 V DC
Max. input voltage	±60 V permanent	±60 V permanent	±60 V permanent
Signal level log. 0 Signal level log. 1	> -6 V; < +6 V < -10 V; > +10 V	> -6 V; < +6 V < -10 V; > +10 V	> -6 V; < +6 V < -10 V; > +10 V
Input current	1 mA, constant	1 mA, constant	1 mA, constant
Debounce filter	Optional: 4 operating modes	Optional: 4 operating modes	Optional: 4 operating modes
Sampling rate	Up to 40 kHz, freely adjustable	Up to 40 kHz, freely adjustable	Up to 40 kHz, freely adjustable
Delay	Typ. 10 µs	Typ. 10 µs	Typ. 10 µs
Electrical isolation channel-channel channel-housing	AC 2.5 kV AC 2.5 kV	AC 2.5 kV AC 2.5 kV	AC 2.5 kV AC 2.5 kV
Connector type	16-pin terminal block, connector with clamp-type terminal and screw flanges (0.2 mm^2 to 2.5 mm^2), included in delivery	16-pin terminal block, connector with clamp-type terminal and screw flanges (0.2 mm^2 to 2.5 mm^2), included in delivery	16-pin terminal block, connector with clamp-type terminal and screw flanges (0.2 mm^2 to 2.5 mm^2), included in delivery
Power supply, indicators			
Power supply	24 V DC ±10 % not stabilized 200 mA (without I/O modules), 3 A (with I/O modules)	24 V DC ±10 % not stabilized 1 A (without I/O modules), 3 A (with I/O modules)	24 V DC ±10 % not stabilized 1 A (without I/O modules), 3 A (with I/O modules)
Power consumption	Up to 5 W	Up to 20 W	Up to 20 W
Indicators	4 LEDs for device status 8 LEDs for digital inputs	4 LEDs for device status 8 LEDs for digital inputs 4 LEDs user-defined applications	4 LEDs for device status 8 LEDs for digital inputs 4 LEDs for CM applications
Certification			
Standards	EMC: IEC 61326-1 FCC part 15 class A	EMC: IEC 61326-1 FCC part 15 class A	EMC: IEC 61326-1 FCC part 15 class A
MTBF[1]	1,951,614 hours / 222 years	255,939 hours / 29 years	–

1) MTBF (mean time between failure) according to Telcordia 3 SR232 (Reliability Prediction Procedure of Electronic Equipment; Issue 3 Jan. 2011) and NPRD (Non-electronic Parts Reliability Data 2011).

Short description	
Name	**ibaPQU-S**
Description	CPU for Power Quality Monitoring applications
Order number	10.150000

Processor unit	
Processor	1.6 GHz Atom processor, dual core CPU
Flash memory	Solid State Drive
Clock	Unbuffered / external buffering possible

Interfaces	
ibaNet	32Mbit Flex 2 ST coupling (50/125 µm and 62.5/125 µm) for RX/TX
Ethernet	10/100 Mbit/s
USB	for service purposes

Digital inputs	
Number	8
Design	Galvanically isolated, protected against reverse polarity, single ended
Input signal	24 V DC
Max. input voltage	±60 V permanent
Signal level log. 0 Signal level log. 1	> -6 V; < +6 V < -10 V; > +10 V
Input current	1 mA, constant
Debounce filter	Optional: 4 different operating modes
Sampling rate	Up to 40 kHz, freely adjustable
Delay	Typ. 10 µs

Electrical isolation
     channel-channel
     channel-housing
	
	AC 2.5 kV
	AC 2.5 kV

Connector type	16-pin terminal block, connector with clamp-type terminal and screw flanges (0.2 mm^2 to 2.5 mm^2), included in delivery

Measured values	
	Voltage, current (raw values) Frequency (all standard-compliant times) RMS and peak value, rectified value, form factor, crest factor (all standard-compliant times) FFT (harmonic up to 50, interharmonic up to 50, from 200 ms all standard-compliant times) THD (from 200 ms all standard-compliant times) Phase values (U / I phase angle relating to the reference voltage) Power values (active, apparent and reactive power, fundamental reactive power, energy, power factor for single conductors and the whole grid system) Symmetrical components of 3-phase systems with N/PE (positive, negative, zero sequence), voltage symmetry Flicker (short term, long term, actual) Events, commutation notches

Power supply, indicators	
Power 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
Indicators	4 LEDs for device status 8 LEDs for digital inputs

Certification	
Standards	EMC: IEC 61326-1 FCC part 15 class A IEC 61000-4-30:2015 Class A IEC 61000-4-15:2010 IEC 61000-4-4:2012 IEC 61180:2016 IEC 62586-2:2013

Short description	
Name	**ibaDAQ**
Description	CPU for stand-alone data acquisition
Order number	10.170001
Processor unit	
Processor	Intel Atom E3845 quad core CPU 1.91 GHz
Operating system	Windows 10 IoT Enterprise x64
Main memory	4 GB
Flash memory	Solid State Drive 256 GB
Clock	Buffered by battery, can be replaced during operation (3V Lithium CR2032) Synchronization via NTP
Interfaces	
ibaNet	32Mbit Flex, 32Mbit, 5Mbit, 3Mbit 2 ST coupling (50/125 µm and 62.5/125 µm) for RX/TX
Ethernet	2x 1 Gbit/s
USB	1x USB 3.0, 1x USB 2.0
DisplayPort	Connection for monitor
Digital inputs	
Number	2
Design	Galvanically isolated, protected against reverse polarity, single ended
Input signal	DC 24 V
Max. input voltage	±60 V permanent
Signal level log. 0 Signal level log. 1	> -6 V; < +6 V < -10 V; > +10 V
Input current	1 mA, constant
Debounce filter	Optional: 4 operating modes, can be configured in ibaPDA
Sampling rate	Up to 40 kHz, freely adjustable in ibaPDA
Delay	Typ. 10 µs
Electrical isolation channel-channel channel-housing	AC 2,5 kV AC 2,5 kV
Connector type	Screw-type terminal (0.14 mm^2 to 1.5 mm^2), screw connection, included in delivery
Digital outputs	
Number	2
Design	Galvanically isolated, solid-state DC switch
Switching voltage	up to DC 200 V, protection against surge voltages
Switching current	up to 350 mA (permanent), overcurrent protection
Switching delay	< 2 ms (at 100 mA)
ON resistance (log. 1)	up to 3,75 Ω (at 100 mA)
OFF resistance (log. 0)	min. 100 MΩ
Electrical isolation channel-channel channel-housing	AC 2.5 kV AC 2.5 kV
Connector type	Screw-type terminal (0.14 mm^2 to 1.5 mm^2), screw connection, included in delivery
Power supply and indicators	
Power supply	24 V DC, ±10 % not stabilized; 1 A (without I/O modules), 3 A (with up to 4 I/O modules)
Power consumption	Up to 36 W
Indicators	6 LEDs for device status, 2 LEDs for digital inputs, 2 LEDs for digital outputs 2 LEDs for customized applications, can be configured in ibaPDA
Certification	
Standards	EMC: IEC 61326-1, FCC part 15 class A

Input modules for analog signal electronics

› ibaMS16xAI-10V
› ibaMS16xAI-10V-HI
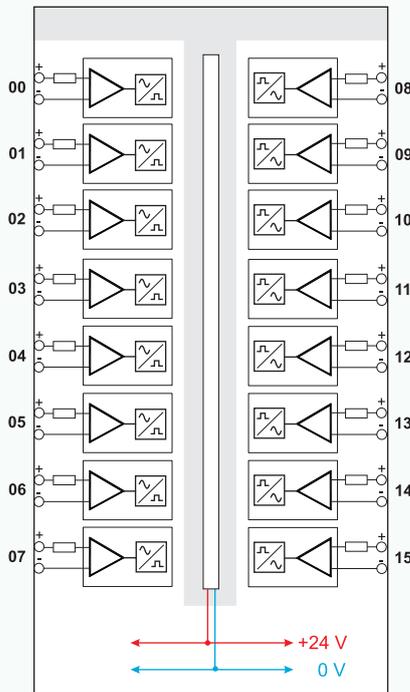› ibaMS16xAI-24V
› ibaMS16xAI-24V-HI
› ibaMS16xAI-20mA

Short description		
Name	**ibaMS16xAI-10V** **ibaMS16xAI-10V-HI** **ibaMS16xAI-24V** **ibaMS16xAI-24V-HI**	ibaMS16xAI-20mA
Description	Input modules with 16 analog voltage inputs	Input module with 16 analog current inputs
Order number	10V: 10.124100 10V-HI: 10.124101 24V: 10.124102 24V-HI: 10.124103	10.124110
Analog inputs		
Number	16	16
Design	Galvanically isolated, single ended	Galvanically isolated, single ended
Resolution	16 Bit	16 Bit
Filter[1] permanent in addition	R/C low-pass, 1st order, 40 kHz (-HI: 25 kHz) Analog anti-aliasing filter (Butterworth), 4th order, 20 kHz Digital anti-aliasing filter (Tschebyscheff I)[2], 8th order , cutoff frequency can be adjusted	R/C low-pass, 1st order, 40 kHz Analog anti-aliasing filter (Butterworth), 4th order, 20 kHz Digital anti-aliasing filter (Tschebyscheff I)[2], 8th order , cutoff frequency can be adjusted
Input signal range	10V/10V-HI: -10 V ... +10 V 24V/24V-HI: -24 V ... +24 V	-20 mA ... +20 mA
Max. input voltage	±60 V permanent ±100 V for 1 min., followed by 10 minutes max. input voltage	±60 V permanent ±100 V for 1 min., followed by 10 minutes max. input voltage
Input impedance	10V: 140 kΩ (110 kΩ when device is switched off) 10V-HI: 1.3 MΩ (1.0 MΩ when device is switched off) 24V: 140 kΩ (110 kΩ when device is switched off) 24V-HI: 1.1 MΩ (1.0 MΩ when device is switched off)	50 Ω
Sampling rate	Up to 40 kHz, freely adjustable	Up to 40 kHz, freely adjustable
Frequency range	0 Hz ... 20 kHz	0 Hz ... 20 kHz
Accuracy	< 0.1 % of total measuring range	< 0.1 % of total measuring range
Electrical isolation channel-channel channel-housing/ power supply	AC 1.5 kV AC 1.5 kV	AC 1.5 kV AC 1.5 kV
Connector type	2x 16-pin multi-pin connector, clamp-type terminal, (0.2 mm² to 2.5 mm²), screw connection, included in delivery	2x 16-pin multi-pin connector, clamp-type terminal, (0.2 mm² to 2.5 mm²), screw connection, included in delivery
Additional functions		
Grid frequency measure- ment 10 Hz ... 80 Hz	Interval 1 s / 10 s (according to IEC 61000-4-30)	Interval 1 s / 10 s (according to IEC 61000-4-30)
Power supply and indicators		
Power supply	24 V DC, internal via backplane bus	24 V DC, internal via backplane bus
Power consumption	Up to 12 W	Up to 12 W
Indicators	4 LEDs for device status 16 LEDs for status of the analog inputs	4 LEDs for device status 16 LEDs for status of the analog inputs
Certification		
Standards	EMC: IEC 61326-1 FCC part 15 class A	EMC: IEC 61326-1 FCC part 15 class A
MTBF according to Telcor- dia 3 SR232 and NPRD	10V: 1,084,665 hours / 123 years	1,124,943 hours / 128 years

1) beginning with hardware version B0
2) can only be enabled when sampling rate > 500 Hz, cut-off frequency adjustable from 100 Hz to 0,5*sampling rate

Fields of application

› Power generation and distribution
› Test benches
› Power factor compensation plants
› General voltage or current measurement
› Condition monitoring

Connection diagrams

ibaMS16xAI-10V / -10V-HI / -24V / -24V-HI

ibaMS16xAI-20mA
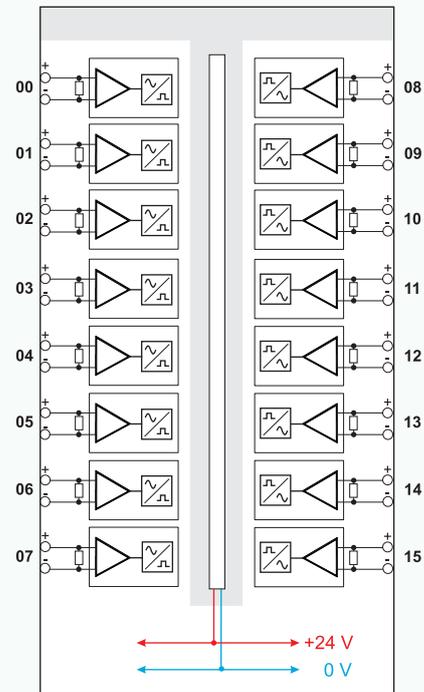
Special feature

The additional functions are automatically detected in ibaPDA and can be configured in the I/O Manager. In addition to the actual measured values, the additional function is available as virtual signal in the signal tree and can be displayed, recorded and used for calculations like all other signals.

Input modules for current transformers in medium and high voltage technology

› ibaMS3xAI-1A
› ibaMS3xAI-5A
› ibaMS3xAI-1A/100A

Short description			
Name	**ibaMS3xAI-1A**	**ibaMS3xAI-5A**	**ibaMS3xAI-1A/100A**
Description	Input module with 3 analog current inputs	Input module with 3 analog current inputs	Input module with 3 analog current inputs
Order number	10.124600	10.124610	10.124620
Analog inputs			
Number	3	3	3
Design	Galvanically isolated, single ended	Galvanically isolated, single ended	Galvanically isolated, single ended, 2 A/D converters per channel
Resolution	16 Bit	16 Bit	16 Bit
Filter[1] permanent in addition	R/C low-pass, 1st order, 40 kHz Analog anti-aliasing filter (Butterworth), 4th order, 20 kHz Digital anti-aliasing filter (Tschebyscheff I)[2], 8th order	R/C low-pass, 1st order, 40 kHz Analog anti-aliasing filter (Butterworth), 4th order, 20 kHz Digital anti-aliasing filter (Tschebyscheff I)[2], 8th order	R/C low-pass, 1st order, 40 kHz Analog anti-aliasing filter (Butterworth), 4th order, 20 kHz Digital anti-aliasing filter (Tschebyscheff I)[2], 8th order
Input signal range	-3.0 A ... +3.0 A	-15.0 A ... +15.0 A	-6.25 A ... +6.25 A -100 A ... +100 A[3]
Max. input current	±10.5 A permanent	±24 A permanent	±24 A permanent ±100 A for 1 s per minute ±500 A for 0.2 s per 5 minutes[4]
Input impedance	25 mΩ	5 mΩ	2.5 mΩ
Sampling rate	Up to 40 kHz, freely adjustable	Up to 40 kHz, freely adjustable	Up to 40 kHz, freely adjustable
Frequency range	0 Hz ... 20 kHz	0 Hz ... 20 kHz	0 Hz ... 20 kHz
Accuracy	< 0.1 % of total measuring range	< 0.1 % of total measuring range	< 0.1 % of total measuring range
Electrical isolation channel-channel channel-housing/ power supply	AC 2.5 kV AC 2.5 kV	AC 2.5 kV AC 2.5 kV	AC 2.5 kV AC 2.5 kV
Connector type	1x 8-pin multi-pin connector, clamp-type terminal (0.5 mm² to 10.0 mm²), and interlocking device, included in delivery, without jumper	1x 8-pin multi-pin connector, clamp-type terminal (0.5 mm² to 10.0 mm²), and interlocking device, included in delivery, without jumper	1x 8-pin multi-pin connector, clamp-type terminal (0.5 mm² to 10.0 mm²), and interlocking device, included in delivery, without jumper
Additional functions			
Grid frequency measurement 10 Hz ... 80 Hz	Interval 1 s / 10 s (according to IEC 61000-4-30)	Interval 1 s / 10 s (according to IEC 61000-4-30)	Interval 1 s / 10 s (according to IEC 61000-4-30)
Power supply and indicators			
Power supply	24 V DC, internal via backplane bus	24 V DC, internal via backplane bus	24 V DC, internal via backplane bus
Power consumption	Up to 12 W	Up to 12 W	Up to 12 W
Indicators	4 LEDs device status 3 LEDs status of analog inputs	4 LEDs device status 3 LEDs status of analog inputs	4 LEDs device status 3 LEDs status of analog inputs
Certification			
Standards	EMC: IEC 61326-1 FCC part 15 class A Safety: IEC 61010-1	EMC: IEC 61326-1 FCC part 15 class A Safety: IEC 61010-1	EMC: IEC 61326-1 FCC part 15 class A Safety: IEC 61010-1
MTBF acc. to Telcordia 3 SR232 and NPRD	-	-	475,416 hours / 54 years

1) beginning with hardware version B0 2) can only be enabled when sampling rate > 500 Hz, cut-off frequency adjustable from 100 Hz to 0,5*sampling rate
3) no additional filters in 100 A measuring range 4) A recalibration is recommended after the occurrence of this current, as in this case a permanent deviation of the measured values may occur.

Fields of application

›   Power generation and distribution
›   Test benches
›   Power factor compensation plants

Connection diagrams

ibaMS3xAI-1A / -5A
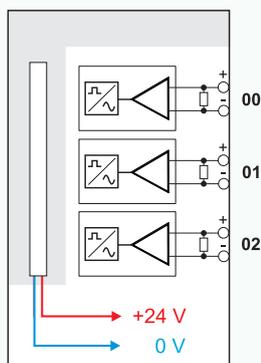
ibaMS3xAI-1A/100A
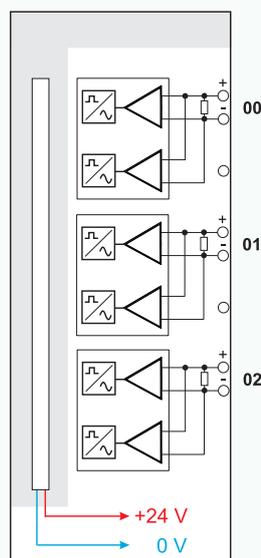
Special Feature

The additional functions are automatically detected in ibaPDA and can be configured in the I/O Manager. In addition to the actual measured values, the additional function is available as virtual signal in the signal tree and can be displayed, recorded and used for calculations like all other signals.

Input modules for voltage transformers in medium and high voltage technology

› ibaMS4xAI-380VAC
› ibaMS8xAI-110VAC

Short descripton		
Name	**ibaMS4xAI-380VAC**	**ibaMS8xAI-110VAC[1]**
Description	Input module with 4 analog voltage inputs	Input module with 8 analog voltage inputs
Order number	10.124521	10.124500
Analog inputs		
Number	4	8
Design	Galvanically isolated, single ended	Galvanically isolated, single ended
Resolution	16 Bit	16 Bit
Filter permanent	R/C low-pass, 1st order, 40 kHz	R/C low-pass, 1st order, 40 kHz
in addition	Analog anti-aliasing filter (Butterworth), 4th order, 20 kHz	Analog anti-aliasing filter (Butterworth), 4th order, 20 kHz
	Digital anti-aliasing filter (Tschebyscheff I)[2], 8th order	Digital anti-aliasing filter (Tschebyscheff I)[2], 8th order
Input signal	380 V AC	110 V AC
End value of measuring range	±1074 V	±312 V
Input impedance	1 MΩ	250 kΩ
Sampling rate	Up to 40 kHz, freely adjustable	Up to 40 kHz, freely adjustable
Frequency range	0 Hz ... 20 kHz	0 Hz ... 20 kHz
Accuracy	< 0.1 % of total measuring range	< 0.1 % of total measuring range
Electrical isolation channel-channel	AC 2.5 kV	AC 1.5 kV
channel-housing/ power supply	AC 2.5 kV	AC 1.5 kV
Connector type	1x 12-pin multi-pin connector, clamp-type terminal and interlocking device (0.08 mm^2 to 2.5 mm^2), included in delivery	1x 16-pin multi-pin connector, clamp-type terminal (0.2 mm^2 to 2.5 mm^2), screw connection, included in delivery
Additional functions		
Grid frequency measurement 10 Hz ... 80 Hz	Interval 1 s / 10 s (acc. IEC 61000-4-30)	Interval 1 s / 10 s (acc. IEC 61000-4-30)
Power supply and indicators		
Power supply	24 V DC, internal via backplane bus	24 V DC, internal via backplane bus
Power consumption	Up to 8 W	Up to 8 W
Indicators	4 LEDs for device status 4 LEDs for status of analog inputs	4 LEDs for device status 8 LEDs for status of analog inputs
Certification		
Standards	EMC: IEC 61326-1 FCC part 15 class A Safety: IEC 61010-1 (CAT II 300 V)	EMC: IEC 61326-1 FCC part 15 class A Safety: IEC 61010-2-030 (CAT II 150 V)
MTBF according to Telcordia 3 SR232 and NPRD	233,973 hours / 26 years	225,984 hours / 25 years

1) beginning with hardware version B0
2) can only be enabled when sampling rate > 500 Hz, cut-off frequency adjustable from 100 Hz to 0,5*sampling rate
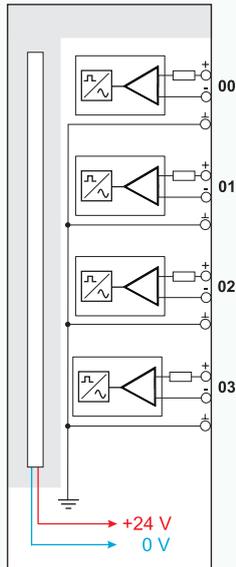
Fields of application

› Power generation and distribution
› Test benches
› Power factor compensation plants

Connection diagrams

ibaMS4xAI-380VAC
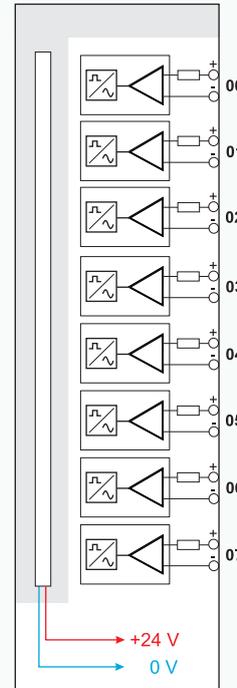
ibaMS8xAI-110VAC

Special feature

The additional functions are automatically detected in ibaPDA and can be configured in the I/O Manager. In addition to the actual measured values, the additional function is available as virtual signal in the signal tree and can be displayed, recorded and used for calculations like all other signals.

Input modules with digital inputs

› ibaMS16xDI-24V
› ibaMS16xDI-220V
› ibaMS32xDI-24V

Short description			
Name	**ibaMS16xDI-24V**	**ibaMS16xDI-220V**	**ibaMS32xDI-24V**
Description	Input module with 16 digital inputs	Input module with 16 digital inputs	Input module with 32 digital inputs
Order number	10.124201	10.124200	10.124210
Digital inputs			
Number	16	16	32
Design	Galvanically isolated, protected against reverse polarity, single ended	Galvanically isolated, protected against reverse polarity, single ended	8 galvanically isolated roots with 4 inputs each
Input signal	24 V DC	220 V DC	24 V DC
Max. input voltage	±60 V permanent	±300 V for 1 minute	±48 V permanent
Signal level log. 0 Signal level log. 1 Hysteresis	> -6 V; < +6 V < -10 V; > +10 V none	> -56 V; < +56 V[1] < -76 V; > +76 V[1] none	> -6 V; < +6 V < -10 V; > +10 V Typ. 1 V
Input current	1 mA, constant	1 mA, constant	1 mA, constant
Debounce filter	Optional: 4 different operating modes	Optional: 4 different operating modes	Optional: 4 different operating modes
Sampling rate	Up to 40 kHz, freely adjustable	Up to 40 kHz, freely adjustable	Up to 40 kHz, freely adjustable
Frequency range	0 Hz ... 20 kHz	0 Hz ... 20 kHz	0 Hz ... 20 kHz
Delay	Typ. 10 µs	Typ. 10 µs	Typ. 10 µs
Electrical isolation Channel-channel Channel-housing/ power supply	AC 2.5 kV AC 2.5 kV	AC 2.5 kV AC 2.5 kV	Root-root AC 1.5 kV Root-housing/ AC 1.5 kV power supply
Connector type	2x 16-pin multi-pin connector, clamp-type terminal (0.2 mm^2 to 2.5 mm^2), screw connection, included in delivery	2x 16-pin multi-pin connector, clamp-type terminal (0.2 mm^2 to 2.5 mm^2), screw connection, included in delivery	4x 12-pin multi-pin connector, screw-type terminal (0.14 mm^2 to 1.5 mm^2), screw connection, included in delivery
Power supply and indicators			
Power supply	24 V DC, internal via backplane bus	24 V DC, internal via backplane bus	24 V DC, internal via backplane bus
Power consumption	Up to 8 W	Up to 8 W	Up to 8 W
Indicators	4 LEDs for device status 16 LEDs for status of digital inputs	4 LEDs for device status 16 LEDs for status of digital inputs	4 LEDs for device status 32 LEDs for status of digital inputs
Certification			
Standards	EMC: IEC 61326-1 FCC part 15 class A	EMC: IEC 61326-1 FCC part 15 class A Safety: IEC 61010-1	EMC: IEC 61326-1 FCC part 15 class A
MTBF according to Telcordia 3 SR232	-	2,460,501 hours / 280 years	1,140,726 hours / 130 years

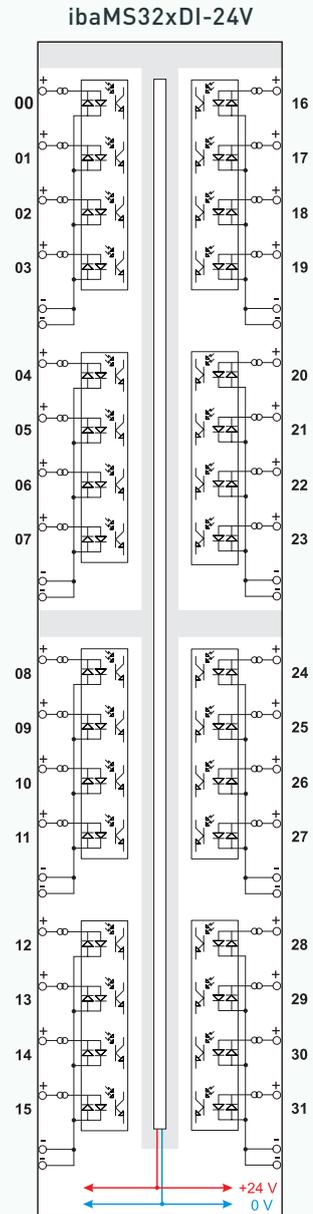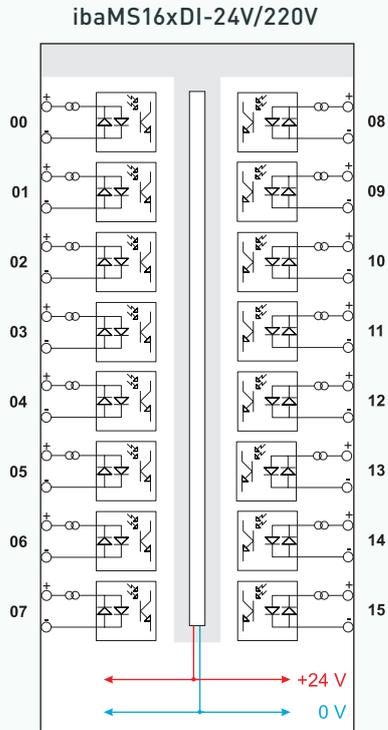1) beginning with hardware version A5

Fields of application

› Power generation and distribution
› Test benches
› Power factor compensation plants
› Condition monitoring

Connection diagrams

ibaMS16xDI-24V/220V

ibaMS32xDI-24V

Output modules with analog outputs

- ibaMS16xAO-10V
- ibaMS16xAO-20mA

Short description		
Name	**ibaMS16xAO-10V**	**ibaMS16xAO-20mA**
Description	Output module with 16 analog voltage outputs	Output module with 16 analog current outputs
Order number	10.124150	10.124160
Analog outputs		
Number	16	16
Design	4 galvanically isolated roots with 4 outputs each	4 galvanically isolated roots with 4 outputs each
Resolution	16 Bit	16 Bit
Filter	R/C low-pass 40 kHz[1], permanent	R/C low-pass 40 kHz[1], permanent
Output signal range	-10 V ... +10 V	-20 mA ... +20 mA
Load	≥1 kΩ	≤ 500 Ω
Output frequency	Up to 40 kHz, freely adjustable	Up to 40 kHz, freely adjustable
Delay	8 µs + 12 µs (settling time, until 90% of the output value is reached)	8 µs + 12 µs (settling time, until 90% of the output value is reached)
Accuracy	< 0.1 % of total measuring range	< 0.5 % of total measuring range
Electrical isolation root-root root-housing/power supply	AC 2.5 kV AC 2.5 kV	AC 2.5 kV AC 2.5 kV
Connector type	4x 12-pin multi-pin connector, screw-type terminal (0.14 mm^2 to 1.5 mm^2), screw connection, included in delivery	4x 12-pin multi-pin connector, screw-type terminal (0.14 mm^2 to 1.5 mm^2), screw connection, included in delivery
Protective functions		
Safe state	Channel root switched off	Channel root switched off
Current limitation	Short-circuit protection	Short-circuit protection
Hardware error (e.g. over temperature)	The root switches to „safe state", when connection is incorrect (resettable via software)	The root switches to „safe state", when connection is incorrect (resettable via software)
Power supply and indicators		
Power supply	24 V DC, internal via backplane bus	24 V DC, internal via backplane bus
Power consumption	Up to 14 W	Up to 14 W
Indicators	4 LEDs for device status 16 LEDs for status of analog outputs	4 LEDs for device status 16 LEDs for status of analog outputs
Certification		
Standards	EMC: IEC 61326-1 FCC part 15 class A	EMC: IEC 61326-1 FCC part 15 class A
MTBF according to Telcordia 3 SR232 and NPRD		218,234 hours / 24 years

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

Fields of applications

Triggering of

- Converters
- Controllers
- Drives / linear drives
- Valves
- Test benches

Connection diagrams

ibaMS16xAO-10V

ibaMS16xAO-20mA
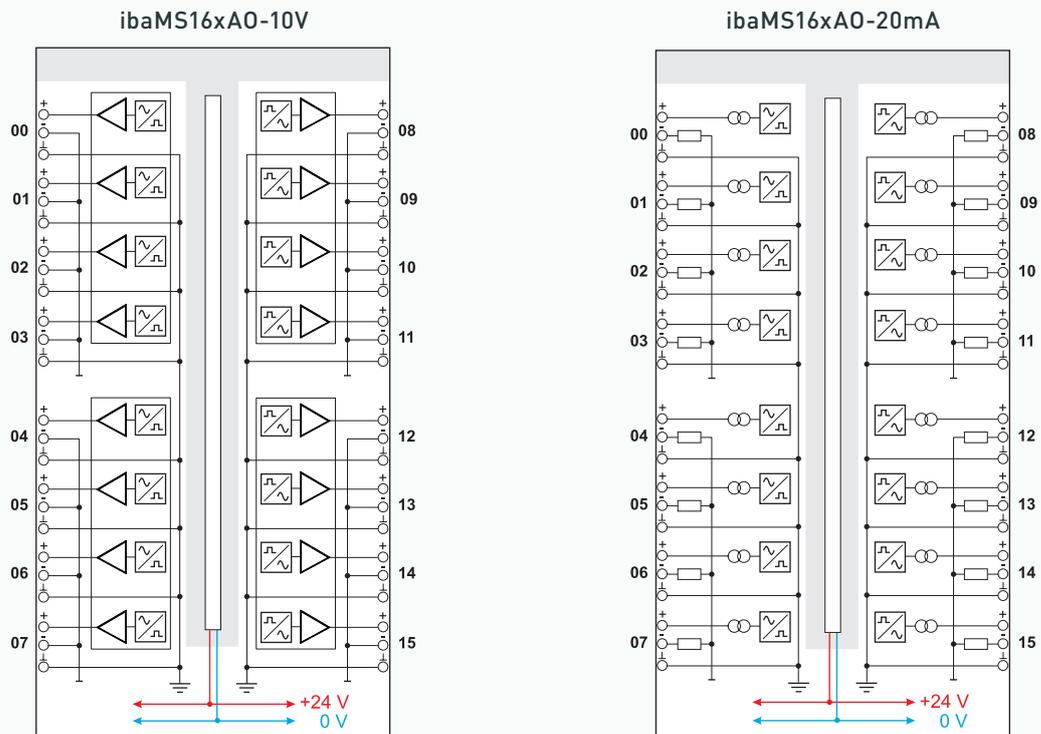
Output modules with digital outputs

- ibaMS16xDO-2A
- ibaMS32xDO-24V

Short description		
Name	**ibaMS16xDO-2A**	**ibaMS32xDO-24V**
Description	Output module with 16 digital outputs	Output module with 32 digital outputs
Order number	10.124250	10.124260
Digital outputs		
Number	16	32
Design	Galvanically isolated, 2-wire system, switch	8 galvanically isolated roots of 4 outputs each, P switch
Load voltage	0 V ... +55 V	24 V DC, external per root, protected against reverse polarity
Load voltage range		+10 V ... +30 V
Switching voltage per channel		= load voltage
Switching current per channel	10 mA ... 2 A	250 mA
Switching current range p. chan.		10 mA ... 500 mA
Inductive load		Up to 200 mJ
Switching frequency	0 Hz ... 5 kHz[1]	Up to 40 kHz[1], freely adjustable
Switching delay	< 10 µs	Switch-on delay (90% ... 10%) < 10 µs Switch-off delay (10% ... 90%) < 10 µs at 24 V DC switching voltage with 100 Ω load
Output impedance	Typ. 0.1 Ω	
Electrical isolation	Channel-channel AC 2.5 kV Channel-housing/power supply AC 2.5 kV	Root-root AC 1.5 kV Root-housing/power supply AC 1.5 kV
Connector type	2x16-pin multi-pin connector, clamp-type terminal (0.2 mm² to 2.5 mm²), screw connection, included in delivery	4x 12-pin multi-pin connector screw-type terminal (0.14 mm² to 1.5 mm²), screw connection, included in delivery
Protective functions		
Safe state	Open switch	Channel root switched off
Current limitation	25 A (peak)	From approx. 0.6 A per channel The root switches to „safe state", when connection is incorrect (resettable via software)
Reverse voltage limitation	Approx. -1 V	-
Overvoltage limitation	+60 V	-
Overtemperature protection	from 150 °C	-
Permanent overcurrent protection	min. >2.0 / typ. 2.3 / max. <2.7A	-
Surge current protection	Channel not active at pulses of approx. 3 A x 80 ms / 5 A x 33 ms / 10 A x 15 ms / 20 A x 7 ms	-
Fire protection	4 A lead fuse	-
Power supply and indicators		
Power supply	24 V DC, internal via backplane bus	24 V DC, internal via backplane bus
Power consumption	Up to 8 W	Up to 7 W
Indicators	4 LEDs for device status 16 LEDs for status of digital outputs	4 LEDs for device status 32 LEDs for status of the digital outputs
Fault indication	Broken line, shorted circuit, over temperature, overcurrent	Overcurrent, supply voltage
Certification		
Standards	EMC: IEC 61326-1, FCC part 15 class A Safety: IEC 61010-1	EMC: IEC 61326-1, FCC part 15 class A
MTBF (Telcordia 3 SR232)	1,417,369 hours / 161 years	2,005,894 hours / 228 years

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

Fields of application

› Triggering of solenoid valves
› Triggering of transmitters (e. g. lamps)
› Test benches

Special feature

ibaMS16xDO-2A includes serveral self protec-
tion and monitoring functions, it detects and
indicates 4 different faults per channel.

Connection diagrams

ibaMS16xDO-2A

ibaMS32xDO-24V
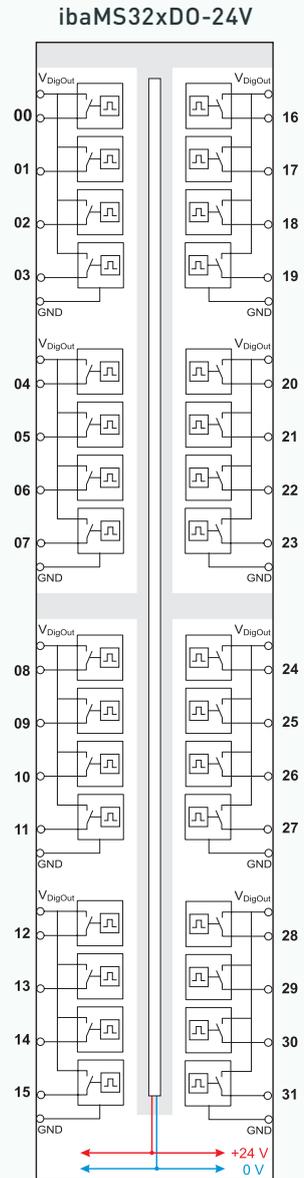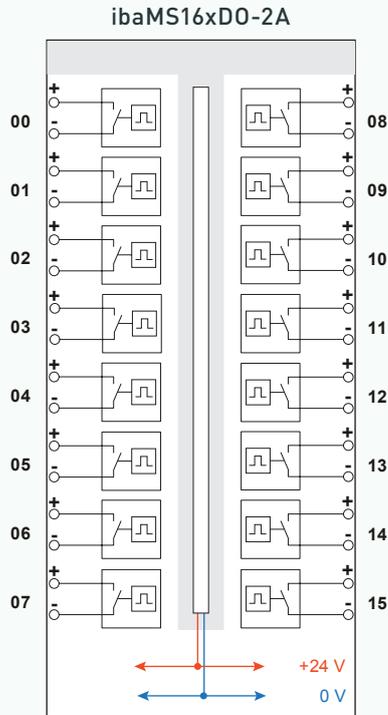
Counter module with 4 channels and digital inputs and outputs

› ibaMS4xUCO

Short description	
Name	**ibaMS4xUCO**
Description	4 channel counter module with digital inputs and outputs
Order number	10.124310
Counter inputs	
Number	4
Design	Galvanically isolated, differential (DIF) or single ended (SE) for incremental encoder or absolute encoder (SSI)
in addition	Pullup, pulldown and termination resistors RS422 termination with 120 Ω Encoder supply 5 V DC / 100 mA
Configuration	Encoder parameter file (xml) per channel
Incremental encoder connection	
Functions	Pulse and up/down counter; measurement of period time, frequency, pulse width and duty cycle
DIF	RS422, 2-wire technology, TTL, HTL (only with external series resistors) Signals A+, A- / B+, B- / N+, N- Quadrature decoder for 4-fold evaluation (in addition)
SE	2-wire technology, TTL, HTL Signals A / B / N R/C low-pass filter, 1st order, 180 kHz, in addition
Frequency range	0 Hz ... 500 kHz (SE) or 0 Hz ... 2 MHz (DIF)
Absolute decoder connection	
Functions	SSI master receiver for direct connection of an encoder SSI slave receiver for sniffing an existing encoder
SSI interface	Binary code, Gray code
SSI master receiver	RS422, 2-wire technology, TTL Signals: clock output (clock+ / clock-), data input (data+ / data-)
SSI slave receiver	RS422, 2-wire technology, TTL Signals: clock input (clock+ / clock-), data input (data+ / data-)
Max. clock frequency T_f	390 kHz
Data rate	$T_f/36$
Multi-function input	
Functions	Input for additional alarm and status signals
Design	single ended, 2-wire technology, TTL, HTL Signal MF Current limitation 10 mA Auxiliary voltage 5 V DC, in addition R/C low-pass filter, 1st order 180 kHz, in addition
Resolution	32 Bit
Input signal	
TTL	5 V
HTL	24 V
Sampling rate counter inputs	50 MHz
Sampling rate system	Up to 40 kHz, freely adjustable
Electrical isolation	
channel-24 V ground	AC 1.5 kV
channel-channel/housing	AC 1.0 kV
Connector type	1x37-pin Sub-D connector, soldered terminal (0.8 mm^2 to 1.2 mm^2), can be connected by screws, included in delivery

Fields of application

› Period measurements
› Frequency measurements
› SSI Slave
› Sony roll gap encoder

Connection diagram

Digital inputs	
Number	8
Design	Galvanically isolated, protected against reverse polarity, single ended
Input signal	24 V DC
Max. input voltage	±60 V permanent
Signal level log. 0 Signal level log. 1 Hysteresis	> -6 V; < +6 V < -10 V; > +10 V none
Input current	1 mA, constant
Debounce filter	Optional: 4 different operating modes
Sampling rate	Up to 40 kHz, freely adjustable
Frequency range	0 Hz ... 20 kHz
Delay	Typ. 10 μs
Electrical isolation	
channel-channel	AC 2.5 kV
channel-housing/power supply	AC 2.5 kV
Connector type	1x16-pin multi-pin connector, clamp-type terminal (0.8 mm^2 to 2.5 mm^2), screw connection, included in delivery

Digital outputs	
Number	4
Design	1 root with 4 outputs, P switch
Load voltage	24 V DC, external per root, protected against reverse polarity
Load voltage range	+10 V ... +30 V
Switching voltage per channel	= load voltage
Switching current per channel	250 mA
Switching current range per channel	10 mA ... 500 mA
Inductive load	Up to 200 mJ
Switching frequency	Up to 40 kHz[1], freely adjustable
Switching delay	
switch-on delay (90%...10%)	< 10 μs
switch-off delay (10%...90%)	< 10 μs at 24 V DC switching voltage with 100 Ω load
Electrical isolation	
root-root	AC 1.5 kV
root-housing/power supply	AC 1.5 kV
Connector type	1x6-pin multi-pin connector, clamp-type terminal (0.8 mm^2 to 2.5 mm^2), screw connection, included in delivery

Protective functions	
Safe state	Channel root switched off
Current limitation	From approx. 0.6 A per channel The root switches to „safe state", when connection is incorrect (resettable via software)

Power supply, indicators	
Power supply	24 V DC, via backplane bus
Power consumption	Up to 10 W
Indicators	4 LEDs for device status 16 LEDs for counters and digital outputs 8 LEDs for digital inputs
Certification	EMC: IEC 61326-1, FCC part 15 class A

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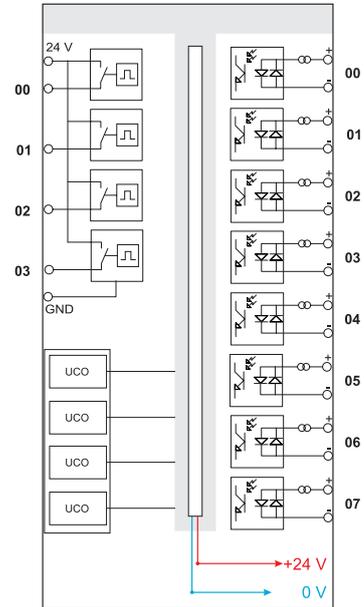
1) deviating switching frequency with ibaLogic (up to 1 kHz) and ibaPDA (up to 20 Hz)

Combi module with analog and digital inputs and outputs

› ibaMS4xADIO

Short description

Name	**ibaMS4xADIO**
Description	Combi module with 4 analog inputs, 4 analog outputs, 4 digital inputs and 4 digital outputs
Order number	10.124120

Analog inputs

Number	4
Design	Galvanically isolated, single ended, can be configured: voltage (10 V) or current (20 mA)
Resolution	16 Bit
Filter	
permanent	R/C low-pass, 1st order, 40 kHz
in addition	Analog anti-aliasing filter (Butterworth), 4th order, 20 kHz
	Digital anti-aliasing filter (Tschebyscheff I)[1], 8th order
Input signal range	
10 V	-10 V ...+10 V
20 mA	-20 mA ...+20 mA
Max. input voltage	±60 V permanent
Input impedance	
10 V	107 kΩ (80 kΩ when device is switched off)
20 mA	50 Ω
Sampling rate	Up to 40 kHz, freely adjustable
Frequency range	0 Hz ... 20 kHz
Accuracy	< 0.1 % of total measuring range
Electrical isolation	
channel-channel	AC 1.5 kV
channel-housing/ power supply	AC 1.5 kV
Connector type	12-pin multi-pin connector, screw-type terminal (0.14 mm^2 to 1.5 mm^2), screw connection, included in delivery

Additional functions

Grid frequency measurement 10 Hz ... 80 Hz	Interval 1 s / 10 s (according to IEC 61000-4-30)

Digital inputs

Number	4
Design	Galvanically isolated, protected against reverse polarity, single ended
Input signal	24 V DC
Max. input voltage	±60 V permanent
Signal level log. 0 Signal level log. 1 Hysteresis	> -6 V; < +6 V < -10 V; > +10 V none
Input current	1 mA, constant
Debounce filter	Optional with 4 different operating modes
Sampling rate	Up to 40 kHz, freely adjustable
Frequency range	0 Hz ... 20 kHz
Delay	Typ. 10 μs
Electrical isolation	
root-root	AC 1.5 kV
root-housing/power supply	AC 1.5 kV
Connector type	8-pin multi-pin connector, screw-type terminal (0.14 mm^2 to 1.5 mm^2), screw connection, included in delivery

Power supply and indicators

Power supply	24 V DC, internal via backplane bus
Power consumption	Up to 12 W
Indicators	4 LEDs for device status 4 LEDs for analog inputs 4 LEDs for digital inputs 4 LEDs for analog outputs 4 LEDs for digital outputs

Certificaton

Standards	EMC: IEC 61326-1, FCC part 15 class A

1) can only be enabled when sampling rate > 500 Hz, cut-off frequency adjustable from 100 Hz to 0,5*sampling rate

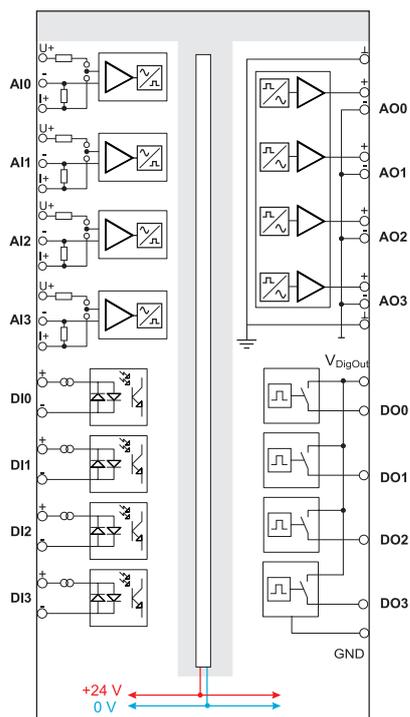| Analog outputs	
Number	4
Design	1 root with 4 outputs
Resolution	16 Bit
Filter	R/C low-pass 40 kHz, permanent
Output signal range	-10 V ... +10 V
Load	$\geq$1 kΩ
Output frequency	Up to 40 kHz[1], freely adjustable
Delay	8 µs + 12 µs (12 µs = (settling time, until 90% of the output value is reached)
Accuracy	< 0.1 % of total measuring range
Electrical isolation root-root	AC 1.5 kV
root-housing/ power supply	AC 1.5 kV
Connector type	10-pin multi-pin connector, screw-type terminal (0.14 mm^2 to 1.5 mm^2), screw connection, included in delivery
Protective functions	
Safe state	Channel root switched off
Current limitation	Short-circuit protection
Hardware error (e.g. over temperature)	The root switches to „safe state", when connection is incorrect (resettable via software)

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

Connection diagram

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

# Combi module with digital inputs and outputs

› ibaMS16xDIO-24V

Short description	
Name	**ibaMS16xDIO-24V**
Description	Module with 16 digital inputs and 16 digital outputs
Order number	10.124220
Digital inputs	
Number	16
Design	4 galvanically isolated roots with 4 inputs each
Input signal	24 V DC
Max. input voltage	±48 V permanent
Signal level log. 0 Signal level log. 1 Hysteresis	> -6 V; < +6 V < -10 V; > +10 V Typ. 1 V
Input current	1 mA, constant
Debounce filter	Optional 4 different operating modes
Sampling rate	Up to 40 kHz, freely adjustable
Frequency range	0 Hz … 20 kHz
Delay	Typ. 10 µs
Electrical isolation root-root root-housing/power supply	AC 1.5 kV AC 1.5 kV
Connector type	2x 12-pin multi-pin connector, screw-type terminal (0.14 mm^2 to 1.5 mm^2), screw connection, included in delivery
Digital outputs	
Number	16
Design	4 galvanically isolated roots with 4 outputs each; P switch
Load voltage	24 V DC, external per root, protected against reverse polarity
Load voltage range	+10 V … +30 V
Switching voltage p. channel	= load voltage
Switching current p. channel	250 mA
Switching current range per channel	10 mA … 500 mA
Inductive load	Up to 200 mJ
Switching frequency	Up to 40 kHz[1], freely adjustable
Switching delay switch-on delay (90%...10%) switch-off delay (10%...90%)	< 10 µs < 10 µs at 24 V DC switching voltage with 100 Ω load
Electrical isolation root-root root-housing/power supply	AC 1.5 kV AC 1.5 kV
Connector type	2x 12-pin multi-pin connector, screw-type terminal (0.14 mm^2 to 1.5 mm^2), screw connection, included in delivery
Protective functions	
Safe state	Channel root switched-off
Current limitation	From approx. 0.6 A per channel The root switches to „safe state", when connection is incorrect (resettable via software)

Fields of application

› Power generation and distribution
› Compensation plants
› Test benches
› Condition monitoring
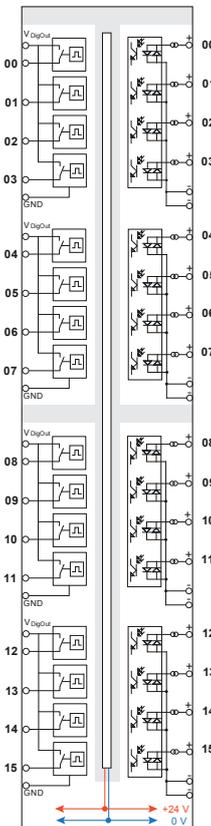
Connection diagram

Power supply, indicators
Power supply: 24 V DC, via backplane bus
Power consumption: Up to 8 W
Indicators: 4 LEDs for device status 16 LEDs for digital inputs 16 LEDs for digital outputs
Certification: EMC: IEC 61326-1, FCC part 15 class A

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

Input module with analog inputs for IEPE sensors

› ibaMS8xIEPE

Short description	
Name	**ibaMS8xIEPE**
Description	Input module with 8 analog inputs, supporting different modes: DC, AC and IEPE 4 x IEPE non-adjustable, 4 x IEPE/DC/AC adjustable
Order number	10.124302

Analog inputs		
Number		8
Design		4 galvanically isolated roots of 2 inputs each, single ended The second input of each root can be adjusted: IEPE or AI-24 V DC or AI-24 V AC 1 GND and 1 GND with 50 Ω per root
	IEPE	Integrated constant current source +4 mA (up to 30 V DC) for direct connection and supply of IEPE sensors
Resolution		24 Bit (delta-sigma)
Delay		37 / sampling rate
Filter		
R/C filter		
	AI-24 V DC	R/C low-pass, 1st order, 25 kHz
	AI-24 V AC	Like AI-24 V DC, in addition: R/C high-pass, 1st order, 1 Hz
	IEPE	R/C high-pass, 1st order, 1 Hz or 0.1 Hz, can be adjusted
Analog filter		
AI-24 V DC / AI-24 V AC /		Anti-aliasing filter (Butterworth), 4th order
	IEPE	Sampling rate ⩽ 8 kHz: cutoff frequency = 4 kHz Sampling rate > 8 kHz: cutoff frequency = 20 kHz
Digital filter		
AI-24 V DC / AI-24 V AC /		Anti-aliasing filter (delta-sigma)
	IEPE	Cutoff frequency = 0,49 * sampling rate Oversampling = 16 * sampling rate
Input signal range		
	AI-24 V DC / AC	-24.0 V ... +24.0 V
	IEPE	-5.0 V ... +5.0 V (at ~160 Hz)
Max. input voltage		±60 V permanent
Input gain IEPE		none
Sampling rate		Up to 40 kHz, freely adjustable
Frequency range		0.1 Hz ... 20 kHz
Error / status signals per channel		
	AI-24 V DC / AC	data valid
	IEPE	data valid, not connected, shorted
Electrical isolation		
	root-root	AC 1.5 kV
	root-housing/power supply	AC 1.5 kV
Connector type		2x 12-pin multi-pin connector, screw-type terminal (0.14 mm^2 to 1.5 mm^2), screw connection, included in delivery
Sensor cable length		Up to 30 m at 100 pF/m cable capacitance and a bandwidth of used signals up to 20 kHz

Fields of application

Measurement of mechanical vibration by means of IEPE accelerometers:

› Wind turbines
› Machine condition monitoring
› Test benches
› Monitoring of bearings
› Mill chatter monitoring

Connection diagram
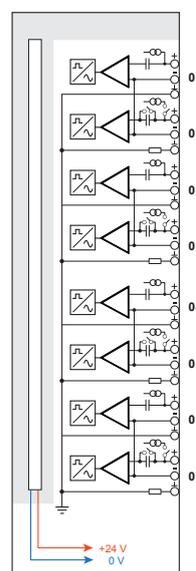
Power supply and indicators
Power supply: 24 V DC, via backplane bus
Power consumption: Up to 8 W
Indicators: 4 LEDs for device status 8 LEDs for analog inputs
Standards: EMC: IEC 61326-1, FCC part 15 class A

Technical data, valid for central units and I/O modules

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)		
Mounting position	Vertical, mounted on backplane panel In ibaMBox horizontal on backplane panel		
Installation altitude	Up to 2000 m		
Humidity class (IEC 40040) (Operation, storage, transport)	F (5% - 95%), no condensation		
Protection class	IP20		
Dimensions and weight	**ibaPADU-S-CM**	**ibaPADU-S-IT / ibaCMU-S / ibaPQU-S / ibaDAQ**	**ibaMS-xxx**
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)	2.20 in x 8.43 in x 5.83 in (56 mm x 214 mm x 148 mm)	1.69 in x 8.43 in x 5.83 in (43 mm x 214 mm x 148 mm)
Weight (incl. box and documentation)	approx. 2.65 lb (1.2 kg)	approx. 3.31 lb (1.5 kg)	approx. 2.42 lb (1.1 kg)

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