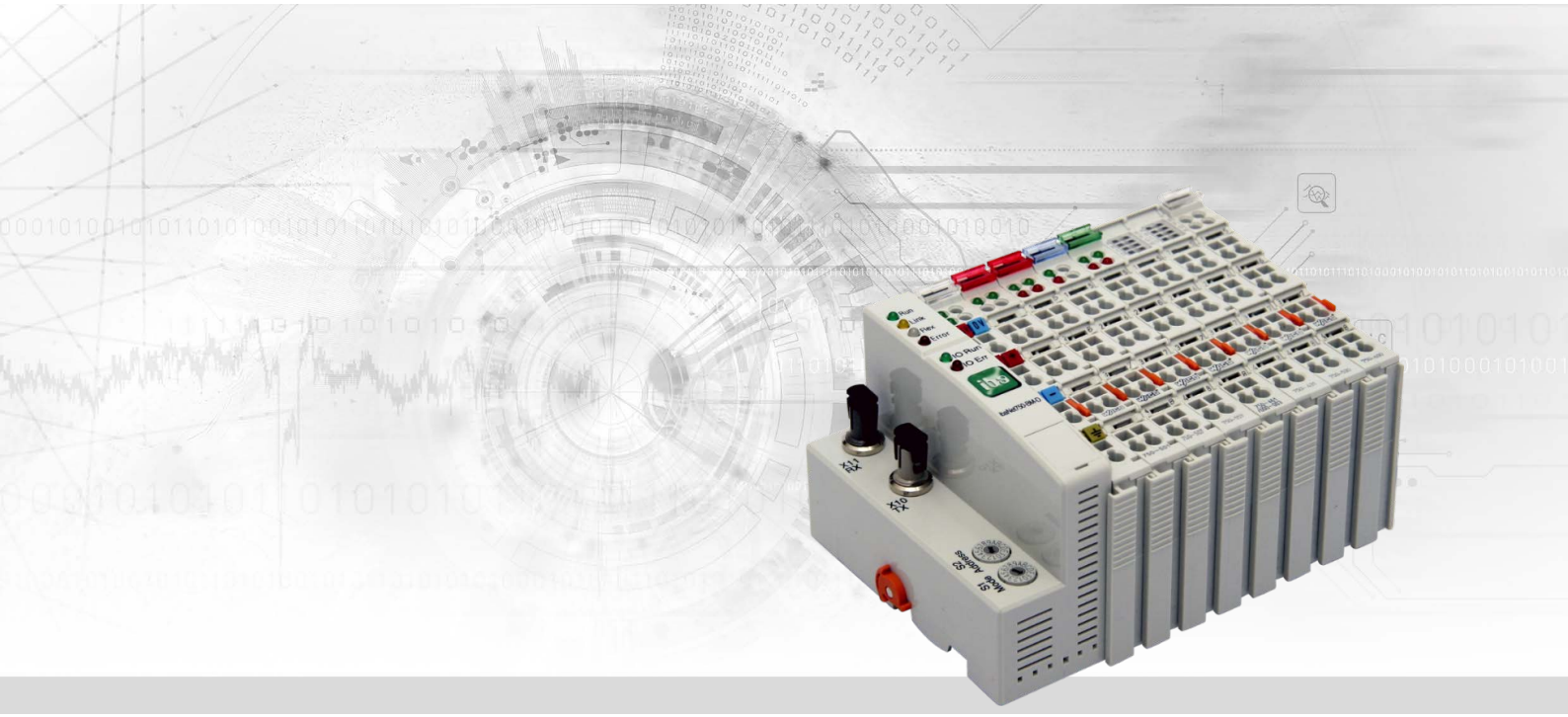


ibaNet750-BM-D

Distributed I/O System

Manual

Issue 2.2

Measurement Systems for Industry and Energy

www.iba-ag.com

Manufacturer

iba AG

Koenigswarterstraße 44

90762 Fuerth

Germany

Contacts

Headquarters	+49 911 97282-0
Support	+49 911 97282-14
Engineering	+49 911 97282-13
E-Mail	iba@iba-ag.com
Web	www.iba-ag.com

Issue	Date	Revision	Author	Version HW/FW
2.2	07-2025	Supported terminals	st	-/ 01.03.005

Certification

The product is certified according to the European standards and directives. This product meets the general safety and health requirements.

Other international and national standards were observed.

Contents

1 About this documentation

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

1.1 Target group and previous knowledge

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

1.2 Notations

In this manual, the following notations are used:

Action	Notation
Menu command	Menu *Logic diagram*
Calling the menu command	*Step 1 – Step 2 – Step 3 – Step x* Example: Select the menu *Logic diagram – Add – New function block*.
Keys	<Key name> Example: <Alt>; <F1>
Press the keys simultaneously	<Key name> + <Key name> Example: <Alt> + <Ctrl>
Buttons	<Key name> Example: <OK>; <Cancel>
Filenames, paths	`Filename`, `Path` Example: `Test.docx`

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:

- Observe the specified measures.

Warning!

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

- Observe the specified measures.

Caution!

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

- Observe the specified measures

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 About ibaNet750-BM-D

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 amount of data to be transferred depends on the selected sampling rate. The following rule applies: The higher the sampling rate, the smaller 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
- 8 complex terminals (i.e. SSI, incremental encoder etc.)
- Fiber optic compatible with *ibaPADU-8* and *ibaPADU-8-O*, that means up to 8 8 bus addresses (= devices on one fiber optic line, 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 behavior of the terminals (no guaranteed simultaneous plant snapshot of all signals within 1ms cycles).
- Operation without PC possible. 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* 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.

In addition, the device can also be operated on an *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 of the WAGO terminal range can be used. Contact iba if in doubt. This also applies to the (basically) compatible Beckhoff terminals.

See also ↗ *Terminal types*, page 34

Note

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

- Digital I/Os (easy to handle)
- Analog I/Os (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.

Note

Restrictions when operating with *ibaPDA*

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 particularly due to the structure of the internal serial IO bus (K-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.

Overview of the most important characteristic values:

- DC 24 V direct current supply (±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
- 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)

3 Scope of delivery

After unpacking, check that the delivery is complete and undamaged.

The scope of delivery includes:

- Device *ibaNet750-BM-D*
- Data medium "iba Software & Manuals"

4 Safety instructions

Observe the following safety instructions for *ibaNet750-BM-D*.

4.1 Intended use

The device is an electrical equipment. It may be used only in the following applications:

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

The device may only be used as defined in the "Technical Data" chapter.

4.2 Special safety instructions

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.

Caution!

The length of the supply cable between the power source and the device must not be longer than 30 m.

Caution!

Before working on or dismounting the device, disconnect it from the power supply.

Note

Do not open the device! Opening the device will void the warranty!

Note

To clean the device, use a dry or slightly moistened cloth.

Other documentation

This documentation 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 documentations for WAGO components are available for download at www.wago.com.

5 System requirements

The following system requirements are necessary for using the *ibaNet750-BM-D* device.

Hardware

- PC with at least:
  - At least 1 free PCI/PCIe slot (PC) or ExpressCard slot (notebook)
  - At least 512 MB RAM
  - 4 GB free memory on the hard drive for measurement values

    On the iba homepage http://www.iba-ag.com you will find suitable computer systems with desktop and industrial housing.
- 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*
- An ibaNet fiber optic patch cable (duplex) for a bidirectional connection between the device and the *ibaPDA*-PC.

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

Software

- *ibaPDA* version 7.3.0 or higher
- *ibaLogic-V4* version 4.2.5.464 or higher (no 32Mbit Flex)
- *ibaLogic-V5* (no 32Mbit Flex)

Firmware

- *ibaNet750-BM-D* version 01.03.005 or higher

6 Mounting and dismounting

In the following, you will learn how to *ibaNet750-BM-D* install, connect and remove the device. Also refer to the notes in chapter ↗ *Safety instructions*, page 13.

Caution!

Before working on or dismounting the device, disconnect it from the power supply.

6.1 Mounting

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

6.2 Dismounting

1. First remove all connections from the device.
2. Pull the orange plastic leash in your direction. The module will easily snap out of the DIN-rail.

7 Device description

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 an additional power terminal, the field supply via the power contacts is always interrupted. This means that a new power supply is provided from this point on, which can also include a potential change. This option ensures a high flexibility of the overall system.

Note

Please note, that some terminals additionally require an own power supply (mostly 24 V DC). These are mainly modules of the type “complex terminals”, see chapter ↗ *Terminal types*, page 34.

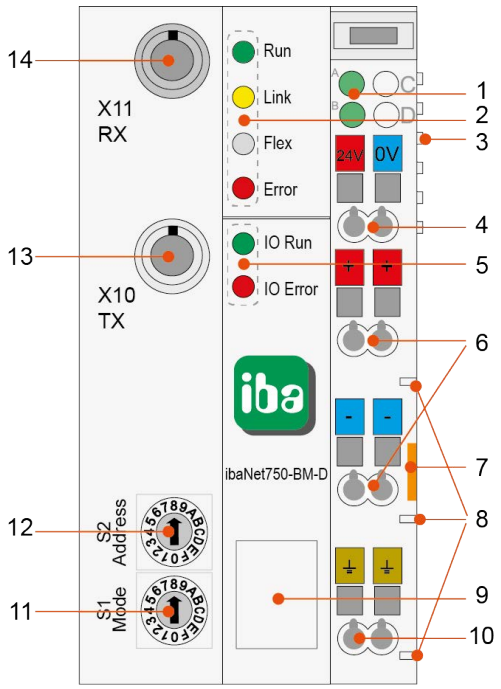
Other documentation

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

7.1 Device views

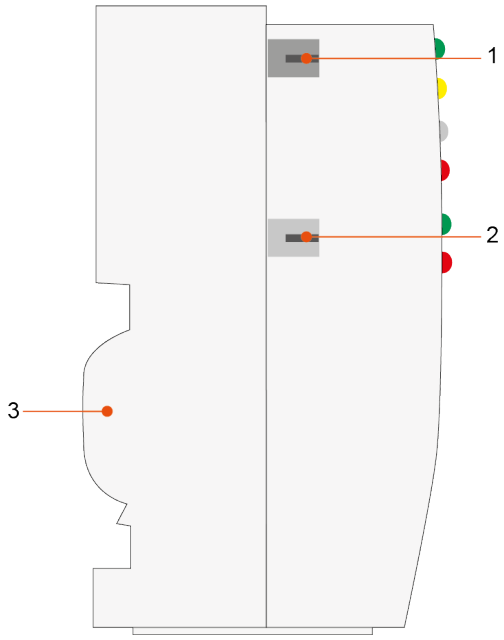
The following views show the operating and indicating elements, as well as the connections of the device *ibaNet750-BM-D*.

Front view



1	Power supply status (A: System/B: Field)	8	Power jumper contacts
2	Operating state display	9	USB interface
3	K-bus connection (incl. power supply)	10	Protective earth connection
4	System power supply 24 V	11	Rotary switch device mode S1
5	Indicators K-bus	12	Rotary switch device address S2
6	Field power supply 24 V	13	FO output (TX) X10
7	Release tab of the DIN rail	14	FO input (RX) X11

Side view



1	FO input (RX) X11	3	DIN rail mounting
2	FO output (TX) X10		

7.2 Indicating elements

Colored LEDs on the device indicate the operating status of the device.

Operating status

LED	Color	Status	Description
Run	Green	Off	Out of operation, no power supply
		Flashing	Ready for operation
		Flashing fast	Firmware update active
		On	Boot sequence active
Link	Yellow	Off	No 3Mbit FO communication
		Flashing	3Mbit signal detected, configuration error (incorrect rotary switch position) or Configuration via 32Mbit Flex
		On	3Mbit FO communication, signal reception at RX
Flex	White	Off	No 32Mbit / 32Mbit Flex signal detected
		Flashing	32Mbit / 32Mbit Flex signal detected, configuration error (incorrect rotary switch position)
		On	32Mbit / 32Mbit Flex signal detected

LED	Color	Status	Description
Error	Red	Flashing	32Mbit Flex: Difference between ibaPDA configuration and the actual hardware 32Mbit and 3Mbit: incorrect rotary switch position
		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 operation
		On	K-bus problem detected (e.g. no termination terminal available)

7.3 Rotary switch

7.3.1 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)

Position S1	ibaNet protocol	3Mbit mode	Allowed positions S2	Function	Description
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

7.3.1.1 3Mbit normal mode

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

7.3.1.2 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. modeSince 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 4 input bytes instead of 8 input and 8 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: ↗ *SSI Terminal (WAGO module -630)*, page 42 and ↗ *Incremental encoder terminal (WAGO module -631)*, page 43

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

7.3.2 Rotary switch S2 (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
1st device	1*

Device number in the cascade	Position of rotary switch S2
2nd device	2
…	…
14th device	E
15th device	F

* delivery state

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 I/Os.
- 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 I/Os.
- 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 I/Os.

Address	Device address	Outputs	Inputs	Note
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 I/Os by binary I/Os.
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 I/Os by binary I/Os.
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 I/Os by binary I/Os.
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 I/Os by binary I/Os.
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 I/Os by binary I/Os.
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 I/Os by binary I/Os.
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 I/Os by binary I/Os.
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 I/Os by binary I/Os.
9	not used			

Address	Device address	Outputs	Inputs	Note
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 I/Os by binary I/Os.
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 I/Os by binary I/Os.
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 I/Os by binary I/Os.
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 I/Os by binary I/Os.
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 I/Os by binary I/Os.
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 I/Os by binary I/Os.

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

7.4 Fiber optic connections X10 and X11

The following fiber optic interfaces are available on the *ibaNet750-BM-D* device:

- X11 (RX): FO receiving interface
- X10 (TX): FO transmitting interface

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 ↗ *Example for FO budget calculation*, page 71.

The specification of the transmission power and the reception sensitivity of the FO components installed in the device can be found in the technical data under ↗ *ibaNet interface (fiber optics)*, page 68.

7.5 Power supply

The *ibaNet750-BM-D* device requires two power supplies.

7.5.1 System supply

The device requires an external 24 V ±10% DC power supply (unregulated) as system power supply. This supply power must be fed via the corresponding terminals on the *ibaNet750-BM-D* and is designed to be protected against polarity reversal.

If required, 24V DIN rail or plug-in power supply units can be ordered 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.

Caution!

The length of the supply cable between the power source and the device must not be longer than 30 m.

7.5.2 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 required, 24V DIN rail or plug-in power supply units can be ordered 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 cable between the power source and the device must not be longer than 30 m.

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

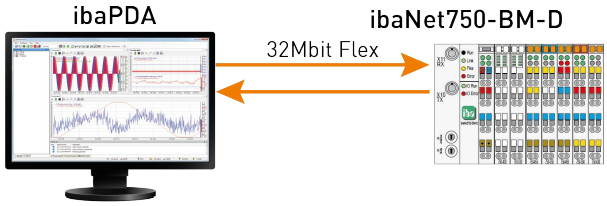
8 System integration

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

- *ibaNet750-BM-D* device (bus station) on the left side.
- Modules 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 communication (stand alone)



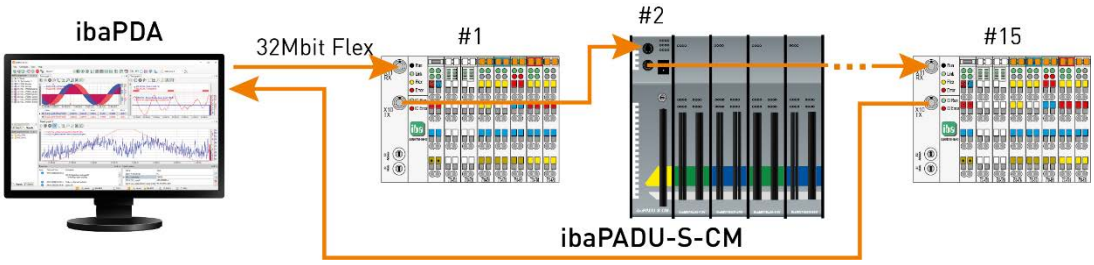
The device is connected to the *ibaFOB-D* card in the *ibaPDA* PC via a bidirectional FO cable. Both configuration and process data are transmitted using the 32Mbit Flex protocol. *ibaPDA* automatically recognizes the connected terminals.

The sampling rate can freely be adjusted to 40 kHz. The maximum amount of data to be transferred depends on the selected sampling rate.

The following rule applies: The higher the sampling rate, the smaller 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



In a ring with 32Mbit Flex protocol, up to 15 devices can be connected. In the ring, all configuration and process data are transmitted.

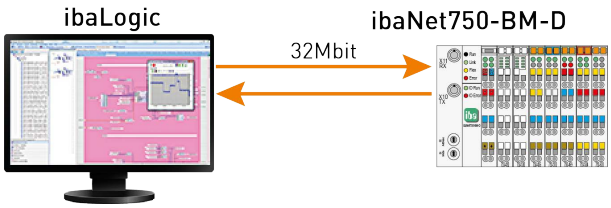
Other 32Mbit Flex-capable devices from iba can also be integrated into the ring, e.g. *ibaPADU-S-CM* as in the example above. The devices in the ring are addressed using the rotary switch for the device address. *ibaPDA* automatically recognizes the devices in the ring.

The amount of data per participant is distributed dynamically. Depending on the number of analogue and digital signals parameterized in *ibaPDA* and the smallest time base set in the ring,

the amount of data is calculated by *ibaPDA*. The maximum amount of data is determined by the 32Mbit Flex protocol and must be divided by the number of devices and the amount of data per device. A reference value is approx. 3000 byte per ms. The individual devices in the cascade can work with different cycle times, but these 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

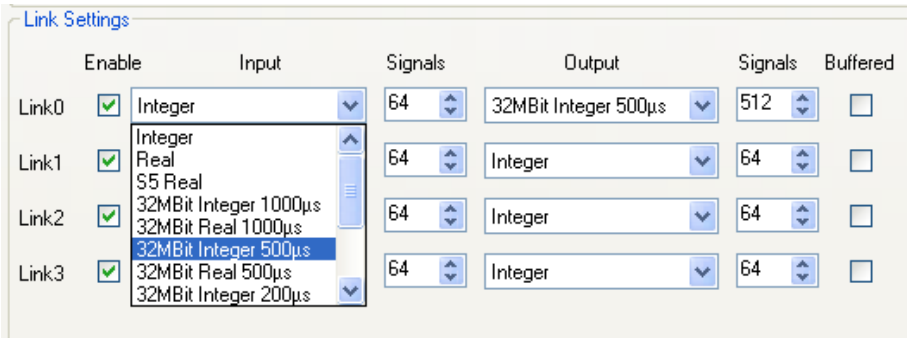
8.2.1 Peer-to-peer communication (stand alone)



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 I/O 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

In order to establish an FTP connection to the device proceed as follows:

1. Connect the device to the PC via an USB cable.

   The USB interface is located behind the plastic flap on the front of the *ibaNet750-BM-D* device.

   A USB cable of type A/Mini-B 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 GDSML file on the data medium "iba Software & Manuals" under

`\02_iba_Hardware\ibaNet750-BM-D\01_USB_Driver\`

→ After having installed successfully, an additional network connection is available with the device name "IBA AG USB Remote NDIS Network Device".

3. 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 subnet mask 255.255.255.0.

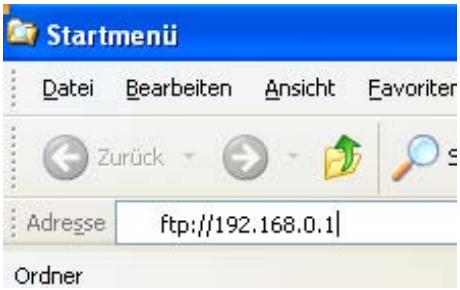
   Example:

   - IP: 192.168.0.2
   - SubNet: 255.255.255.0

4. Now, you can establish a FTP connection to the device. Use either a special 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`

5. Download the file `WagoSignals.txt` to your computer.
6. 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
```

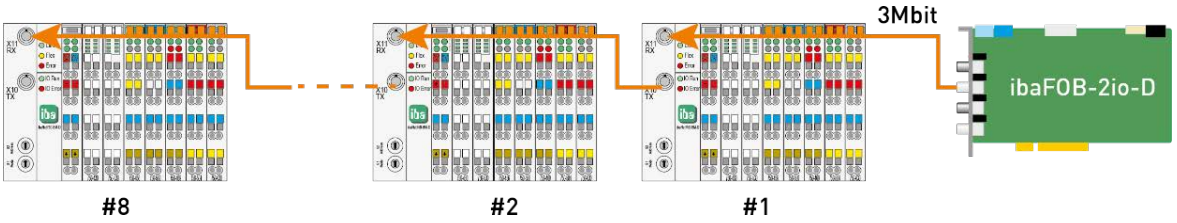
The list shows the order of the inputs and outputs used in the *ibaLogic* application.

8.3 System integration with 3Mbit

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

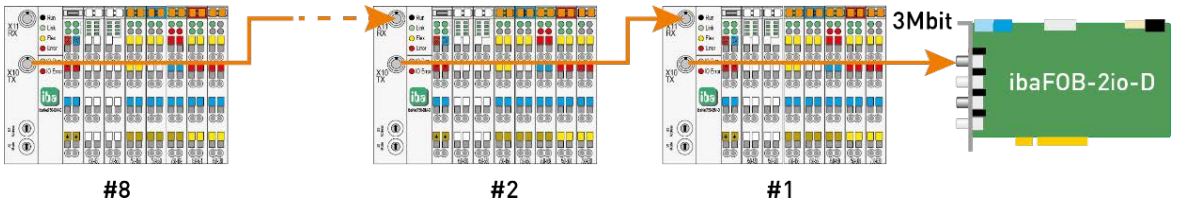
8.3.1 Line topology for outputs only

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 sym-metric to each other. All inputs and outputs of station 1 must have exactly matching out-puts/inputs on station 1' and vice versa) The devices update themselves automatically in a ring cycle of one millisecond.

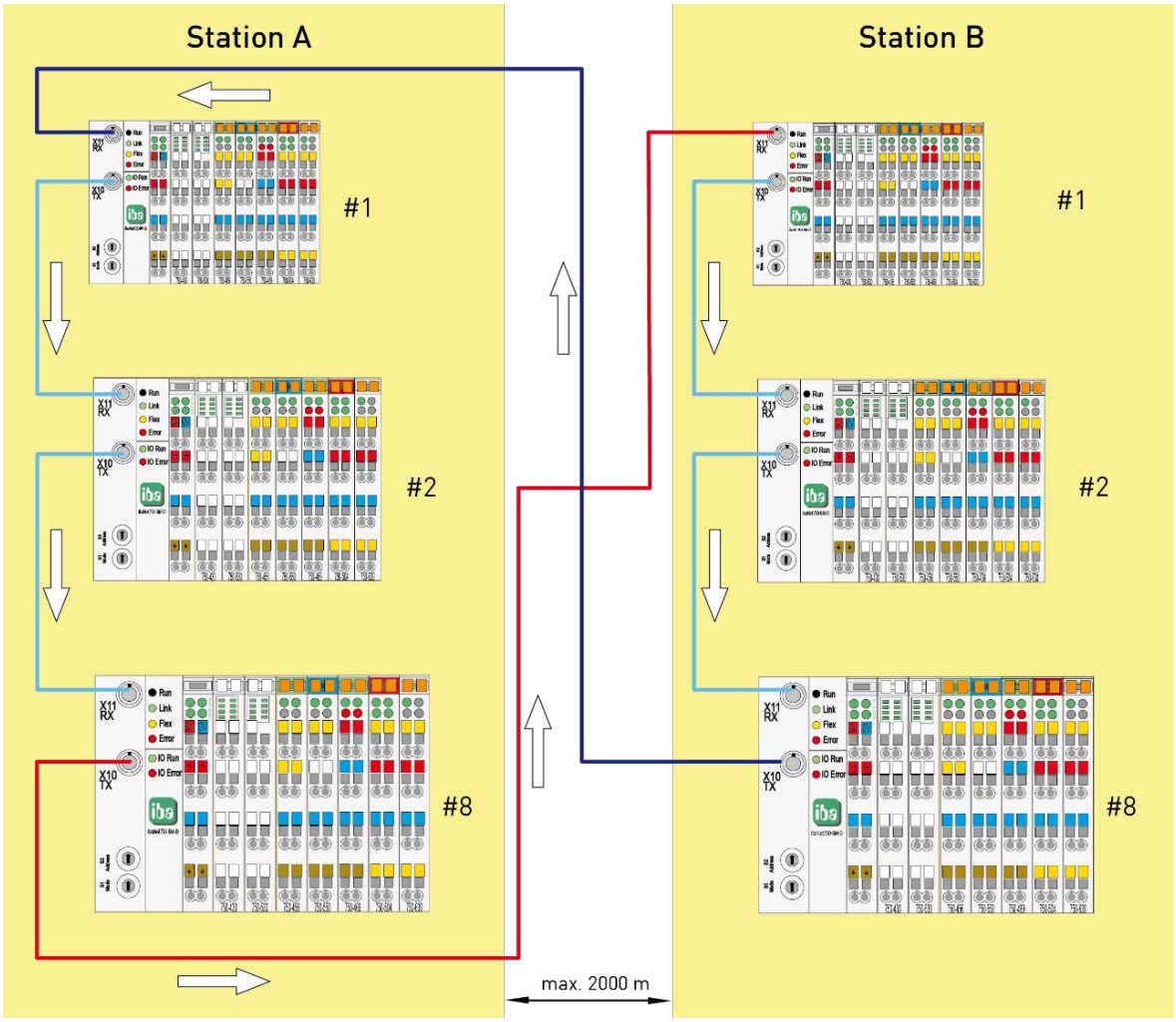
Note

Ring master and ring slaves

In order for the ring structure to be set up independently, any device within this ring must be operated in ring master mode (switch mode = 8 = ring master). This device initiates the start sequence of communication. The other devices can be operated in mode = 0 = Run or in mode = 1 = Monitored ring slave. Mode 1 ensures that the ring master can detect interruptions in the ring.

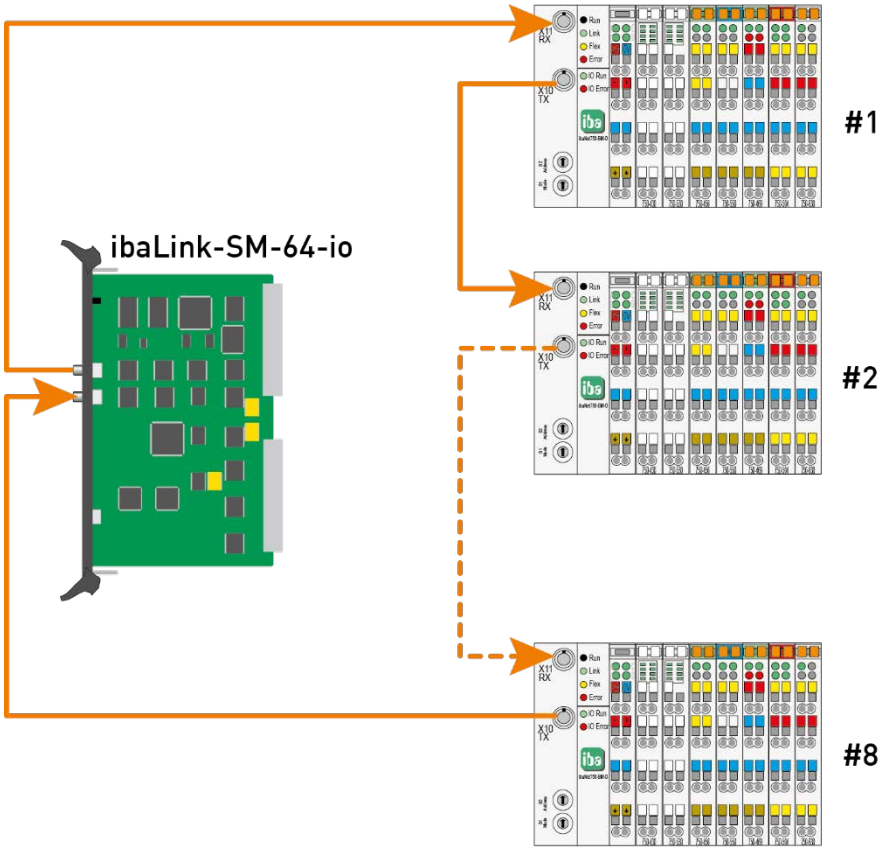
- Maximum length between devices shall not exceed 2 km (6500 ft., 1.24 mi)
- Up to 8 x 136 binary signals in each direction or
- 8 x (8 analog plus 8 binary signals) in each direction or any other valid device configuration.

- 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
- Operate all other devices in mode = 0 = run or 1 = monitored ring slave!



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).

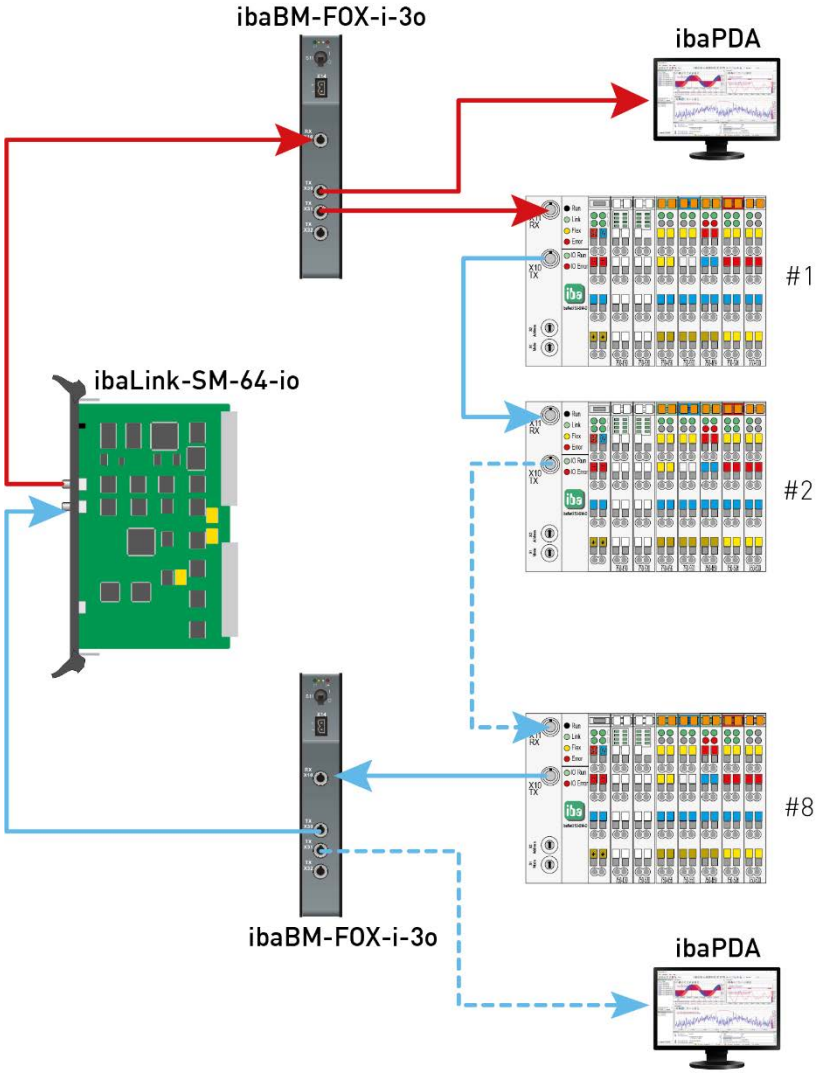


8.3.5 Redundant output of process values

With the help of the *ibaBM-FOX-i-3o* device, optical links may be multiplied (split) several times. This is possible at any point within the chain, i.e. also between *ibaNet750-BM-D* devices.

It is possible to generate a variety of different topologies. In addition to redundant output systems, the output chains can also be measured in parallel with the *ibaPDA* system by connecting the output of the fiber optic chain directly to the input of an *ibaFOB-D* card.

The following example shows how both output values and input values of an *ibaNet750-BM-D* ring can be measured in parallel on an *ibaLink-SM-64-io* module using two *ibaBM-FOX-i-3o* devices.



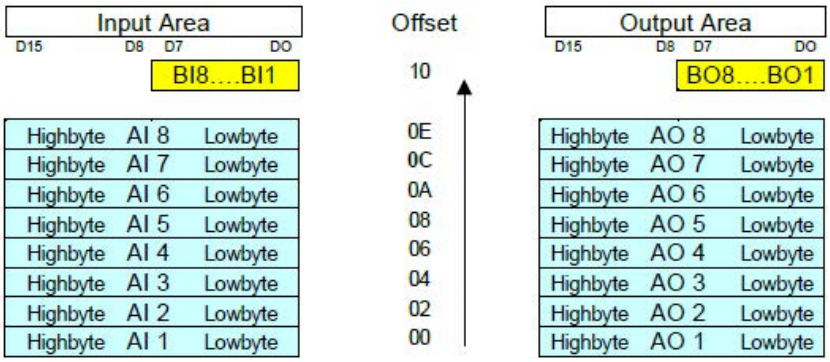
9 Address spaces

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

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: All rules apply analogously here, but within *ibaPDA* counting starts from 0, i.e. AE1 becomes AE0 and so on.

Enumeration rules:

Analog inputs (all examples for ibaLogic):

FOB-F M**y** Int **x** ;

where x is calculated:
x = Analog_chan_no + (device_address - 1) * 8

If the device has device address 2 and the 2nd 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 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 inputs D1..D8 are always in a fixed range and appear in *ibaLogic* sorted according to the device addresses as FOB-F M**y** Dig 01...08. (for device address 1 etc.)

However, more than 8 BI (also BO) can be operated per device. 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 I/O-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 I/O-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. That means that max 16 + 16 bytes can be used. This is true for the input and the output address space.

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 I/O modules are placed than there is address space available, the red LED (Error) of the *ibaNet750-BM-D* flashes.

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*.

Other documentation

This documentation 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 documentations for WAGO components are available for download at www.wago.com.

10.1 Supported terminals

ibaPDA currently supports the following terminals from WAGO and Beckhoff. Further terminals may have been added in later firmware versions. Terminals available from iba AG are listed with the iba order number.

Manufacturer	Original order no.	iba order no.	Description
	Digital inputs		
WAGO	750-1400		16 Channel Digital Input Terminal; 24 V DC; 3 ms; Positive Switching
WAGO	750-1405		16 Channel Digital Input Terminal; 24 V DC; 3 ms; Positive Switching
WAGO	750-1406		16 Channel Digital Input Terminal; 24 V DC; 0.2 ms; Positive Switching
WAGO	750-400	15.144000	2 Channel Digital Input Terminal; 24 V DC; 3 ms; Positive Switching
WAGO	750-401	15.144010	2 Channel Digital Input Terminal; 24 V DC; 0.2 ms; Positive Switching
WAGO	750-402	15.144020	4 Channel Digital Input Terminal; 24 V DC; 3 ms; Positive Switching

Manufacturer	Original order no.	iba order no.	Description
WAGO	750-402/ 025-000	15.144021	4 Channel Digital Input Terminal; 24 V DC; 3 ms; Positive Switching, extended temperature range
WAGO	750-403	15.144030	4 Channel Digital Input Terminal; 24 V DC; 0.2 ms; Positive Switching
WAGO	750-405	15.144050	2 Channel Digital Input Terminal; 230 V AC; 10 ms; Positive Switching
WAGO	750-406	15.144060	2 Channel Digital Input Terminal; 120 V AC; 10 ms; Positive Switching
WAGO	750-408	15.144080	4 Channel Digital Input Terminal; 24 V DC; 3 ms; Negative Switching
WAGO	750-409		4 Channel Digital Input Terminal; 24 V DC; 0.2 ms; Negative Switching
WAGO	750-410	15.144100	2 Channel Digital Input Terminal; 24 V DC; 3 ms; Positive Switching; 2-wire Proximity Sensor
WAGO	750-411		2 Channel Digital Input Terminal; 24 V DC; 0.2 ms; Positive Switching; 2-wire Proximity Sensor
WAGO	750-412	15.144120	2 Channel Digital Input Terminal; 48 V DC; 3 ms; Positive Switching
WAGO	750-414		4 Channel Digital Input Terminal; 5 V DC; 0.2 ms; Positive Switching
WAGO	750-415	15.144150	4 Channel Digital Input Terminal; 24 V (AC/DC); 20 ms; Negative Switching
WAGO	750-427		2 Channel Digital Input Terminal; 110 V DC; 3 ms; Positive/Negative Switching
WAGO	750-428		4 Channel Digital Input Terminal; 42 V (AC/DC); 20 ms; Positive Switching
WAGO	750-430	15.144300	8 Channel Digital Input Terminal; 24 V DC; 3 ms; Positive Switching
WAGO	750-431	15.144310	8 Channel Digital Input Terminal; 24 V DC; 0.2 ms; Positive Switching
WAGO	753-434		8 Channel Digital Input Terminal; 5/12 V DC; 0.2 ms; Positive Switching
Beckhoff	KL1408		8 Channel Digital Input Terminal; 24 V DC; 3 ms; Positive Switching
Beckhoff	KM1002		16 Channel Digital Input Terminal; 24 V DC; 3 ms; Positive Switching
Beckhoff	KM1004		32 Channel Digital Input Terminal; 24 V DC; 3 ms; Positive Switching
Beckhoff	KM1008		64 Channel Digital Input Terminal; 24 V DC; 3 ms; Positive Switching

Manufacturer	Original order no.	iba order no.	Description
Beckhoff	KM1012		16 Channel Digital Input Terminal; 24 V DC; 0.2 ms; Positive Switching
Beckhoff	KM1014		32 Channel Digital Input Terminal; 24 V DC; 0.2 ms; Positive Switching
Beckhoff	KM1018		64 Channel Digital Input Terminal; 24 V DC; 0.2 ms; Positive Switching
	Digital outputs		
WAGO	750-1500		16 Channel Digital Output Terminal; 24 V DC; 0.5 A; 1 kHz; Positive Switching; Ribbon cable
WAGO	750-1504		16 Channel Digital Output Terminal; 24 V DC; 0.5 A; 1 kHz; Positive Switching
WAGO	750-501	15.145010	2 Channel Digital Output Terminal; 24 V DC; 0.5 A; 5 kHz; Positive Switching
WAGO	750-502	15.145020	2 Channel Digital Output Terminal; 24 V DC; 2 A; 2.5 kHz; Positive Switching
WAGO	750-504	15.145040	4 Channel Digital Output Terminal; 24 V DC; 0.5 A; 1 kHz; Positive Switching
WAGO	750-506		2 Channel Digital Output Terminal; 24 V DC; 0.5 A; 5 kHz; Positive Switching; Diag
WAGO	750-507	15.145070	2 Channel Digital Output Terminal; 24 V DC; 2 A; 2.5 kHz; Positive Switching; Diag
WAGO	750-508		2 Channel Digital Output Terminal; 24 V DC; 2 A; 1 kHz; Positive Switching; Diag
WAGO	750-512	15.145120	2 Channel Digital Output Terminal; Relay; make contacts; 250 V AC / 30 V DC; 2 A; non-floating
WAGO	750-513	15.145130	2 Channel Digital Output Terminal; Relay; make contacts; 250 V AC / 30 V DC; 2 A; isolated outputs
WAGO	750-514	15.145140	2 Channel Digital Output Terminal; Relay; changeover contacts; 125 V AC / 30 V DC; 0.5 A / 1 A; 0.33 Hz; isolated outputs
WAGO	750-517	15.145170	2 Channel Digital Output Terminal; Relay; changeover contacts; 250 V AC / 300 V DC; 1 A / 0.15 A; 0.1 Hz; isolated outputs
WAGO	750-530	15.145300	8 Channel Digital Output Terminal; 24 V DC; 0.5 A; 2 kHz; Positive Switching
WAGO	750-531		4 Channel Digital Output Terminal; 24 V DC; 0.5 A; 1 kHz; Positive Switching
WAGO	750-532		4 Channel Digital Output Terminal; 24 V DC; 0.5 A; 2 kHz; Positive Switching; Diag
WAGO	750-537		8 Channel Digital Output Terminal; 24 V DC; 0.5 A; 1 kHz; Positive Switching; Diag

Manufacturer	Original order no.	iba order no.	Description
Beckhoff	KL2408		8 Channel Digital Output Terminal; 24 V DC; 0.5 A; Positive Switching
Beckhoff	KM2002		16 Channel Digital Output Terminal; 24 V DC; 0.5 A; Positive Switching
Beckhoff	KM2004		32 Channel Digital Output Terminal; 24 V DC; 0.5 A; Positive Switching
Beckhoff	KM2008		64 Channel Digital Output Terminal; 24 V DC; 0.5 A; Positive Switching
	Digital inputs and outputs		
WAGO	750-1506		8 Channel Digital Input/Output Terminal; 24 V DC; 0.5 A; 3 ms; 1 kHz; Positive Switching
	Analog inputs		
WAGO	750-452	15.144520	2 Channel Analog Input Terminal; 0 … 20 mA; Differential Input; 220 Ω;12 Bit; 2 ms
WAGO	750-453	15.144530	4 Channel Analog Input Terminal; 0 … 20 mA; Single Ended; 100 Ω; 12 Bit; 10 ms
WAGO	750-454	15.144540	2 Channel Analog Input Terminal; 4 … 20 mA; Differential Input; 220 Ω;12 Bit; 2 ms
WAGO	750-455	15.144550	4 Channel Analog Input Terminal; 4 … 20 mA; Single Ended; 100 Ω; 12 Bit; 10 ms
WAGO	750-456	15.144560	2 Channel Analog Input Terminal; ±10 V; Differential Input; 570 kΩ; 12 Bit; 2 ms
WAGO	750-457	15.144570	4 Channel Analog Input Terminal; ±10 V; Single Ended; 100 kΩ; 12 Bit; 10 ms
WAGO	750-459		4 Channel Analog Input Terminal; 0 … 10 V; Single Ended; 100 kΩ; 12 Bit; 10 ms
WAGO	750-460	15.144600	4 Channel Analog Input Terminal; RTD; PT100; 2-wire; Res. 0.1 °C; 250 ms
WAGO	750-460/000-003	15.144603	4 Channel Analog Input Terminal; RTD; PT1000; 2-wire; Res. 0.1 °C; 250 ms
WAGO	750-461	15.144610	2 Channel Analog Input Terminal; RTD; PT100; 3-wire; Res. 0.1 °C; 320 ms
WAGO	750-461/000-003	15.144613	2 Channel Analog Input Terminal; RTD; PT1000; 3-wire; Res. 0.1 °C; 320 ms
WAGO	750-465	15.144650	2 Channel Analog Input Terminal; 0 … 20 mA; Single Ended; 220 Ω; 12 Bit; 2 ms
WAGO	750-466	15.144660	2 Channel Analog Input Terminal; 4 … 20 mA; Single Ended; 220 Ω; 12 Bit; 2 ms
WAGO	750-467	15.144670	2 Channel Analog Input Terminal; 0 … 10 V; Single Ended; 130 kΩ; 12 Bit; 2 ms

Manufacturer	Original order no.	iba order no.	Description
WAGO	750-468		4 Channel Analog Input Terminal; 0 … 10 V; Single Ended; 133 kΩ; 12 Bit; 4 ms
WAGO	750-469	15.144690	2 Channel Analog Input Terminal; Thermocouple, Type K; 2-wire; Res. 0.1 °C; 320 ms; Diag
WAGO	750-469/ 000-006	15.144696	2 Channel Analog Input Terminal; Thermocouple, Type J; 2-wire; Res. 0.1 °C; 320 ms; Diag
WAGO	750-472		2 Channel Analog Input Terminal; 0 … 20 mA; Single Ended; 220 Ω; 15 Bit; 80 ms
WAGO	750-473		2 Channel Analog Input Terminal; 4 … 20 mA; Single Ended; 160 Ω; 12 Bit; 80 ms
WAGO	750-474		2 Channel Analog Input Terminal; 4 … 20 mA; Single Ended; 220 Ω; 15 Bit; 80 ms
WAGO	750-475	15.144750	2 Channel Analog Input Terminal; 0 … 1 A (AC/DC); Differential Input; 22 mΩ; 15 Bit; 200 ms
WAGO	750-476		2 Channel Analog Input Terminal; ±10 V; Single Ended; 130 kΩ; 16 Bit; 80 ms
WAGO	750-477		2 Channel Analog Input Terminal; 0 … 10 V (AC/DC); Differential Input; 120 kΩ; 15 Bit; 200 ms
WAGO	750-478		2 Channel Analog Input Terminal; 0 … 10 V; Single Ended; 130 kΩ; 16 Bit; 80 ms
WAGO	750-479	15.144790	2 Channel Analog Input Terminal; ±10 V; Differential Input; 1 MΩ; 14 Bit; SAR 1 ms
WAGO	750-480		2 Channel Analog Input Terminal; 0 … 20 mA; Differential Input; 270 Ω; 13 Bit; SAR 1 ms
WAGO	750-483		2 Channel Analog Input Terminal; 0 … 30 V; Differential Input; 1 MΩ; 14 Bit; SAR 1 ms
WAGO	750-491	15.144910	1 Channel Analog Input Terminal; DMS (Resistance Jumpers); 16 Bit; 500 ms
WAGO	750-491/ 000-001	15.144911	1 Channel Analog Input Terminal; DMS (Resistance Jumpers); 16 Bit; 125 ms
WAGO	750-492		2 Channel Analog Input Terminal; 4 … 20 mA; Differential Input; 270 Ω; 13 Bit; SAR 1 ms
Beckhoff	KL3001		1 Channel Analog Input Terminal; ±10 V; Differential Input; >200 kΩ; 12 Bit; 1 ms
Beckhoff	KL3002		2 Channel Analog Input Terminal; ±10 V; Differential Input; >200 kΩ; 12 Bit; 2 ms
Beckhoff	KL3011		1 Channel Analog Input Terminal; 0 … 20 mA; Differential Input; 80 Ω; 12 Bit; 1 ms
Beckhoff	KL3012		2 Channel Analog Input Terminal; 0 … 20 mA; Differential Input; 80 Ω; 12 Bit; 2 ms

Manufacturer	Original order no.	iba order no.	Description
Beckhoff	KL3021		1 Channel Analog Input Terminal; 4 … 20 mA; Differential Input; 80 Ω; 12 Bit; 1 ms
Beckhoff	KL3022		2 Channel Analog Input Terminal; 4 … 20 mA; Differential Input; 80 Ω; 12 Bit; 2 ms
Beckhoff	KL3041		1 Channel Analog Input Terminal; 0 … 20 mA; Single Ended; 80 Ω; 12 Bit; 1 ms
Beckhoff	KL3042		2 Channel Analog Input Terminal; 0 … 20 mA; Single Ended; 80 Ω; 12 Bit; 2 ms
Beckhoff	KL3044		4 Channel Analog Input Terminal; 0 … 20 mA; Single Ended; 80 Ω; 12 Bit; 4 ms
Beckhoff	KL3051		1 Channel Analog Input Terminal; 4 … 20 mA; Single Ended; 80 Ω; 12 Bit; 1 ms
Beckhoff	KL3052		2 Channel Analog Input Terminal; 4 … 20 mA; Single Ended; 80 Ω; 12 Bit; 2 ms
Beckhoff	KL3054		4 Channel Analog Input Terminal; 4 … 20 mA; Single Ended; 80 Ω; 12 Bit; 4 ms
Beckhoff	KL3061		1 Channel Analog Input Terminal; 0 … 10 V; Single Ended; >200 kΩ; 12 Bit; 1 ms
Beckhoff	KL3062		2 Channel Analog Input Terminal; 0 … 10 V; Single Ended; >200 kΩ; 12 Bit; 2 ms
Beckhoff	KL3064		4 Channel Analog Input Terminal; 0 … 10 V; Single Ended; >200 kΩ; 12 Bit; 4 ms
Beckhoff	KL3102		2 Channel Analog Input Terminal; ±10 V; Differential Input; >200 kΩ; 16 Bit; 140 ms; 50 Hz
Beckhoff	KL3112		2 Channel Analog Input Terminal; 0 … 20 mA; Differential Input; 50/60 Ω; 15 Bit; 140 ms; 50 Hz
Beckhoff	KL3122		2 Channel Analog Input Terminal; 4 … 20 mA; Differential Input; 50/60 Ω; 15 Bit; 140 ms; 50 Hz
Beckhoff	KL3201		1 Channel Analog Input Terminal; RTD; PT100; 3-wire; Res. 0.1 °C; 200 ms
Beckhoff	KL3202		2 Channel Analog Input Terminal; RTD; PT100; 3-wire; Res. 0.1 °C; 250 ms
Beckhoff	KL3204		4 Channel Analog Input Terminal; RTD; PT100; 2-wire; Res. 0.1 °C; 250 ms
Beckhoff	KL3311		1 Channel Analog Input Terminal; Thermocouple, Type K; 2-wire; Res. 0.1 °C; 200 ms
Beckhoff	KL3312		2 Channel Analog Input Terminal; Thermocouple, Type K; 2-wire; Res. 0.1 °C; 250 ms
Beckhoff	KL3314		4 Channel Analog Input Terminal; Thermocouple, Type K; 2-wire; Res. 0.1 °C; 250 ms

Manufacturer	Original order no.	iba order no.	Description
	Analog outputs		
WAGO	750-550	15.145500	2 Channel Analog Output Terminal; 0 ... 10 V; Single Ended; ≥5 kΩ; 12 Bit; 2 ms
WAGO	750-552	15.145520	2 Channel Analog Output Terminal; 0 … 20 mA; Single Ended; ≤600 Ω; 12 Bit; 2 ms
WAGO	750-554	15.145540	2 Channel Analog Output Terminal; 4 … 20 mA; Single Ended; ≤600 Ω; 12 Bit; 2 ms
WAGO	750-555	15.145550	4 Channel Analog Output Terminal; 4 … 20 mA; Single Ended; ≤600 Ω; 12 Bit; 10 ms
WAGO	750-556	15.145560	2 Channel Analog Output Terminal; ±10 V; Single Ended; ≥5 kΩ; 12 Bit; 2 ms
WAGO	750-557	15.145570	4 Channel Analog Output Terminal; ±10 V; Single Ended; ≥5 kΩ; 12 Bit; 10 ms
WAGO	750-559		4 Channel Analog Output Terminal; 0 … 10 V; Single Ended; ≥5 kΩ; 12 Bit; 10 ms
WAGO	750-585		2 Channel Analog Output Terminal; 0 … 20 mA; Single Ended; ≤500 Ω; 12 Bit; 2 ms; Ex i
Beckhoff	KL4001		1 Channel Analog Output Terminal; 0 ... 10 V; Single Ended; >5 kΩ; 12 Bit; 1.5 ms
Beckhoff	KL4002		2 Channel Analog Output Terminal; 0 ... 10 V; Single Ended; >5 kΩ; 12 Bit; 1.5 ms
Beckhoff	KL4004		4 Channel Analog Output Terminal; 0 ... 10 V; Single Ended; >5 kΩ; 12 Bit; 2 ms
Beckhoff	KL4011		1 Channel Analog Output Terminal; 0 ... 20 mA; Single Ended; <500 Ω; 12 Bit; 1.5 ms
Beckhoff	KL4012		2 Channel Analog Output Terminal; 0 ... 20 mA; Single Ended; <500 Ω; 12 Bit; 1.5 ms
Beckhoff	KL4021		1 Channel Analog Output Terminal; 4 ... 20 mA; Single Ended; <500 Ω; 12 Bit; 1.5 ms
Beckhoff	KL4022		2 Channel Analog Output Terminal; 4 ... 20 mA; Single Ended; <500 Ω; 12 Bit; 1.5 ms
Beckhoff	KL4031		1 Channel Analog Output Terminal; ±10 V; Single Ended; >5 kΩ; 12 Bit; 1.5 ms
Beckhoff	KL4032		2 Channel Analog Output Terminal; ±10 V; Single Ended; >5 kΩ; 12 Bit; 1.5 ms
Beckhoff	KL4034		4 Channel Analog Output Terminal; ±10 V; Single Ended; >5 kΩ; 12 Bit; 2 ms
Beckhoff	KL4112		2 Channel Analog Output Terminal; 0 ... 20 mA; Single Ended; <500 Ω; 15 Bit; 3.5 ms
Beckhoff	KL4132		2 Channel Analog Output Terminal; ±10 V; Single Ended; >5 kΩ; 16 Bit; 1.5 ms

Manufacturer	Original order no.	iba order no.	Description
Beckhoff	KL4404		4 Channel Analog Output Terminal; 0 ... 10 V; Single Ended; >5 kΩ; 12 Bit; 4 ms
	Complex terminals		
WAGO	750-404		Up/Down Counter; 24 V DC
WAGO	750-404/000-001	15.144041	Up Counter; 24 V DC; Release Input
WAGO	750-404/000-003	15.144043	Frequency Counter; 24 V DC
WAGO	750-404/000-004		Up/Down Counter; 24 V DC; Switching Output
WAGO	750-630	15.146300	SSI-Interface
WAGO	750-631/000-004	15.146310	Incremental Encoder; 5 V DC; Differential Input; RS422; 16 Bit
WAGO	750-637	15.146370	Incremental Encoder; 24 V DC; Differential Input; RS422; 32 Bit
	Configurable terminals		
WAGO	750-494	15.144940	3-Phase Power Measurement Module; 480 V AC / 1 A
WAGO	750-494/000-001	15.144941	3-Phase Power Measurement Module; 480 V AC / 5 A
WAGO	750-494/000-005		3-Phase Power Measurement Module; 480 V AC / ext. Shunts
WAGO	750-494/025-000		3-Phase Power Measurement Module; 480 V AC / 1 A; extended temperature range
WAGO	750-494/025-001		3-Phase Power Measurement Module; 480 V AC / 5 A; extended temperature range
WAGO	750-495	15.144950	3-Phase Power Measurement Module; 690 V AC / 1 A
WAGO	750-495/000-001	15.144951	3-Phase Power Measurement Module; 690 V AC / 5 A
WAGO	750-495/000-002		3-Phase Power Measurement Module; 690 V AC / Rogowski-Coils
WAGO	750-495/040-000		3-Phase Power Measurement Module; 690 V AC / 1 A; extended temperature range
WAGO	750-495/040-001		3-Phase Power Measurement Module; 690 V AC / 5 A; extended temperature range
WAGO	750-495/040-002		3-Phase Power Measurement Module; 690 V AC / Rogowski-Coils; extended temperature range
	Other terminals		
WAGO	750-600	15.146000	End Module
WAGO	750-602	15.146020	Supply Module; Field; 24 V DC
WAGO	750-603		Supply Module; Field; 8x 24 V DC

Manufac-turer	Original order no.	iba order no.	Description
WAGO	750-604		Supply Module; Field; 8x 0 V DC
WAGO	750-610	15.146100	Supply Module; Field; 24 V DC; Fuse Holder; Diag
WAGO	750-612	15.146120	Supply Module; Field; 230 V (AC/DC)
WAGO	750-613		Supply Module; System/Field; 24 V DC
WAGO	750-614	15.146140	Supply/Distribution Module; Field; 230 V (AC/DC)
WAGO	750-623		Supply Module; System/Field; 5 … 15 V DC
WAGO	750-624		Supply/Filter Module; Field; 24 V DC
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

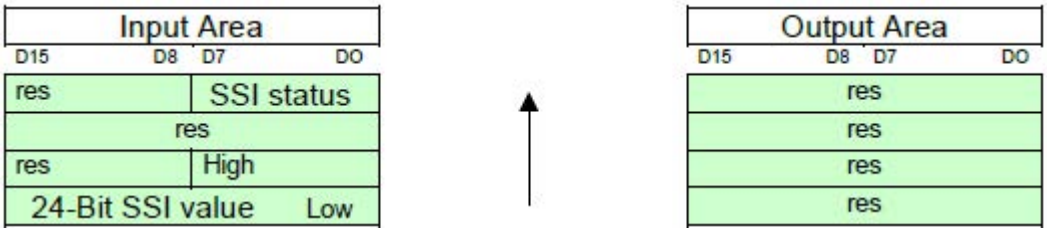
When the device is used in 3Mbit or 32Mbit mode, observe the following description.

10.2.1 SSI Terminal (WAGO module -630)

This terminal is also supported in the so-called ECO mode of the *ibaNet750-BM-D*, see ↗ *Rotary switch S1 (device mode)*, page 20.

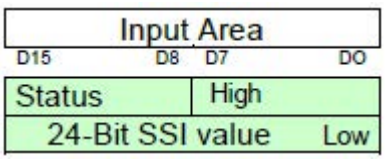
Normal mode operation

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



ECO mode operation

Needed memory: 4 bytes input

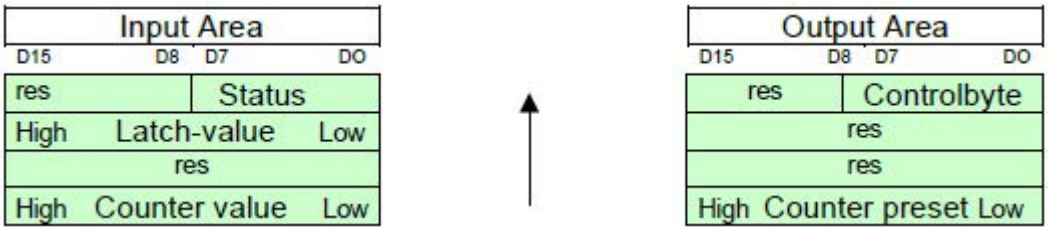


10.2.2 Incremental encoder terminal (WAGO module -631)

This terminal is also supported in the so-called ECO mode of the *ibaNet750-BM-D*, see ↗ *Rotary switch S1 (device mode)*, page 20.

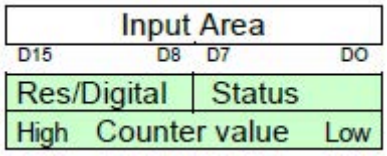
Normal mode operation

Needed memory: 8 bytes input and 8 bytes output



ECO mode operation

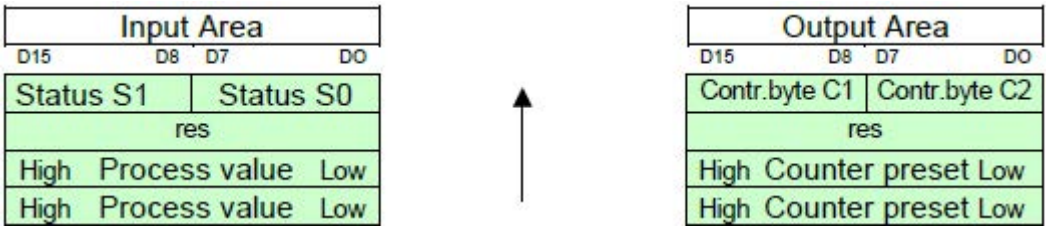
Needed memory: 4 bytes input



Note: 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 -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 ↗ *Main data*, page 67, and on the update times of the process data of the terminal and the measured values in *ibaPDA*.

Note

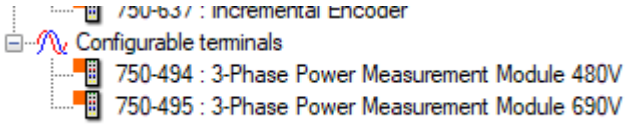
Restrictions when operating with *ibaNet750-BM-D*

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

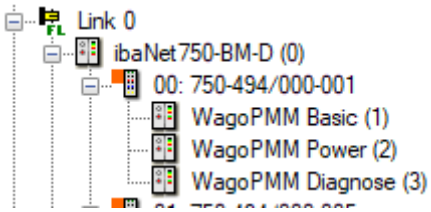
- Only the measured values of the AC measured value collections are transmitted.
- Measured values of the harmonic analyses (harmonic measured values) for both terminal types, but also the DC measured values for the WAGO750-494 terminal, are omitted.

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

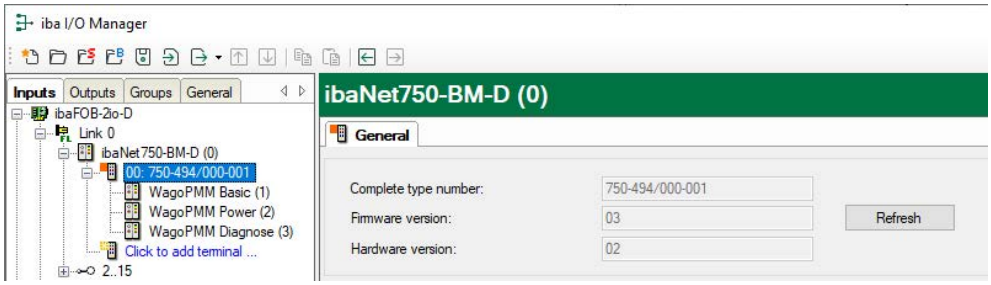
- 3-Phase Power Measurement Module 480V
- 3-Phase Power Measurement Module 690V



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.



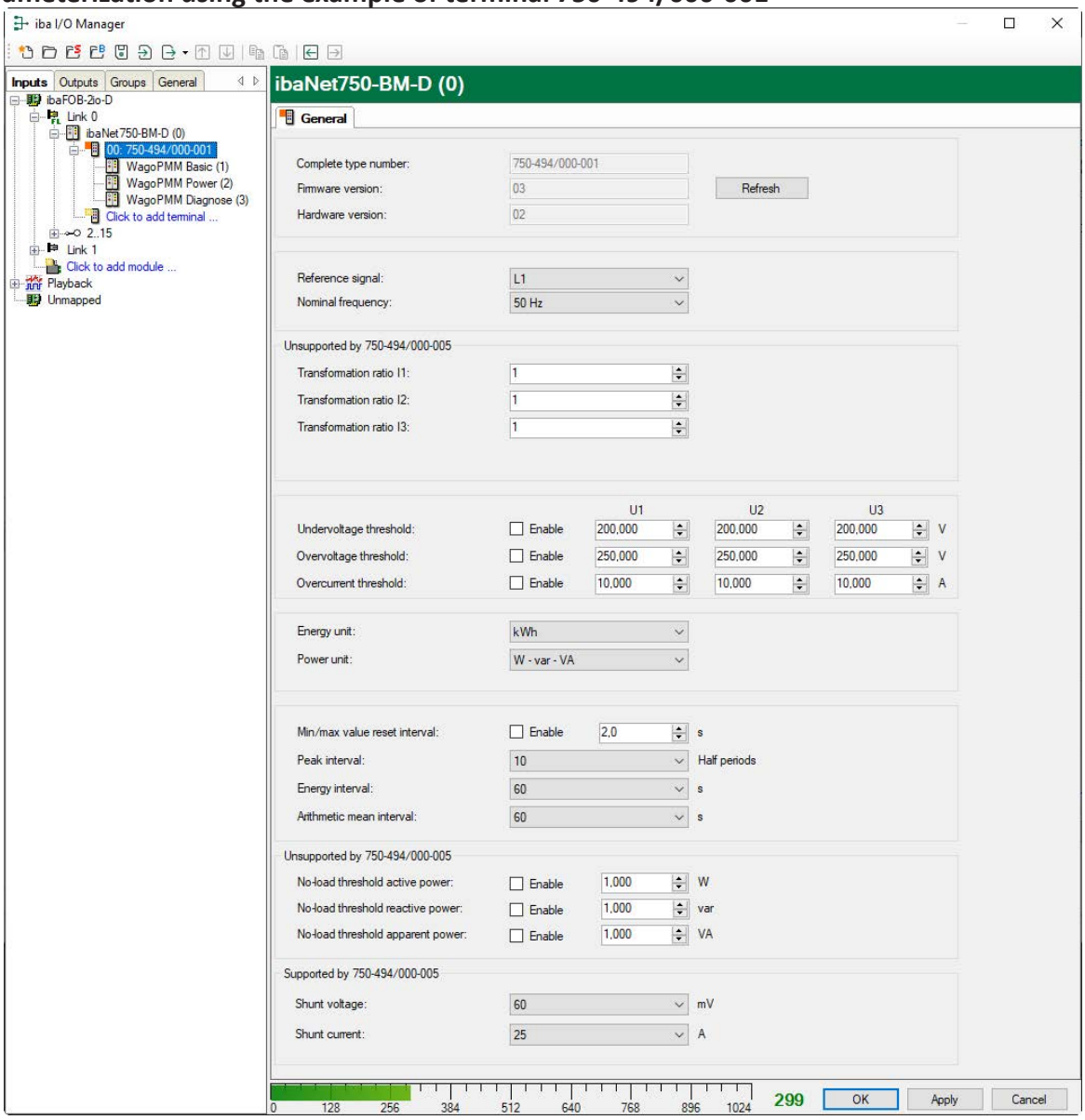
In addition to the detection of the terminal type, the firmware and hardware versions are also detected and displayed in the *General* tab.



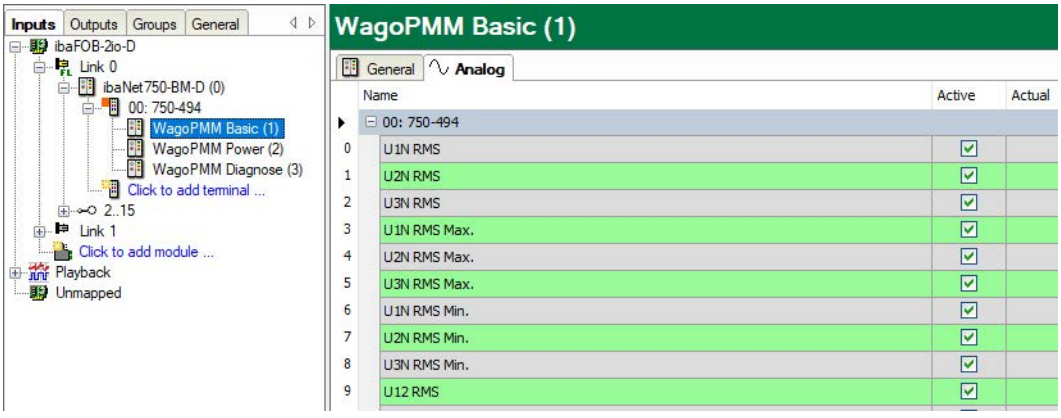
Via <Refresh> you can also read this information directly from the terminal at any time.

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

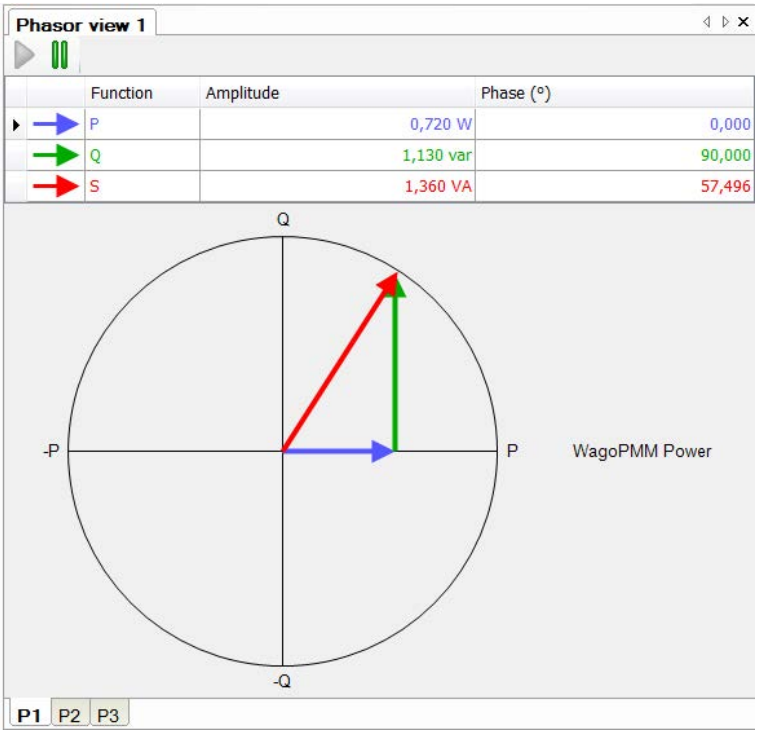
Parameterization using the example of terminal 750-494/000-001



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



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 *ibaNet750-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.

Note

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

Since the measured values are retrieved from the terminals serially via the K-bus, the update time of the measured values in *ibaPDA* depends on the number of values to be transmitted. The more values are to be transferred, the longer the K-bus cycle time takes (see also ↗ *Main data*, page 67).

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, measured value collection and process data update, please refer to the original WAGO documentation.

Data sheets and manuals for WAGO components are available for download at www.wago.com.

10.4 Example configurations

Note

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

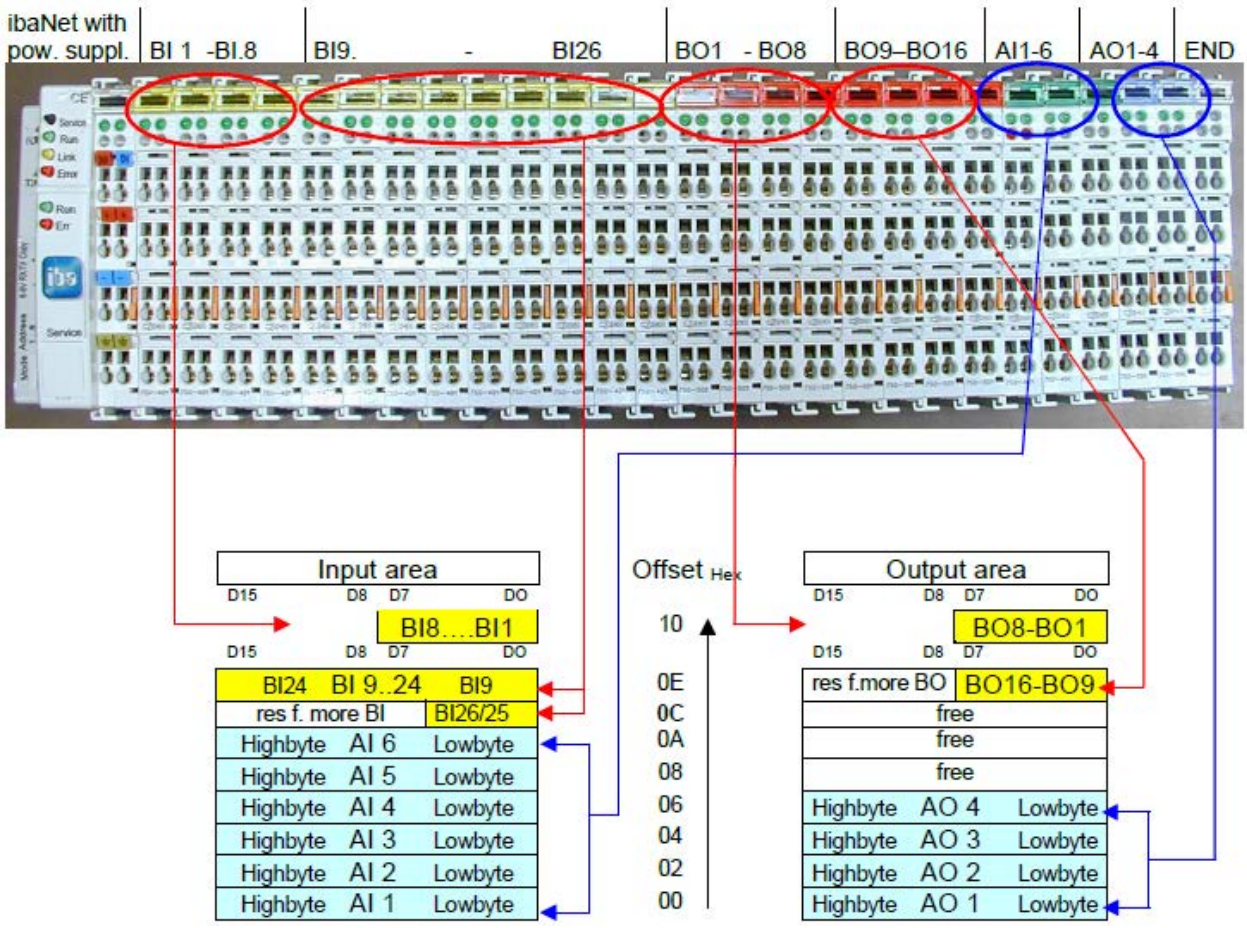
Note

Terminal characteristics

Please refer to the manufacturer's original manuals for more information Further information can be found there, e.g. on the topics of rooting with the aid of additional feed terminals, looping through of potential terminals, connection technology, etc.

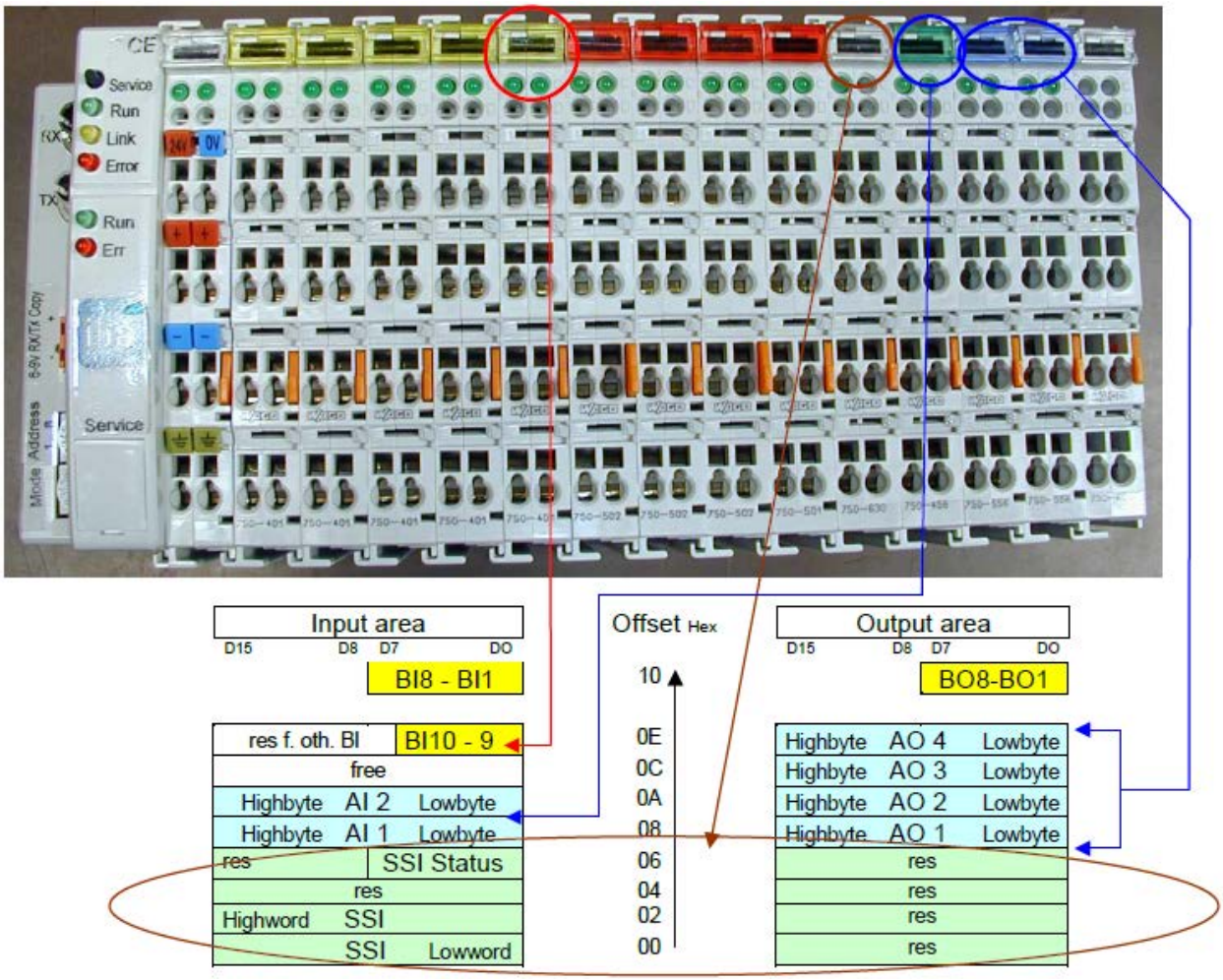
10.4.1 Analog and digital terminals

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



This results in the above memory distribution!

11 Configuration in ibaPDA

With *ibaPDA*, you can configure, capture and record 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 ↗ *Rotary switch S1 (device mode)*, page 20 and ↗ *Rotary switch S2 (address)*, page 21.

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, see ↗ *Configurable terminals*, page 44.

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

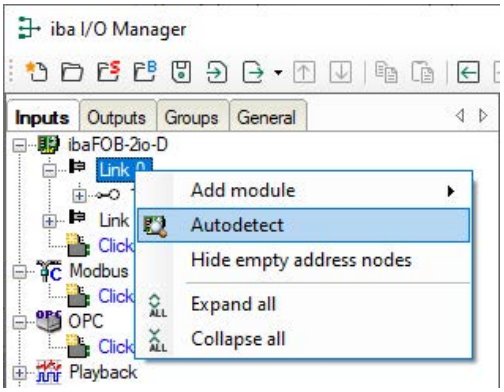
11.1.1 First steps for configuration in ibaPDA

Proceed as follows for the basic configuration of the terminals.

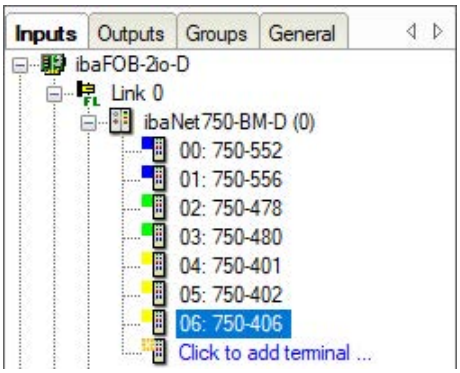
1. Start *ibaPDA* and open the I/O Manager.
2. In the signal tree (left), select the link of the *ibaFOB-D* card to which *ibaNet750-BM-D* is connected.
3. Right-click the link.

→ A submenu opens.

4. Select *Autodetect*.

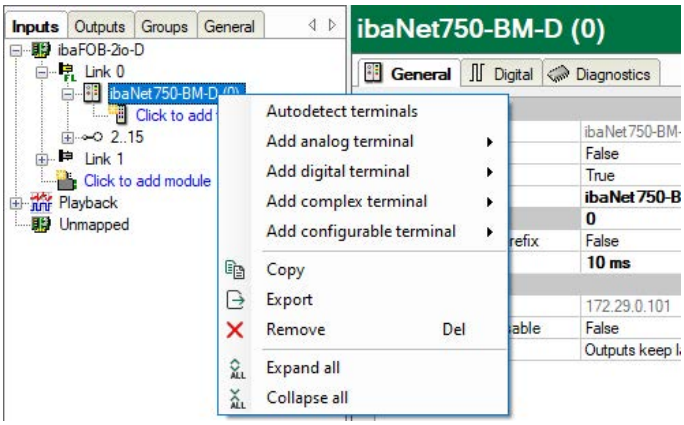


→ *ibaPDA* detects the device automatically, the device and the connected modules are listed in the module tree.



5. You can apply a subsequent modification of the configuration by clicking on “Auto-detect terminals” in the *General* tab or by right-clicking *Autodetect terminals* in the context menu of the *ibaNet750-BM-D* module.

or

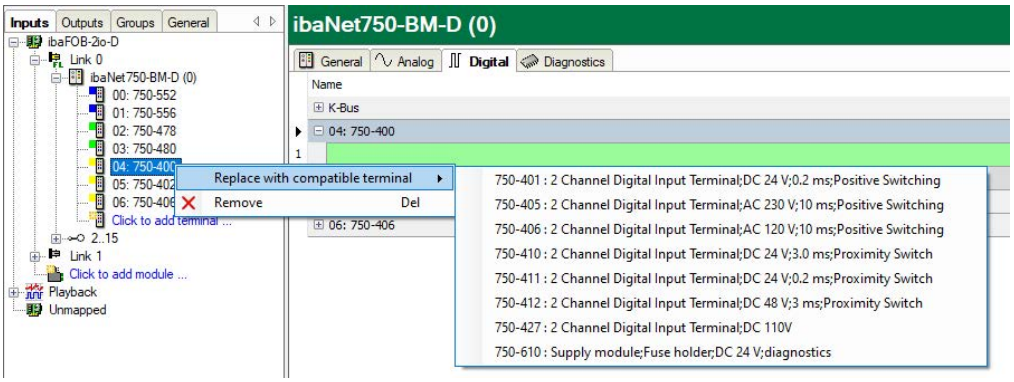


→ The connected terminals will be recognized and listed automatically.

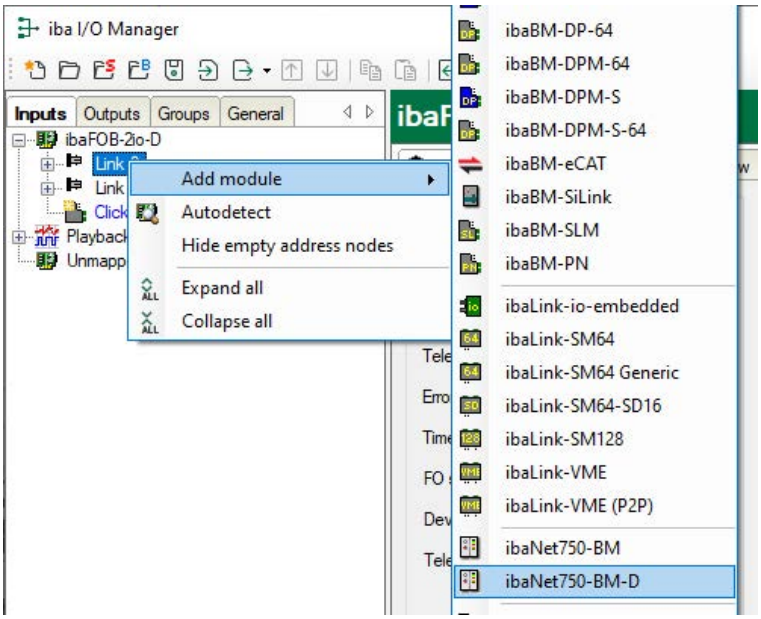
Note

The 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.



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



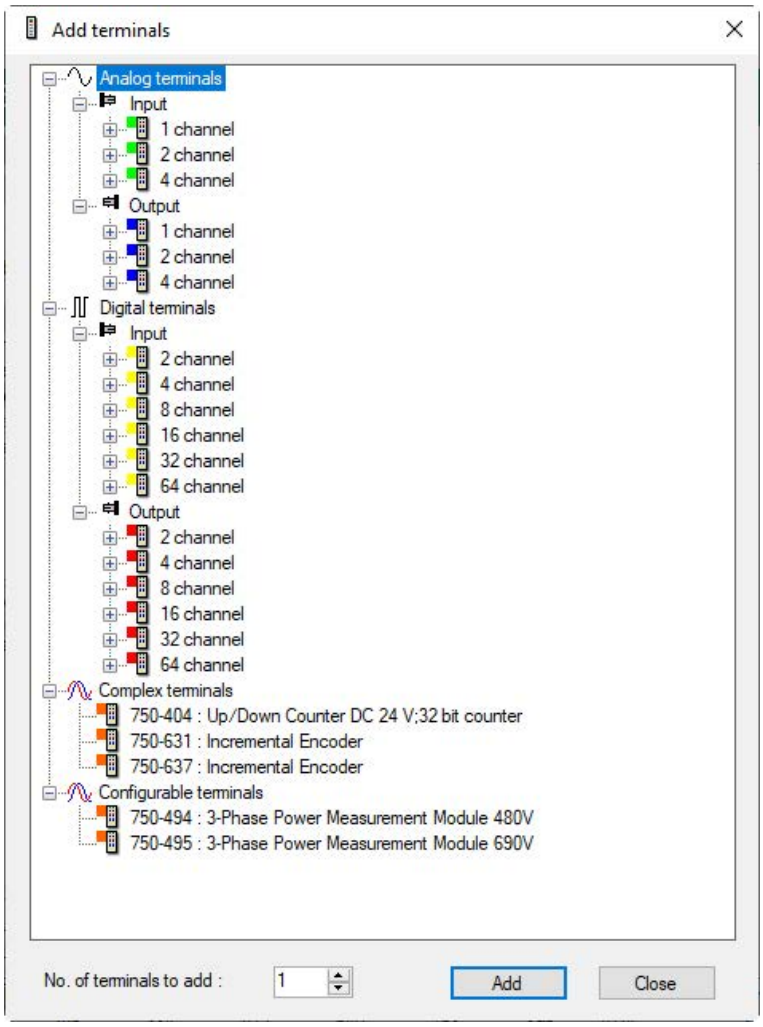
→ The device is displayed in the module tree.

8. 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 corresponds to address 1 – 15.

9. Click on the link “Click to add terminal ...”.

→ A selection window opens.



10. 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.
11. When a terminal shall be added several times, enter the desired number in the field *No. of terminals to add*. The terminal is added as often as specified.

Note

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

12. Finish the terminal selection with <Close>.
13. Configure *ibaNet750-BM-D* and the connected terminals, e.g. giving names, see ↗ *ibaNet750-BM-D – General tab*, page 54.

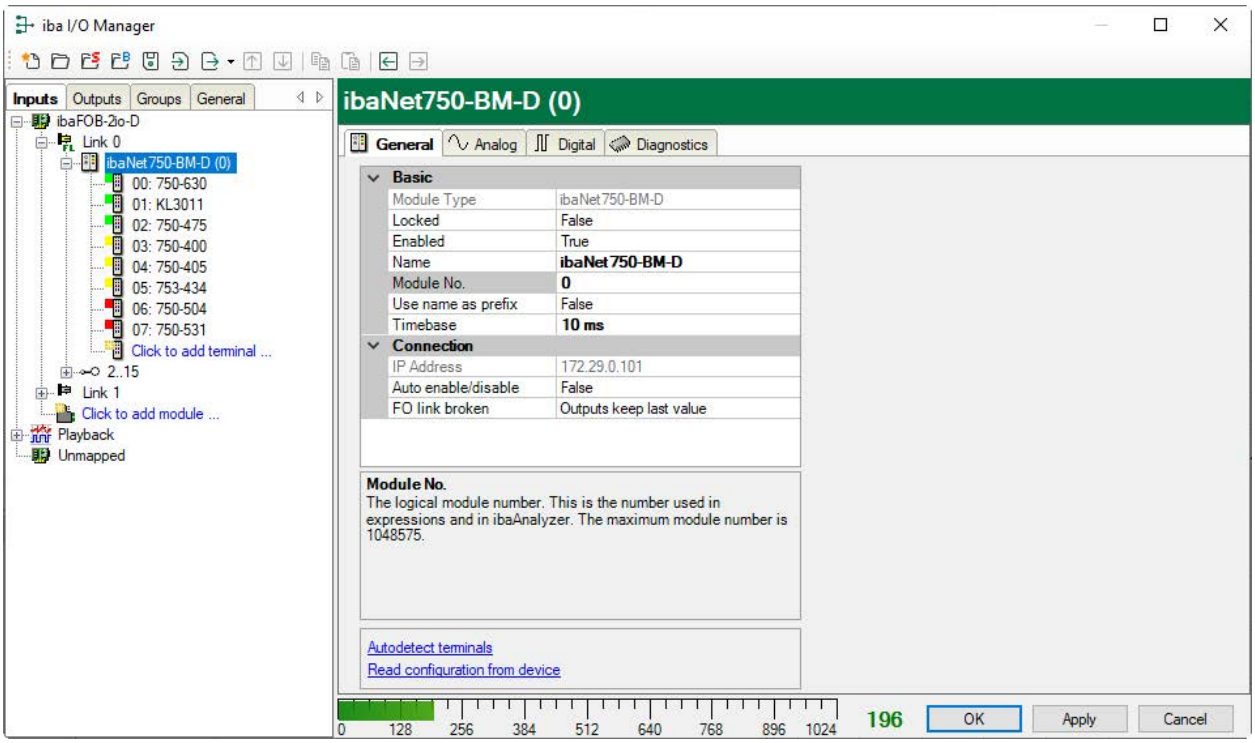
    The signal tables for the analog and digital signals are adjusted automatically for each terminal type..
14. Click on <Apply> or <OK> in order to write the configuration to the device.

11.1.2 Modules in the Inputs area

The device module and the signal tables are described below.

11.1.2.1 ibaNet750-BM-D – General tab

In the *General* tab, you can make the basic settings and connection settings.



Basic settings

Module Type (information only)
Indicates the type of the current module.

Locked
You can lock a module to avoid unintentional or unauthorized changing of the module settings.

Enabled
Enable the module to record signals.

Name
You can enter a name for the module here.

Module No.
This internal reference number of the module determines the order of the modules in the signal tree of *ibaPDA* client and *ibaAnalyzer*.

Use module name as prefix
This option puts the module name in front of the signal names.

Timebase
All signals of the module are sampled on this timebase.

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*.

If each cycle is to be recorded, iba recommends that the time base for *ibaPDA* should not be more than half the maximum cycle time. It is always the current 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 the value is TRUE, the data acquisition is started even though the device is missing. The missing device is temporarily disabled in the configuration. During the measurement process, *ibaPDA* tries to re-establish the connection to the missing device. If this is successful, the measurement is restarted automatically including the device that has been missing.

If the value is FALSE, the measurement will not be started, in case *ibaPDA* cannot establish a connection to the device.

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

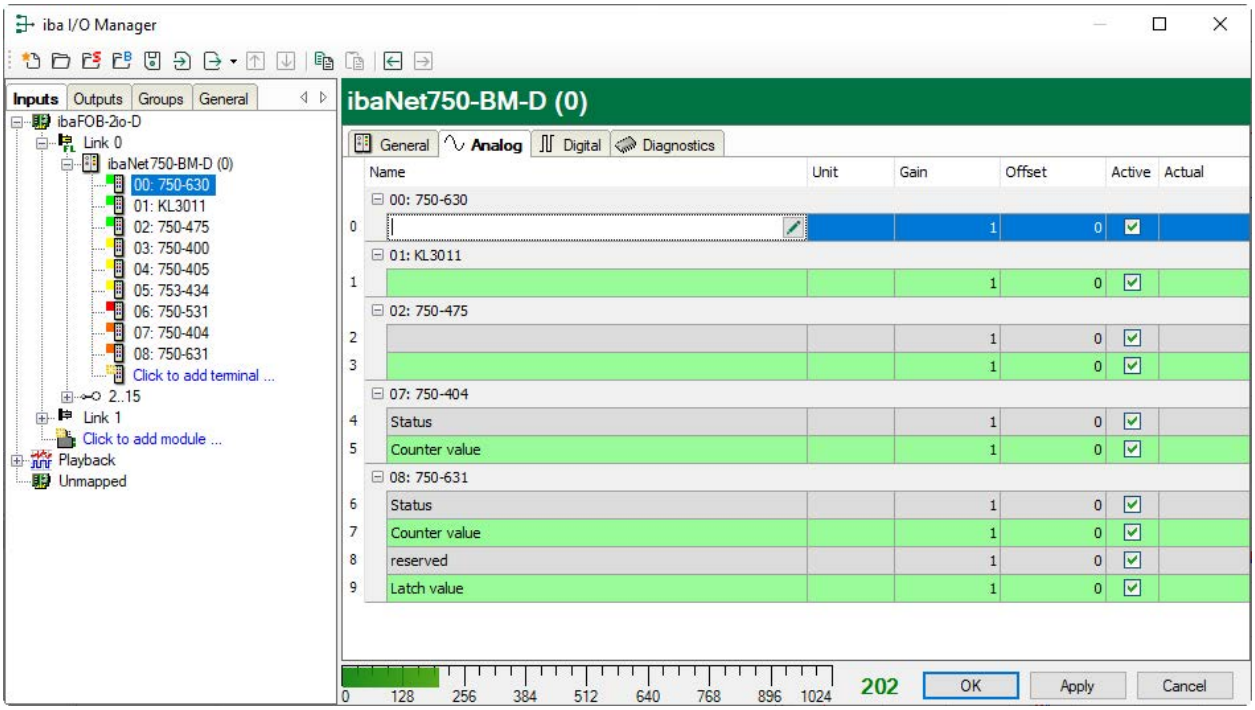
Autodetect terminals
The connected terminals will be detected automatically

Read configuration from device
Reads the configuration stored most recently from the device.

Modified settings are applied 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.

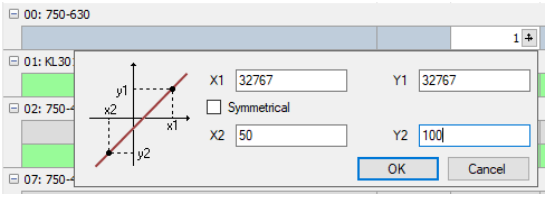


Name
The WAGO terminal number is automatically applied. One row per channel is displayed. You can enter a signal name and additionally two comments when clicking on the  symbol in the *Name* field.

Unit
Here you can enter the physical unit of the analog value.

Gain/Offset
Gradient (gain) and y-intercept (offset) of a linear equation. This allows you to convert a standardized, unit-free transmitted value into a physical value.

For making the calculation of Gain/Offset easier, an auxiliary dialog appears when clicking on the co-ordinate cross icon 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.



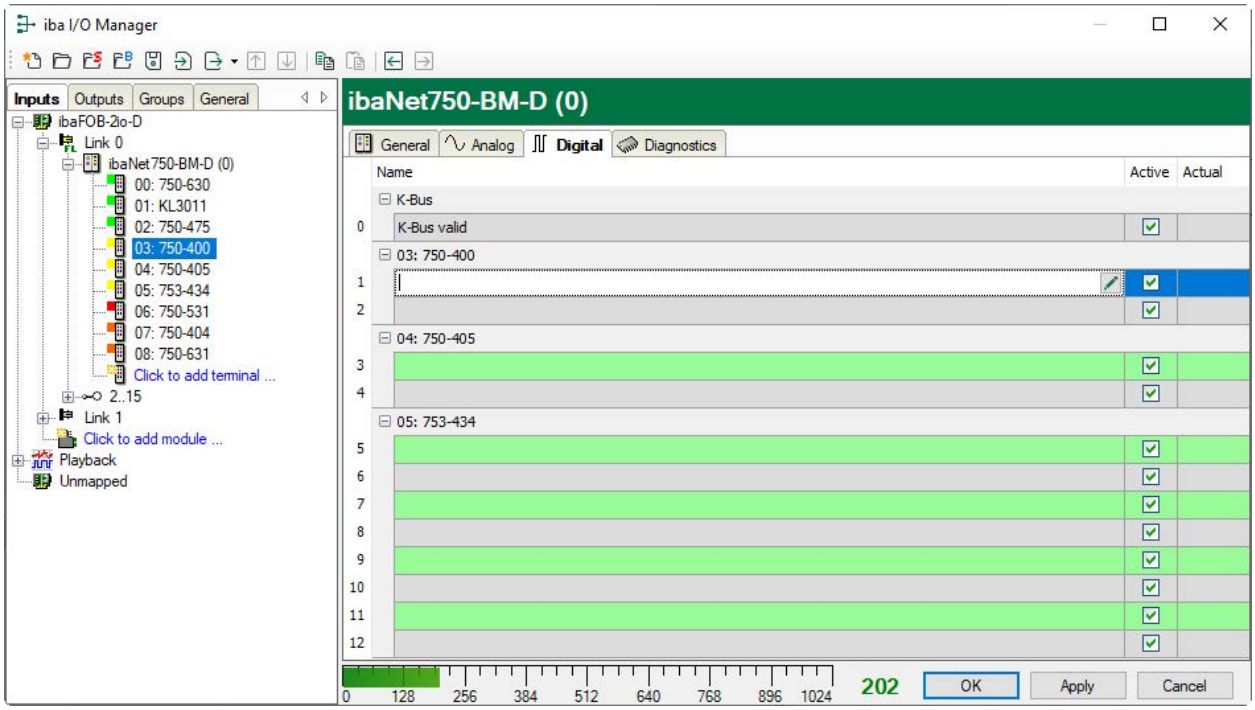
Active
Enabling/disabling the signal

Actual
The actual measured value is displayed here.

You can display or hide further columns using the context menu (right-click in the header line).

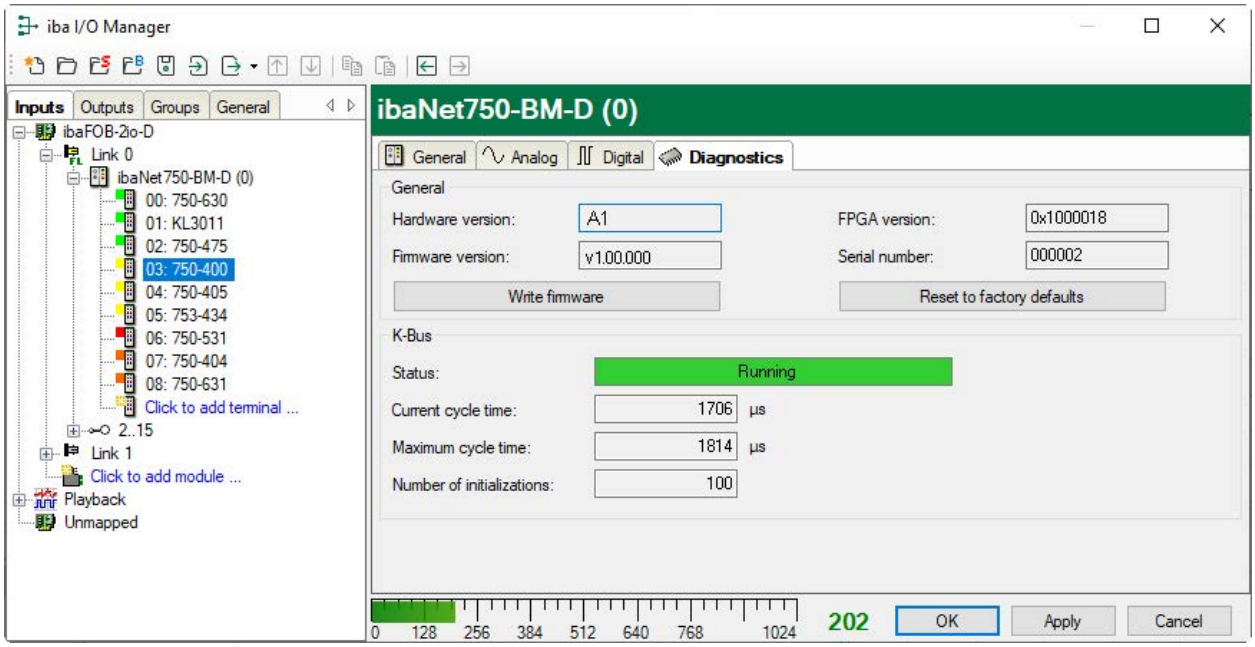
11.1.2.3 ibaNet750-BM-D – Digital tab

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



The meaning of the columns is as in the *Analog* tab, see ↗ *ibaNet750-BM-D – Analog tab*, page 56. Here, however, the columns *Unit*, *Gain* and *Offset* are not available.

11.1.2.4 ibaNet750-BM-D – Diagnostics tab



General

The *General* section displays the version of hardware, firmware and FPGA, as well as the serial number of the device.

Write firmware

With this button it is possible to perform firmware updates. Select the update file `net750d_v[xx.yy.zzz].iba` in the browser and start the update with <OK>.

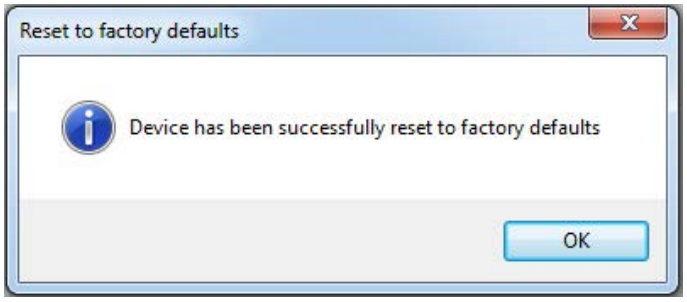
Note

This process 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>.

Then you will receive the following message:

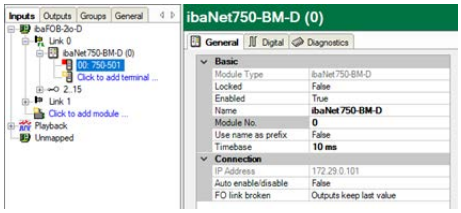


K-bus

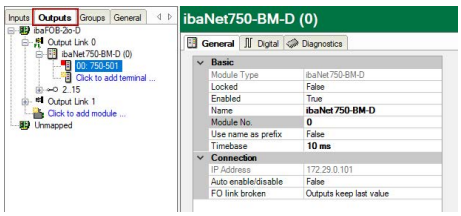
Field	Description
Status	Possible values: ■ Running (K-bus acquisition is running) ■ I/O error (K-bus interrupted) ■ Configuration error (The device configuration is different from the connected terminals)
Current cycle time	Current samling time
Maximum cycle time	Max. samling time
Number of initializations	Number of K-bus initializations

11.1.3 Outputs

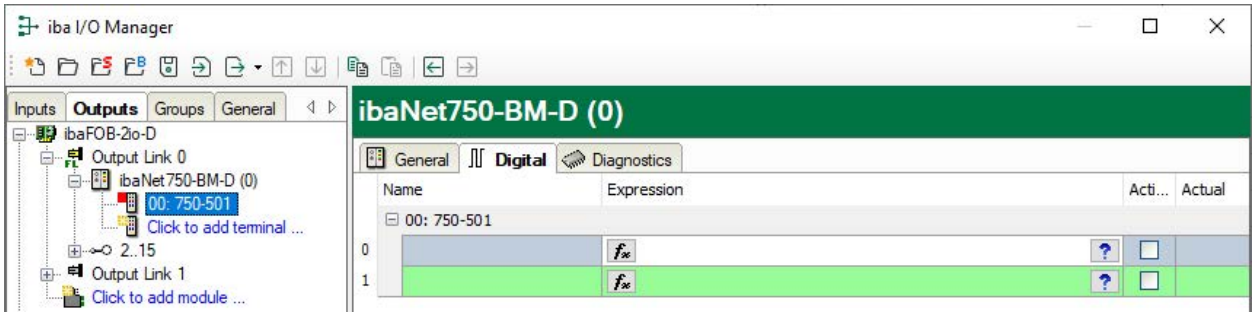
All terminals that you have either automatically detected or manually added on the input side (*Inputs* tab) are also displayed on the output side (under *Outputs*). An *Analog* and a *Digital* tab are automatically adjusted for the analog and digital output terminals.



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



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.



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

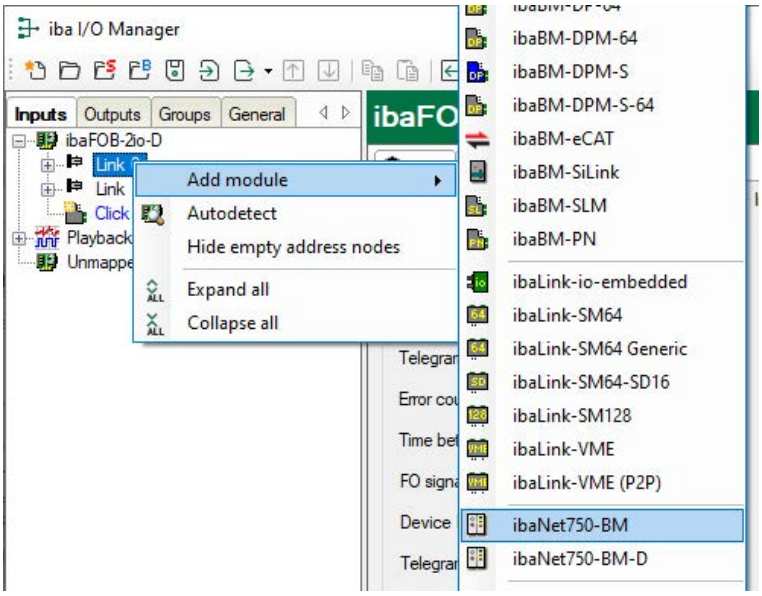
The 32Mbit mode is especially implemented for the use with *ibaLogic* version 4.2.5.464 or later. It is possible to assign input and output signals in the *ibaLogic* configuration with the help of the text file `WagoSignals.txt` (see ↗ *System integration with 32Mbit and ibaLogic*, page 26), which is 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

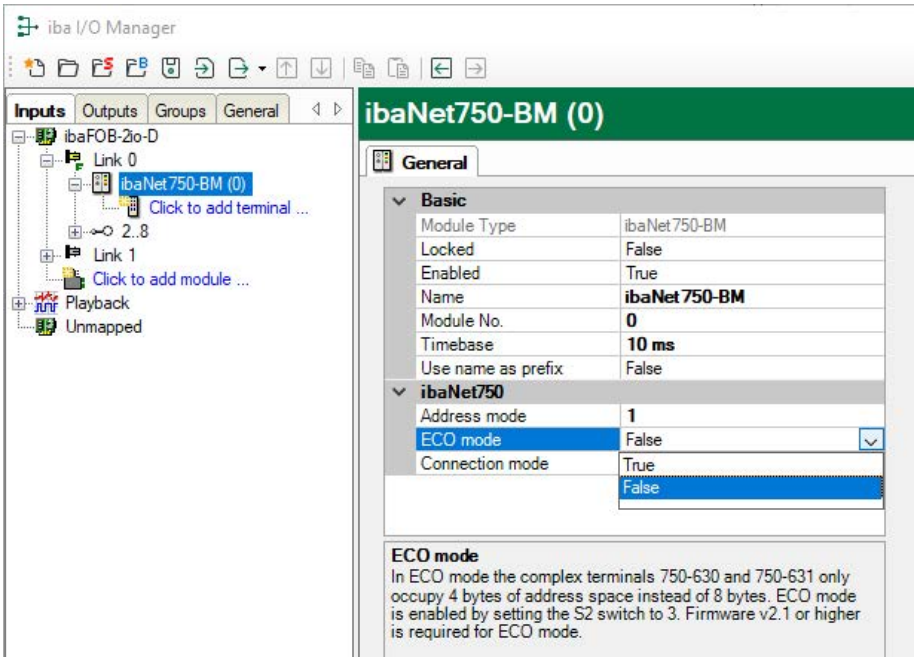
Using the 3Mbit mode, the device is compatible to the predecessor *ibaNet750-BM* and can replace it.

Procedure

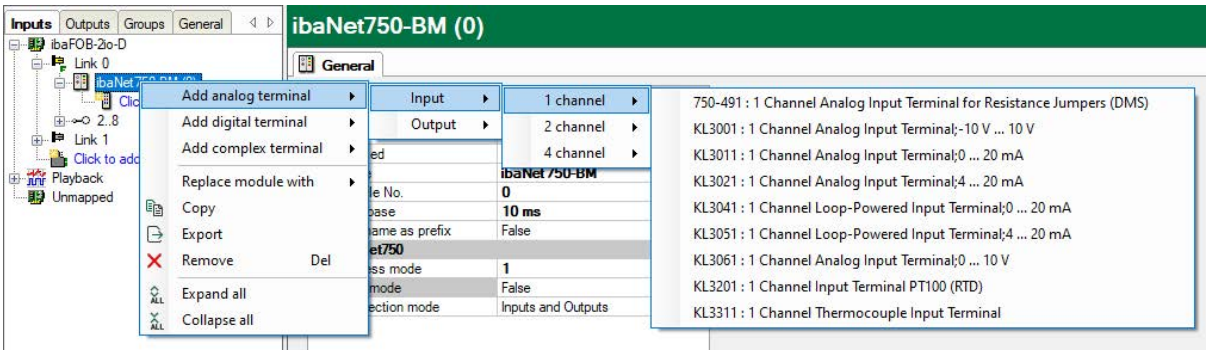
1. Start *ibaPDA* and open the I/O Manager.
2. In the signal tree (left), select the link of the *ibaFOB* card to which *ibaNet750-BM-D* is connected.
3. Open the context menu with the right mouse button and select the *ibaNet750-BM* module type via *Add module*.



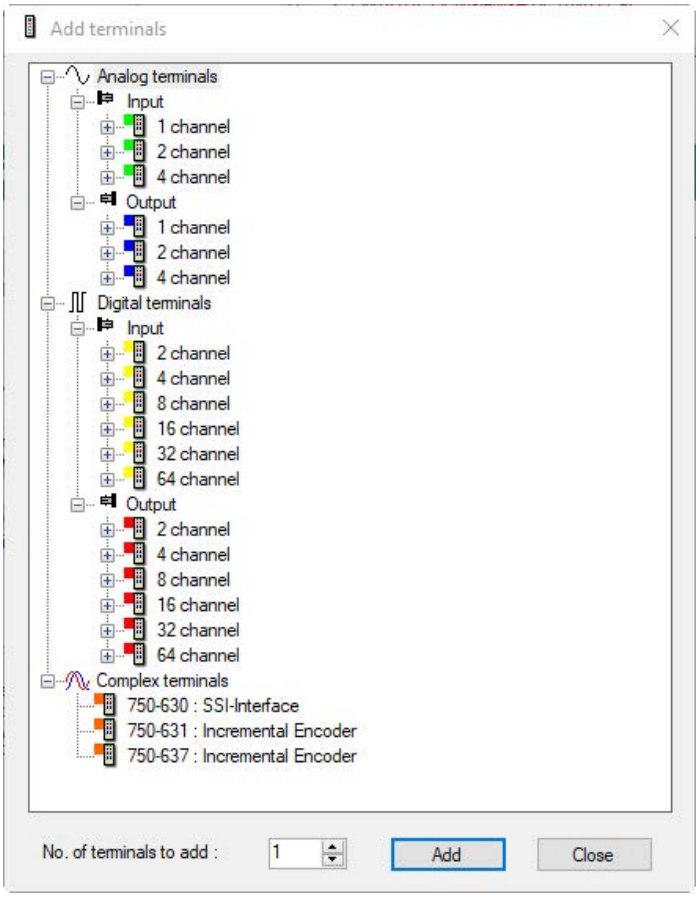
4. In the *General* tab, set the device mode and ECO mode according to the position of the rotary switches S1 and S2.



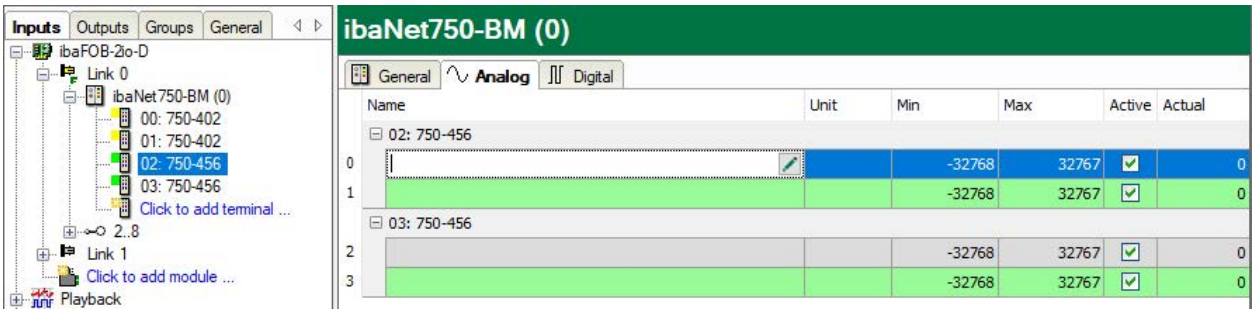
5. Right-click on the added module and select the desired terminal from the context menus.



Alternatively you can click on the link “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.


Inputs
Outputs
Groups
General
ibaFOB-2io-D
Link 0
ibaNet750-BM (0)
00: 750-402
01: 750-402
02: 750-456
03: 750-456
Click to add terminal ...
2..8
Link 1
Click to add module ...
Playback
ibaNet750-BM (0)
General
Analog
Digital
Name
Unit
Min
Max
Active
Actual
02: 750-456
0
-32768
32767
0
1
-32768
32767
0
03: 750-456
2
-32768
32767
0
3
-32768
32767
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 K-bus cycle time depends on the number and the 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.

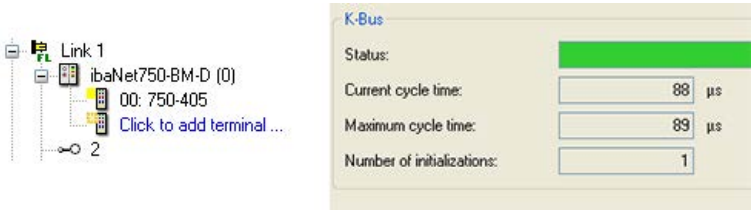
Unfortunately, the cycle time cannot be calculated in advance in *ibaNet750-BM-D*.

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 input terminal WAGO750-405

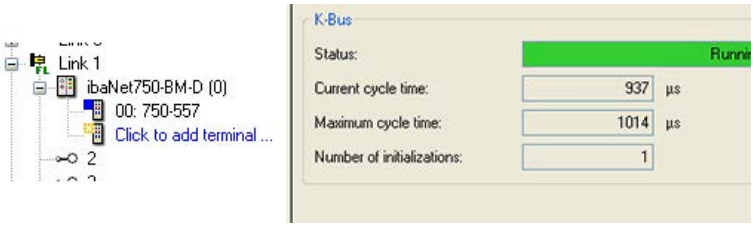
  and 2 x 2-channel digital output terminal WAGO750-502

Analog terminals

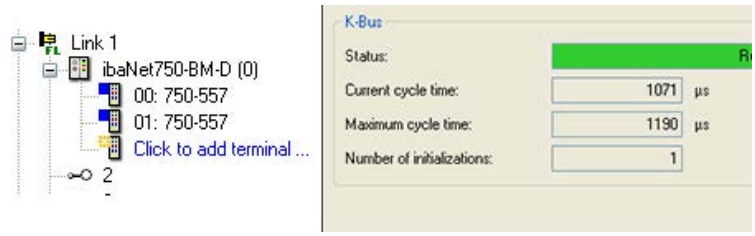
- 1 x 2-channel analog input terminal WAGO750-476

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

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

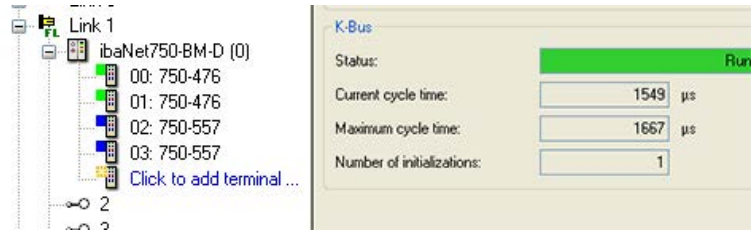


- 2 x 4-channel analog output terminal WAGO750-557



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

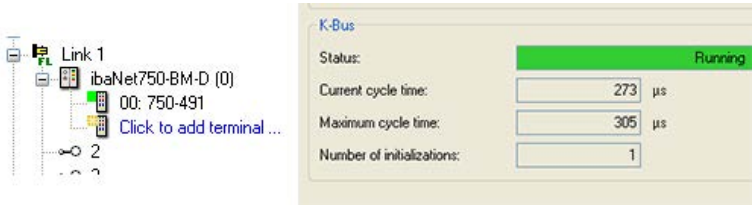
  and 2 x 4-channel analog output terminal WAGO750-557



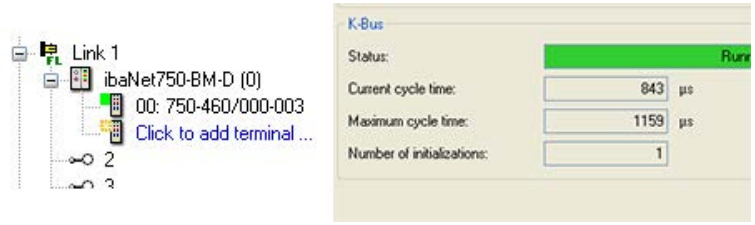
Digital and analog terminals

Complex terminals

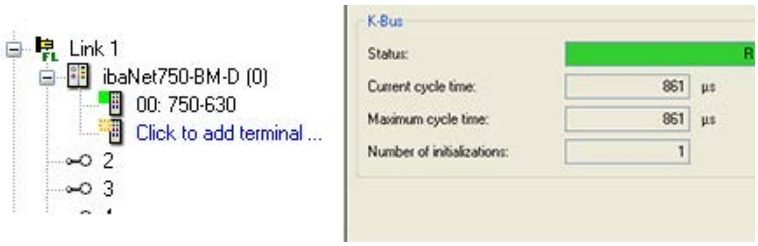
- 1-channel analog input terminal for resistance bridges (DMS) WAGO750-491



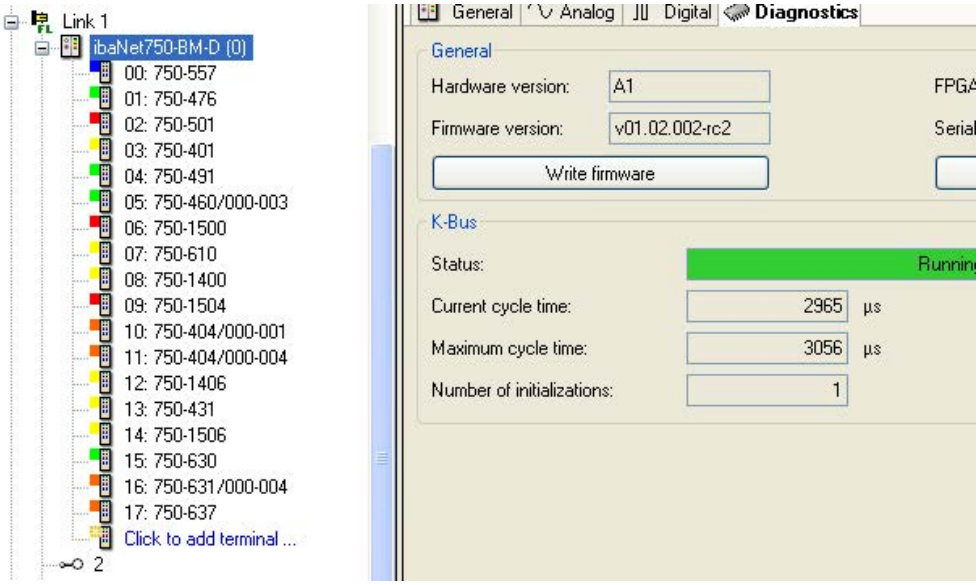
- 4-channel analog input terminal for resistance sensors WAGO750-460



- SSI encoder interface WAGO750-630



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.



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 you want to enter a new, changed value in *ibaPDA* without a major time delay, you should select the smallest possible time base in *ibaPDA*. 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

In the following you will find the technical data and dimensions for *ibaNet750-BM-D*.

13.1 Main data

Short description

Name	ibaNet750-BM-D
Description	Bus module for WAGO I/O system 750
Order number	15.140010

System supply

Voltage supply external	24 V DC (±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 mm² ... 2.5 mm², 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)

Field supply

Power supply	24 V DC (±10%), without protection
Power consumption	Max. 10 A
Connector type	4 CAGE CLAMP® contacts, 0.08 mm² ... 2.5 mm², AWG 28-14

Further interfaces, operating and indicating elements

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	1 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 mm² ... 2.5 mm², AWG 28-14

Operating and environmental conditions

Temperature ranges	

Operation Storage/transport	32 °F to 122 °F (0 °C to 50 °C) -13 °F to 149 °F (-25 °C to +70 °C)
Mounting	on DIN rail according to EN 50022 (TS 35, DIN Rail 35)
Cooling	passive
Humidity class acc. to DIN 40040	F, no condensation
Protection class	IP20
Norms and standards	CE, EMC (EN 61326-1:2006, class A)
MTBF[1)]	5,366,925 hours / 612 years
Mechanical stability	DIN IEC 60068-2-6 (when 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. packaging and documentation	0.16 kg / approx. 0.3 kg

13.2 Interfaces

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 (fiber optics)

Number	1		
Design	Fiber optics		
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

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

Data transmission rate	32 Mbit/s	32 Mbit/s	3 Mbit/s
Sampling rate	max. 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. ↗ *Example for FO budget calculation*, page 71.		

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	
Laser class	Class 1	
Receiving interface (RX)		
Sensitivity[2)]	100/140 µm FO cable	-33,2 dBm to -26,7 dBm
Temperature range	-40 °F to 185 °F (-40 °C to 85 °C)	

13.3 Declaration of conformity

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

Unique Identifier: 15.140010 ibaNet750-BM-D

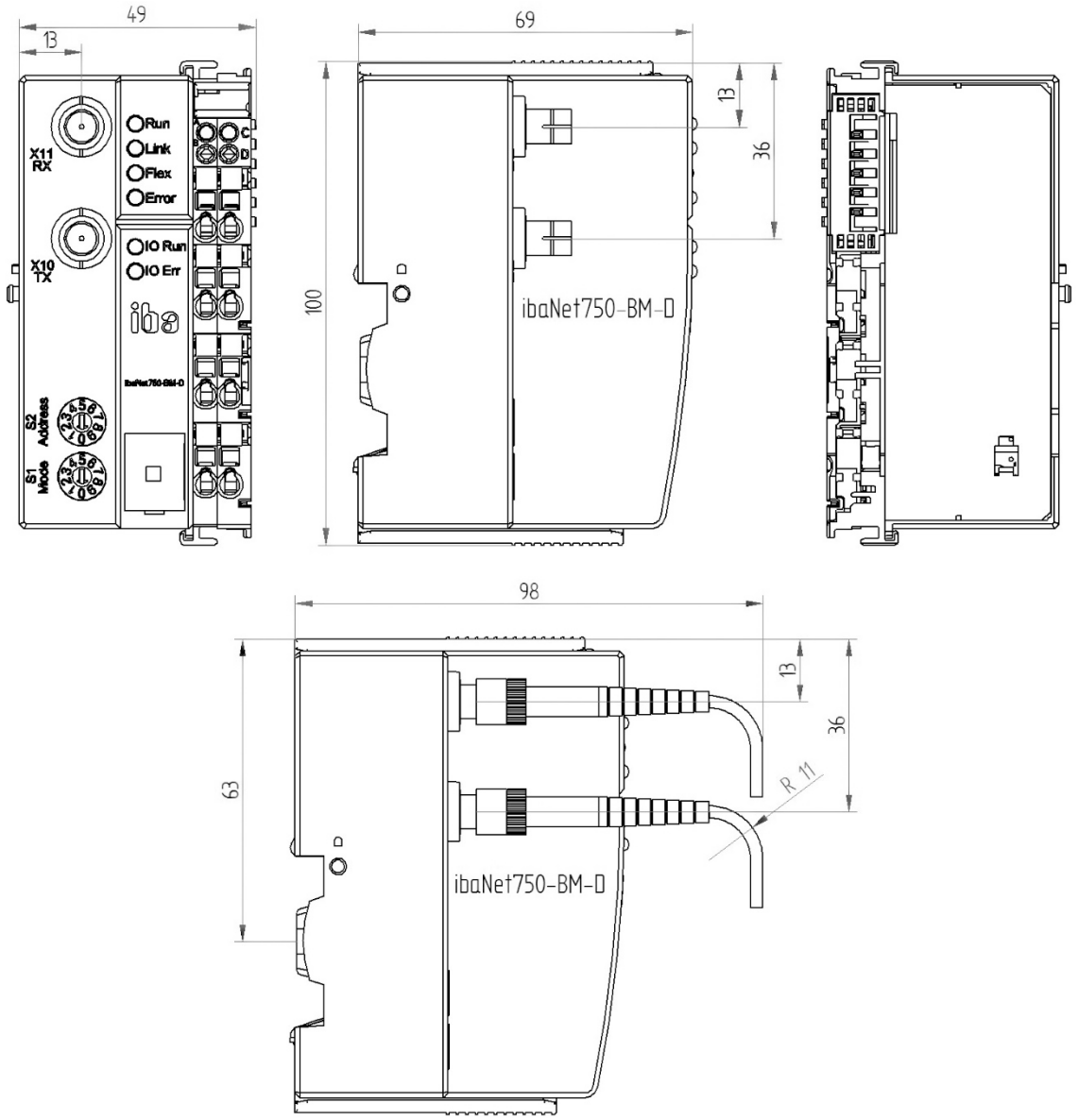
Responsible Party - U.S. Contact Information
iba America, LLC
370 Winkler Drive, Suite C
Alpharetta, Georgia
30004

(770) 886-2318-102
www.iba-america.com

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.

[2)] Specifications for other fiber diameters not specified

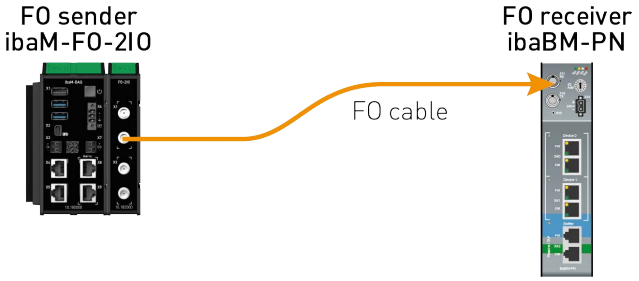
13.4 Dimensions



(dimensions in mm)

13.5 Example for FO budget calculation

A fiber optic link from an *ibaM-FO-2IO* module (FO transmitter) to an *ibaBM-PN* device (FO receiver) is used as an example.



The example refers to a P2P connection with an FO cable of type 62.5/125 µm. 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 relevant device manual in the chapter "Technical data" under "ibaNet interface".

ibaM-FO-2IO specification

Output power of FO transmitting interface		
FO cable in µm	Min.	Max.
62.5/125	-16 dBm	-9 dBm

ibaBM-PN specification

Sensitivity of FO receiving interface		
FO cable in µm	Min.	Max.
62.5/125	-30 dBm	

Specification FO cable
Refer to the data sheet for the fiber optic cable used:

FO cable	62.5/125 µm
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 ibaM-FO-2IO -> ibaBM-PN in the best case:

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

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

Calculation for the example ibaM-FO-2IO -> ibaBM-PN in the worst case:

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

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

Note

When connecting several devices as a daisy chain or as a 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 reduced distance (by approx. 30–40%) must be expected.

Note

In addition to conventional multimode cable types OM1 (62.5/125 µm) and OM2 (50/125 µm), the other cable types OM3, OM4 and OM5 of the 50/125 µm fiber can also be used.

14 Appendix

14.1 Firmware update via USB interface

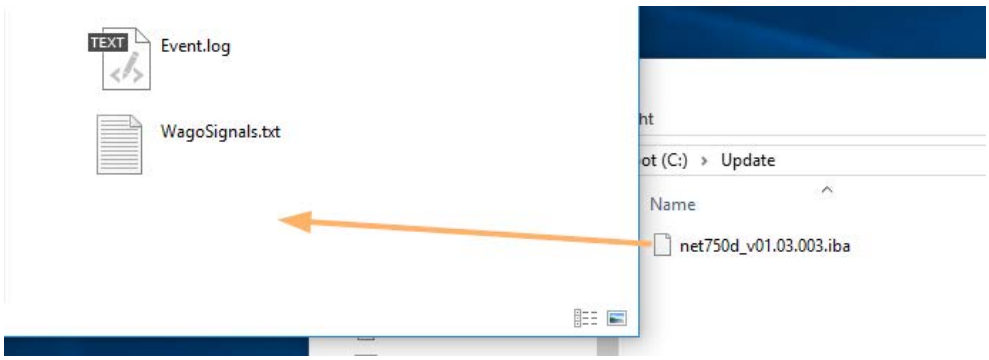
Firmware updates are usually executed with *ibaPDA* in 32Mbit Flex mode, see also chapter ↗ *ibaNet750-BM-D – Diagnostics tab*, page 57.

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

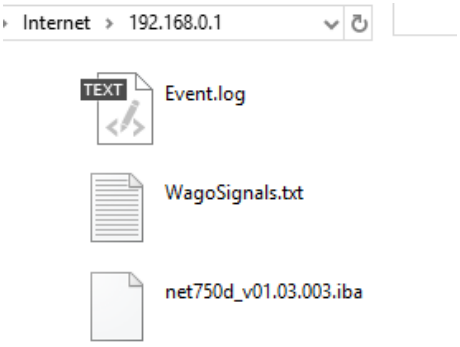
This may be necessary, for example, if *ibaNet750-BM-D* is operated in 32Mbit or 3Mbit mode and *ibaPDA* is not available as a communication partner.

Procedure

1. Establish an FTP connection to the device as described in chapter ↗ *FTP connection to the device*, page 26 step 1-5.
2. Copy the update file `net750d_v*.iba` you received from iba to the device via the FTP connection.



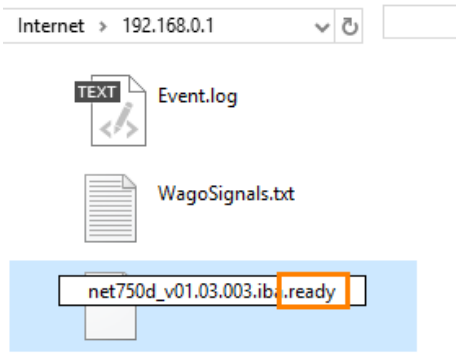
Device directory:



3. Once the file is uploaded, rename it:

   old: net750d_v*.iba

   newnet750d_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 ] A1
[t=8s : Firmware version ] v01.03.003
[t=14s : signal copy maschine] New configuration for fiber optic
```

15 Support and contact

Support

Phone: +49 911 97282-14

Email: support@iba-ag.com

Note

If you need support for software products, please state the number of the license container. For hardware products, please have the serial number of the device ready.

Contact

Headquarters

iba AG
Koenigswarterstrasse 44
90762 Fuerth
Germany

Phone: +49 911 97282-0

Email: iba@iba-ag.com

Mailing address

iba AG
Postbox 1828
D-90708 Fuerth, Germany

Delivery address

iba AG
Gebhardtstrasse 10
90762 Fuerth, Germany

Regional and Worldwide

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

www.iba-ag.com