Compact measurement modules for analog and digital signals

ibaPADU-8AI-U/ibaPADU-8AI-I
Analog digital input modules for data acquisition up to 1 kHz

ibaPADU-D-8AI-U/-8AI-I
Analog digital input modules for data acquisition up to 40 kHz

ibaPADU-4-AI-U
Analog input module for fast sampling up to 100 kHz

ibaPADU-C-8AI
Analog digital input module for grid independent measurements

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

Acquire signals with high precision on site

Compact measurement modules

Using the ibaPADU (Parallel Analog Digital Unit) device family, analog and digital signals can be acquired and recorded with high precision by the data acquisition system ibaPDA. Fast and synchronous sampling of all signals allows detailed analyzing of all processes.

At a glance

- Sampling rate of 1 kHz with ibaPADU-8AI-U and ibaPADU-8AI-I
- Sampling rate up to 40 kHz with ibaPADU-D-8AI-U and ibaPADU-D-8AI-I
- Sampling rate up to 100 kHz with ibaPADU-4-AI-U
- Simultaneous data acquisition due to one A/D converter per channel, 16 bit resolution
- Adjustable level and input characteristic
- Full electrical isolation per channel
- Integrated filters reduce interference
- Comfortable configuration of the devices and signals in ibaPDA (except ibaPADU-C)

Inputs for current and voltage signals

ibaPADU is a device family for measurement of analog and digital signals. The analog inputs are available as current and voltage inputs with different measuring ranges. Each channel is galvanically isolated and equipped with its own A/D converter.

The devices support different ibaNet protocols and hence, offer different properties. The main properties of the devices and the adjustable signal ranges are listed in the table on page 5.

Acquiring measurement data with 1 kHz

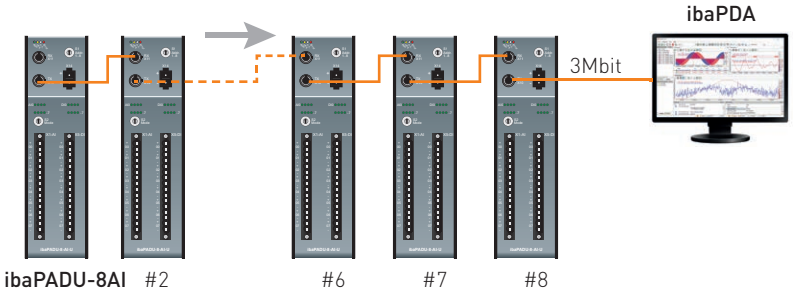
The devices ibaPADU-8AI-U and ibaPADU-8AI-I work with the 3Mbit protocol. Thus, up to 8 devices can be connected in a daisy-chain on the fiber optics link and up to 64 analog and 64 digital signals can be transmitted at a fixed sampling rate of 1 kHz. The possible distance between two devices may be up to 2 km.

An analog low-pass filter is permanently active in both devices ibaPADU-8AI-U and ibaPADU-8AI-I. In the voltage module ibaPADU-8AI-U, an additional digital low-pass filter can be activated as option.

Each device has an additional RJ11-jack for the connection to a notebook with an ibaCom-PCMCIA-F card. Thus, it is possible to carry out measurements in parallel at the RJ11-jack without affecting the data transmission on the fiber optic cable.

Different device modes, which provide the device specific properties of the previous devices like measuring range, input impedance and filters, are set by means of a rotary switch.

The 3Mbit devices can replace all previous ibaPADU-8 models which used the 3Mbit protocol. In existing installations, older ibaFOB cards and the I/O configuration in ibaPDA can remain in use.



Up to 8 ibaPADU-8 devices can be linked in a daisy-chain.

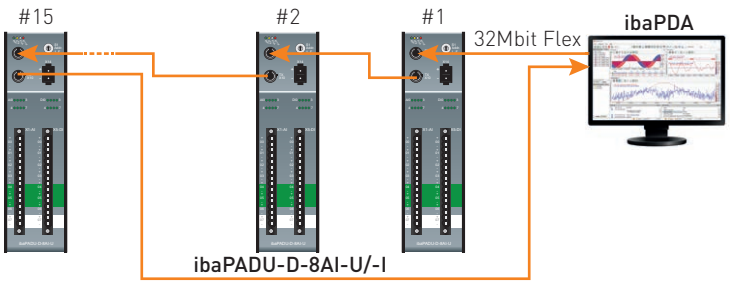
Acquiring measurement data from 1 kHz to 100 kHz

Flexible settings with „Flex“ protocol

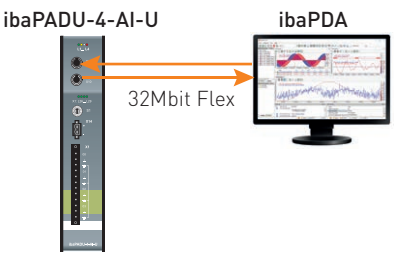
The devices ibaPADU-4-AI-U, ibaPADU-D-8AI-U and ibaPADU-D-8AI-I work with the 32Mbit Flex protocol. With 32Mbit Flex, the data transmission rate is 32 Mbit/s and up to 15 „Flex“ devices can be connected to a ring topology. Thus, it is possible to use an ibaPADU-D device as extension for an ibaPADU-S modular system, when all slots are already occupied.

The size of the data telegrams is flexible as long as the total data volume does not exceed 4060 bytes in the ring. The general rule is: The less data is transferred, the higher is the possible sampling rate.

The sampling rate of the devices ibaPADU-D-8AI-U and ibaPADU-D-8AI-I can be up to 40 kHz. A sampling rate of even 100 kHz is possbile with ibaPADU-4-AI-U in a point-to-point connection.



Up to 15 „32Mbit Flex“ devices can be connected to a „Flex“ ring.



With ibaPADU-4-AI-U, the sampling rate can be up to 100 kHz in a point-to-point connection.

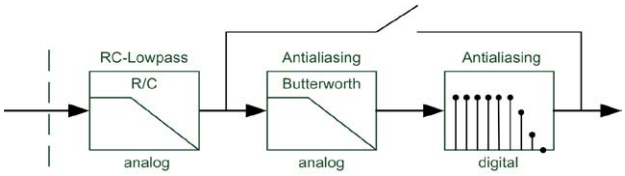
Comfortable configuration in ibaPDA

The signals are converted internally and are available via the FO interface. A fiber optic card of ibaFOB-D type is the interface to the data acquisition software ibaPDA. The signals can be conveniently selected and configured with ibaPDA. All necessary parameters like input signal range, input impedance, or filters can be adjusted for each channel in the software.

Anti-aliasing filters reduce disturbances

A digital filter can be activated per channel together with an analog anti-aliasing filter. The digital anti-aliasing filter is adjusted automatically to the configured sampling rate.

Filters:



Overview compact measurement modules

	Input signal range (adjustable)	Sampling rate	Input impedance	Inputs / Outputs	ibaNet protocol
ibaPADU-4-AI-U	±250 mV, ±500 mV, ±1 V, ±2.5 V, ±5 V, ±10 V, ±24 V	up to 100 kHz	100 kΩ	4 AI	32Mbit Flex
ibaPADU-D-8AI-U	±2.5 V, ±10 V, ±24 V, ±60 V	up to 40 kHz	100 kΩ or 1 MΩ	8 AI + 8 DI	32Mbit Flex
ibaPADU-8AI-U	±10 V, ±24 V, ±60 V	1 kHz	100 kΩ or 1 MΩ	8 AI + 8 DI	3Mbit
ibaPADU-D-8AI-I	±20 mA, 0..20 mA, 4..20 mA	up to 40 kHz	50 Ω	8 AI + 8 DI	32Mbit Flex
ibaPADU-8AI-I	±20 mA	1 kHz	50 Ω	8 AI + 8 DI	3Mbit

AI: analog input, DI: digital input

Technical data measurement modules with 3Mbit protocol

Short description		
Name	**ibaPADU-8AI-U**	**ibaPADU-8AI-I**
Description	Input module with 8 digital and 8 analog voltage inputs	Input module with 8 digital and 8 analog curent inputs
Order number	10.100000	10.100010
Analog inputs		
Number	8	
Design	Galvanically isolated, single ended	
Resolution	16 Bit	
Filter	R/C low-pass 4 kHz (permanent) Digital anti-aliasing Tschebyscheff 8th order 330 Hz[1] Digital low-pass Butterworth 2nd order 250 Hz[1]	R/C low-pass 4 kHz (permanent)
Input signal range	±10 V/ ±24 V / ±60 V[1] (max. for all ranges: ±60 V)	±20 mA (max.)
Input impedance	100 kΩ / 1 MΩ[1]	50 Ω
Sampling rate	Synchronous with ibaNet sampling rate	
Accuracy	< 0,1 % of total measuring range	
Electrical isolation Channel-channel Channel-housing/power supply	 1.5 kV AC 1.5 kV AC	
Connector type	16-pin multi-pin connector, clamp-type terminal (0.2 mm² to 2.5 mm²), screw connection, included in delivery	
Digital inputs		
Number	8	
Design	Galvanically isolated, protected against reverse polarity, single ended	
Input signal	24 V DC	
Max. input voltage	±60 V permanent	
Signal level log. 0 log. 1	 > -6 V; < +6 V[2] < -10 V; > +10 V	
Input current	1 mA, constant	
Sampling rate	Synchronous with ibaNet sampling rate	
Connector type	16-pin multi-pin connector, clamp-type terminal (0.2 mm² to 2.5 mm²), screw connection, included in delivery	
ibaNet interface		
Number	1 (e. g. for the connection to ibaPDA)	
Design	Fiber optic cable	
ibaNet protocol	3Mbit	
Data transmission rate	3.3 Mbit/s	
Connector type	2 ST connectors for RX and TX; iba recommends the use of fiber optic cables of type 50/125 µm or 62.5/125 µm; Cable length up to 2000 m possible without amplifier, depending on transmitter, receiver, FO and environment	
Transmitting interface (TX)		
Output power	50/125 µm FO cable: -19.8 dBm to -12.8 dBm 62.5/125 µm FO cable: -16 dBm to -9 dBm 100/140 µm FO cable: -12.5 dBm to -5.5 dBm 200 µm FO cable: -8.5 dBm to -1.5 dBm	
Temperature range	-40 °F to 185 °F (-40 °C to 85 °C)	
Light wavelength	850 nm	
Receiving interface (RX)		
Sensitivity[3]	100/140 µm FO cable: -24 dBm to -10 dBm	
Temperature range	-40 °F to 185 °F (-40 °C to 85 °C)	

[1] selectable with rotary switch [2] when used as replacement for previous devices, please note: signal level log. 0 before: > -9 V; < +9 V
[3] data for other FO cable diameters not specified

	ibaPADU-8AI-U	ibaPADU-8AI-I
Supply		
Power supply	24 V DC (±10 %)	
Power consumption max.	8 W	
Connector type	1 x 2-pin multi-pin connector; clamp-type terminal (0.2 mm² to 2.5 mm²), screw connection, included in delivery	
Further interfaces, operating and indicating elements		
Ethernet	RJ45 socket (for service purposes only)	
Notebook	RJ11 socket (for ibaCom-PCMCIA-F card only)	
Indicators	4 LEDs for device status 8 LEDs for status of analog inputs 8 LEDs for status of digital inputs	
Rotary switches	2, address setting, device mode	2, address setting, without function
Operating and environmental conditions		
Temperature ranges Operation Storage/transport	 32 °F to 122 °F (0 °C to 50 °C) -13 °F to 149 °F (-25 °C to 65 °C)	
Mounting	DIN rail according to EN50022 (TS 35, DIN Rail 35)	
Cooling	Passive	
Humidity class	F, no condensation	
Protection class	IP20	
Standards	EMC (EN 61326-1:2006) FCC part 15 class A	
Mechanical stability	DIN IEC 60068-2-6 (when installed correctly)	
Dimensions (width x height x depth)	53 mm x 200 mm x 141 mm	
Weight / incl. box and documentation	1.54 lbs (0.7 kg) / 2.42 lbs (1.1 kg)	

The devices ibaPADU-8AI-U and ibaPADU-8AI-I replace the following devices and integrate the known functions in one device. The operating mode with the device-specific properties, such as measuring range, input impedance and filter, is set according to the predecessor models with a rotary switch.

	ibaPADU-8AI-U	ibaPADU-8AI-I
Replacement for previous devices	ibaPADU-8 ibaPADU-8-F1 ibaPADU-8-60 ibaPADU-8-HI ibaPADU-8-HI-F1 ibaPADU-8-HI-25 ibaPADU-8-HI-60	ibaPADU-8-I
Supported ibaFOB cards	ibaFOB-4i, ibaFOB-io ibaFOB-4i-S, ibaFOB-io-S ibaFOB-4i-X, -2i-X, -2io-X, -io-X ibaFOB-4i-D, -2i-D, -2io-D, -io-D	

Technical data measurement modules with 32Mbit Flex protocol



Short description			
Name	**ibaPADU-4-AI-U**	**ibaPADU-D-8AI-U**	**ibaPADU-D-8AI-I**
Description	Input module with 4 fast analog voltage inputs	Input module with 8 digital inputs and 8 analog voltage inputs	Input module with 8 digital inputs and 8 analog current inputs
Order number	10.121000	10.100100	10.100110
Analog inputs			
Number	4	8	
Design	Galvanically isolated, single ended		
Resolution	16 bit		
Filter	R/C low-pass 72 kHz (permanent) Analog anti-aliasing Butterworth 4th order 50 kHz and digital anti-aliasing filter, cut-off frequency 1/3 of the adjusted sampling rate, can be activated only together	R/C low-pass 40 kHz (permanent) Analog anti-aliasing Butterworth 4th order 20 kHz and digital anti-aliasing filter, cut-off frequency 1/3 of the adjusted sampling rate, can be activated only together	
Input signal range	±250 mV / ±500 mV / ±1 V / ±2.5 V / ±5 V / ±10 V / ±24 V	±2.5 V / ±10 V / ±24 V / ±60 V	±20 mA / 0...20 mA / 4...20 mA
Input impedance	100 kΩ	100 kΩ / 1 MΩ[4]	50 Ω
Sampling rate	Synchronous with ibaNet sampling rate		
Frequency range	0 Hz to 50 kHz	0 Hz to 20 kHz	
Accuracy	< 0.1 % of total measuring range (±1 V; ±2.5 V; ±5 V; ±10 V; ±24 V) < 0.5 % of total measuring range (± 250 mV; ±500 mV)	< 0.1 % of total measuring range	
Electrical isolation Channel-channel Channel-housing/ power supply	 1.5 kV AC 1.5 kV AC		
Connector type	12-pin multi-pin connector (Phoenix); 3.81 mm, clamp-type terminal (0.14 mm² to 1.5 mm²) screw connection, included in delivery	16-pin multi-pin connector, clamp-type terminal (0.2 mm² to 2.5 mm²), screw connection, included in delivery	
Digital inputs			
Number	-	8	
Design		Galvanically isolated, protected against reverse polarity, single ended	
Input signal		24 V DC	
Max. input voltage		±60 V permanent	
Signal level log. 0 log. 1		 > -6 V; < +6 V < -10 V; > +10 V	
Input current		1 mA, constant	
Debounce filter		Optional: 4 different operating modes	
Sampling rate		Synchronous with ibaNet sampling rate	
Connector type		1 x 16-pin multi-pin connector; clamp-type terminal (0.2 mm² to 2.5 mm²), screw connection, included in delivery	

[4] 1 MΩ not possible in combination with ±2.5 V

	ibaPADU-4-AI-U	ibaPADU-D-8AI-U	ibaPADU-D-8AI-I
ibaNet interface			
Number	1		
Design	Fiber optic cable		
ibaNet protocol	32Mbit Flex; allows the simultaneous connection of up to 15 devices in a fiber optic ring; can be used simultaneously for data, settings and service (e. g. updates)		
Data transmission rate	32 Mbit/s		
Sampling rate	Up to 100 kHz, freely adjustable	Up to 40 kHz, freely adjustable	
Connector type	2 ST connectors for RX and TX; iba recommends the use of fiber optic cables of type 50/125 µm or 62.5/125 µm; Cable length up to 2000 m possible without amplifier, depending on transmitter, receiver, FO and environment		
Transmitting interface (TX)			
Output power	50/125 µm FO cable: -19.8 dBm to -12.8 dBm 62.5/125 µm FO cable: -16 dBm to -9 dBm 100/140 µm FO cable: -12.5 dBm to -5.5 dBm 200 µm FO cable: -8.5 dBm to -1.5 dBm		
Temperature range	-40 °F to 185 °F (-40 °C to 85 °C)		
Light wavelength	850 nm		
Receiving interface (RX)			
Sensitivity [5]	100/140 µm FO cable: -33.2 dBm to -26.7 dBm	62.5/125 µm FO cable: -30 dBm	
Temperature range	-40 °F to 185 °F (-40 °C to 85 °C)	77 °F (25 °C)	
Supply			
Power supply	24 V DC (±10 %)	24 V DC (±10 %)	
Power consumption max..	10 W	10 W	
Connector type	1 x 2-pin multi-pin connector; clamp-type terminal (0.2 mm² to 2.5 mm²), screw connection, included in delivery		
Further interfaces, operating and indicating elements			
Ethernet	-	RJ45 socket (for service purposes only)	
Indicators	4 LEDs for device status 4 LEDs for status of analog inputs	4 LEDs for device status 8 LEDs for status of analog inputs 8 LEDs for status of digital inputs	
Switch	1, address setting	1, address setting	
Operating and environmental conditions			
Temperature ranges			
Operation	32 °F to 122 °F (0 °C to 50 °C)		
Storage/transport	-13 °F to 149 °F (-25 °C to 65 °C)		
Mounting	DIN rail according to EN 50022 (TS 35, DIN Rail 35)		
Free space for air circulation		Min. 2 cm on top and bottom of the device required	
Cooling	Passive		
Humidity class	F, no condensation		
Protection class	IP20		
Standards	EMC (EN 61326-1:2006), FCC part 15 class A		
Mechanical stability		DIN IEC 60068-2-6 (when installed correctly)	
Dimensions (width x height x depth)	37 mm x 188 mm x 141 mm	53 mm x 200 mm x 141 mm	
Weight / incl. box and documentation	0.7 kg / 1.1 kg	0.7 kg / 1.1 kg	

[5] Data for other FO cable diameters not specified

Grid independent data logger

ibaPADU-C-8AI is a grid independent measurement module for mobile data acquisition and recording. Using the easy-to-handle, compact device analog and digital signals can be recorded just where they arise.

Record data autonomously

ibaPADU-C-8AI is intended for off-line data recording of process data. With the internal lithium ion battery the device can be powered for about 24 h independent of the power grid. Once ibaPADU-C-8AI is connected to the power grid, the internal battery will be charged automatically. Connected to external power supply, the device can be used for longer recordings and thereby provides by-pass protection during unexpected power failure.

ibaPADU-C-8AI is ideally suited for the mobile use. Measuring data can be acquired with high precision via 8 analog and 8 digital inputs and stored autonomously in the device.

Data stored as iba-data files

The settings for the device are configured very easily and without additional software via FTP access and by editing a configuration file located in the device. This process does not need an ibaPDA system.

The data are stored as iba-data files (*.dat) or CSV-files. The data recording can be started and stopped manually by keystroke or triggered by external signal.

The sampling rate can be flexibly adjusted for long term data logging (sampling rate 1 sample/min.) as well as for fast measurement (sampling rate 1000 samples/s).

Powerful analyzing with ibaAnalyzer

In order to retrieve the recorded data files the device should be connected to a computer via USB interface. The computer recognizes the devices per plug and play like a mass storage device. In addition, it is possible to retrieve the data using a network connection via FTP.

For displaying and analyzing the data, the analysis software ibaAnalyzer can be used as usual.

Device versions

The device is available in two versions with different memory space:

- ibaPADU-C-8AI-Z1 with 4 GB
- ibaPADU-C-8AI-Z2 with 32 GB

The 4 GB memory, for example, offers sufficient space for measurements over 1000 days at 1 s acquisition time or 1 day at 1 ms.

Areas of application

- Temporary, highly precise data logging of analog and digital data, e. g. during commissioning and trouble shooting
- Flight recorder

At a glance

- Grid independent data logger with internal lithium ion battery
- 8 analog inputs, 16 bit resolution
- 8 digital inputs
- Synchronous data recording of all channels
- Sampling rate 1 sample/min. to 1000 samples/s
- External trigger
- Data storage (4 or 32 GB) for local recording of measuring files
- USB interface
- Battery run-time up to 24 h during normal operation

Short description		
Name	**ibaPADU-C-8AI-Z1** (4 GB memory)	**ibaPADU-C-8AI-Z2** (32 GB memory)
Order number	10.130000	10.130001
Description	Compact data acquisition module with 8 analog and 8 digital inputs	
Analog inputs		
Number	8	
Design	Single-ended, no galvanic isolation	
Resolution	16 bit	
Filter	R/C filter 8 kHz	
Input signal range	-10 V to +10 V	
Input impedance	680 kΩ (580 kΩ when device is switched off)	
Sampling rate	up to 1 kHz, freely adjustable	
Accuracy	< 0.1 % of total measuring range	
Digital inputs		
Number	8	
Design	Single-ended, no galvanic isolation	
Input signal	0 V to +30 V	
Signal level log. 0 Signal level log. 1	< 0.9 V > 2.2 V	
Sampling rate	Linked with analog sampling	
Communication interfaces		
USB	USB 2.0 Full Speed (12 Mbit/s)	
Ethernet	10/100BASE-T	
Power supply, memory, operating and indicating elements		
Trigger input	External contact or voltage level (signal level like digital inputs)	
Voltage supply	DC input 9 V to 30 V, USB, integrated battery	
Integrated lithium ion battery	Capacity 6.8 Ah at 3.7 V, battery runtime about 19 - 24 h during normal operation	
Power consumption	Max. 6 W, depending on parameter settings and operating status	
Data memory	4 GByte	32 GByte
Indicators	4 LEDs for operating status of the device	
Connector type signal inputs	36-pin multi-pin connector, clamp-type terminal, included in delivery Cable inflexible/flexible (0.2 mm² to 1.5 mm²) Flexible with cable end sleeve without plastic sleeve (0.25 mm² to 1.5 mm²) Flexible with cable end sleeve with plastic sleeve (0.25 mm² to 0.75 mm²)	
Operating and environmental conditions		
Temperature range Operation Storage/transport	 32 °F to 122 °F (0 °C to 50 °C) -13 °F to 158 °F (-25 °C to 70 °C)	
Mounting	DIN rail according to EN 50022 (TS 35, DIN Rail 35)	
Cooling	Passive	
Humidity class	F, no condensation	
Protection class	IP20	
Standards	EMC: IEC 61326-1: 2006-10 FCC part 15 class A	
Dimensions (width x height x depth)	1.61 in x 7.40 in x 5.55 in (41 mm x 188 mm x 141 mm)	
Weight (incl. packaging and documentation)	approx. 1.1 kg	

Headquarters Germany

iba AG

Office address
Koenigswarterstr. 44
D-90762 Fuerth

Mailing address
P.O. box 1828
D-90708 Fuerth

Tel.: +49 (911) 97282-0
Fax: +49 (911) 97282-33

www.iba-ag.com
info@iba-ag.com

Europe

iba Austria GmbH
Austria & Hungary
order@iba-austria.at

iba Benelux BV
Belgium, the Netherlands, Luxembourg, France, Ireland, Great Britain, French-speaking Switzerland
sales@iba-benelux.com

iba Czechia
Czechia, Slovakia
josef.dusek@compas.cz

iba Ibérica
Spain, Portugal
sales@iba-iberica.com

iba Italia S.R.L.
Italy, Slovenia, Croatia, Serbia, Italian-speaking Switzerland
sales@iba-italia.com

iba Nordic
Denmark, Finland, Norway, Sweden
c/o Begner Agenturer AB
info@begner.com

iba Polska
c/o ADEGIS Sp. z o.o. Sp.k.
support@iba-polska.com

OOO iba Russia
dmitry.rubanov@iba-russia.com

Asia

iba Asia GmbH & Co. KG
Western and Central Asia, Philippines, Cambodia, Laos, Myanmar, Bhutan, Nepal
henry.regn@iba-asia.com

iba China Ltd.
julia.wang@iba-china.com

iba Gulf
Saudi Arabia, UAE, Qatar, Kuwait, Bahrain and Oman
c/o ASM
a.magboul@iba-gulf.com

iba Indonesia
c/o PT. Indahjaya Ekaperkasa
sandhi.sugiarto@iba-indonesia.com

iba Korea System Co. Ltd.
Japan
hj.park@ibakorea.co.kr

iba Korea System Co. Ltd.
Korea
sh.lee@ibakorea.co.kr

iba Malaysia
c/o iba Engineering & Consulting (Malaysia) SDN. BHD
bruno.marot@iba-malaysia.com

iba Singapore
c/o iba (S.E.A.) Engineering & Consulting Pte. Ltd.
bruno.marot@iba-sea.com

iba Systems India Pvt. Ltd.
India, Bangladesh, Nepal, Pakistan, Sri Lanka
shraddhap@iba-india.com

iba Thailand
c/o SOLCO Siam Co. Ltd.
pairote@iba-thai.com

iba Turkey Ltd.
ahmet@iba-turkey.com

iba Vietnam
c/o Tang Minh Phat Co., Ltd
sales@iba-vietnam.com

Australia and Oceania

iba Oceania Systems Pty Ltd.
Australia, New Zealand, PNG, Micronesia and South Pacific Islands (except US territories)
fritz.woller@iba-oceania.com

Central and South America

iba LAT, S.A.
iba@iba-lat.com

iba LAT Argentina
iba@iba-argentina.com

iba LAT Bolivia
iba@iba-bolivia.com

iba Brasil
iba@iba-brasil.com

iba Chile
iba@iba-chile.com

North America (USMCA)

iba America, LLC
USA
esnyder@iba-america.com

iba America, LLC
Canada
dkober@iba-america.com

iba America, LLC
Mexico
jgiraldo@iba-america.com

Africa

iba Benelux BV
Maghreb (Morocco, Algeria, Tunisia), Senegal
sales@iba-benelux.com

iba Africa
South Africa
c/o Variable Speed Systems cc
danie@iba-africa.com

iba AG is represented worldwide by subsidiaries and sales partners.
Technical changes and errors excepted.

Brochure_ibaCompactMeasurementModules_v1.1_en 09/2023