

# ibaNet750-BM-D

Distributed I/O System

Manual

Issue 2.1

Measurement Systems for Industry and Energy

[www.iba-ag.com](http://www.iba-ag.com)



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The current version is available for download on our web site <http://www.iba-ag.com>.

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## 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.



Issue	Date	Revision	Chapter	Author	Version HW / FW
2.1	12-2023	Miscellaneous			



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# 1 About this manual

This manual describes the construction, the use and the operation of the device ibaNet750-BM-D.

## 1.1 Target group

This manual addresses in particular the qualified professionals who are familiar with handling electrical and electronic modules as well as communication and measurement technology. A person is regarded to as professional if he/she is capable of assessing safety and recognizing possible consequences and risks on the basis of his/her specialist training, knowledge and experience and knowledge of the standard regulations.

## 1.2 Notations

The following designations are used in this manual:

Action	Notations
Menu command	Menu „Logic diagram“
Call of menu command	„Step 1 – Step 2 – Step 3 – Step x“ Example: Select menu „Logic diagram – Add – New logic diagram“
Keys	<Key name> Example: <Alt>; <F1>
Press keys simultaneously	<Key name> + <Key name> Example: <Alt> + <Ctrl>
Buttons	<Button name> Example: <OK>; <Cancel>
File names, Paths	„File name“, „Path“ Example: „Test.doc“



## 1.3 Used symbols

If safety instructions or other notes are used in this manual, they mean:



### **⚠ DANGER**

The non-observance of this safety information may result in an imminent risk of death or severe injury:

- By an electric shock!
- Due to the improper handling of software products which are coupled to input and output procedures with control function!

If you do not observe the safety instructions regarding the process and the system or machine to be controlled, there is a risk of death or severe injury!



### **⚠ WARNING**

The non-observance of this safety information may result in a potential risk of death or severe injury!



### **⚠ CAUTION**

The non-observance of this safety information may result in a potential risk of injury or material damage!



### **Note**

A note specifies special requirements or actions to be observed.



### **Tip**

Tip or example as a helpful note or insider tip to make the work a little bit easier.



### **Other documentation**

Reference to additional documentation or further reading.



## 2 Introduction

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.

Up to 255 WAGO I/O terminals can be connected to ibaNet750-BM-D and a data volume of up to 2048 Bytes can be transferred over the K-bus.

The signals are internally converted and are available via the fiber optic interface. For the connection to a data acquisition system, such as ibaPDA, an ibaFOB-D card is used with a bidirectional fiber optic cable connection.

The device supports different ibaNet protocols:

### 32Mbit Flex

Using 32Mbit Flex, configuration as well as process data is transmitted via a bidirectional fiber optics connection. ibaPDA automatically detects the modules used and the signals can be easily selected and configured by mouse click.

With 32Mbit Flex, the sampling rate can be flexibly set up to 40 kHz. The maximum data volume to be transmitted depends on the adjusted sampling rate. The following rule applies: the higher the sampling rate, the lower the data volume. The ibaPDA application automatically determines the maximum sampling rate, which depends on the desired data volume and the number of devices in the ring.

With the ibaNet protocol 32Mbit Flex, it is possible to connect up to 15 devices to a ring topology. The signal limitation applies for the entire ring. Thereby, the distance between the devices can be up to 2 km. Other 32Mbit Flex-enabled iba devices can be integrated into the ring as well.

### 32Mbit

The 32Mbit protocol is especially used with ibaLogic-V4 version 4.2.5.464 or later. With the 32Mbit protocol it is possible to connect an ibaNet750-BM-D system to ibaLogic with a data transmission rate of 32 Mbit/s. The cycle time is 500 µs and up to 256 (REAL) / 512 (INT) analog and digital signals are transmitted. A bidirectional fiber optic connection is necessary in order to integrate output terminals.

### 3Mbit

Using the 3Mbit protocol, the device is compatible to the previous ibaNet750-BM version. Up to 8 devices may be connected in a line topology and used as pure input or output devices. If input and output signals should be processed at the same time, it is recommended to use a ring topology. Moreover, the devices may operate peer-to-peer without a PC involved. The cycle time is 1 ms in all applications.



#### Note

Please note, that the modes 1 and 3 of the previous device ibaNet750-BM are not supported any more.



Characteristics in 3Mbit mode:

- ☐ Works as input and output station at the same time
- ☐ 32+32 analog inputs and outputs plus 32+32 binary inputs and outputs **per station** or
- ☐ Up to 512+32 binary inputs plus 512+32 binary outputs or
- ☐ Eight complex terminals (i.e. SSI, incremental encoder etc.),
- ☐ Fiber optic compatible with ibaPADU-8 and ibaPADU-8-O, that means up to 8 ibaNet750-BM-D I/O-devices on 1 bus (ring or star topology)
- ☐ Integrated power supply for the modules (internal load up to 1.5 A)
- ☐ For operation with ibaPDA there are restrictions regarding the time behaviour of the terminals (no guaranteed simultaneous plant snapshot of all signals within 1ms cycles).
- ☐ Operation without PC. Using this device mode, it is possible to replace conventional copper wire bundles with ibaNet750-BM-D devices (up to 8x 136 digital signals in each direction on 2 fiber optics).

The behavior of the device at the iba fiber optics bus is identical to one or four ibaPADU-8, ibaPADU-8AI-U/-I or ibaPADU-O devices. That means, that every device can send and receive 8 (or 32) analog channels (16 bit each) and 8 (or 32) binary channels (8 bit), in total 17+17 (68 + 68) Byte net data cyclically every millisecond. The devices can be cascaded like ibaPADU-8 (ibaPADU-8-O) devices, with up to 8 devices per cascade. The device converts the incoming data stream from the fiber optic link simultaneously and exactly to the millisecond for all channels, regenerates the optical signal and sends it to the other devices within the cascade. It is allowed to mix ibaPADU-8, ibaPADU-8-O and ibaNet750-BM-D devices within an optical link.

An ibaFOB-D input card is required on the PC side. If ibaNet750-BM-D is used as replacement for the predecessor ibaNet750-BM, even older PC cards (ibaFOB-io, ibaFOB-4i and ibaFOB-4i-S) can act as receivers.

Additionally each station can simultaneously be used as output device (like ibaPADU-8-O). This is in particular necessary when terminals with set/reset function are used, e.g. counter etc. For this purpose, an ibaFOB-D card with output(s) is required on the PC side.

To add more functions, ibaNet750-BM-D can also be used with the ibaLink-SM-64-io, ibaLink-SM-128V-i-2o or ibaLink-VME card. This allows to create simple I/O extensions for the systems Siemens Simatic S5 115U, 135U, 155U, as well as Siemens MMC216 and VME buses.



#### Note

**Data transmission:** Every ibaNet750-BM-D device can transmit exactly 17, 34 or 68 input bytes plus 17, 34 or 68 output bytes in 3Mbit mode, whereby inputs and outputs are operated simultaneously.



**Note**

**I/O range 1:** Not all WAGO IO terminals may be usable. Please contact iba to make sure the specific terminal will work. This also applies to the (basically) compatible Beckhoff terminals. See also the tables in chapter 10 “Terminal types”.

**Note**

**I/O range 2:** There are 4 different terminal types:

- Digital IOs (easy to handle)
- Analog IOs (easy to handle)
- Complex terminals (require more knowledge of the terminal design than usual)
- Configurable terminals (ibaNet 32Mbit Flex only, must be configured before use)

Before project engineering, check for each terminal type which transmission capacity is required.

**Note**

**Terminal diagnostics:** With the exception of complex terminals no diagnostic information is supported.

**Note**

**Compatibility in 3Mbit mode:** The fiber optic telegram definition of ibaNet750-BM-D is 100% compatible to the existing ibaPADU-8 devices.

**ibaPDA restrictions**

While all iba devices normally deliver exactly 1 ms synchronized simultaneous snapshots of the process, this cannot be guaranteed when using the WAGO750 I/O system. This is caused by the fact, that the WAGO modules are themselves running with a serial bus which is totally independent from the ibaNet bus. Further on, the cycle time depends on the number of channels connected to a station. Especially analog channels and counters (terminals with a high number of bits) decrease the bus cycle, and cycle times may take several milliseconds. When several stations are used simultaneously, different cycle times may cause phase differences of up to 10 ms. This means the simultaneous measurement of a huge number of signals < 10 ms cannot be guaranteed. Anyway, to measure some additional RTD or thermocouple inputs this timing is sufficient.



### 3 **Scope of delivery**

After unpacking check the completeness and intactness of the delivery.

The scope of delivery includes:

- ☐ ibaNet750-BM-D device
- ☐ Data medium "iba Software & Manuals"



## 4 Safety instructions

### 4.1 Designated use

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

- ☐ Measurement data logging and analysis
- ☐ Applications of iba software products (ibaPDA, etc.) and iba hardware products

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

### 4.2 Special advices



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#### Warning!

This is a Class A device. This equipment may cause radio interference in residential areas. In this case, the operator will be required to take appropriate measures.

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#### CAUTION

The length of the supply line from the voltage source to the device must not exceed 30 m.

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#### Important note

Do not open the device!

There are no serviceable parts inside the device.

Opening the device will void the warranty.

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#### Note

Cleaning

To clean the device, use a dry or slightly moistened cloth. A note specifies special requirements or actions to be observed.

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#### Other documentation

This manual describes only the properties of the WAGO devices which are relevant for iba systems integration.

For a detailed description of the single WAGO terminals with information on pin assignment, data format and A/D conversion, please refer to the original WAGO documentation.

Data sheets and manuals for WAGO components are available for download at [www.wago.com](http://www.wago.com).

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## 5 System requirements

### 5.1 Hardware

☐ PC with at least:

- At least one free PCI/PCIe slot (PC) or ExpressCard slot (notebook)
- Min. 512 MB RAM
- 4 GB free disk space for measured values

On our homepage <http://www.iba-ag.com> you will find several PC systems suitable for desktop or industry use.

☐ At least one fiber optic card of type ibaFOB-D,  
(Firmware version V2.00 build 176 (C6) or higher), e. g.

- ibaFOB-io-D/ibaFOB-io-Dexp
- ibaFOB-2io-D/ibaFOB-2io-Dexp
- ibaFOB-2i-D/ibaFOB-2i-Dexp optional with extension module ibaFOB-4o-D\*
- ibaFOB-4i-D/ibaFOB-4i-Dexp optional with extension module ibaFOB-4o-D\*
- ibaFOB-io-ExpressCard

☐ Double fiber optic patch cable for a bidirectional connection between  
ibaNet750-BM-D and ibaPDA-PC (suitable FO patch cables are available at iba).

\* The extension module is required for bidirectional connections, it is mandatory with 32Mbit Flex, and optional with 32Mbit and 3Mbit.

### 5.2 Software

- ☐ ibaPDA version 7.3.0 or later
- ☐ ibaLogic-V4 version 4.2.5.464 or later (no 32Mbit Flex)
- ☐ ibaLogic-V5 (no 32Mbit Flex)

### 5.3 Firmware

- ☐ ibaNet750-BM-D ab Version 01.03.005



## 6 Mounting and dismounting



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### Important note

Make sure the 24 V power supply is turned off when adding or removing modules.

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### 6.1 Mounting

- ☐ Press the device slightly against the DIN-rail. When you hear the click the device is securely mounted.

### 6.2 Dismounting

- ☐ Remove all I/O connections.
- ☐ Pull the orange plastic leash in your direction. The module will easily snap out of the DIN-rail.



## 7 Device description

### 7.1 Properties

- ☐ DC 24 V direct current supply ( $\pm 10\%$ ), to supply the device and the K-bus.
- ☐ The power supply is able to supply I/O modules with a max of 1.5 A. If more current is needed, additional power supply modules must be integrated within the K-bus.
- ☐ Rugged plastic chassis with DIN-rail mounting
- ☐ 4 LEDs (Run, Link, Flex, Error) for the operating status
- ☐ 2 LEDs (IO-Run, IO-Err) for the WAGO K-bus (serial bus)
- ☐ 1 fiber optic input plus one fiber optic output to transmit configuration and process data
- ☐ Automatic module detection in ibaPDA (in 32Mbit Flex mode)
- ☐ Flexible setting of sampling rate (in 32Mbit Flex mode)
- ☐ Ring topology for input and output processes with up to 15 devices and ibaPDA as ring master (in 32Mbit Flex mode)



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#### Note

Please note, that some I/O terminals may have no or just single power contacts (depending on the function of the terminal). Therefore the daisy chaining of power supplies from module to module may be interrupted. If it is necessary to supply subsequent terminals (more right positioned), an additional power supply terminal is necessary. With some terminals it is basically not possible to connect them together because the grooves for the blade contacts are closed at the top.

With the placement of a new power supply module, a new common power potential is generated, while the old one (to the left) is always interrupted. This means that a total new power definition may be defined from this point on, which can also include a potential change.

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#### Note

Please note, that some terminals additionally require an own power supply (mostly 24 V DC). These are mainly complex terminals, see chapter 10.

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#### Other documentation

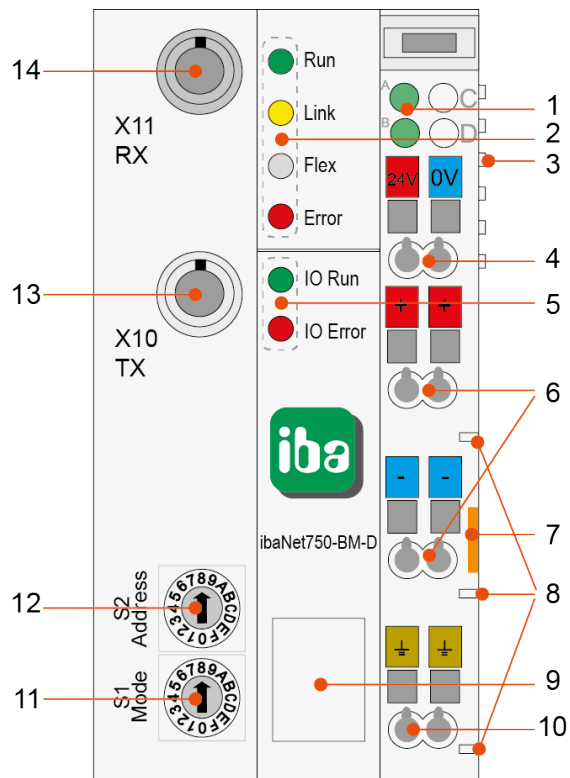
Please refer to the manufacturer's original manual(s) for more information.

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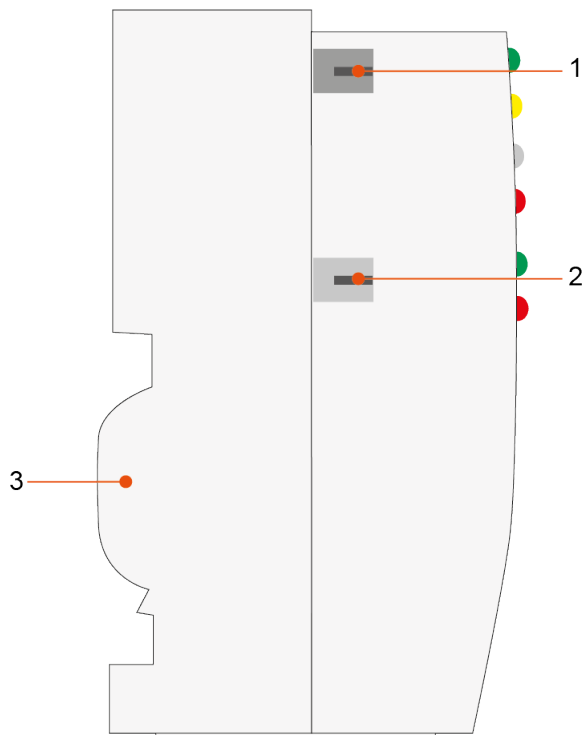
## 7.2 Device view

### 7.2.1 Front view



- 1 Power supply status (A: System / B: Field)
- 2 Operating status indicator
- 3 K-Bus connection (incl. power supply)
- 4 System power supply 24 V
- 5 Indicators for WAGO K-bus
- 6 Field power supply 24 V
- 7 Remove device by pulling this orange plastic out
- 8 Power jumper contacts
- 9 USB interface
- 10 Earth connection
- 11 Rotary switch device mode S1
- 12 Rotary switch device address S2
- 13 Fiber optic transmitter (TX) X10
- 14 Fiber optic receiver (RX) X11

### 7.2.2 Side view



- 1 Fiber optic receiver (RX) X11
- 2 Fiber optic transmitter (TX) X10
- 3 DIN rail mount



## 7.3 Indicating elements

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

### Operating status

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 32Mbit and 3Mbit: rotary switch position is wrong
		On	Hardware error

### K-bus status

LED	Color	Status	Description
IO Run	Green	Off	K-bus not active
		On	K-bus active
IO Err	Red	Off	Normal status
		On	K-bus problem detected (e.g. no K-bus end module present)



## 7.4 Rotary switches

### 7.4.1 Rotary switch S1 (device mode)

The device mode and the ibaNet protocol is set with the S1 rotary switch.

Position S1	ibaNet protocol	3Mbit mode	Allowed positions S2	Function	Description
0	3Mbit	Normal	1-8, A-F	Daisy-chain operation and telegram generation	For line / ring communication
1	-	-	-	-	Available in predecessor ibaNet750-BM, not supported any more
2	3Mbit	ECO	1-8, A-F	Daisy-chain operation and telegram generation	For line / ring communication, only complex terminals are supported 750-630 (SSI) 750-631 (Incr. encoder)
3	-	-	-	-	Available in predecessor ibaNet750-BM, not supported any more
4	32Mbit		5	Cycle time = 500 µs	P2P communication (stand alone) to ibaLogic
8	3Mbit	Normal	1-8, A-F	Ring master operation	P2P communication (stand alone)
A	3Mbit	ECO	1-8, A-F	Ring master operation	P2P communication (stand alone), only complex terminals are supported 750-630 (SSI) 750-631 (Incr. encoder)
F	32Mbit Flex	-	1-F	Sampling rate, can freely be set (max. 40 kHz)	Delivery state

#### 7.4.1.1 3Mbit normal mode

In 3Mbit normal mode, all connected terminals are supported with their standard input and output signals.

#### 7.4.1.2 3Mbit ECO mode

Using 3Mbit protocol, the so called ECO mode is available besides normal mode. The ECO mode was developed for some complex terminals which usually require a larger memory space for inputs and outputs in normal mode. Since only a few input bytes are required for some applications, the address range used for these special terminals has been reduced. Consequently, not all available bytes provided by a terminal are used in the ibaNet telegram, e. g. only four input bytes instead of eight input and eight output bytes are transmitted in the telegram.

As a result more terminals of the complex type can be used with one ibaNet750-BM-D device. Currently, the ECO mode is supported for the following complex terminals:

- ☐ SSI Terminal (750-630)
- ☐ Incremental Encoder Terminal (750-631)



For more information about memory addresses see: 10.2.1 und 10.2.2.

All other terminals of type A (digital) and B (analog) will run in normal mode although the switch is set to ECO mode.

### 7.4.2 Rotary switch S2 (device address)

The rotary switch S2 has different functions depending on the used device mode.

#### 32Mbit Flex and S1 = F

The devices are addressed via the S2 rotary switch in 32Mbit Flex protocol.

Device number in the cascade	Position of rotary switch S2
not allowed	0
1 <sup>st</sup> device	1
2 <sup>nd</sup> device	2
⋮	⋮
14 <sup>th</sup> device	E
15 <sup>th</sup> device	F

Delivery state: S2 = 1

#### 32Mbit and S1 = 4

The position of the rotary switch S2 determines the cycle time of the 32Mbit protocol:

Cycle time	Position of rotary switch S2
500 µs	5

Other cycle times are not supported at the moment.

#### 3Mbit and S1 = 0, 2, 8 or A

The rotary switch S2 is used to set the device address. Valid addresses are 1...8 and A...F. The position of the device in the chain may differ from the address setting of the device.

With switch in positions 1...8 the ibaNet750-BM-D device behaves like an ibaPADU-8 device and uses its device address (1...8) for eight binary and eight analog IOs.

In positions A or B the ibaNet750-BM-D device uses **four** device addresses (A = 1...4, B = 5..8) and hence is able to transmit up to 32 binary and 32 analog IOs.

In positions C...F the ibaNet750-BM-D device uses **two** device addresses (1+2, 3+4, 5+6, 7+8) and hence is able to transmit up to 16 binary and 16 analog IOs.



Address	Device Address	Outputs	Inputs	Remark
0	not used			
1	1	8 BO + 8 AO (8 BO + 128 BO)	8 BI + 8 AI (8 BI + 128 BI)	Figures in brackets for replacement of analog IOs by binary IOs.
2	2	8 BO + 8 AO (8 BO + 128 BO)	8 BI + 8 AI (8 BI + 128 BI)	Figures in brackets for replacement of analog IOs by binary IOs.
3	3	8 BO + 8 AO (8 BO + 128 BO)	8 BI + 8 AI (8 BI + 128 BI)	Figures in brackets for replacement of analog IOs by binary IOs.
4	4	8 BO + 8 AO (8 BO + 128 BO)	8 BI + 8 AI (8 BI + 128 BI)	Figures in brackets for replacement of analog IOs by binary IOs.
5	5	8 BO + 8 AO (8 BO + 128 BO)	8 BI + 8 AI (8 BI + 128 BI)	Figures in brackets for replacement of analog IOs by binary IOs.
6	6	8 BO + 8 AO (8 BO + 128 BO)	8 BI + 8 AI (8 BI + 128 BI)	Figures in brackets for replacement of analog IOs by binary IOs.
7	7	8 BO + 8 AO (8 BO + 128 BO)	8 BI + 8 AI (8 BI + 128 BI)	Figures in brackets for replacement of analog IOs by binary IOs.
8	8	8 BO + 8 AO (8 BO + 128 BO)	8 BI + 8 AI (8 BI + 128 BI)	Figures in brackets for replacement of analog IOs by binary IOs.
9	not used			
A	1 + 2 + 3 + 4	32 BO + 32 AO (32 BO + 512 BO)	32 BI + 32 AI (32 BI + 512 BI)	Figures in brackets for replacement of analog IOs by binary IOs.
B	5 + 6 + 7 + 8	32 BO + 32 AO (32 BO + 512 BO)	32 BI + 32 AI (32 BI + 512 BI)	Figures in brackets for replacement of analog IOs by binary IOs.
C	1 + 2	16 BO + 16 AO (16 BO + 256 BO)	16 BI + 16 AI (16 BI + 256 BI)	Figures in brackets for replacement of analog IOs by binary IOs.
D	3 + 4	16 BO + 16 AO (16 BO + 256 BO)	16 BI + 16 AI (16 BI + 256 BI)	Figures in brackets for replacement of analog IOs by binary IOs.
E	5 + 6	16 BO + 16 AO (16 BO + 256 BO)	16 BI + 16 AI (16 BI + 256 BI)	Figures in brackets for replacement of analog IOs by binary IOs.
F	7 + 8	16 BO + 16 AO (16 BO + 256 BO)	16 BI + 16 AI (16 BI + 256 BI)	Figures in brackets for replacement of analog IOs by binary IOs.

AI = analog inputs AO = analog outputs BI = binary inputs BO = binary outputs

## 7.5 Fiber optic connections X10 and X11

❑ X11 (RX): FO input

❑ X10 (TX): FO output

Point-to-point connection: the X11 (RX) connector will be connected to the output (TX) of the ibaFOB-D card and the X10 (TX) connector with the input (RX) of the ibaFOB-D card.

Ring topology: the output X10 will be connected to the input X11 of the next device and so on until all max. 15 devices are wired in a ring.

### Maximum distance of fiber optic connections

The maximum distance of fiber optic connections between 2 devices depends on various influencing factors. This includes, for example, the specification of the fiber (e.g.



50/125 µm, 62.5/125 µm, etc.), or the attenuation of other components in the fiber optic cable plant such as couplers or patch panels.

However, the maximum distance can be estimated on the basis of the output power of the transmitting interface (TX) or the sensitivity of the receiving interface (RX). A model calculation can be found in chapter 13.3.

The specification of the transmitter's output power and the receiver's sensitivity of the fiber optic components installed in the device can be found in chapter "Technical data" 13.1 under "ibaNet interface".

## 7.6 Power supply

The device requires two power supplies.

### 7.6.1 System supply

The device requires an external 24 V  $\pm 10\%$  DC power supply (unregulated) as system power supply. The supply voltage is to be connected via the appropriate terminals on the device and it is protected against reverse polarity.

If desired, you can order DIN rail or 24V power supply units from iba.

The 24 V voltage is internally converted to a 5 V operating voltage (galvanically connected).

The voltage does not only supply the device, it also supplies connected terminals via the bus interface.

Up to 2000 mA can be used for both supplies.

If a higher load is necessary, additional system power supply modules are required (e.g. Wago 750-613)

Some terminals do not need a supply voltage from the system supply, but use the additional field supply.



The length of the supply line from the voltage source to the device must not exceed 30 m.

---

### 7.6.2 Field supply

Individual terminal types connected to the ibaNet750-BM-D system require a 24 V voltage supply via the field supply.

This supply voltage must be applied via appropriate terminals on the device, it is a passive supply without protection.

If desired, you can order DIN rail or 24V power supply units from iba.

The operating voltage is available for other terminals as voltage supply via power terminals. Power connections are made automatically from module to module via the internal power jumper contacts when snapping the terminals together.

The power load of the power contacts must not permanently exceed 10 A.



When inserting a terminal without power jumper contacts or an additional power terminal the field supply fed through the power jumper contacts is interrupted.

If necessary, a new potential can be generated on the power jumper contacts by a power terminal (e. g. WAGO750-610 for 24 V DC, WAGO750-611 for 230 V AC).

---

**⚠ CAUTION**

The length of the supply line from the voltage source to the device must not exceed 30 m.

---

Regarding the power supply, please refer to the manufacturer's original manual(s) for more information.



## 8 System integration

The structure of an ibaNet750-BM-D bus station is always as follows.

- ❑ ibaNet750-BM-D device (bus station) on the left side.
- ❑ modules (or terminals) of the WAGO I/O System 750 (I/O modules, power supply terminals..), the device supports up to 255 terminals.
- ❑ one end terminal at the right end of the station to terminate the serial K-bus.

### 8.1 System integration with 32Mbit Flex and ibaPDA

#### 8.1.1 Peer-to-peer connection (stand alone)

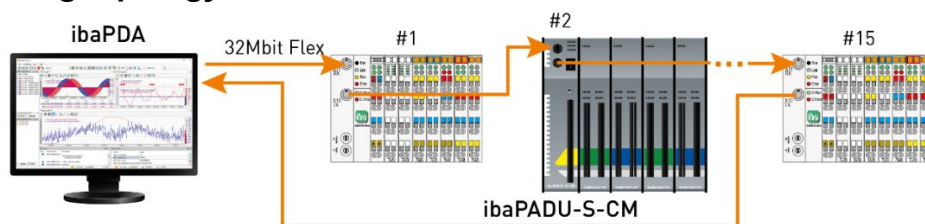


The device will be connected to the ibaFOB-D card in the ibaPDA PC via a bidirectional FO line to transfer configuration and process data. ibaPDA detects automatically the connected terminals.

The sampling rate can freely be adjusted to 40 kHz. The maximum data transfer depends on the adjusted sampling rate. The following rule applies: the higher the sampling rate, the lower the data volume.

The update time of the signals is also limited by the update rate of the K-bus and the connected terminals with their specific properties.

#### 8.1.2 Ring topology



With 32Mbit Flex, up to 15 devices can be connected to a ring. Configuration and process data are transmitted in the ring.

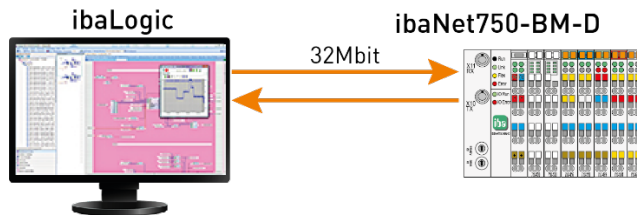
Other 32Mbit Flex-enabled iba devices can be integrated into the ring as well. The devices in the ring are addressed via the rotary switch for device addresses S2. ibaPDA detects automatically the connected devices within the ring.

The data volume per participant is allocated dynamically. ibaPDA calculates the data volume depending on the number of analog and digital signals configured in ibaPDA and the smallest timebase in the ring. The maximum total data volume is determined by the 32Mbit Flex protocol. It has to be divided by the number of devices and the data volume per device in the ring. A reference value is approx. 3000 Byte per ms. Each system can work with its own sample rate. However the cycle time must be an integer multiple of the smallest cycle. If the maximum transfer rate will be exceeded, ibaPDA displays an error message and recommends increasing the timebase or decreasing the amount of data.



## 8.2 System integration with 32Mbit and ibaLogic

### 8.2.1 Peer-to-peer communication (stand-alone)

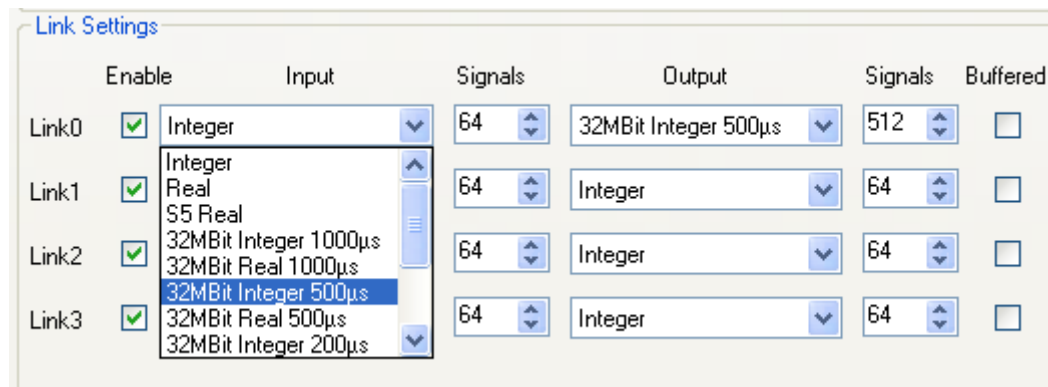


The device is connected to an ibaLogic system with the 32Mbit protocol.

Only a peer-to-peer communication is possible.

The sampling rate of this device mode is fixed to 2 kHz (= 500 µs cycle time). The maximum data volume is limited to 256 (REAL) / 512 (INT) analog and digital signals.

The corresponding 32Mbit protocol must be selected in the IO Configurator in ibaLogic:



The signal mapping is done automatically when the device is booting and the appropriate device mode is adjusted (S1 = 4 and S2 = 5). The signal mapping can be downloaded via FTP access.

### 8.2.2 FTP connection to the device

Proceed the following steps to establish a FTP connection to the device:

1. Connect the device to the PC via an USB cable.  
The USB interface is located behind the plastic cover on the frontside of the device. A USB cable of A/Mini-B type is required.  
A suitable cable is available at iba on request.
2. As soon as the computer is connected for the first time to the device, the "Found New Hardware Wizard" will show up and the driver for the USB connection has to be installed.  
You find the driver on the data medium "iba Software & Manuals" delivered with the device in this directory:  
\\02\_iba\_Hardware\ibaNet750-BM-D\01\_USB\_Driver\
3. After having installed successfully, an additional network connection is available with the device name „IBA AG USB Remote NDIS Network Device“.
4. A fixed IP address must be assigned to this interface. The address has to be from this range: 192.168.0.n with n = 2...254 and the subnetmask 255.255.255.0.

**Example:**



IP: 192.168.0.2  
SubNet: 255.255.255.0

- Now, you can establish a FTP connection to the device. You may use a FTP client or the Windows File Explorer.

In both cases, the address is „192.168.0.1“ and the user is „anonym“ without any password.

**Example:** Windows File Explorer:



The following files are displayed in the file window: Event.log and WagoSignals.txt

- Download the file „WagoSignals.txt“ to your computer.
- Open the file with a file editor. The file contains the signal mapping and signal order generated automatically by the system:

```

### Fiber optic mode: 32Mbit/s, 500 us sample time (signal numbers 0 to 511) ###
Hex switches: mode = 4; address = 5

*** Analog Input signals ***
Module 1 (Wago 750-476/000-000), signal 0: Fiber optic analog signal 0, length 16 bits
Module 1 (Wago 750-476/000-000), signal 1: Fiber optic analog signal 1, length 16 bits

*** Digital Input signals ***
Module 3 (digital in module with 2 input signals), signal 0: Fiber optic digital signal 0
Module 3 (digital in module with 2 input signals), signal 1: Fiber optic digital signal 1

*** Analog Output signals ***
Module 0 (Wago 750-557/000-000), signal 0: Fiber optic analog signal 0, length 16 bits
Module 0 (Wago 750-557/000-000), signal 1: Fiber optic analog signal 1, length 16 bits
Module 0 (Wago 750-557/000-000), signal 2: Fiber optic analog signal 2, length 16 bits
Module 0 (Wago 750-557/000-000), signal 3: Fiber optic analog signal 3, length 16 bits

*** Digital Output signals ***
Module 2 (digital out module with 2 outputs and 0 status or input signals), signal 0: Fiber optic digital signal 0
Module 2 (digital out module with 2 outputs and 0 status or input signals), signal 1: Fiber optic digital signal 1

```

The list shows the order of the inputs and outputs used in the ibaLogic application.

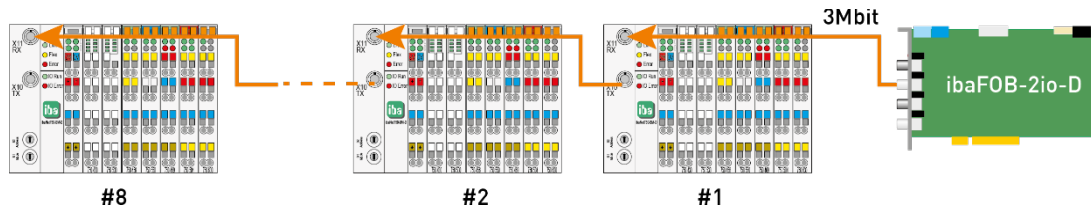


## 8.3 System integration with 3Mbit

Using 3Mbit mode, the device is compatible to the predecessor ibaNet750-BM.

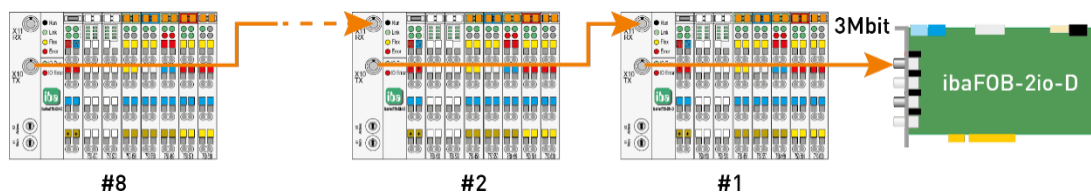
### 8.3.1 Line topology for outputs only

The following picture shows the daisy chaining of up to eight ibaNet750-BM-D devices with an ibaFOB-D output in a pure output chain. There are eight valid device addresses (1 ... 8). The device address must not necessarily be the same as the number within the chain.



### 8.3.2 Line topology for inputs only

ibaNet750-BM-D as a pure process input device connected to an ibaFOB-D input:



### 8.3.3 Peer-to-peer communication (stand alone)

ibaNet750-BM-D devices may operate peer to peer without a PC involved. In this case a high number of signals may be transmitted between devices on 2 fiber optic cables (making thousands of copper wires obsolete). Each station address must be present two times within that ring topology whereas the devices I/O-channels must be mirror symmetric to each other (all inputs and outputs of station 1 must have exactly matching outputs/inputs on station 1' and vice versa). All inputs and outputs are updated in a 1 ms cycle.



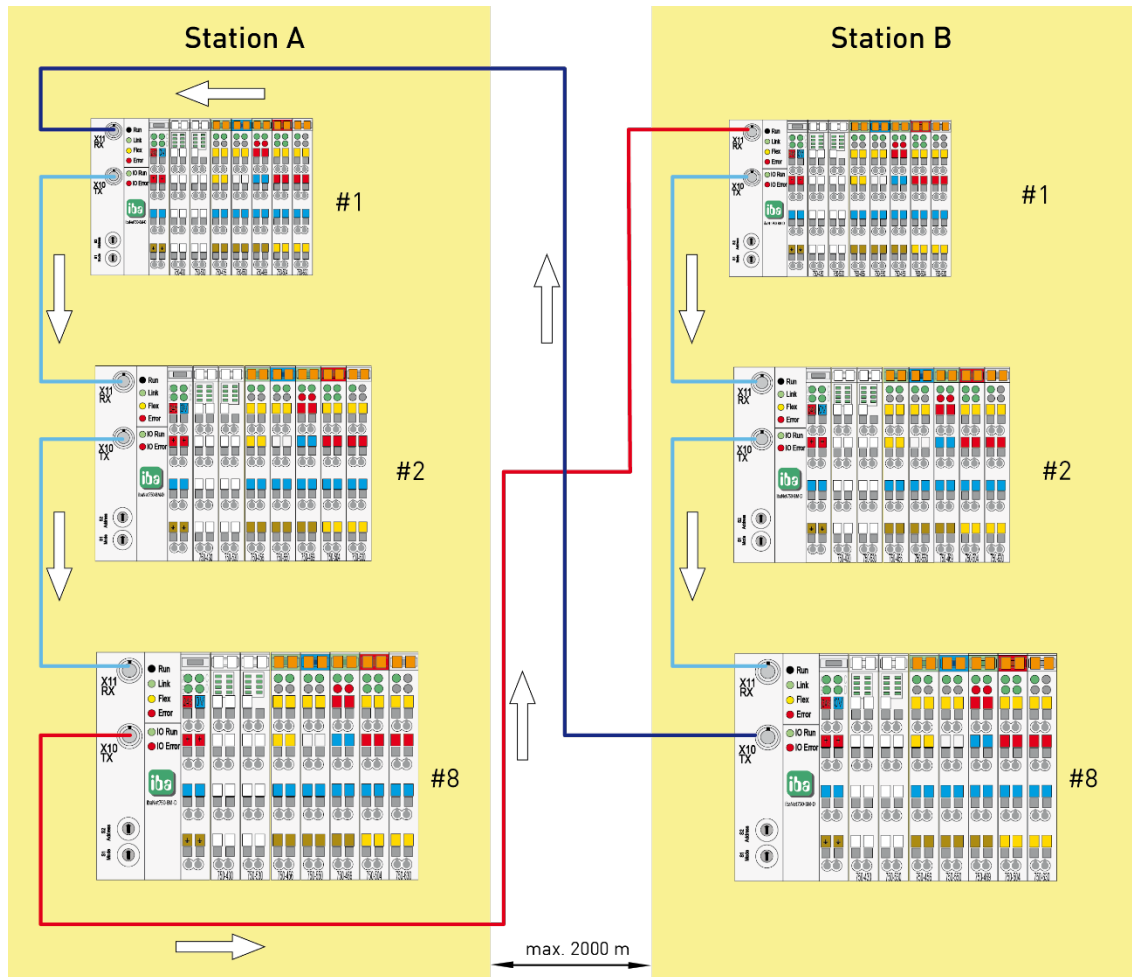
#### Ringmaster and Ring slaves

To run this mode one of the devices must be operated in ring master mode (mode = 8). This device initiates the start sequence of communication. The other devices must operate in mode 0 (run).

- ☐ Maximum length between devices shall not exceed 2 km (6500 ft., 1.24 mi)
- ☐ Up to 8 x 136 binary signals in each direction or
- ☐ 8 x (8 analog plus 8 binary signals) in each direction or any other valid device configuration.
- ☐ Update rate of 1 ms is guaranteed
- ☐ Each input/output must have its corresponding output/input in the related station



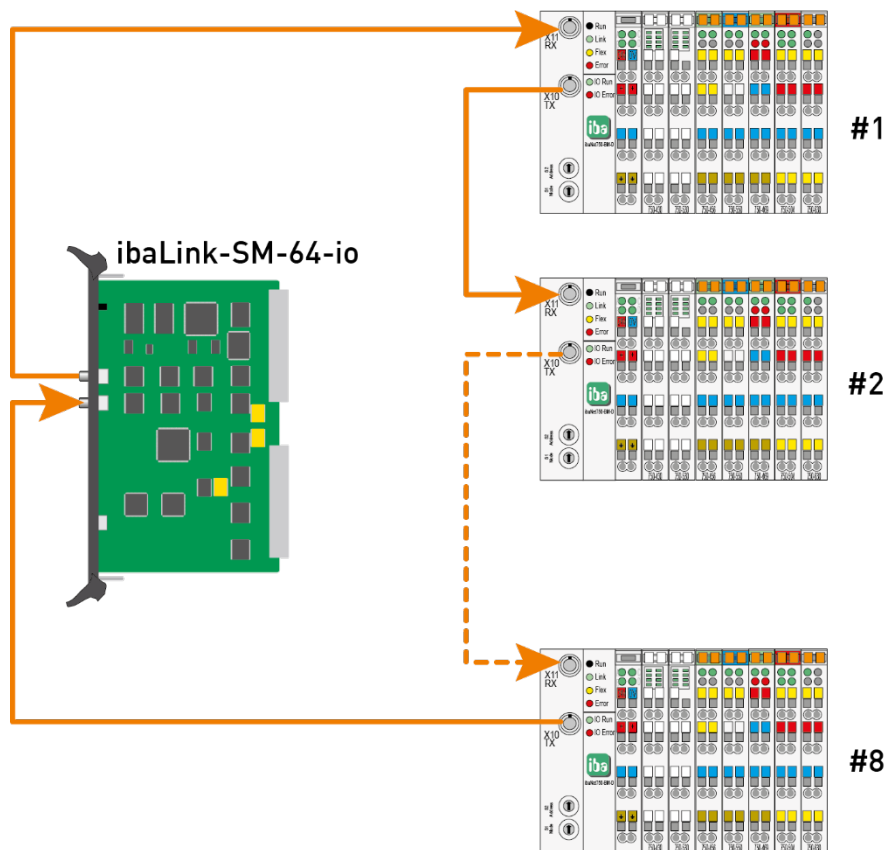
- ❑ ONE of the devices has to run in mode 8 (ring master)
- ❑ The ring master must have 2 binary output contacts
- ❑ All other devices must operate in mode 0 (run).





### 8.3.4 Ring structure for process IOs

ibaNet750-BM-D devices as process IOs connected to an ibaLink-SM-64-io card (i.e. as IO-expander for SIMATIC S5 and MMC 216 with ibaPADU-8 input devices). Possible signals on this ring are up to 64 analog inputs + 64 binary inputs + 64 analog outputs + 64 binary outputs).



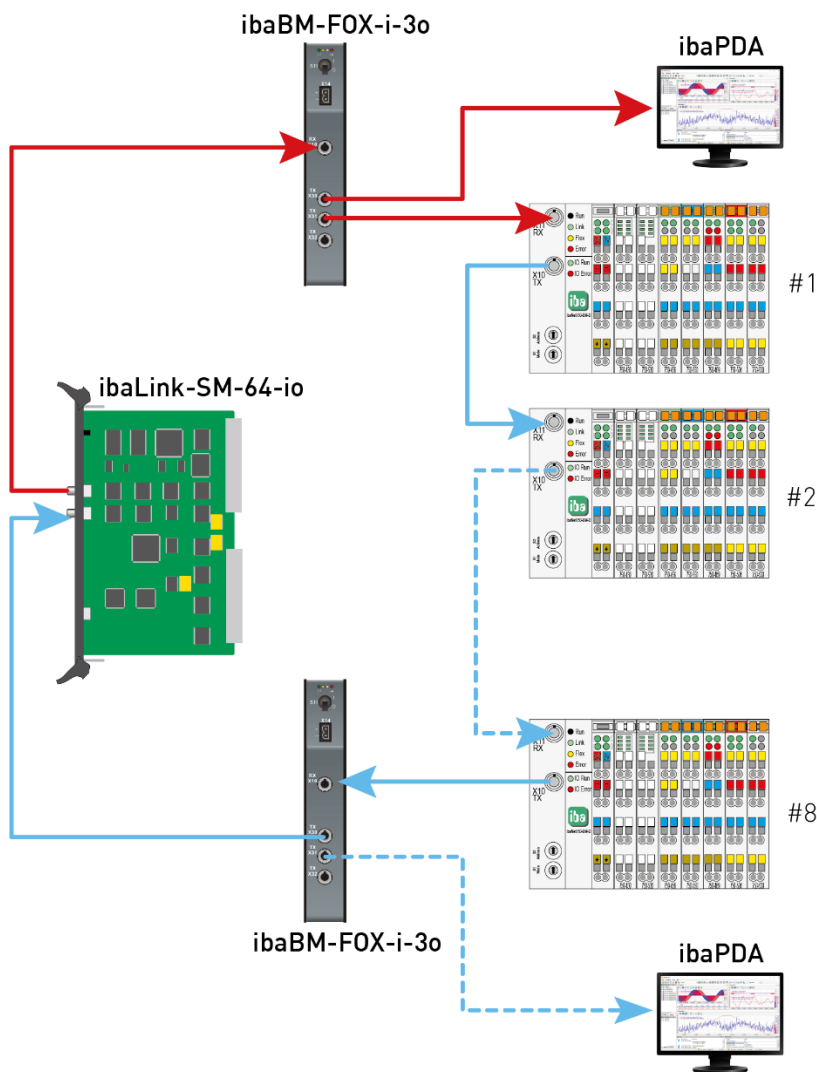


### 8.3.5 Redundant process IOs

With the help of the ibaBM-FOX-i-3o device, optical links may be multiplied (split) several times. This is allowed at every point within the optical network.

It is possible to generate a variety of different topologies. This ranges from redundant IOs to the ability to measure process IOs in parallel and in real time, when the split output of such an optic fiber is itself again connected to an input of an ibaFOB-D card.

The following picture shows an example how to share the input and the output information (between an ibaLink-SM-64-io and an ibaPDA system) of an optical ring structure containing up to eight ibaNet750-BM-D devices. This is done by integrating 2 additional ibaBM-FOX-i-3o devices and connecting them to an ibaPDA system.





## 9 Address spaces

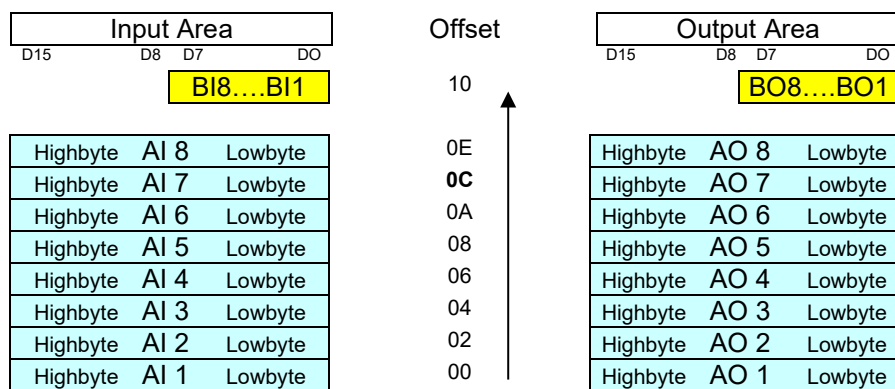
With 32Mbit Flex, the addresses are assigned automatically in the fiber optic telegram. With 3Mbit and 32Mbit, address assignment follows the rules explained hereafter:

### 9.1 Address space with 3Mbit

Each device sends and receives 4\*17 bytes of data simultaneously. This is due to the compatibility to ibaPADU-8 devices, which always have eight analog (2 bytes) and eight binary channels (1 byte).

Example: The following example shows an ibaNet station which has the function of an ibaPADU-8 (8 AI + 8 BI) and an ibaPADU-8-O (8 AO + 8 BO) at the same time.

(Note that count direction for all graphics is bottom up!)



#### Channel enumeration rules:

**ibaLogic:** ... counts all channels beginning with the 1. That means the first analog channel will be addressed with the ibaLogic resources ibaFOB My Ana 01.

**ibaPDA:** Analogous rules apply but ibaPDA begins counting with 0 (!), means the 1<sup>st</sup> input is addressed with AI0 within ibaPDA!

Enumeration rules:

#### Analog inputs (all examples for ibaLogic):

FOB-F My Int **x** ; where x is calculated:

$$x = \text{Analog\_chan\_no} + (\text{device\_address} - 1) * 8$$

If the device has device address 2 and the 2<sup>nd</sup> analog channel is meant the **x** = 2 + (2 - 1) \* 8 = 10 addresses FOB M1 Int **10**.

Every 32 channels a new so called module is created (found) within the ibaLogic and ibaPDA resources. Whenever a new module begins, channel count starts again with no 1 (or 0 in ibaPDA), while the module number **y** will be incremented by 1.

The upper example is also valid for the ibaLogic channel resources ibaFOB My Ana x in which the analog values are represented as float values instead of Integers.



**Analog Outputs:**

The rules for the analog outputs correspond to the rules of the analog inputs (FOB IO/O My Ana x).

**Binary Inputs:**

The first eight binary signals always use their reserved byte (Offset 10hex) and are per standard definition represented as resources FOB-F My Dig 01...08.

It is allowed to have more than eight binary inputs (and outputs respectively). To allow later additions for new channels it was necessary to find a rule therefore. So these signals occupy first the space of analog channel 8 then 7 and so on. They fill the address space from backwards in steps of 16 signals (inputs and outputs are counted separately!).

## 9.2 Address space with 32Mbit

Assigning addresses in 32Mbit mode is analogous to the 3Mbit mode. However in 32Mbit mode, 256 (REAL) or 512 (INT) analog and 256 or 512 digital channels are available.

## 9.3 Rules for addressing the IO-space

The following rules apply for the internal address space with 3Mbit and 32Mbit:

**Priority:**

Terminal type C (complex terminal) has a higher priority than terminal type B (analog terminals). Therefore it will be always placed first.

**Filling the IO-space**

Terminal types C (first) and B will be placed beginning with analog channel 1 until the end of the valid address space is reached. This is true for the input and the output address space. That means that max 16 + 16 bytes can be used.

Terminal type A (binaries) occupy the space reserved for binary values Bx1..Bx8 (DI/ DO = binary inputs/outputs).

If there are more than eight binary input and / or output channels needed, these signals use first the space of analog channel 8 (for further 16 signals) then 7 and so on. They fill the address space from backwards in steps of 16 signals (inputs and outputs are counted separately).

If more IO-modules are placed than there is free addressing space the red LED will start blinking. It is therefore not allowed to place more modules than there is space for them.

It is allowed to mix different types within a station, it is not necessary to place similar modules one beside the other.

If a module was pulled out (e.g. for repair) a dummy module should be used to avoid re-enumeration of signals (and their connected resources).



## 10 Terminal types

There are 5 different terminal types:

- ☐ Digital I/O terminals
- ☐ Analog I/O terminals
- ☐ Complex terminals that generate multiple I/O and calculated signals for data and status
- ☐ Configurable terminals which have to be configured before use
- ☐ Miscellaneous terminals such as end terminals and terminals that do not provide I/O or status signals and are therefore usually not displayed in ibaPDA.



### Further information

This manual describes only the properties of the WAGO devices which are relevant for iba systems integration.

For more detailed descriptions of the single WAGO terminals providing information about pin assignment, data format and A/D-conversion, please refer to the manufacturer's documentation from WAGO. Data sheets and manuals of the WAGO components are available for download via their website [www.wago.com](http://www.wago.com).

### 10.1 Supported terminals

ibaPDA currently supports the following terminals from the manufacturers WAGO and Beckhoff. In later firmware versions further modules may have been added. Modules available from iba are listed with the iba order number.

Manufac.	Original order no.	Iba order no.	Description
<b>Digital inputs</b>			
WAGO	750-1400		16 Channel Digital Input Terminal; DC 24 V; 3.0 ms; Positive Switching
WAGO	750-1405		16 Channel Digital Input Terminal; DC 24 V; 3.0 ms; Positive Switching
WAGO	750-1406		16 Channel Digital Input Terminal; DC 24 V; 0.2 ms; Positive Switching
WAGO	750-400	15.144000	2 Channel Digital Input Terminal; DC 24 V; 3.0 ms; Positive Switching
WAGO	750-401	15.144010	2 Channel Digital Input Terminal; DC 24 V; 0.2 ms; Positive Switching
WAGO	750-402	15.144020	4 Channel Digital Input Terminal; DC 24 V; 3.0 ms; Positive Switching
WAGO	750-402/025-000	15.144021	4 Channel Digital Input Terminal; DC 24 V; 3.0 ms; Positive Switching, extended temperature range
WAGO	750-403	15.144030	4 Channel Digital Input Terminal; DC 24 V; 0.2 ms; Positive Switching
WAGO	750-405	15.144050	2 Channel Digital Input Terminal; AC 230 V; 10 ms; Positive Switching
WAGO	750-406	15.144060	2 Channel Digital Input Terminal; AC 120 V; 10 ms; Positive Switching



Manufac.	Original order no.	Iba order no.	Description
WAGO	750-408	15.144080	4 Channel Digital Input Terminal; DC 24 V; 3.0 ms; Negative Switching
WAGO	750-409		4 Channel Digital Input Terminal; DC 24 V; 0.2 ms; Negative Switching
WAGO	750-410	15.144100	2 Channel Digital Input Terminal; DC 24 V; 3.0 ms; Proximity Switch
WAGO	750-411		2 Channel Digital Input Terminal; DC 24 V; 0.2 ms; Proximity Switch
WAGO	750-412	15.144120	2 Channel Digital Input Terminal; DC 48 V; 3 ms; Proximity Switch
WAGO	750-415	15.144150	4 Channel Digital Input Terminal; AC/DC 24 V; 20 ms; Negative Switching
WAGO	750-427		2 Channel Digital Input Terminal; DC 110V
WAGO	750-428		4 Channel Digital Input Terminal; AC/DC 42 V; 20.0 ms; Positive Switching
WAGO	750-430	15.144300	8 Channel Digital Input Terminal; DC 24 V; 3.0 ms; Positive Switching
WAGO	750-431	15.144310	8 Channel Digital Input Terminal; DC 24 V; 0.2 ms; Positive Switching
WAGO	753-434		8 Channel Digital Input Terminal; DC 5/12 V; 0.2 ms; Positive Switching
Beckhoff	KL1408		8 Channel Digital Input Terminal;
Beckhoff	KM1002		16 Channel Digital Input Terminal; DC 24 V; 3.0 ms; Positive Switching
Beckhoff	KM1004		32 Channel Digital Input Terminal; DC 24 V; 3.0 ms; Positive Switching
Beckhoff	KM1008		64 Channel Digital Input Terminal; DC 24 V; 3.0 ms; Positive Switching
Beckhoff	KM1012		16 Channel Digital Input Terminal; DC 24 V; 0.2 ms; Positive Switching
Beckhoff	KM1014		32 Channel Digital Input Terminal; DC 24 V; 0.2 ms; Positive Switching
Beckhoff	KM1018		64 Channel Digital Input Terminal; DC 24 V; 0.2 ms; Positive Switching
<b>Digital outputs</b>			
WAGO	750-1500		16 Channel Digital Output Terminal; DC 24 V; 0.5 A; Positive Switching; Ribbon cable
WAGO	750-1504		16 Channel Digital Output Terminal; DC 24 V; 0.5 A; Positive Switching
WAGO	750-501	15.145010	2 Channel Digital Output Terminal; DC 24 V; 0.5 A; Positive Switching
WAGO	750-502	15.145020	2 Channel Digital Output Terminal; DC 24 V; 2.0 A; Positive Switching
WAGO	750-504	15.145040	4 Channel Digital Output Terminal; DC 24 V; 0.5 A; Positive Switching
WAGO	750-506		2 Channel Digital Output Terminal; DC 24 V; 0.5 A; Positive Switching; Diagnostics
WAGO	750-507	15.145070	2 Channel Digital Output Terminal; DC 24 V; 2.0 A; Positive Switching; Diagnostics
WAGO	750-508		2 Channel Digital Output Terminal; DC 24 V; 2.0 A; Positive Switching; Diagnostics
WAGO	750-512	15.145120	2 Channel Digital Output Terminal; Relay; AC 230 V, DC 30 V, AC/DC 2 A; non-floating; 2 make contacts



Manufac.	Original order no.	Iba order no.	Description
WAGO	750-513	15.145130	2 Channel Digital Output Terminal; Relay; AC 230 V, DC 30 V, AC/DC 2 A; Iso- lated outputs; 2 make contacts
WAGO	750-514	15.145140	2 Channel Digital Output Terminal; Relay; AC 125 V, AC 0.5 A, DC 30 V, DC 1 A; Isolated outputs; 2 changeover contacts
WAGO	750-517	15.145170	2 Channel Digital Output Terminal; Relay; AC 230 V, 1 A; Isolated outputs; 2 changeover contacts
WAGO	750-530	15.145300	8 Channel Digital Output Terminal; DC 24 V; 0.5 A; Positive Switching
WAGO	750-531		4 Channel Digital Output Terminal; DC 24 V; 0.5 A; Positive Switching
WAGO	750-532		4 Channel Digital Output Terminal; DC 24 V; 0.5 A; Positive Switching; Diag- nostics
WAGO	750-537		8 Channel Digital Output Terminal; DC 24 V; 0.5 A; Positive Switching; Diag- nostics
Beckhoff	KL2408		8 Channel Digital Output Terminal;
Beckhoff	KM2002		16 Channel Digital Output Terminal; DC 24 V; 0.5 A; Positive Switching
Beckhoff	KM2004		32 Channel Digital Output Terminal; DC 24 V; 0.5 A; Positive Switching
Beckhoff	KM2008		64 Channel Digital Output Terminal; DC 24 V; 0.5 A; Positive Switching
<b>Digital inputs and outputs</b>			
WAGO	750-1506		8 Channel Digital Input/Output Terminal; DC 24 V; 0.5 A; Positive Switching
<b>Analog inputs</b>			
WAGO	750-452	15.144520	2 Channel Analog Input Terminal; 0-20 mA; Differential Input
WAGO	750-453	15.144530	4 Channel Analog Input Terminal; 0-20 mA; Single Ended
WAGO	750-454	15.144540	2 Channel Analog Input Terminal; 4-20 mA; Differential Input
WAGO	750-455	15.144550	4 Channel Analog Input Terminal; 4-20 mA; Single Ended
WAGO	750-456	15.144560	2 Channel Analog Input Terminal; $\pm 10V$ ; Differential Input
WAGO	750-457	15.144570	4 Channel Analog Input Terminal; $\pm 10V$ ; Single Ended
WAGO	750-459		4 Channel Analog Input Terminal; 0-10 V; Single Ended
WAGO	750-460	15.144600	4 Channel Analog Input Terminal; PT100 (RTD)
WAGO	750-460/000-003	15.144603	4 Channel Analog Input Terminal; PT1000 (RTD)
WAGO	750-461	15.144610	2 Channel Analog Input Terminal; PT100 (RTD)
WAGO	750-461/000-003	15.144613	2 Channel Analog Input Terminal; PT1000 (RTD)
WAGO	750-462	15.144620	2 Channel Analog Input Terminal for Thermo Elements
WAGO	750-465	15.144650	2 Channel Analog Input Terminal; 0-20 mA; Single Ended
WAGO	750-466	15.144660	2 Channel Analog Input Terminal; 4-20 mA; Single Ended



Manufac.	Original order no.	Iba order no.	Description
WAGO	750-467	15.144670	2 Channel Analog Input Terminal; 0-10 V; Single Ended
WAGO	750-468		4 Channel Analog Input Terminal; 0-10 V; Single Ended
WAGO	750-469	15.144690	2 Channel Analog Input Terminal; Thermocouple, Type K
WAGO	750-469/000-006	15.144696	2 Channel Analog Input Terminal; Thermocouple, Type J
WAGO	750-472		2 Channel Analog Input Terminal; 0-20 mA; Single Ended
WAGO	750-473		2 Channel Analog Input Terminal; 4-20 mA; Single Ended
WAGO	750-474		2 Channel Analog Input Terminal; 4-20 mA; Single Ended
WAGO	750-475	15.144750	2 Channel Analog Input Terminal; 0-1 A AC/DC; Differential Input
WAGO	750-476		2 Channel Analog Input Terminal; $\pm 10V$ ; Single Ended
WAGO	750-477		2 Channel Analog Input Terminal; 0-10 V AC/DC; Differential Input
WAGO	750-478		2 Channel Analog Input Terminal; 0-10 V; Single Ended
WAGO	750-479	15.144790	2 Channel Analog Input Terminal; $\pm 10V$ ; Differential Input
WAGO	750-480		2 Channel Analog Input Terminal; 0-20 mA; Differential Input
WAGO	750-483		2 Channel Analog Input Terminal; 0-30 V; Differential Input
WAGO	750-491	15.144910	1 Channel Analog Input Terminal for Resistance Jumpers (DMS)
WAGO	750-491/000-001	15.144911	1 Channel Analog Input Terminal for Resistance Jumpers (DMS); 125ms
WAGO	750-492		2 Channel Analog Input Terminal; 4-20 mA; Differential Input
Beckhoff	KL3001		1 Channel Analog Input Terminal; -10 V ... 10 V
Beckhoff	KL3002		2 Channel Analog Input Terminal; -10 V ... 10 V
Beckhoff	KL3011		1 Channel Analog Input Terminal; 0 ... 20 mA
Beckhoff	KL3012		2 Channel Analog Input Terminal; 0 ... 20 mA
Beckhoff	KL3021		1 Channel Analog Input Terminal; 4 ... 20 mA
Beckhoff	KL3022		2 Channel Analog Input Terminal; 4 ... 20 mA
Beckhoff	KL3041		1 Channel Loop-Powered Input Terminal; 0 ... 20 mA
Beckhoff	KL3042		2 Channel Loop-Powered Input Terminal; 0 ... 20 mA
Beckhoff	KL3044		4 Channel Input Terminal; 0 ... 20 mA
Beckhoff	KL3051		1 Channel Loop-Powered Input Terminal; 4 ... 20 mA
Beckhoff	KL3052		2 Channel Loop-Powered Input Terminal; 4 ... 20 mA



Manufac.	Original order no.	Iba order no.	Description
Beckhoff	KL3054		4 Channel Input Terminal; 4 ... 20 mA
Beckhoff	KL3061		1 Channel Analog Input Terminal; 0 ... 10 V
Beckhoff	KL3062		2 Channel Analog Input Terminal; 0 ... 10 V
Beckhoff	KL3064		4 Channel Analog Input Terminal; 0 ... 10 V
Beckhoff	KL3102		2 Channel Analog Input Terminal; -10 V ... 10 V
Beckhoff	KL3112		2 Channel Input Terminal; 0 ... 20 mA
Beckhoff	KL3122		2 Channel Input Terminal; 4 ... 20 mA
Beckhoff	KL3201		1 Channel Input Terminal PT100 (RTD)
Beckhoff	KL3202		2 Channel Input Terminal PT100 (RTD)
Beckhoff	KL3204		4 Channel Input Terminal PT100 (RTD)
Beckhoff	KL3311		1 Channel Thermocouple Input Terminal
Beckhoff	KL3312		2 Channel Thermocouple Input Terminal; Open-Circuit Recognition
Beckhoff	KL3314		4 Channel Thermocouple Input Terminal; Open-Circuit Recognition
<b>Analog outputs</b>			
WAGO	750-550	15.145500	2 Channel Analog Output Terminal; 0-10 V
WAGO	750-552	15.145520	2 Channel Analog Output Terminal; 0-20 mA
WAGO	750-554	15.145540	2 Channel Analog Output Terminal; 4-20 mA
WAGO	750-555	15.145550	4 Channel Analog Output Terminal; 4-20mA
WAGO	750-556	15.145560	2 Channel Analog Output Terminal; $\pm 10V$
WAGO	750-557	15.145570	4 Channel Analog Output Terminal; 0-10 V
WAGO	750-559		4 Channel Analog Output Terminal; $\pm 10V$
WAGO	750-585		2 Channel Analog Output Terminal; 0-20 mA; Ex i
Beckhoff	KL4001		1 Channel Analog Output Terminal; 0 ... 10 V
Beckhoff	KL4002		2 Channel Analog Output Terminal; 0 ... 10 V
Beckhoff	KL4004		4 Channel Analog Output Terminal; 0 ... 10 V
Beckhoff	KL4011		1 Channel Analog Output Terminal; 0 ... 20 mA
Beckhoff	KL4012		2 Channel Analog Output Terminal; 0 ... 20 mA
Beckhoff	KL4021		1 Channel Analog Output Terminal; 4 ... 20 mA



Manufac.	Original order no.	Iba order no.	Description
Beckhoff	KL4022		2 Channel Analog Output Terminal; 4 ... 20 mA
Beckhoff	KL4031		1 Channel Analog Output Terminal; -10 V ... 10 V
Beckhoff	KL4032		2 Channel Analog Output Terminal; -10 V ... 10 V
Beckhoff	KL4034		4 Channel Analog Output Terminal; -10 V ... 10 V
Beckhoff	KL4112		2 Channel Analog Output Terminal; 0 ... 20 mA
Beckhoff	KL4132		2 Channel Analog Output Terminal; -10 V ... +10 V
Beckhoff	KL4404		4 Channel Analog Output Terminal; 0 ... 10 V
<b>Complex terminals</b>			
WAGO	750-404		Up/Down Counter DC 24 V
WAGO	750-404/000-001	15.144041	Up Counter DC 24 V; Release Input
WAGO	750-404/000-003	15.144043	Frequency Counter DC 24 V
WAGO	750-404/000-004		Up/Down Counter DC 24 V; Switching Output
WAGO	750-630	15.146300	SSI-Interface
WAGO	750-631		Incremental Encoder
WAGO	750-631/000-004	15.146310	Incremental Encoder; RS422 (differential)
WAGO	750-637	15.146370	Incremental Encoder
<b>Configurable terminals</b>			
WAGO	750-494	15.144940	3-Phase Power Measurement Module (480V/1A)
WAGO	750-494/000-001	15.144941	3-Phase Power Measurement Module (480V/5A)
WAGO	750-494/000-005		3-Phase Power Measurement Module (480V/ ext. Shunts)
WAGO	750-494/025-000		3-Phase Power Measurement Module (480V/1A), extended temperature range
WAGO	750-494/025-001		3-Phase Power Measurement Module (480V/5A) ), extended temperature range
WAGO	750-495	15.144950	3-Phase Power Measurement Module (690V/1A)
WAGO	750-495/000-001	15.144951	3-Phase Power Measurement Module (690V/5A)
WAGO	750-495/000-002		3-Phase Power Measurement Module (690V/RC) Rogowski-Coils
WAGO	750-495/040-000		3-Phase Power Measurement Module (690V/1A), extended temperature range
WAGO	750-495/040-001		3-Phase Power Measurement Module (690V/5A), extended temperature range
WAGO	750-495/040-002		3-Phase Power Measurement Module (690V/RC) Rogowski-Coils, extended temperature range



Manufac.	Original order no.	Iba order no.	Description
<b>Miscellaneous terminals</b>			
WAGO	750-600	15.146000	End Module
WAGO	750-602	15.146020	Supply Module; Field; DC 24 V
WAGO	750-610	15.146100	Supply Module; Field; DC 24 V; Fuse Holder; Diagnostics
WAGO	750-612	15.146120	Supply Module; Field; AC/DC 230 V
WAGO	750-613		Supply Module; System/Field; DC 24 V;
WAGO	750-614	15.146140	Supply/Distribution Module; Field; AC/DC 230 V
WAGO	750-624		Supply/Filter Module; Field; DC 24 V
WAGO	750-627	15.146270	End Module; Bus Extension; Outgoing
WAGO	750-628	15.146280	Coupler Module; Bus Extension; Incoming/Outgoing
Beckhoff	KL9010		End Module



## 10.2 Terminal type C; Complex terminals



### Note

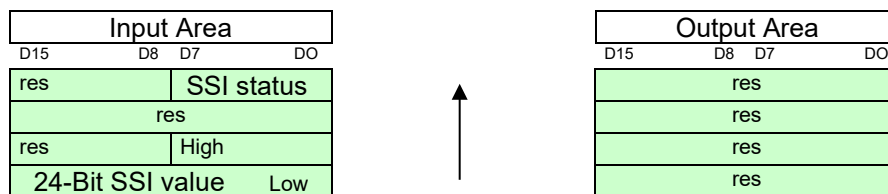
When the device is used in 3Mbit or 32Mbit mode, observe the following description.

### 10.2.1 SSI Terminal (WAGO module 750-630)

This terminal is also supported in ECO mode (refer to section 7.4.1).

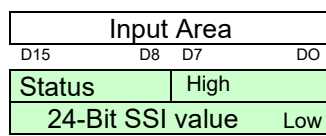
#### 10.2.1.1 Normal mode operation

Needed memory: 8 bytes input and 8 bytes output (note count direction is bottom up!)



#### 10.2.1.2 ECO mode operation

Needed memory: 4 bytes input

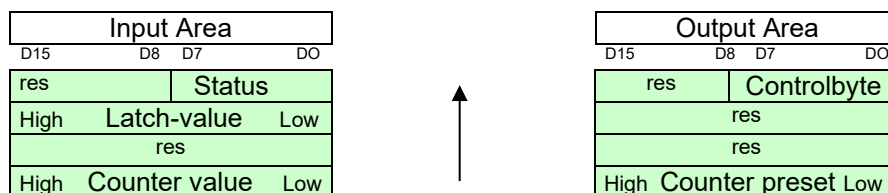


### 10.2.2 Incremental encoder terminal (WAGO module 750-631)

This terminal is also supported in ECO mode (refer to section 7.4.1).

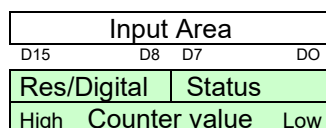
#### 10.2.2.1 Normal mode operation

Needed memory: 8 bytes input and 8 bytes output



#### 10.2.2.2 ECO mode operation

Needed memory: 4 bytes



#### Notice

Contents of "Res/Digital" depends on terminal type

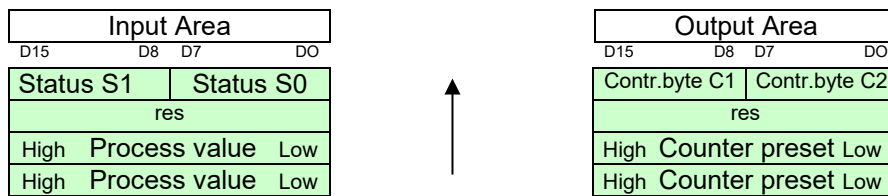
Type -001 : not used

Types -004, -010, -011 : DIG\_INPUT



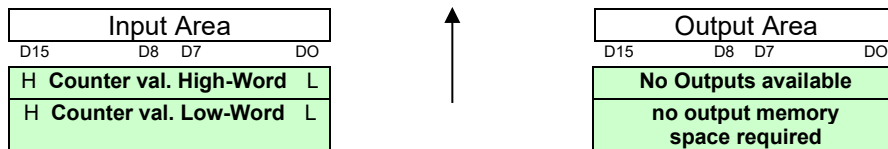
### 10.2.3 Incremental encoder terminal (WAGO module 750-637)

Needed memory: 8 bytes input and 8 bytes output



### 10.2.4 Up / down counter (WAGO module 750-404)

Needed memory: 4 bytes input, no outputs





## 10.3 Configurable terminals



### Note

This terminal type can only be used with ibaNet 32Mbit Flex, since parameterization is required before use. Parameterization can be carried out conveniently in ibaPDA.

### 10.3.1 3-phase power measurement terminals (WAGO module -494/495)

3-phase power measurement terminals are used to record and measure electrical data and characteristic values of a three-phase supply network.

Before use, these terminals must be parameterized in order to adapt them to the supply network and to determine which data and characteristics are to be recorded in ibaPDA.

Parameterization is carried out conveniently in ibaPDA.

The maximum number of power measurement terminals on an ibaNet750-BM-D device is not restricted. The maximum number is based on the usual terminal limitation, see chapter 13.1, and on the update times of the process data of the terminal and the measured values in ibaPDA.



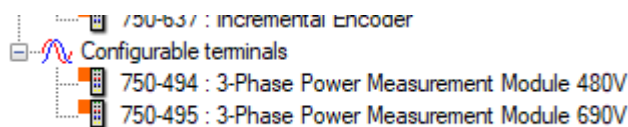
### Restrictions when operating with ibaNet750-BM-D

The scope of functions is limited when operating with ibaNet750-BM-D compared to the guaranteed scope of functions of WAGO:

- Only the measured values of the AC measured value collections are transmitted.
- Measured values of the harmonic analyses (harmonic measured values) for both terminal types, but also the DC measured values for the WAGO750-494 terminal, are omitted.

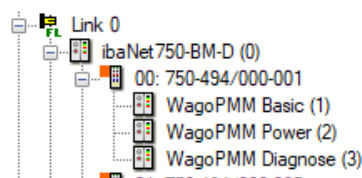
If one of the two terminals is added manually in the I/O manager, two basic types are available for selection:

- ☐ 3-Phase Power Measurement Module 480V
- ☐ 3-Phase Power Measurement Module 690V



Selection of basic types

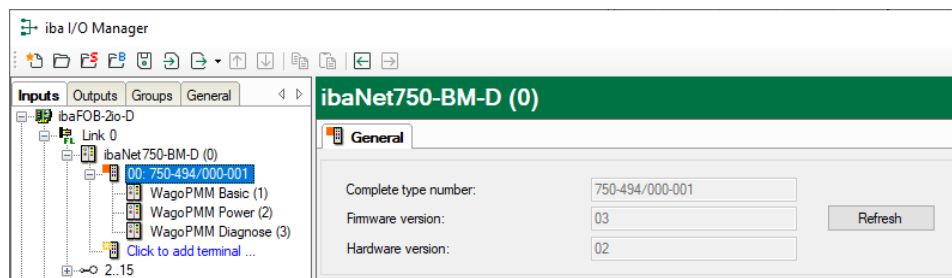
If the terminal is detected via automatic detection or the manually added terminal is applied in the I/O manager, the corresponding terminal type is also updated.



Terminal in the module tree

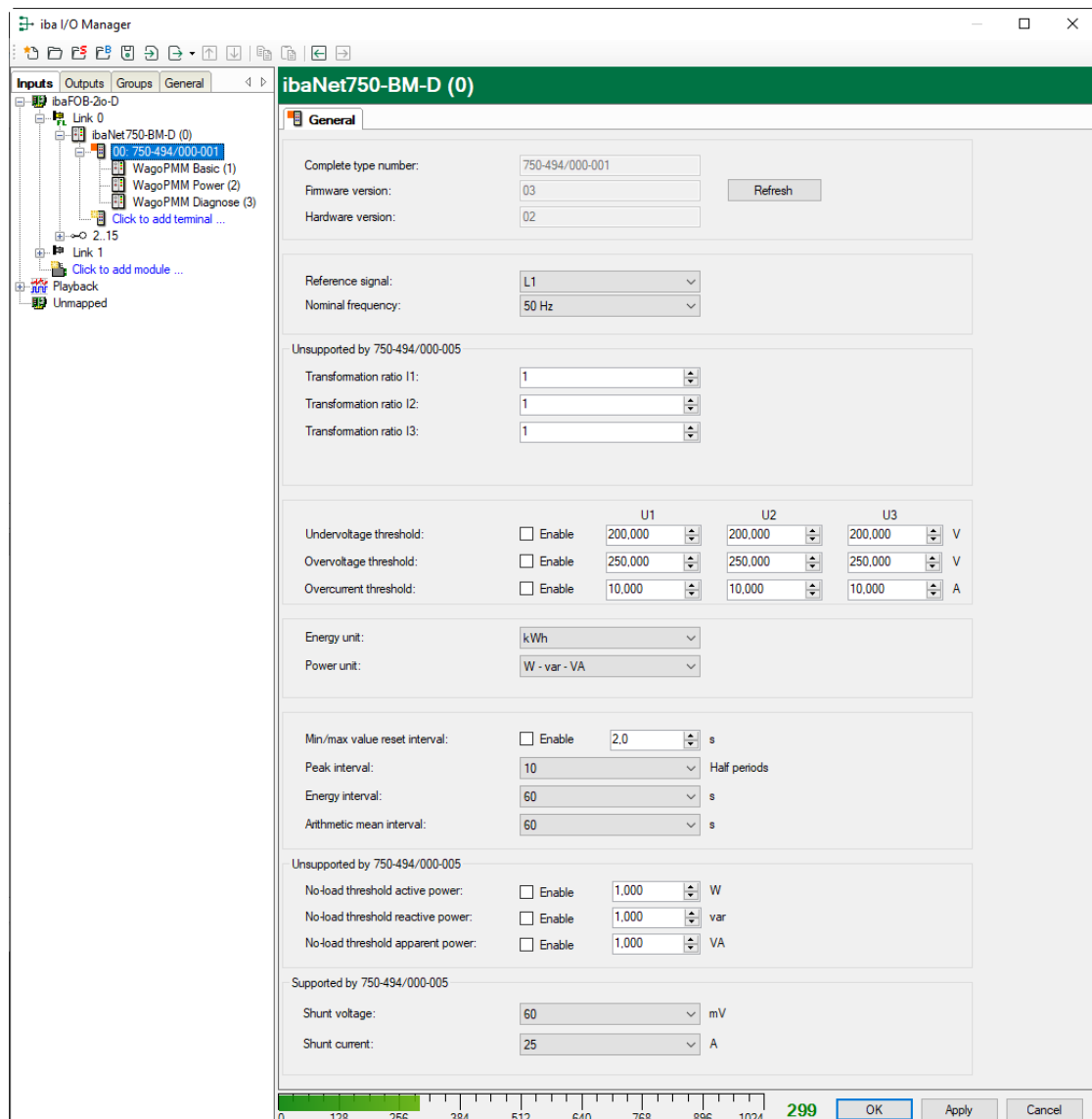


In addition to the detection of the terminal type, the firmware and hardware versions are also detected and displayed in the "General" tab.



Via <Refresh> you can also read this information directly from the terminal at any time.

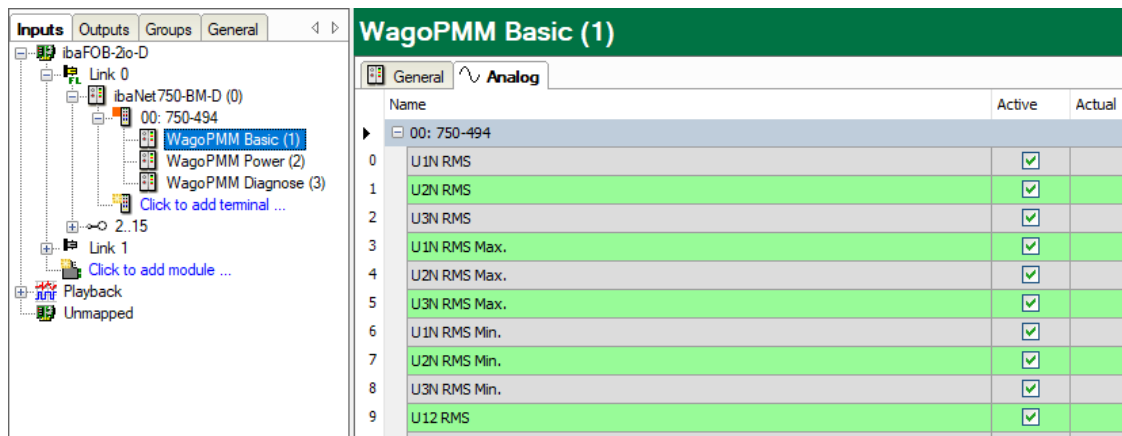
According to the detected terminal type, the input dialog is automatically adjusted.



Parameterization using the example of terminal 750-494/000-001

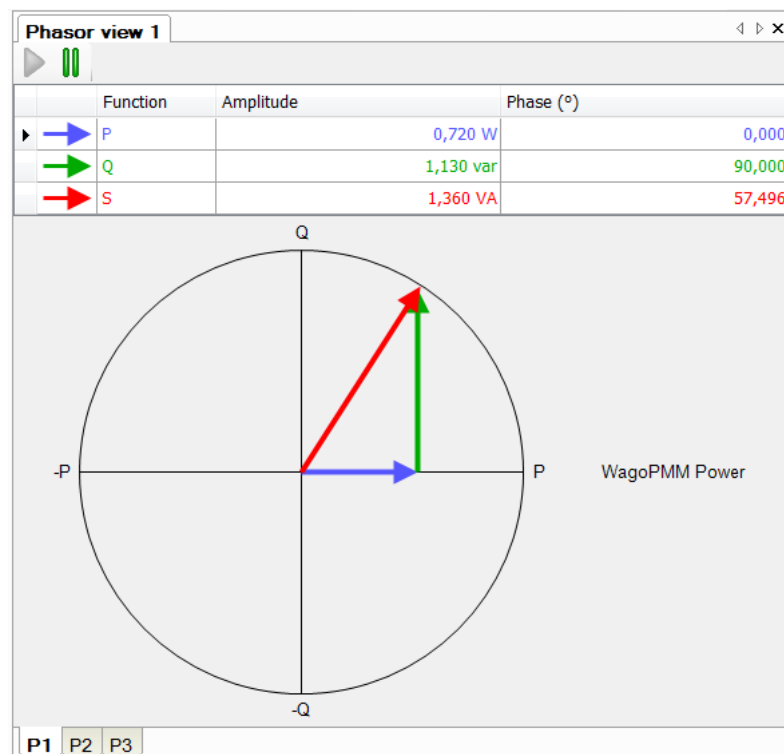
Three "WagoPMM" modules with corresponding assigned signals are available below the terminal:





Signals in the WagoPMM Basic module

The special feature of the "WagoPMM Power" module is that it can be used for a phasor view.



### Special behavior in ibaPDA

- ☐ Due to the system, the terminal parameterization is not reset if iba-Net750-BM-D is reset to factory settings. The parameterization is stored in the terminal, even if it is switched off.
- ☐ All values of this terminal type are transmitted to ibaPDA in 32 bit format, regardless of the format of this value in the terminal.





### The following generally applies to the update times of the measured values:

As the measured values are retrieved serially from the terminals via the K-bus, the update time of the measured values in ibaPDA depends on the number of values to be transmitted via the terminal bus. The more values are to be transferred, the longer the K-bus cycle time takes (see also appendix, chapter 12.1).

However, the update time also depends on the update time of the process data in the module (see chapter "Process data update" in the original documentation of the WAGO modules).



### Other documentation

For a detailed description of the single WAGO terminals with information on pin assignment, data format and A/D conversion, please refer to the original WAGO documentation.

Data sheets and manuals for WAGO components are available for download at [www.wago.com](http://www.wago.com).

## 10.4 Example configurations



### Note

When the device is used in 3Mbit or 32Mbit mode, the following description may be helpful.

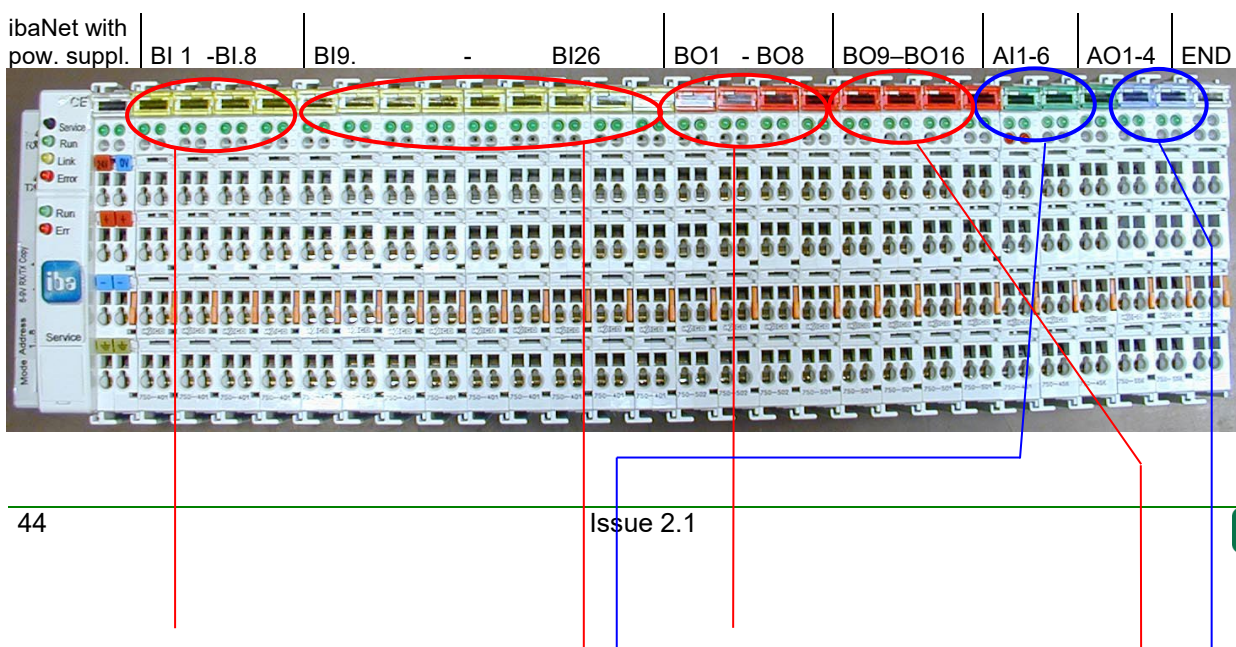


### Terminal characteristics:

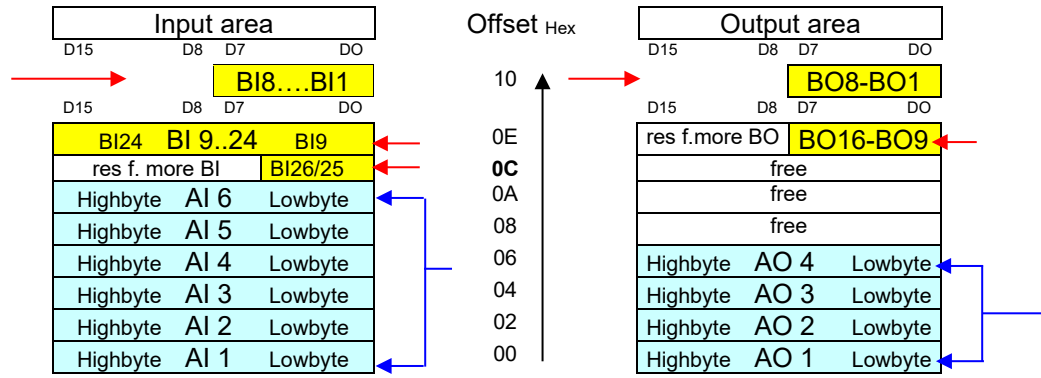
Please refer to the manufacturer's original manuals for more information about common potentials, connecting the device, special registers and so on.

### 10.4.1 Analog and binary terminals

Here station #1 has the following terminals: 26 BI and 6 AI plus 16 BO and 4 AO (all examples without possible additional power supplies).



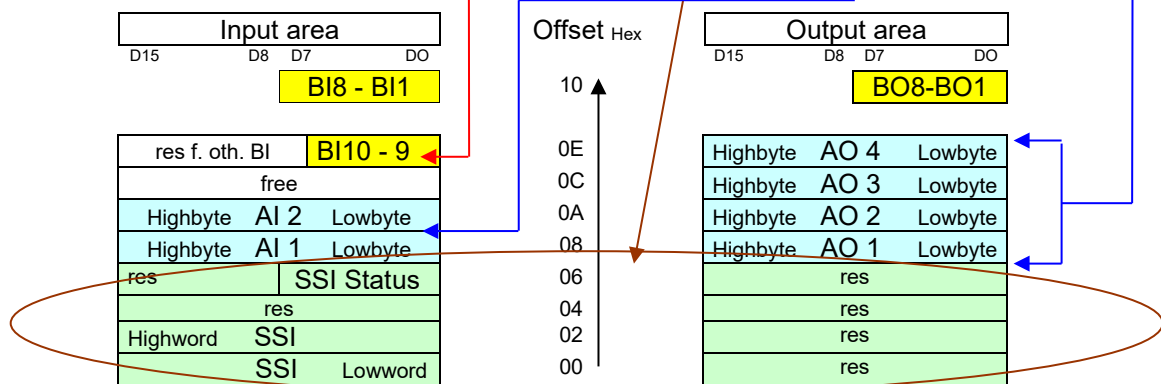
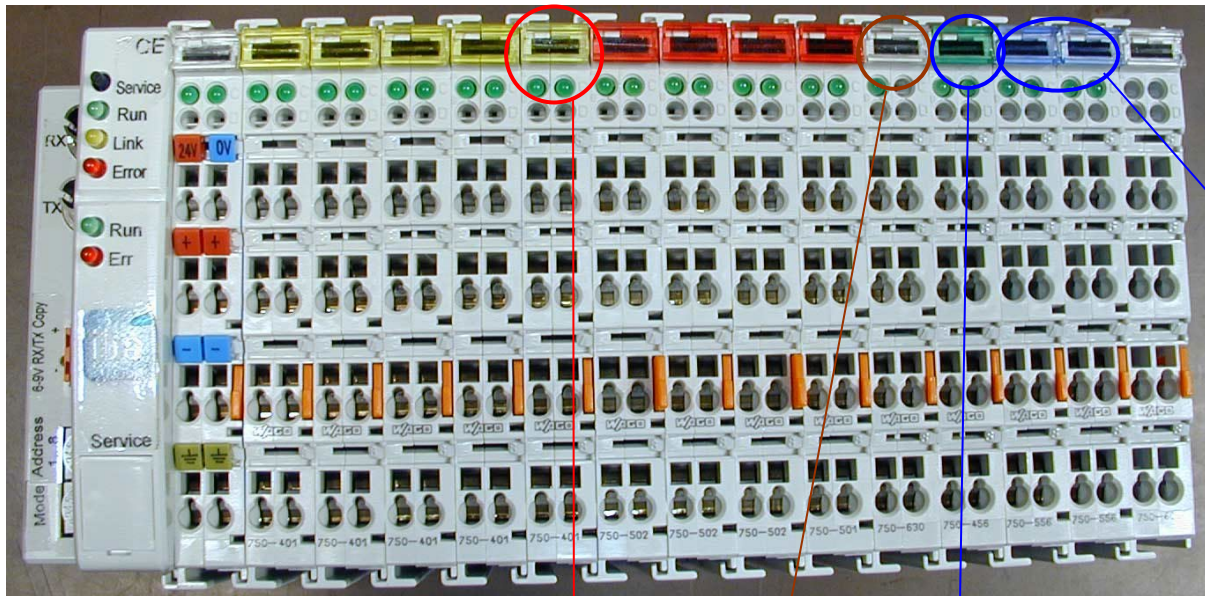






### 10.4.2 Example with complex SSI terminal

Here station #2 has the following terminals: 1 SSI, 10 BI and 2 AI plus 8 BO and 4 AO





## 11 Configuration in ibaPDA

With ibaPDA, it is possible to configure, capture, record and output the analog and digital signals of the connected terminals. You should first set the desired device mode with the rotary switches S1 and S2, see also chapter 7.4.1 and 7.4.2.

### 11.1 Configuration in 32Mbit Flex Mode

Parameterizable terminals can only be used in 32Mbit Flex mode and require additional parameterization before use.

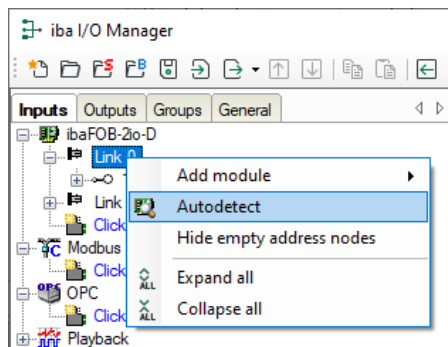
This terminal-specific parameterization is conveniently done in ibaPDA and is described in the corresponding chapter under 10.3.

The basic configuration of these terminals as well as the configuration of the other terminal types is explained in the following chapters.

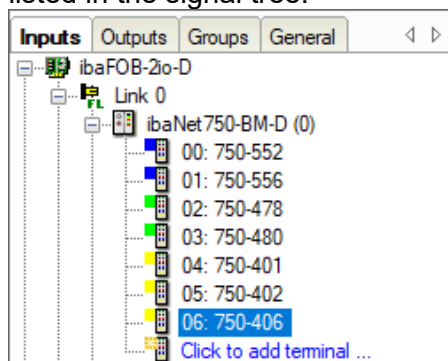
#### 11.1.1 First steps in ibaPDA configuration

##### Proceeding

1. Start the ibaPDA client and open the I/O manager
2. Choose the correct ibaFOB-D input card in the signal tree (on the left hand side) and mark the link ibaNet750-BM-D is connected to. Right-click on the link and choose "Autodetect".

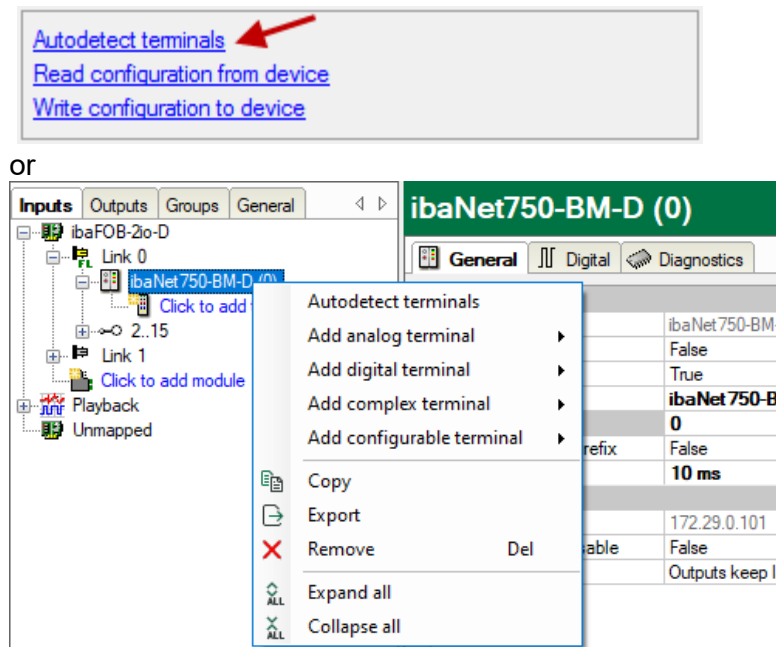


ibaPDA recognizes the device automatically. The device and the terminals will be listed in the signal tree.



3. You can apply a subsequent modification of the configuration by clicking on "Autodetect terminals" in the general tab or by right-clicking "Autodetect terminals" in the popup menu of the ibaNet750-BM-D module.





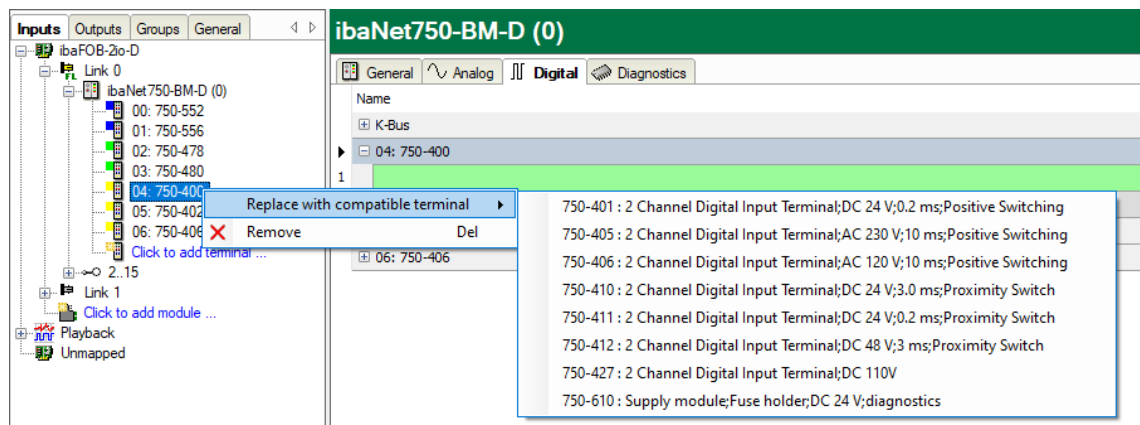
The connected terminals will be recognized and listed automatically.



### Note

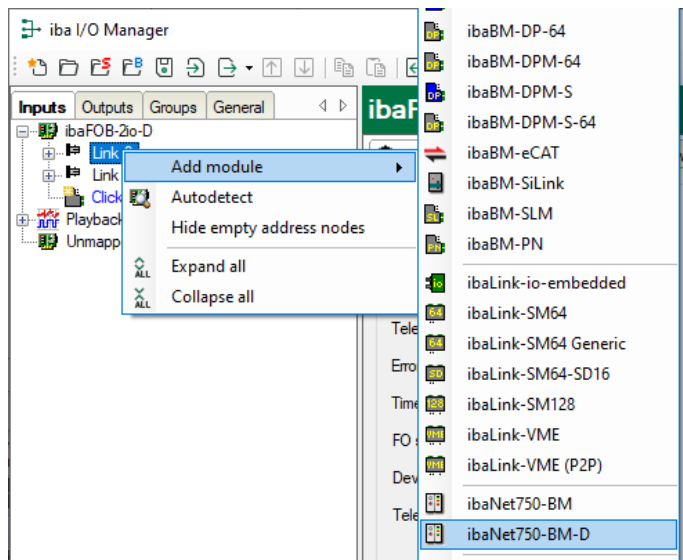
The numbers or terminal names of digital signals cannot be read out via the K-bus. However, the terminal type is correctly recognized and a terminal with the right numbers of inputs and outputs will be displayed in ibaPDA.

This terminal can be replaced with another compatible terminal. Right-click on the terminal and select the desired terminal.



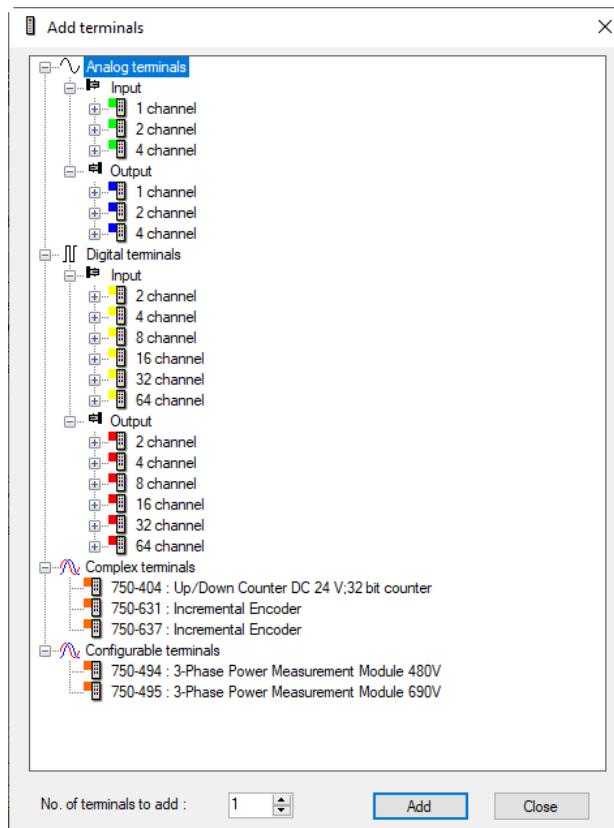
4. When ibaPDA does not recognize automatically the device, because it is not yet connected for example, you can manually add the device and the terminals.
5. Right-click on the link of the ibaFOB-D card the device should be connected to. Select "Add module..." and then "ibaNet750-BM-D".





The device will be listed in the signal tree.

6. Hold down the mouse button and drag the device to the address (link 1 – 15 below the device), the device address switch is set to. Position 1 – F refers to address 1 – 15.
7. A click on the blue link “Click to add terminal...” opens a selection window.



Mark the appropriate terminal and click on <Add> or double-click on the terminal. The terminal will be added to the signal tree while the selection window remains open.

8. When a terminal shall be added several times, enter the desired number in the field “No. of terminals to add”.





### Note

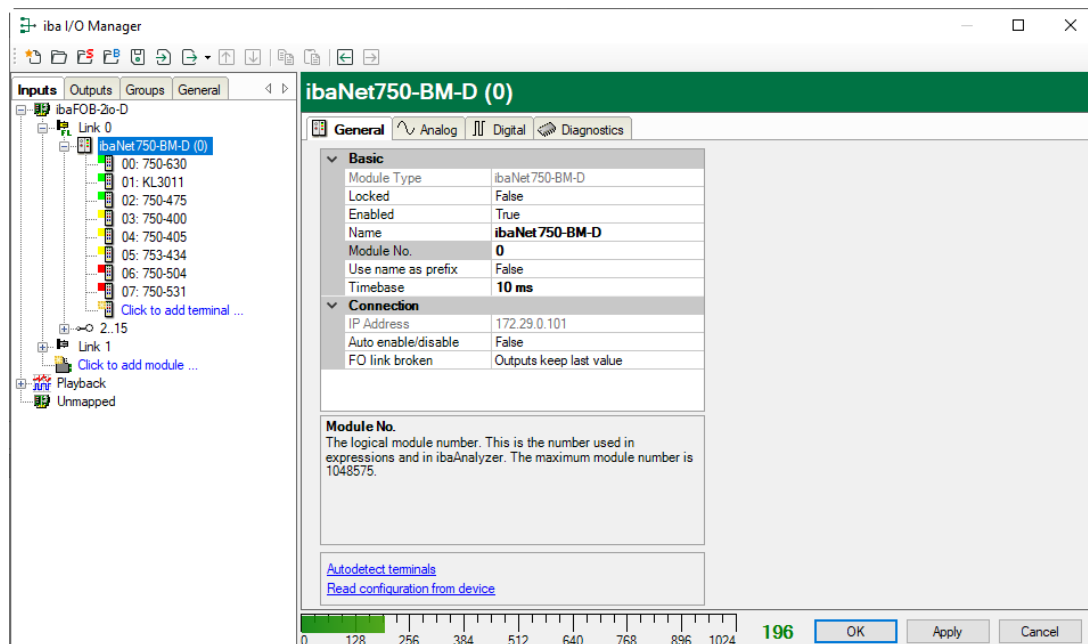
If output terminals are connected, add them also in the described way. ibaPDA automatically adds the output terminals to an output module under “Alarms” at the appropriate link.

9. A click on <Close> will finish the terminal selection.
10. Configure ibaNet750-BM-D and the connected terminals, e.g. giving names (refer to the following chapter). The signal grids for the analog and digital signals will be adjusted automatically for each terminal type.
11. Click on <Apply> or <OK> in order to write the configuration to the device.

## 11.1.2 Modules in ibaPDA

The device module and the signal tables are described below.

### 11.1.2.1 ibaNet750-BM-D – General tab



### Basic settings

#### ☐ Module type (information only)

Indicates the type of the current module.

#### ☐ Locked

A module can be locked to avoid unintentional or unauthorized changing of the module settings.

#### ☐ Enabled

Disabled modules are excluded from signal acquisition.

#### ☐ Name

The plain text name should be entered here as the module designation.



☐ **Module No.**

Internal reference number of the module. This number determines the order of the modules in the signal tree of ibaPDA client and ibaAnalyzer.

☐ **Use name as prefix**

Puts the module name in front of the signal names

☐ **Timebase**

All signals of the module will be sampled on this time base.

**Note**

The timebase given here is independent from the K-bus cycle time. The K-bus cycle time depends on the number and the type of the connected terminals and may vary. You can see the maximum cycle time on the K-bus on the Diagnostics tab in the field "maximum cycle time".

When each cycle is to be captured, iba recommends setting the ibaPDA timebase not more than half the maximum cycle time. It is always the actual data telegram that is captured.

**Connection**☐ **IP Address**

IP address of the device used for communication with 32Mbit Flex (only information).

☐ **Auto enable/disable**

If TRUE, the acquisition will start even when a device cannot be connected.

☐ **FO link broken**

Here you can set how outputs should behave in the system if the fiber optic link is broken. Please note that configuration and control outputs of complex terminals are treated accordingly.

Possible settings:

- Outputs keep last value (default)
- Outputs are reset to zero

**Further functions**☐ **Autodetect terminals**

The connected terminals will be detected automatically

☐ **Read configuration from device**

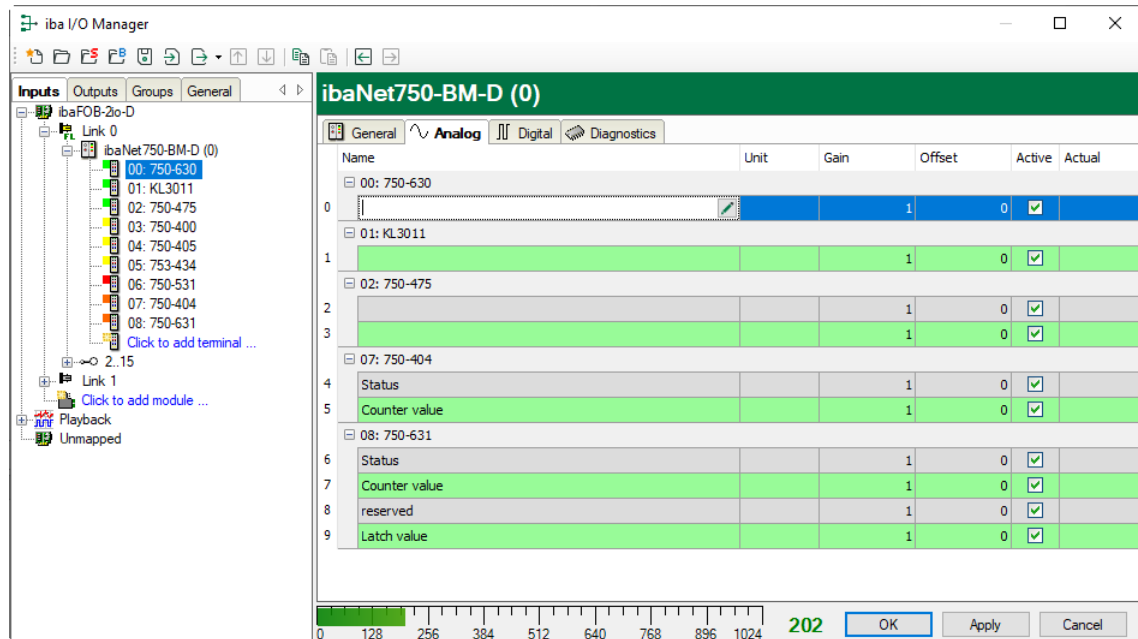
Reading the configuration from the device.

The changed settings become valid by clicking on <OK> or <Apply>.



### 11.1.2.2 ibaNet750-BM-D – Analog tab

The analog signal table is automatically adjusted for each terminal type. The terminals are displayed in the order in which they are added.



#### ☐ Name

The WAGO terminal number is automatically applied. One row per channel is displayed. You can enter signal names and additionally two comments when clicking on the symbol in the field "Name".

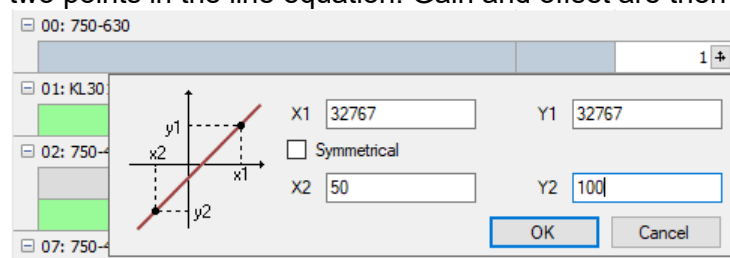
#### ☐ Unit

You can enter a unit for the analog signal.

#### ☐ Gain / Offset

Gradient (Gain) and y axis intercept (Offset) of a linear equation. You can convert a standardized value transferred without a unit into a physical value.

For making the calculation of Gain/Offset easier, an auxiliary dialog appears when clicking on the co-ordinate cross in the „Gain“ or „Offset“ field. In this dialog, you only enter two points in the line equation. Gain and offset are then calculated automatically.



#### ☐ Active

Activating/deactivating the signals

#### ☐ Actual

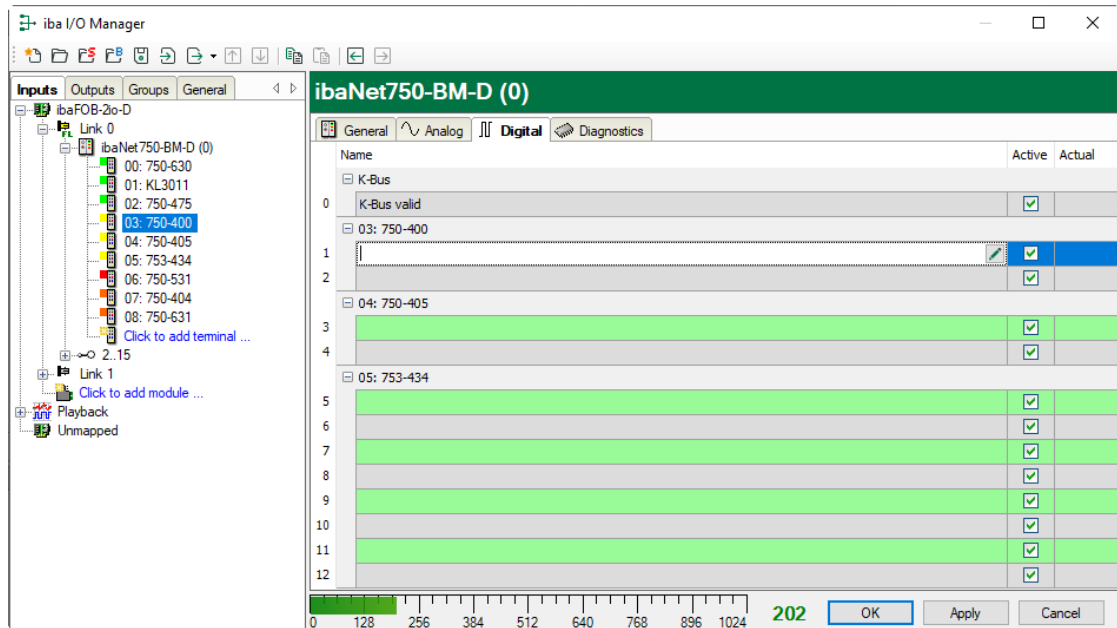
The actual measured value is displayed here

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



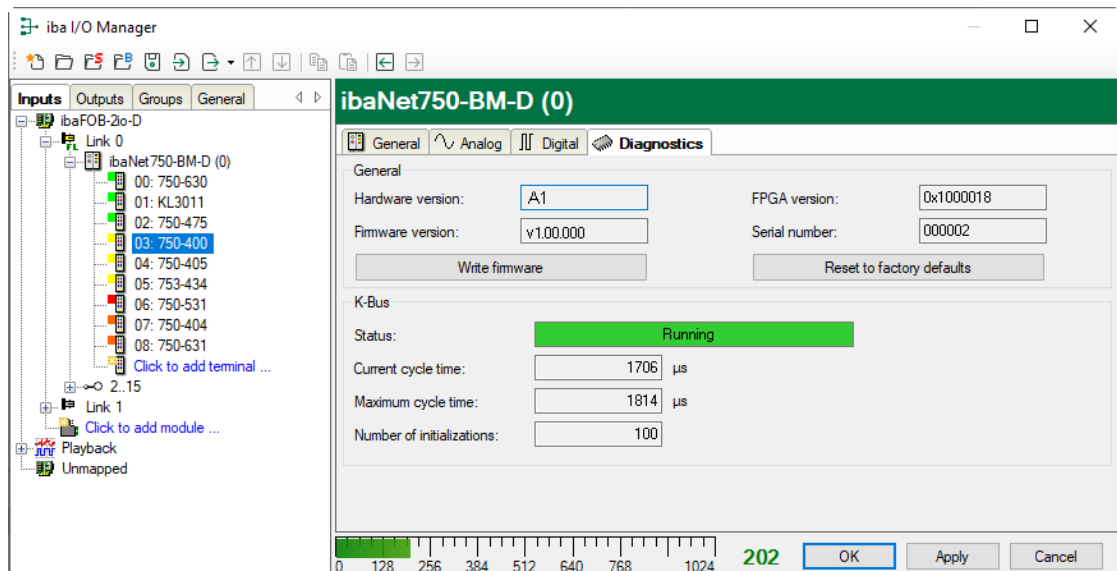
### 11.1.2.3 ibaNet750-BM-D – Digital tab

The digital signal table is automatically adjusted for each terminal type. The terminals are displayed in the order in which they are added.



The properties of the columns here are the same as in the analog tab, but without the columns unit, gain and offset.

### 11.1.2.4 ibaNet750-BM-D – Diagnostics tab



#### General

The “General” section displays the version of hardware, firmware and FPGA, and the serial number of the device.

#### Write firmware

Using this button you can install a firmware update. Select the update file “net750d\_v[xx.yy.zzz].iba” in the browser and start the update with <OK>.



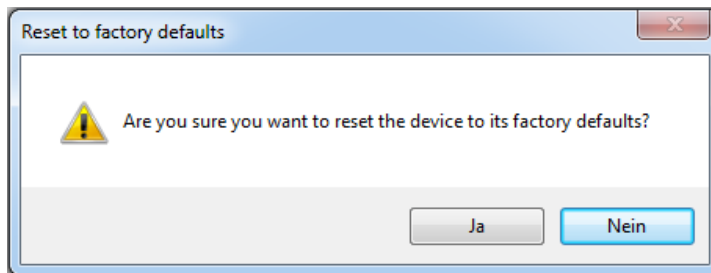


### Important note

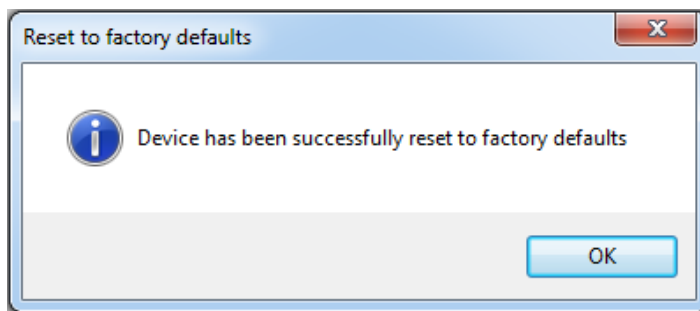
The update may take several minutes and must not be interrupted.

#### ☐ Reset to factory defaults

Using this button all settings are reset to factory defaults after having confirmed the following request with <Yes>.



After the reset the following message appears.



### K-Bus

Status:	Running (K-bus capturing is running) I/O error (K-bus interrupted) Configuration error (The device configuration is different from the connected terminals.)
Current cycle time	Current cycle time
Maximum cycle time	max. possible cycle time
Number of initializations:	Number of K-bus initializations



### 11.1.3 Outputs

All terminals, you have manually configured at the input side (in the “Inputs” tab) or that are detected automatically, are also displayed at the output side (in the “Outputs” tab). An analog and a digital tab are automatically adjusted for the analog and digital output terminals.

**ibaNet750-BM-D (0)**

Basic	
Module Type	ibaNet750-BM-D
Locked	False
Enabled	True
Name	ibaNet750-BM-D
Module No.	0
Use name as prefix	False
Timebase	10 ms

Connection	
IP Address	172.29.0.101
Auto enable/disable	False
FO link broken	Outputs keep last value

The configuration is shown as well in the “Outputs” tab at the appropriate output link:

**ibaNet750-BM-D (0)**

Basic	
Module Type	ibaNet750-BM-D
Locked	False
Enabled	True
Name	ibaNet750-BM-D
Module No.	0
Use name as prefix	False
Timebase	10 ms

Connection	
IP Address	172.29.0.101
Auto enable/disable	False
FO link broken	Outputs keep last value

The digital signals are listed in the digital tab and the analog signals are listed in the analog tab. For each signal you can specify an expression using the expression builder.

**ibaNet750-BM-D (0)**

Name	Expression	Acti...	Actual
00: 750-501			
0	<i>f<sub>se</sub></i>	<input type="checkbox"/>	<input type="checkbox"/>
1	<i>f<sub>se</sub></i>	<input type="checkbox"/>	<input type="checkbox"/>



#### Note

If the connection at the FO input of the device (RX) is removed, the output terminals will send the last received value.



## 11.2 Configuration in 32Mbit Mode

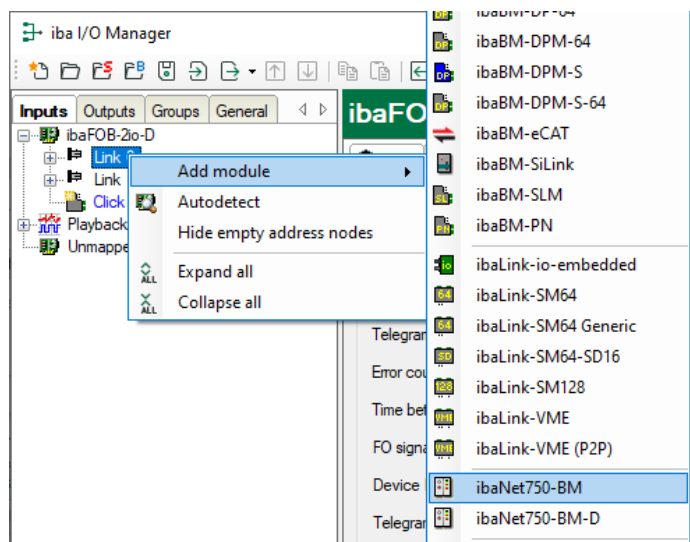
The 32Mbit mode is especially implemented for the use with ibaLogic version 4.2.5.464 or later. It is possible to assign input and output signals in the ibaLogic configuration with the help of the text file „WagoSignals.txt“ (see chapter 8.2), which is automatically generated. The file contains the signal mapping and the signal order. Although it is possible to use the 32Mbit mode with ibaPDA, iba recommends using 32Mbit Flex mode which is more comfortable and powerful.

## 11.3 Configuration in 3Mbit Mode

Using the 3Mbit mode, the device is compatible to the predecessor ibaNet750-BM and can replace it.

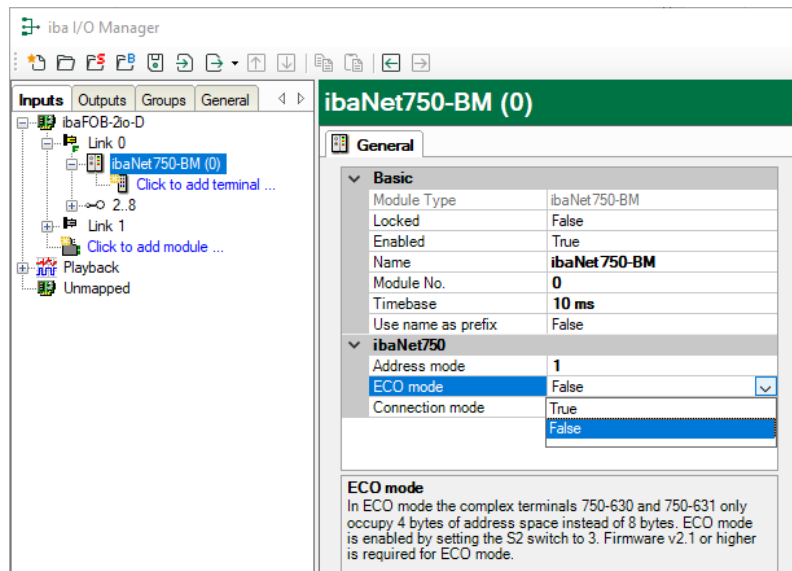
### Proceeding

1. Start the ibaPDA client and open the I/O manager
2. Choose the correct ibaFOB-D input card in the signal tree (on the left hand side) and mark the link ibaNet750-BM-D is connected to.
3. Right-click on the link and choose “Add module” and the module type “ibaNet750-BM”.

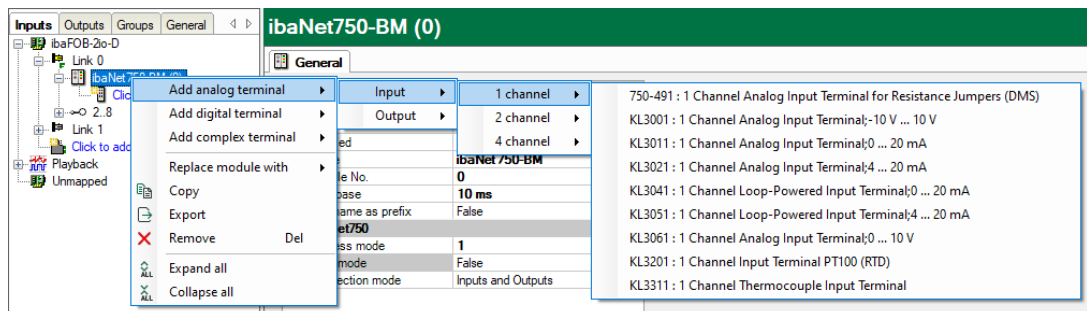


4. In the General tab, set the device mode and ECO mode according to the position of the rotary switches S1 and S2.



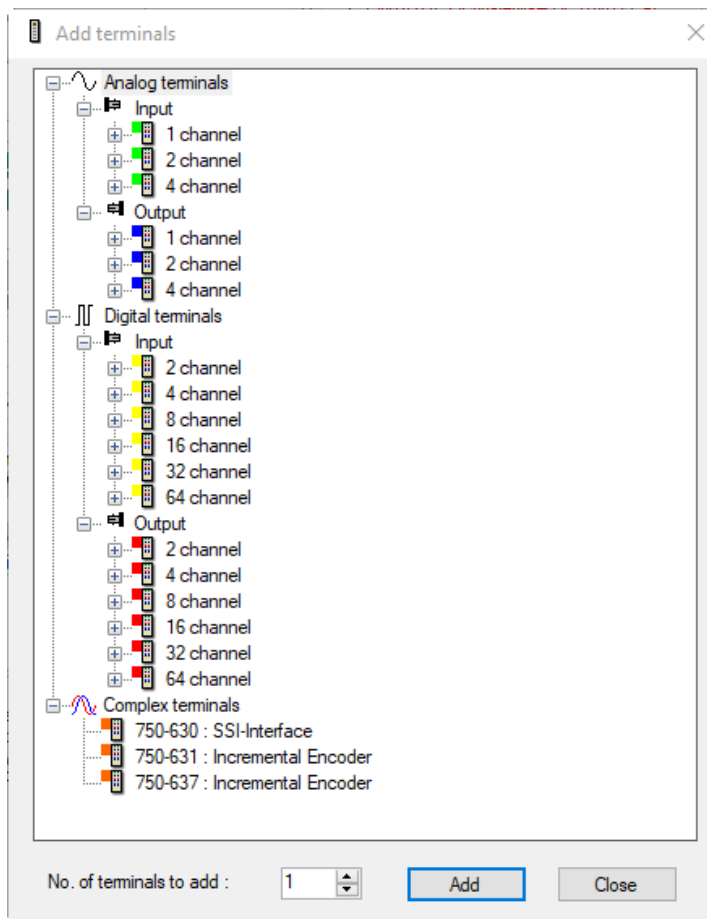


- Then make a right mouse click on the added module in the tree and choose the required terminal type from the cascading context menu



You may also use the hyperlink “Click to add module...”. You will then get a dialog window where you can select and add multiple terminals at once without closing the dialog after each selection.





The signal tables for analog and digital signals are automatically structured according to the type of terminals and the sequence of selection as shown in the example below.

Name	Unit	Min	Max	Active	Actual
<b>02: 750-456</b>					
0		-32768	32767	<input checked="" type="checkbox"/>	0
1		-32768	32767	<input checked="" type="checkbox"/>	0
<b>03: 750-456</b>					
2		-32768	32767	<input checked="" type="checkbox"/>	0
3		-32768	32767	<input checked="" type="checkbox"/>	0



## 12 K-Bus notes

For better diagnosis and optimal use of the device, the use with 32Mbit Flex protocol is assumed in the following.

### 12.1 Cycle time of the K-Bus

The K-bus of the ibaNet750-BM-D device is asynchronous, i.e. independent from the sampling rate in the fiber optics and the adjusted time base in ibaPDA.

The cycle time on the K-bus depends on the number and type of the connected terminals and may vary. Different terminals have different influence on the K-Bus: digital have low influence, analog terminals have more and complex terminals the most influence.

The current cycle time on the K-bus is measured with each cycle and is displayed on the Diagnostics tab in the "Current cycle time" field.

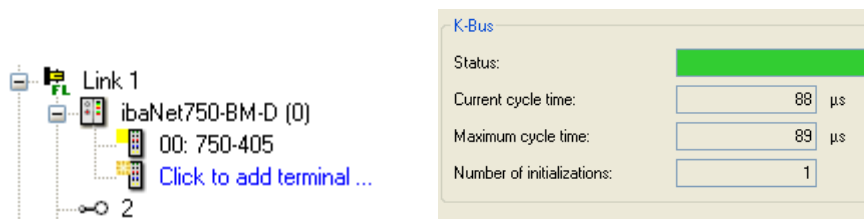
Unfortunately, the cycle time cannot be calculated in advance in ibaNet750-BM-D.

The actual K-bus cycle time can be seen in ibaPDA only after initial operation.

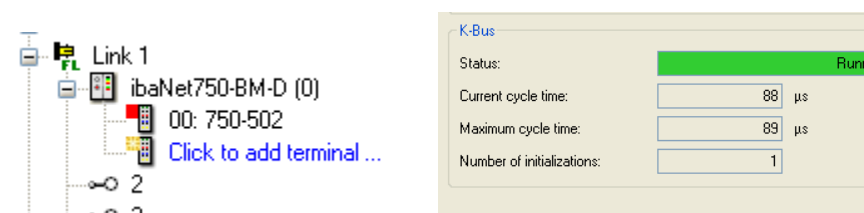
Here are some examples with measured cycle times:

#### Digital terminals

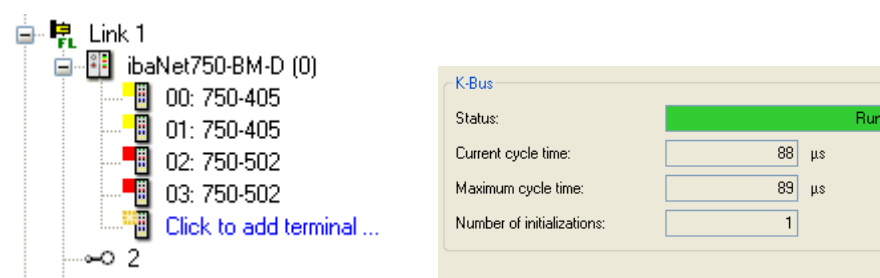
- ☐ 1 x 2-channel digital input terminal WAGO750-405



- ☐ 1 x 2-channel digital output terminal WAGO750-502



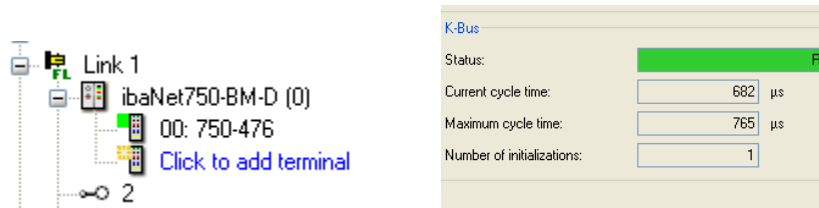
- ☐ 2 x 2-channel digital output terminal WAGO750-405  
and 2 x 2-channel digital output terminal WAGO750-502





## Analog terminals

### ❑ 1 x 2-channel analog input terminal WAGO750-476



Link 1

ibaNet750-BM-D (0)

00: 750-476

Click to add terminal

2

K-Bus

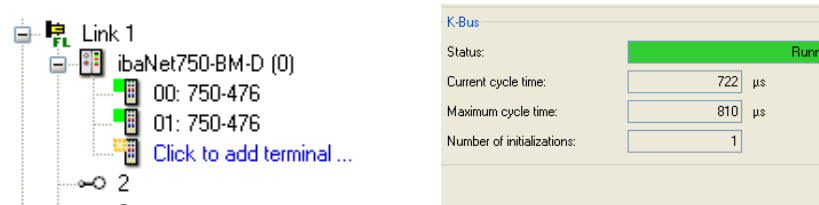
Status: Run

Current cycle time: 682 µs

Maximum cycle time: 765 µs

Number of initializations: 1

### ❑ 2 x 2-channel analog input terminal WAGO750-476



Link 1

ibaNet750-BM-D (0)

00: 750-476

01: 750-476

Click to add terminal ...

2

K-Bus

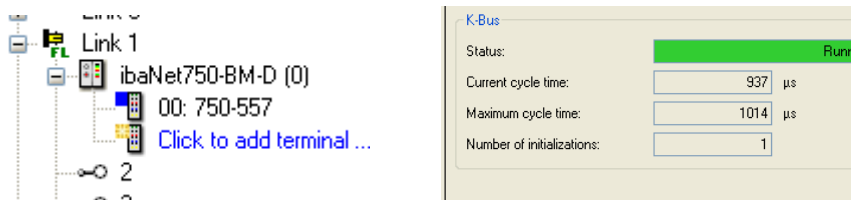
Status: Run

Current cycle time: 722 µs

Maximum cycle time: 810 µs

Number of initializations: 1

### ❑ 1 x 4-channel analog output terminal WAGO750-557



Link 1

ibaNet750-BM-D (0)

00: 750-557

Click to add terminal ...

2

K-Bus

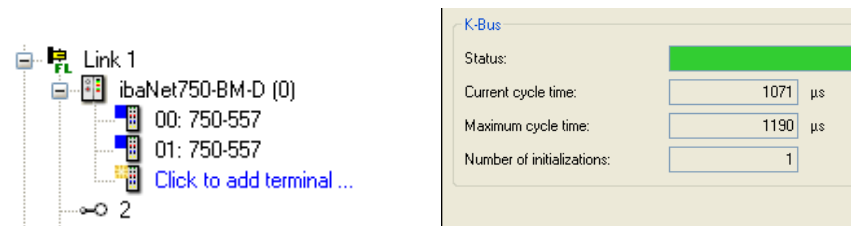
Status: Run

Current cycle time: 937 µs

Maximum cycle time: 1014 µs

Number of initializations: 1

### ❑ 2 x 4-channel analog output terminal WAGO750-557



Link 1

ibaNet750-BM-D (0)

00: 750-557

01: 750-557

Click to add terminal ...

2

K-Bus

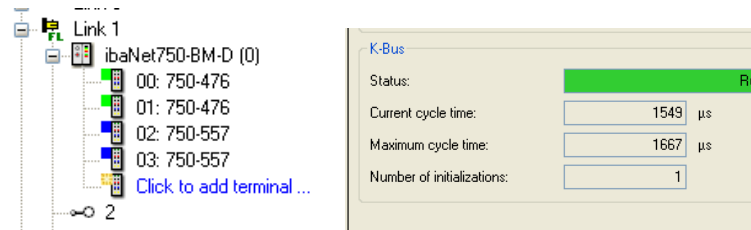
Status: Run

Current cycle time: 1071 µs

Maximum cycle time: 1190 µs

Number of initializations: 1

### ❑ 2 x 2-channel analog input terminal WAGO750-476 and 2 x 4-channel analog output terminal WAGO750-557



Link 1

ibaNet750-BM-D (0)

00: 750-476

01: 750-476

02: 750-557

03: 750-557

Click to add terminal ...

2

K-Bus

Status: Run

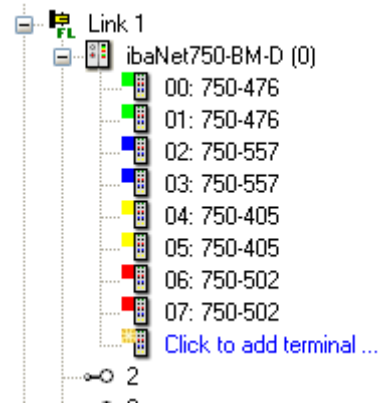
Current cycle time: 1549 µs

Maximum cycle time: 1667 µs

Number of initializations: 1



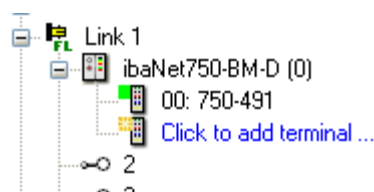
## Digital and analog terminals



K-Bus	
Status:	Running
Current cycle time:	1629 $\mu$ s
Maximum cycle time:	1745 $\mu$ s
Number of initializations:	1

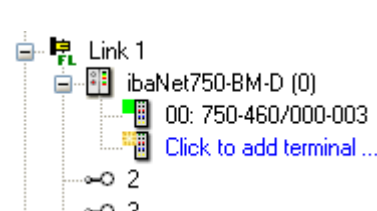
## Complex terminals

- ❑ 1-channel analog input terminal for resistance bridges (DMS) WAGO750-491



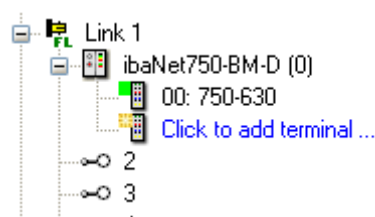
K-Bus	
Status:	Running
Current cycle time:	273 $\mu$ s
Maximum cycle time:	305 $\mu$ s
Number of initializations:	1

- ❑ 4- channel analog input terminal for resistance sensors WAGO750-460



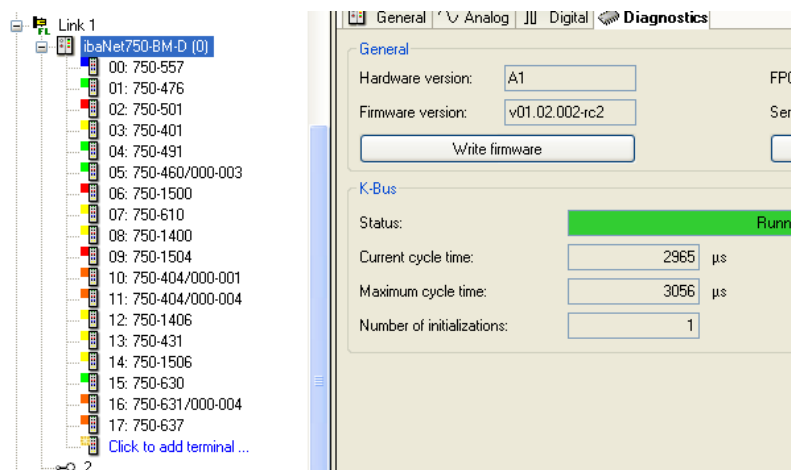
K-Bus	
Status:	Running
Current cycle time:	843 $\mu$ s
Maximum cycle time:	1159 $\mu$ s
Number of initializations:	1

- ❑ SSI encoder interface WAGO750-630



K-Bus	
Status:	Running
Current cycle time:	861 $\mu$ s
Maximum cycle time:	861 $\mu$ s
Number of initializations:	1

If different terminal types (digital, analog and complex) are used together, the cycle time increases up to 3 ms, even when only 18 terminals are connected.



General	
Hardware version:	A1
Firmware version:	v01.02.002-rc2
Write firmware	

K-Bus	
Status:	Running
Current cycle time:	2965 $\mu$ s
Maximum cycle time:	3056 $\mu$ s
Number of initializations:	1



## 12.2 Update rate of the signals

Independent from the K-bus cycle time, the input filters of the digital terminals and the conversion time of the analog terminals have to be considered.

These two factors mainly affect the update rate of the single input signals.

The following is essential:

If a new, changed value should be acquired with a minimum delay, the time base in ibaPDA should be set as small as possible. It has also to be considered, that the data volume in the ibaNet is limited.

The difference between the value conversion in the K-bus and the ibaNet is the least, when a small time base is used.



## 13 Technical data

### 13.1 Main data

Short description			
Name	ibaNet750-BM-D		
Description	Bus module for WAGO-I/O system 750		
Order no.	15.140010		
Bus interface (K-bus)			
Number	1		
Data volume	Up to 2048 Byte or up to 255 terminals		
Sampling rate	According to the bus cycle time  The update time of the signals may differ from the bus cycle due to terminal specific properties.		
Connector type	6 sliding contacts, according to WAGO-I/O system 750, incl. power supply		
ibaNet interface (FO)			
Number	1 (e. g. connection to ibaPDA)		
ibaNet protocol	32Mbit Flex (bidirectional) Allows connecting up to 15 devices at a time in ring topology. Can be used for measured data, setup data and service (e. g. updates)	32Mbit	3Mbit
Data transmission rate	32 Mbit/s	32 Mbit/s	3 Mbit/s
Sampling rate	Up to 40 kHz, freely adjustable	2 kHz	1 kHz
Connector type	2 ST connectors for RX and TX;  iba recommends the use of FO with multimode fibers of type 50/125 µm or 62.5/125 µm;  For information on cable length, see chap. 13.3		
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 <sup>1</sup>	100/140 µm FO cable	-33,2 dBm to -26,7 dBm	
Temperature range	-40 °F to 185 °F (-40 °C to 85 °C)		

<sup>1</sup> Data for other FO cable diameters not specified



<b>System supply</b>	
Voltage supply external	24 V DC ( $\pm 10\%$ ), protected against reverse polarity
Power consumption external	70 mA (without terminals)
Max. power consumption external	500 mA
Connector type	2 CAGE CLAMP® contacts, 0.08 mm <sup>2</sup> ... 2.5 mm <sup>2</sup> , AWG 28-14
System voltage internal	5 V DC
Power consumption internal	300 mA
Max. total current internal	2000 mA
Connector type	Via bus interface (K-bus)
<b>Field supply</b>	
Voltage supply	24 V DC ( $\pm 10\%$ ), without protection
Power consumption	Up to 10 A
Connector type	4 CAGE CLAMP® contacts, 0.08 mm <sup>2</sup> ... 2.5 mm <sup>2</sup> , AWG 28-14
<b>Further interfaces, operating and indicating elements</b>	
Indicators (LEDs)	4 LEDs (green, yellow, white, red) for device status 2 LEDs (green, red) for K-bus
Rotary switch	2, device mode and address setting
USB	socket, Mini B
Power jumper contacts	2 spring contacts, according to WAGO-I/O system 750
Protective earth connection	2 CAGE CLAMP® contacts, 0.08 mm <sup>2</sup> ... 2.5 mm <sup>2</sup> , AWG 28-14
<b>Operating and environment conditions</b>	
Temperature ranges	
Operation	0 °C ... +50 °C (32 °F ... 122 °F)
Storage/transport	-25 °C ... +70 °C (-13 °F ... 158 °F)
Mounting	DIN rail according to EN 50022 (TS 35, DIN Rail 35)
Cooling	passive
Humidity class	F, no condensation
Protection class	IP20
Standards	CE, EMC (EN 61326-1:2006, class A)
MTBF <sup>2</sup>	5,366,925 hours / 612 years
Mechanical stability	DIN IEC 60068-2-6 (if mounted correctly)
Dimensions (width x height x depth)	49 mm x 100 mm x 80 mm (incl. clip) (1.99 in x 3.94 in x 3.15 in)
Weight / incl. box and documenta- tion	0.16 kg / approx. 0.3 kg

<sup>2</sup> 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).



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

**Unique Identifier:** 15.140010 ibaNet750-BM-D

**Responsible Party - U.S. Contact Information**

iba America, LLC  
370 Winkler Drive, Suite C  
Alpharetta, Georgia  
30004

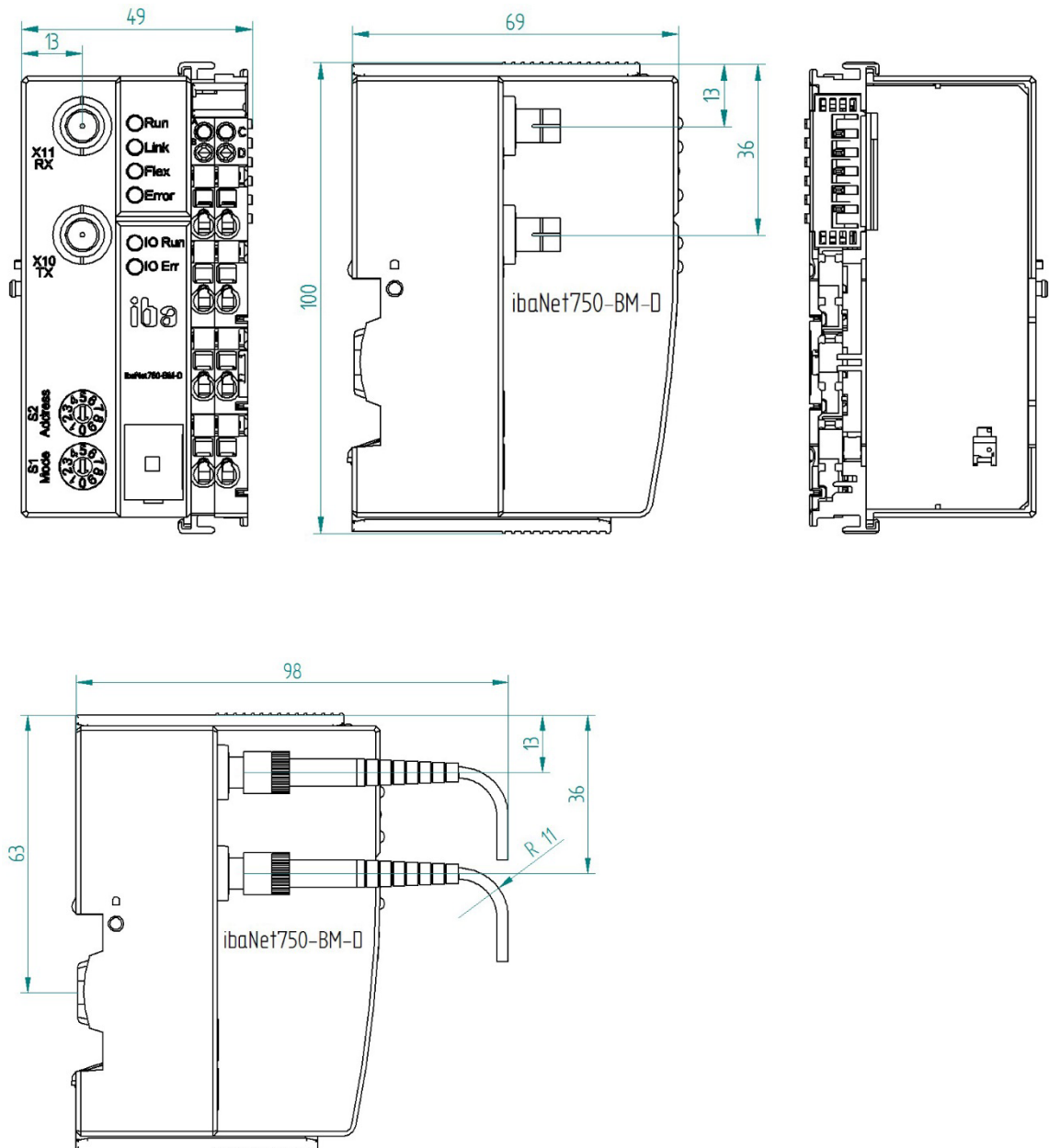
(770) 886-2318-102  
[www.iba-america.com](http://www.iba-america.com)

**FCC Compliance Statement**

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.



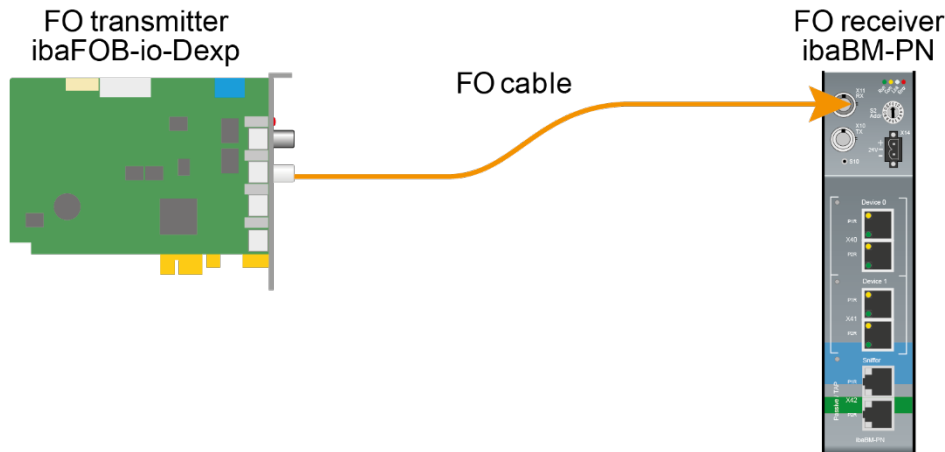
## 13.2 Dimensions





### 13.3 Example for FO budget calculation

As an example, an FO connection from an ibaFOB-io-Dexp card (FO transmitter) to an ibaBM-PN device (FO receiver) is used.



The example refers to a point-to-point connection with an FO cable of type 62.5/125  $\mu\text{m}$ . The light wavelength used is 850 nm.

The range of the minimum and maximum values of the output power or receiver sensitivity depends on the component and, among other things, on temperature and aging.

For the calculation, the specified output power of the transmitting device and on the other side the specified sensitivity of the receiving device must be used in each case. You will find the corresponding values in the respective device manual in the chapter "Technical data" under "ibaNet interface".

#### Specification ibaFOB-io-Dexp:

Output power of FO transmitting interface		
FO cable in $\mu\text{m}$	Min.	Max.
62.5/125	-16 dBm	-9 dBm

#### Specification ibaBM-PN:

Sensitivity of FO receiving interface		
FO cable in $\mu\text{m}$	Min.	Max.
62.5/125	-30 dBm	

#### Specification FO cable

To be found in the data sheet of the fiber optic cable used:

FO cable	62.5/125 $\mu\text{m}$
Connector loss	0.5 dB connector
Cable attenuation at 850 nm wavelength	3.5 dB / km



**Equation for calculating the FO budget ( $A_{Budget}$ ):**

$$A_{Budget} = |(P_{Receiver} - P_{Sender})|$$

$P_{Receiver}$  = sensitivity of FO receiving interface

$P_{Sender}$  = output power of FO transmitting interface

**Equation for calculating the fiber optic cable length ( $l_{Max}$ ):**

$$l_{Max} = \frac{A_{Budget} - (2 \cdot A_{Connector})}{A_{Fiberoptic}}$$

$A_{Connector}$  = connector loss

$A_{Fiberoptic}$  = cable attenuation

**Calculation for the example ibaFOB-io-Dexp -> ibaBM-PN in the best case:**

$$A_{Budget} = |(-30 \text{ dBm} - (-9 \text{ dBm}))| = 21 \text{ dB}$$

$$l_{Max} = \frac{21 \text{ dB} - (2 \cdot 0.5 \text{ dB})}{3.5 \frac{\text{dB}}{\text{km}}} = 5.71 \text{ km}$$

**Calculation for the example ibaFOB-io-Dexp -> ibaBM-PN in the worst case:**

$$A_{Budget} = |-30 \text{ dBm} - (-16 \text{ dBm})| = 14 \text{ dB}$$

$$l_{Max} = \frac{14 \text{ dB} - (2 \cdot 0.5 \text{ dB})}{3.5 \frac{\text{dB}}{\text{km}}} = 3.71 \text{ km}$$

**Note**

When connecting several devices as daisy chain (e.g. ibaPADU-8x with 3Mbit) or as ring (e.g. ibaPADU-S-CM with 32Mbit Flex), the maximum distance applies to the section between two devices. The FO signals are re-amplified in each device.

**Note**

When using fiber optics of the 50/125 µm type, a distance reduction of approx. 30-40% must be expected.



## 14 Appendix

### 14.1 Firmware Update via USB interface

Firmware updates are usually executed with ibaPDA in 32Mbit Flex mode, see also chapter 11.1.2.4.

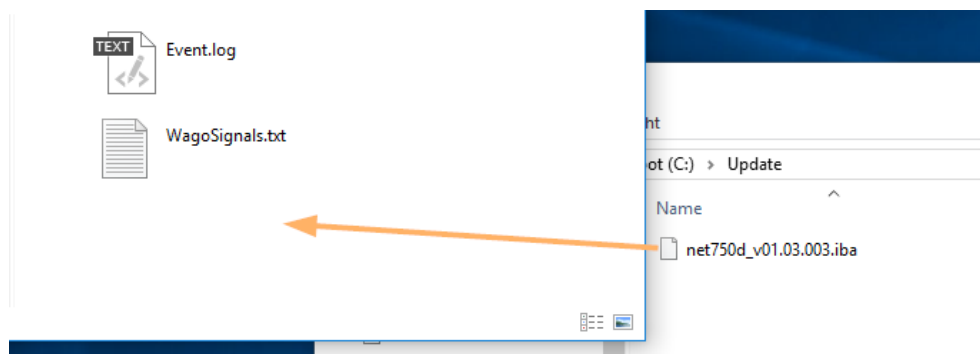
However, the update file can also be imported via the USB interface.

This may be necessary, for example, if ibaNet750-BM-D is operated in 32Mbit or 3Mbit mode and ibaPDA is not available as a communication partner.

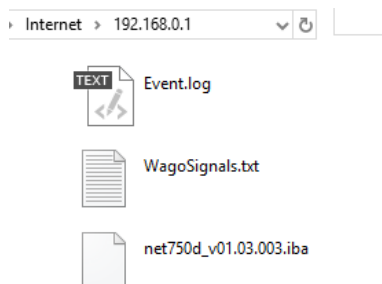
#### Proceeding:

Establish an FTP connection to the device as described in chapter 8.2.2 step 1-5.

Copy the update file "net750d\_v\*.iba" you received from iba to the device via the FTP connection.



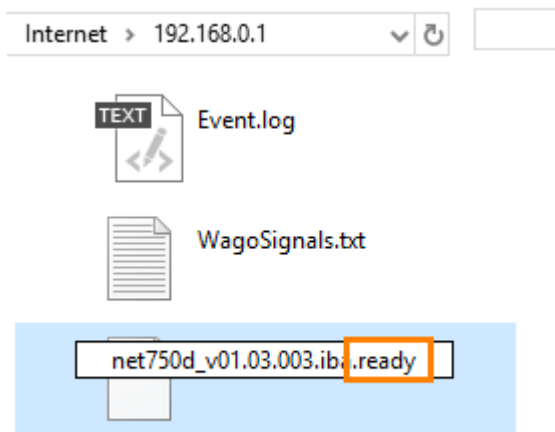
#### Device directory:



Once the file is uploaded, rename it:

Old: net750d\_v\*.iba → new: net750d\_v\*.iba.**ready**





Then the update process starts immediately. The update process is indicated by rapid flashing of the Run LED.

Once the update process is complete, the device will automatically restart.

The Event.log file can be used to check whether the update was successful. First, the FTP connection must be re-established after the restart.

```
[t=7s : Device name      ] ibanet750-BM-D
[t=7s : Serial number   ] 000003
[t=8s : Hardware version ] 01
[t=8s : Firmware version] v01.03.003
[t=14s : signal copy machine] New configuration for fiber optic
```



## 15 Support and contact

### Support

Phone: +49 911 97282-14

Fax: +49 911 97282-33

E-Mail: [support@iba-ag.com](mailto:support@iba-ag.com)



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### Note

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

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### Contact

#### Headquarters

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#### Regional and Worldwide

For contact data of your regional iba office or representative please refer to our web site

**[www.iba-ag.com](http://www.iba-ag.com).**