IntesisBox® BACnet/IP Server

M-Bus meters

User's manual

Issue Date: 12/2013

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Intesis Software S.L.
Milà i Fontanals, 1 bis
08700 Igualada
Spain

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Gateway for the integration of M-Bus devices into BACnet/IP control systems.

Models available for this gateway, with their following **Order codes**:

IBOX-BAC-MBUS-100
Basic model supporting integration of up to 10 M-BUS meters and 100 internal datapoints.

IBOX-BAC-MBUS-A
Basic model supporting integration of up to 60 M-BUS meters and 600 internal datapoints.

IBOX-BAC-MBUS-B
Extended model supporting integration of up to 500 M-BUS meters and 2000 internal datapoints.

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URL http://www.intesis.com
Email info@intesis.com
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1. Description

1.1 Introduction

This document describes the integration of M-Bus meters with BACnet ASHRAE 135 – 2001 Annex J - BACnet protocol compatible devices or systems using the gateway IntesisBox BACnet/IP Server - M-Bus.

This document assumes that the user is familiar with M-Bus and BACnet/IP technology and technical terms.

From now on, and with the aim of easy the read of this document, the words "gateway" or "IntesisBox" are used instead of IntesisBox BACnet/IP Server - M-Bus. Any other use of the word "gateway" not meaning IntesisBox BACnet/IP Server - M-Bus will be specifically indicated.

The aim of this integration is to make accessible M-Bus system signals and resources from a BACnet/IP based control system or device, as if it was a part of the own BACnet system and vice-versa. For this, the gateway acts as a BACnet/IP Server device in its BACnet interface, allowing other BACnet/IP devices to perform subscription (COV) requests, and also read and write its internal points. From the M-Bus system point of view, IntesisBox acts as a M-Bus master device (EN-1434-3), the readings of the M-Bus slave device(s) is performed by IntesisBox by automatic continuous polling.

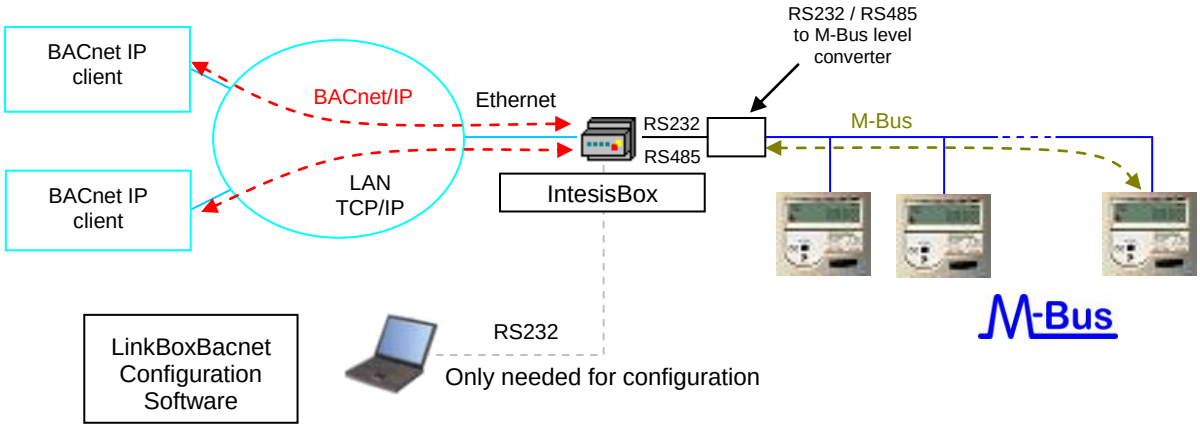

Figure 1.1 Integration of M-Bus and BACnet/IP using *IntesisBox BACnet/IP Server - M-Bus* gateway

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1.2 Functionality

The integration operation is as follow:

IntesisBox polls, either continuously or only when ordered from BACnet side, the M-Bus devices to obtain updated readings for the points configured in it (the points corresponding to measures and states of the meters in the integration points list explained later in this document). With every read, the new values received are updated in the Intesisbox's memory and become available in BACnet side. When a change in any point configured as output in IntesisBox is detected (this is written from the BACnet side), the corresponding action in the M-Bus will be performed, these actions can be: force a polling of a concrete M-Bus device or force a polling of all M-Bus devices.

The polling of a concrete M-Bus device, or of all M-Bus devices, can be forced in any moment from BACnet side by writing a 1 in the corresponding binary point specially enabled for this purpose in the IntesisBox.

Also the automatic continuous polling of all M-Bus devices can be activated/deactivated writing from BACnet in a specific binary point specially enabled for this purpose in the IntesisBox.

Other M-Bus information accessible from BACnet using specific points of the IntesisBox is:

- Bus activity (indicates if meters are actually being polled or if polling is in stand-by).
- M-Bus status of every meter (this M-Bus status is sent by the own meter with every poll and indicates internal status, manufacturer specific in every case).

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1.3 Capacity of IntesisBox

Element	Tiny version	Basic version	Extended version	Notes
Type of BACnet devices				Only those supporting BACnet/IP.
Number of BACnet points	100	600	2000	Maximum number of points that can be defined in the virtual BACnet device inside the gateway.
Number of BACnet subscribers	8	8	8	Maximum number of BACnet subscribers accepted by the gateway.
Number of BACnet subscriptions (COV) requests	1000	1000	6000	Maximum number of BACnet subscriptions (COV) requests accepted by the gateway.
Number of M-Bus devices	10	60	500	Number of M-Bus meters (connected to the bus) that can be read from IntesisBox.
Number of M-Bus signals	100	600	2000	Number of M-Bus signals (readings in the meters) that can be read from IntesisBox.

There are different models of *IntesisBox BACnet/IP Server - M-Bus,* with different capacity every one of them.

- Tiny model supporting connection to up to 10 M-Bus devices and up to 100 internal data points. *Ref.: IBOX-BAC-MBUS-100.*
- Basic model supporting connection to up to 60 M-Bus devices and up to 600 internal data points. *Ref.: IBOX-BAC-MBUS-A.*
- Extended model supporting connection to up to 500 M-Bus devices and up to 2000 internal data points. *Ref.: IBOX-BAC-MBUS-B.*

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2. Interfaces

This section gives the reader an idea on how a M-Bus system/installation is integrated with IntesisBox BACnet. It is not meant to provide an in-depth explanation on how BACnet or M-Bus technology work as understanding the protocol principles is assumed throughout this document.

The IntesisBox behaves as a regular BACnet device inside the BACnet system integrating all the M-Bus devices. Note that each datapoint defined on IntesisBox will have two associated data types:

- One data-type, related to the BACnet/IP protocol of the IntesisBox
- And another data-type, related to M-Bus side of IntesisBox

Conversions of data values from M-Bus to BACnet/IP data-types (and vice versa) are internally performed at application level of IntesisBox, and keeping the highest possible level of precision, with the restrictions of the data-type itself. Further detail on behavior and data-types of the BACnet/IP and M-Bus interfaces of IntesisBox is given in the following sections.

All configuration of IntesisBox BACnet is done using software tool *LinkBoxBacnet*. This tool, covered in depth in section 5, is used to define the M-Bus and BACnet related parameters on each of the datapoints defined in IntesisBox.

2.1 BACnet

The IntesisBox integrates all the M-Bus devices in a single BACnet device. The communication with the other BACnet devices is done via the Ethernet port of the gateway which implements the BACnet ASHRAE 135 – 2001 Annex J - BACnet protocol.

The supported BACnet Objects and Building Blocks can be found in the PICS document available on the web:

http://www.intesis.com/pdf/IntesisBox_BACnet_IP_Server_M-Bus_PICS.pdf

Configuration of all BACnet/IP parameters of IntesisBox and their links to M-Bus using LinkBoxBacnet software tool is covered in section 5.1.

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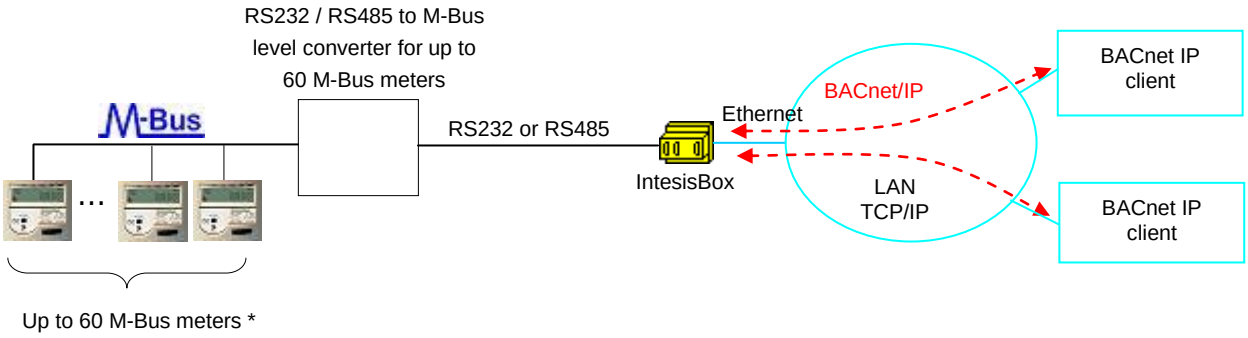
2.2 M-Bus

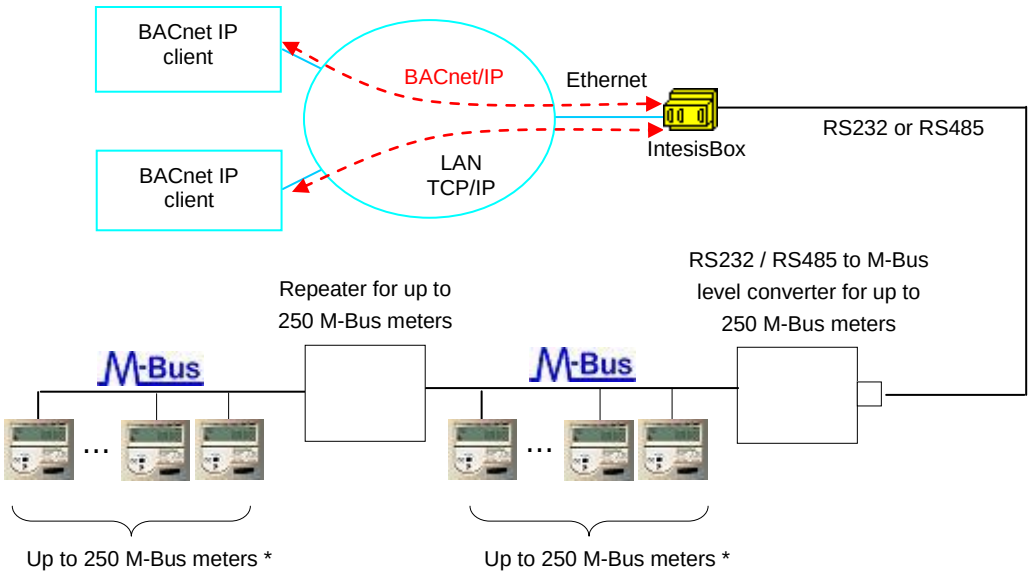
The gateway connects to the M-Bus system through an external RS232 or RS485 to M-Bus level converter, this external level converter is not included in the scope of delivery of IntesisBox, and must be ordered separately or purchased directly by the customer to any manufacturer of such kind of devices. Contact Intesis Software in case you are looking for a supplier for these M-Bus level converters or repeaters for your installation.

Apart of making the electrical level conversion, the converter must also feed the M-Bus, due to this there are different models of level converters and repeaters, depending on the maximum number of M-Bus meters that can be connected to them (normally 3, 20, 60, 120 or 250 meters).

The following is a diagram of a small/medium size installation (up to 60 meters):



The following is a diagram of a large installation (up to 500 meters):



* The maximum bus distance allowed by the converter or repeater will depend on the baud rate used, the section of the wires used , the number of M-Bus devices connected and the location of the devices inside the bus (all concentrated at the end of the bus, equally distributed along the bus, etc.). See the converter or repeater manual for details in every case.

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These are the main features of the M-Bus interface of IntesisBox:

- RS232 (DB9 male connector, DTE) or RS485 two wires (plug-in terminal bloc with screws), which one to use is software configurable.
- Baud rate configurable from 300 to 9600 bps (allowed baud rates in M-Bus. The devices are normally configured at 2400 bps at the factory).
- Primary or secondary addressing allowed.
- Useful timeouts and specific parameters to make the interface widely compatible with many meter's peculiarities found usually between different manufacturers.
- Polling of the meters can be continuously, either configured in the own IntesisBox or you can activate/deactivate continuous polling of the meters from BACnet side using a special datapoint.
- You can force a polling of the meters (refresh of readings) in any moment from BACnet side using special datapoints: one datapoint to force a polling of all the meters, and one specific datapoint per meter to force the polling of the individual meter.
- IntesisBox can also be configured to make a single polling of the meters (refresh of readings) at the start up.
- For each meter, a datapoint is available in BACnet indicating communication error with the meter, also a general communication error datapoint is available (that will be active whenever the communication with one or more meters has failed).
- Fully flexible configuration of the registers to poll in the meter, to adapt to any meter.

2.2.1 Signals

IntesisBox can read for example the following type of signals offered by M-Bus devices:

- Energy (kWh or J).
- Volume (m3, feet3, gallon).
- Mass (kg).
- Power (kW or J/h).
- Volume flow (m3/h, m3/min or m3/s, gallon/h, gallon/min, gallon/s).
- Mass flow (kg/h).
- Flow Temperature (°C).
- Return Temperature (°C).
- Temperature difference (K).
- External Temperature (°C).
- Temp. limit (°C).
- Pressure (Bar).
- Volts (volts).
- Amps (amps).
- H.C.A., without units. (Multipurpose signal used, for example, by some energy meters to offer the readings of auxiliary pulse counter inputs of the device).
- On Time, normally in hours but depends on the meter.
- Operating Time, normally in hours but depends on the meter.
- Averaging Duration, normally in hours but depends on the meter.
- Actuality Duration, normally in hours but depends on the meter.
- And others.

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These are the type of signals more frequently offered by M-Bus devices and used by energy meters and electricity meters. The readings of other more specific type of signals also specified in the standard M-Bus, for example date/time, could be also implemented in IntesisBox on demand; contact your nearest distributor for details.

Every meter, depending on manufacturer and model, offers different type of signals from the mentioned before. To know what signals offers the meter and of what type, to be able to integrate those wanted, refer to the device technical documentation. Anyway, and to ease and speed up the identification of the signals offered by any device (and of what type), it has been embedded in the firmware of IntesisBox an utility to poll the meter and show details about the signals offered by the device and the corresponding signal code needed in the points list of IntesisBox for every one of the signals to integrate. This is explained in more detail in Annex I of this document.

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3. Quick Setup

1. Install LinkBoxBacnet. Details in section 5
2. Install IntesisBox in the desired installation site (DIN rail mounting inside a metallic industrial cabinet connected to ground is recommended).
3. Power up and connect the communication cables. Details in section 4.
4. Open LinkBoxBacnet, open a project or create a new one. Details in section 5.
5. Connect to the IntesisBox (details in section 5).
6. (optional) Configure the IntesisBox. Details in section 5.1.
7. Check if there is communication in both BACnet and M-Bus buses (section 5)
8. The IntesisBox is ready to be used in your system.

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4. Connection

The device uses a standard enclosure allowing DIN EN60715 TH35 rail mounting. Its plastic meets standard PC UL 94 V0.

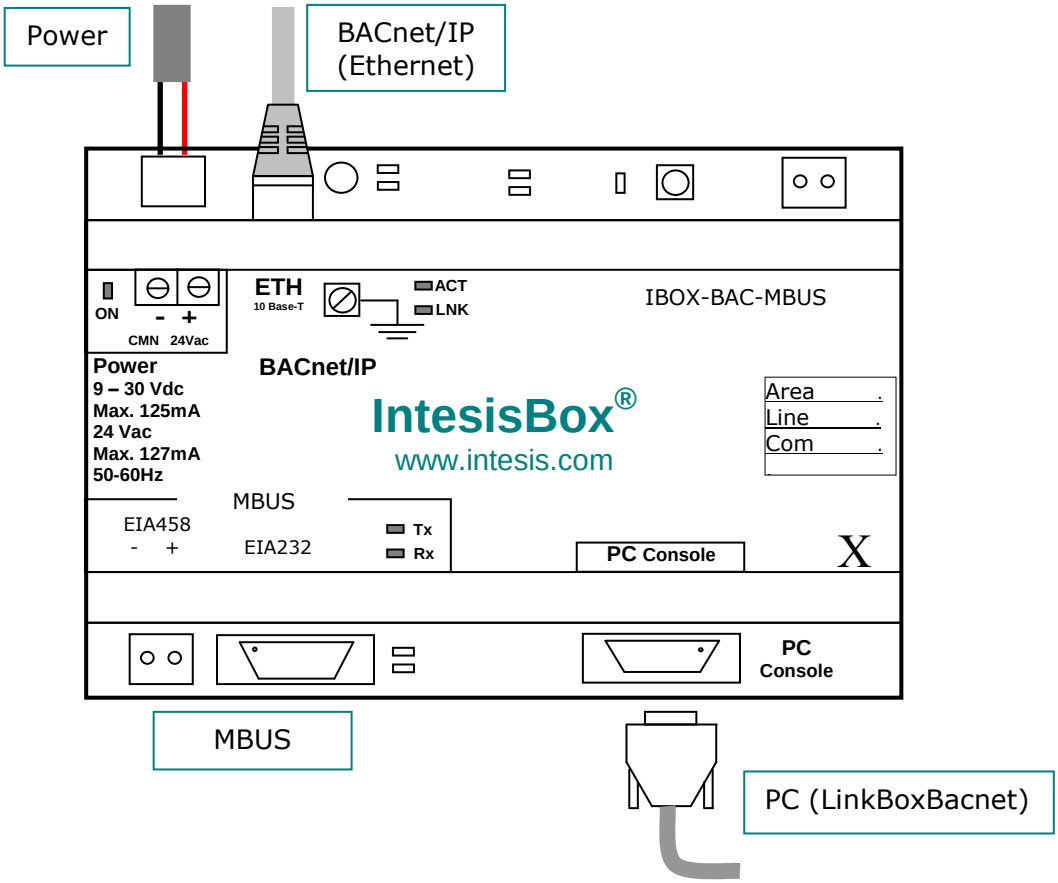

Figure 4.1 Device connection diagram

Ensure proper space for all connectors when mounted.

The items supplied by Intesis Software for this integration are:

- IntesisBox BACnet/IP Server - M-Bus hardware
- Console cable. Standard DB9F-DB9M cable 1.8 meter long.
- Installation sheet, containing a link to the LinkBoxBacnet software and this manual.

4.1 Power device

The first step to perform is to power up the device. To do so a power supply working with any of the voltage range allowed is needed (check section 6). Once connected the ON led (Figure 4.1) will turn on.

WARNING! In order to avoid earth loops that can damage the gateway and/or any other equipment connected to it, we strongly recommend:

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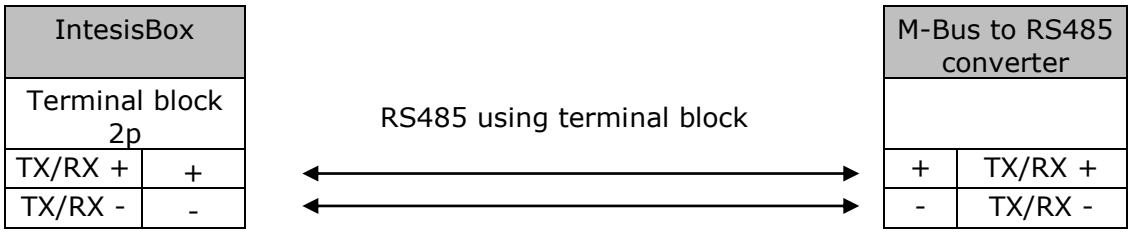
- The use of DC power supplies, floating or with the negative terminal connected to earth. **Never use a DC power supply with the positive terminal connected to earth**.
- The use of AC power supplies only if they are floating and not powering any other device.

4.2 Connect to M-Bus

Connect the communication cable coming from the M-Bus network to the port marked as M-Bus of IntesisBox (Figure 4.1). Two methods to connect to the M-Bus network can be used:

- The RS485 port if a M-Bus to RS485 converter is used



- The RS232 port to connect to the M-Bus to RS232 converter

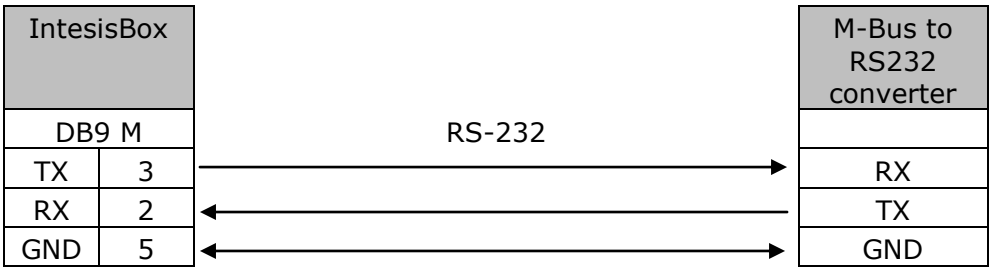


Table 4.1 M-Bus RS232 cable pinout

How to check if there is communication with the M-Bus bus is explained in the LinkBoxBacnet Manual (section 5).

4.3 Connect to BACnet

Connect the communication cable coming from the network hub or switch to the ETH port (Figure 4.1) of IntesisBox. The cable to be used depends on where the IntesisBox is being connected:

- Connecting directly to a BACnet/IP device: crossover Ethernet UTP/FTP CAT5 cable
- Connecting to a hub or switch of the LAN of the building: a straight Ethernet UTP/FTP CAT5 cable

In case there is no response from the BACnet devices to the frames sent by IntesisBox, check that they are operative and reachable from the network connection used by IntesisBox. Check the IntesisBox Ethernet interface sending Pings to its IP address using a PC connected to the same Ethernet network.

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4.4 Connect to PC (LinkBoxBacnet)

This action allows the user to have access to configuration and monitoring of the device (more information can be found in the LinkBoxBacnet User Manual [section 5]). Two methods to connect to the PC can be used:

- Ethernet: Using the ETH port (Figure 4.1) of IntesisBox. How to check connectivity is explained in section 4.3.

- Serial cable: To connect the device to the PC the serial cable supplied should be plugged to the PC console port (Figure 4.1).
  The cable is a RS-232 straight cable and its pinout is at explained in Table 4.2.

IntesisBox			PC	
DB9 M		RS-232 (Straight)	DB9 F	
TX	2	→	2	RX
RX	3	←	3	TX
GND	5	↔	5	GND

Table 4.2 Configuration serial cable pinout

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5. LinkBoxBacnet. Configuration & monitoring of IntesisBox BACnet series

How to install and use the LinkBoxBacnet is explained in its Manual. It can be found in the installation folder (if the Software is already installed) or it can be downloaded from the link that can be found in the installation sheet supplied with the IntesisBox.

In this section only the specific project configuration for IntesisBox BACnet/IP Server - M-Bus is going to be explained.

The External Protocol in this IntesisBox is M-Bus

5.1 Project configuration

To configure the integration connection parameters, and the points list, click on *Config* in the *Button Bar (*Figure 5.1*).* The M-Bus *Configuration* window will be opened. For integrations with a large number of points an alternative CSV based configuration method is explained in the LinkBoxBacnet Manual.

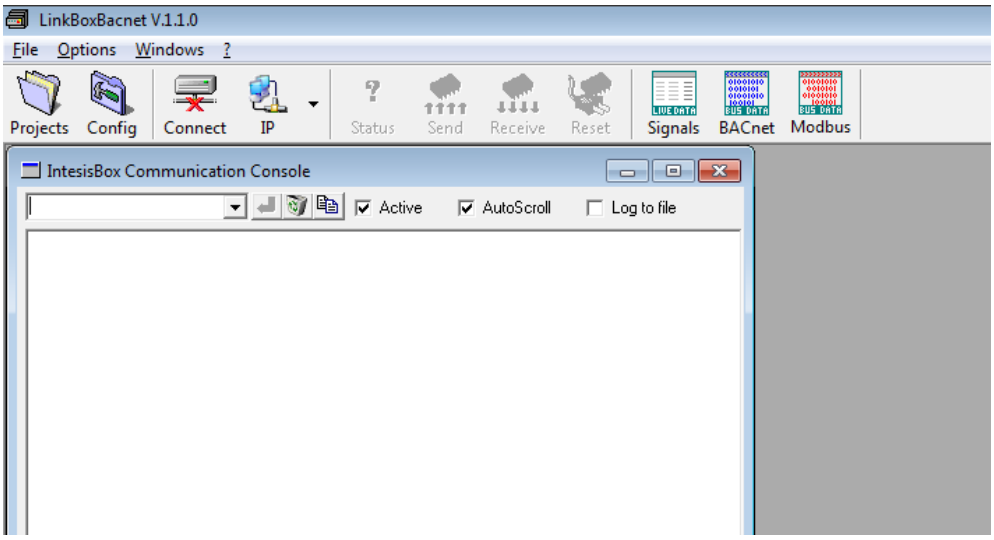

Figure 5.1 Menu and Button Bar in LinkBoxBacnet

5.1.1 Connection configuration

Two subsets of information are configured using this window, the BACnet/IP parameters of the IntesisBox, and the parameters of the M-Bus interface.

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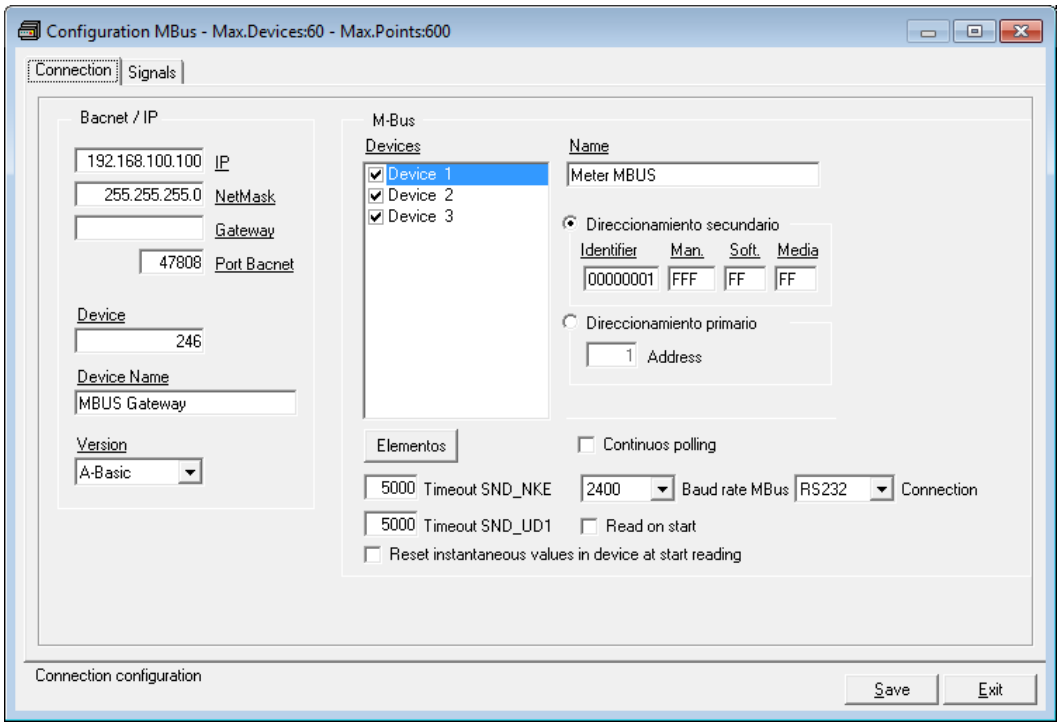

Figure 5.2 Configuration: Connection Tab

BACnet/IP interface configuration parameters:

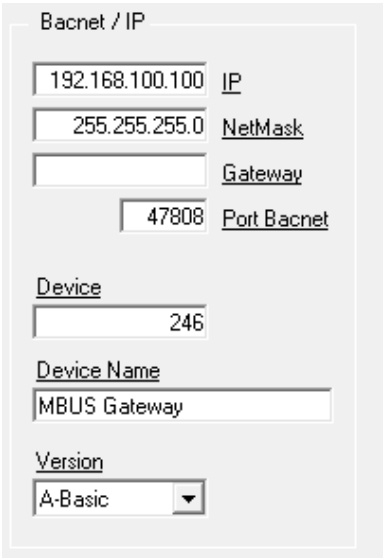

Figure 5.3 BACnet/IP interface Configuration

- **IP:** Enter the IP address for the gateway (supplied by the network administrator).
- **NetMask**: Enter the IP NetMask for the gateway (supplied by the network administrator).
- **Gateway:** Enter the Default Gateway address (router address) in case the gateway (IntesisBox) is in a different sub network than other BACnet devices (supplied by the network administrator). Leave blank if there is no need of router address.

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- **BACnet Port:** Enter the BACnet port number used by the gateway (by default 47808, which is BAC0).

- **Device**: Enter the BACnet device number for the gateway (must be unique inside the BACnet system).

- **Device Name:** Select the BACnet device name for the gateway (by default "M-Bus Gateway"). This name will be collected by BACnet browsers among others.

- **Version:** Select the gateway model used: Tiny, Basic or Extended. You can check the gateway model in the identification given by the device when it connects to LinkBoxBacnet, it appears in the IntesisBox Communication Console window once connected to the gateway

  IntesisBox_Bacnet_M-Bus-**100**… → Tiny model
  IntesisBox_Bacnet_M-Bus-**A**… → Basic model
  IntesisBox_Bacnet_M-Bus-**B**… → Extended model

M-Bus interface configuration parameters:

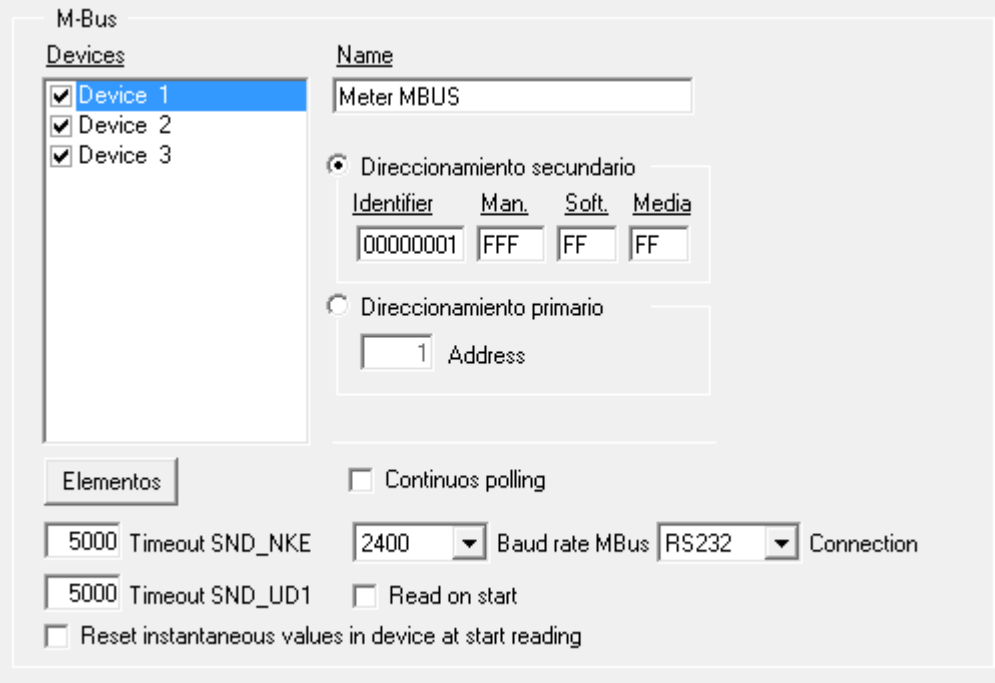

Figure 5.4 M-Bus interface Configuration

- **Devices:** List of M-Bus slave devices to communicate to. Check the devices you want to activate. Select a device to configure its properties.

- **Elements:** Use this button to define the number of M-Bus slave devices to communicate to. This automatically will create in the configuration as many devices as specified, adding for every device: *communication error* signal, *force device reading* signal, and device's *status M-Bus* signal in the points list.

- **Continuous polling:** if ticked the IntesisBox will continuously read the M-Bus meters.

- **Name:** Enter the device name (optional, just for identification purposes).

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- **Device's secondary address**. Select this if you want to use the secondary address of the device as the address used by IntesisBox to poll the device. The secondary address of a device is composed of:
    - *Identifier*: It's a number identifying the device, composed of 8 digits, normally is printed in the device's label, as *Id. Number* or similar.
    - *Manufacturer*: Manufacturer IEC code, if unknown enter FFF in this field.
    - *Software*: Software version of the device, if unknown enters FF in this field.
    - *Media*: Code identifying media read, if unknown enters FF in this field.
- **Device's primary address**. Select this if you want to use the primary address of the device as the address used by IntesisBox to poll the device.

NOTE: The selection of primary or secondary address affects to all the configured devices. Some models of devices do not support secondary addressing mode (for example the Kamstrup Multical 400), for this kind of devices the primary address must be selected, and in the case of the Kamstrup Multical for example, the primary address entered here must coincide with the last three digits of the serial number of the device. In other devices this primary address is programmed at the factory or can be also programmed later using some software tool supplied by the manufacturer. Refer to the technical documentation of the device in every case to know what types of addressing supports and which is the address number of the device.

- **Baud rate** M-Bus**:** Baud rate used to communicate with the devices, in general, those devices supporting configuration of baud rate are preconfigured at 2400 bps at the factory. Some device models support autobauding (adjust the baud rate automatically to the baud rate used by M-Bus master polling; refer to the technical documentation of the device to know the baud rates supported in every case). This parameter affects to all the devices.
- **Connection:** Select the port used to connect to the external level converter, can be RS232 or RS485, and consult *Connections* section for details of pinout for each one of the ports.
- **Timeout SND_NKE:** Waiting time (in milliseconds) before sending the SND_NKE frame. Necessary for some models of devices (refer to the technical documentation of the device). This parameter affects to all the devices.
- **Timeout SND_UD1:** Waiting time (in milliseconds) before sending the SND_UD1 frame. Necessary for some models of devices (refer to the technical documentation of the device). This parameter affects to all the devices.
- **Read on start:** Check this to force IntesisBox to poll all the meters at the start up.
- **Reset instantaneous values:** Check this to force a refresh of instantaneous values in the meter before start reading. This is necessary for some meters, for example SONTEX Supercal 539. Consult the meter technical documentation in every case.

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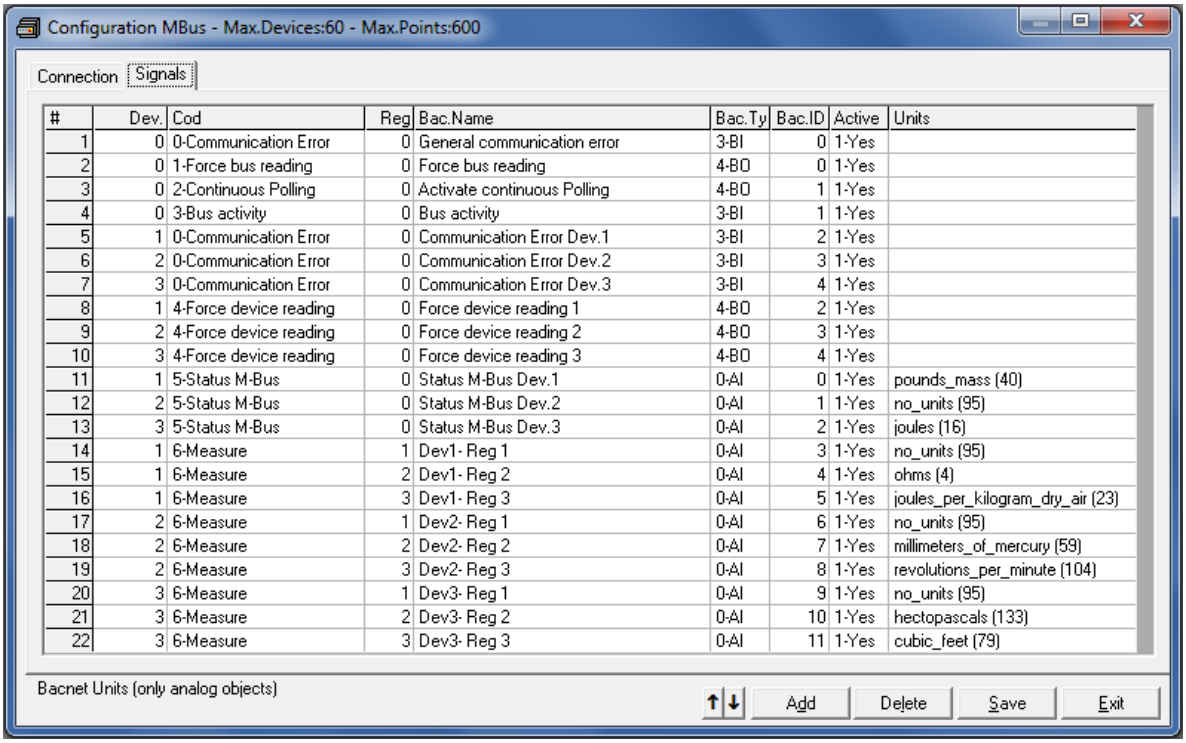
5.1.2 Signals configuration

Select the Signals tab (Figure 5.5) to configure the signals list (the IntesisBox internal points). More information about the meaning of the columns can be found in the tables below.

Every row in the grid corresponds to a signal (point). Signals (rows in the grid) can be added or deleted selecting the desired row and clicking Add or Delete buttons. Multiple consecutive rows can be deleted too.



#	Dev.	Cod	Reg	Bac.Name	Bac.Ty	Bac.ID	Active	Units
1	0	0-Communication Error	0	General communication error	3-BI	0	1-Yes	
2	0	1-Force bus reading	0	Force bus reading	4-BO	0	1-Yes	
3	0	2-Continuous Polling	0	Activate continuous Polling	4-BO	1	1-Yes	
4	0	3-Bus activity	0	Bus activity	3-BI	1	1-Yes	
5	1	0-Communication Error	0	Communication Error Dev.1	3-BI	2	1-Yes	
6	2	0-Communication Error	0	Communication Error Dev.2	3-BI	3	1-Yes	
7	3	0-Communication Error	0	Communication Error Dev.3	3-BI	4	1-Yes	
8	1	4-Force device reading	0	Force device reading 1	4-BO	2	1-Yes	
9	2	4-Force device reading	0	Force device reading 2	4-BO	3	1-Yes	
10	3	4-Force device reading	0	Force device reading 3	4-BO	4	1-Yes	
11	1	5-Status M-Bus	0	Status M-Bus Dev.1	0-AI	0	1-Yes	pounds_mass (40)
12	2	5-Status M-Bus	0	Status M-Bus Dev.2	0-AI	1	1-Yes	no_units (95)
13	3	5-Status M-Bus	0	Status M-Bus Dev.3	0-AI	2	1-Yes	joules (16)
14	1	6-Measure	1	Dev1- Reg 1	0-AI	3	1-Yes	no_units (95)
15	1	6-Measure	2	Dev1- Reg 2	0-AI	4	1-Yes	ohms (4)
16	1	6-Measure	3	Dev1- Reg 3	0-AI	5	1-Yes	joules_per_kilogram_dry_air (23)
17	2	6-Measure	1	Dev2- Reg 1	0-AI	6	1-Yes	no_units (95)
18	2	6-Measure	2	Dev2- Reg 2	0-AI	7	1-Yes	millimeters_of_mercury (59)
19	2	6-Measure	3	Dev2- Reg 3	0-AI	8	1-Yes	revolutions_per_minute (104)
20	3	6-Measure	1	Dev3- Reg 1	0-AI	9	1-Yes	no_units (95)
21	3	6-Measure	2	Dev3- Reg 2	0-AI	10	1-Yes	hectopascals (133)
22	3	6-Measure	3	Dev3- Reg 3	0-AI	11	1-Yes	cubic_feet (79)

Figure 5.5 Signal list

# (Signal's number)	
Description	Enumeration of the rows in the grid (signals). If clicked on them the whole row will be selected (↑↓ to be used to delete/add rows)
Restrictions	Cannot be edited

Dev	
Description	Device number to which belongs the point. Referenced to the list of devices defined in *Connection Tab (*Figure 5.4*)*
Values	Depending on the version
Edit mode	Text edit or AutoEnumeration
Comments	This is not the slave number configured in the M-Bus device itself, it is just the order of the device (from top to bottom) in the devices list

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<table>
<tr><th colspan="2">Cod</th></tr>
<tr><td>Description</td><td>Point code. Automatically assigned</td></tr>
<tr><td>Values</td><td>
0- Communication error, virtual signal indicating the status of the communication with the M-Bus device, this point will be activated when there is a problem communicating with the M-Bus device. It's a binary input signal. It is also available a general communication error signal associated to the device 0 (non-existent device) that will be activated in case of activation of any of the individual communication error signals for the devices. 1 indicates communication error, 0 indicates no error.

1- Force bus reading, virtual signal used to send an order to IntesisBox in any moment to initiate the polling of all the M-Bus devices. It's a binary output signal. Writing a 1 in this point will activate a bus reading (a polling of all M-Bus meters).

2- Continuous polling, virtual signal used to activate in IntesisBox a continuous polling of all M-Bus meters. It's a binary output signal. Be careful activating this option because depending on the type of meter, the internal battery of the meter is decreased with every read, so for this kind of meters activating this option will lead to exhausting the meter's internal battery in short time. Writing a 1 in this point will activate continuous polling.

3- Bus activity, virtual signal used to indicate to the BACnet side if there is a polling running on M-Bus (indicated by a 1) or if the M-Bus is in stand-by (indicated by a 0). It's a binary input signal.

4- Force device reading, virtual signal used to send an order to IntesisBox in any moment to initiate the polling of a specific M-Bus device. It's a binary output signal. Writing a 1 in this signal will activate the polling of the M-Bus meter related.

5- Status M-Bus, virtual signal that indicates the status of the device (status referent to the own M-Bus device indicated by the device itself in every poll of the device). It's an analogue input signal. Codification for this status field is established by the own M-Bus standard (as showed in the table below. Consult meter documentation for details about the possible Manufacturer Specific Values.
<table>
<tr><th>Bit</th><th>Meaning with Bit set</th><th>Significance with Bit not set</th></tr>
<tr><td>2</td><td>Power low</td><td>Not power low</td></tr>
<tr><td>3</td><td>Permanent error</td><td>No permanent error</td></tr>
<tr><td>4</td><td>Temporary error</td><td>No temporary error</td></tr>
<tr><td>5</td><td>Specific to manufacturer</td><td>Specific to manufacturer</td></tr>
<tr><td>6</td><td>Specific to manufacturer</td><td>Specific to manufacturer</td></tr>
<tr><td>7</td><td>Specific to manufacturer</td><td>Specific to manufacturer</td></tr>
</table>
6- Measure: indicates normal point to integrate corresponding to an M-Bus device's reading. These types of points (readings of meters) are all analogue input points.
</td></tr>
<tr><td>Edit mode</td><td>It can't be edited.</td></tr>
</table>

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Reg	
Description	M-Bus Internal register number into the M-Bus meter (this number identifies this specific signal between all the possible signals offered by the M-Bus meter).
Edit mode	Text edit or AutoEnumeration
Comments	For details on how to obtain the list of signals offered by an M-Bus meter and how to identify the register number to enter in this column, see Annex I of this document.

Bac.Name	
Description	BACnet object name for the signal. This name is included into the BACnet's *Object_name* property for the point and it will be collected by any BACnet explorer.
Restrictions	Maximum 30 characters
Edit mode	Text edit
Comments	Recommended to give a descriptive name to each point with indication of the M-Bus slave/register associated

Bac.Type	
Description	BACnet object type for the signal.
Values	• AI = Analog Input. • AO = Analog Output. • AV = Analog Value. • DI = Digital Input. • DO = Digital Output. • DV = Digital Value. • MI = Multistate Input. • MO = Multistate Output. • MV = Multistate Value.
Edit mode	Single / Multiple Values selection.
Comments	Edit using the mouse right-button-click pop-up menu

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Bac.ID	
Description	BACnet object instance number for the point. It can be manually entered by the user or can be automatically assigned by LinkBoxBacnet when saving the configuration (section 5.1.3)
Restrictions	All the object instance numbers for objects of the same type must be different
Edit mode	Text edit or AutoEnumeration
Comments	It is recommended to let LinkBoxBacnet assign automatically object instance numbers for the points

Active	
Description	Indicates if the signal is active or not for the integration
Values	• 0: Not active • 1: Active
Edit mode	Single / Multiple Values selection.

Units	
Description	Select a type for the BACnet Units
Values	• Area: Square Meters, Square Feet, etc. • Electrical: Amperes, Ohms, etc. • Light: Lumens, Luxes, etc. • Mass: Kilograms, Pounds Mass, Tons. • Pressure: Bars, Pascals, etc • Time: Years, Months, etc. • Temperature: Degrees Celsius, Degrees Kelvin, etc. • Etc.
Restrictions	Only for the analog objects
Comments	Edit using the mouse right-button-click pop-up menu

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↑↓	
Description	Buttons to move the selected row (or rows) up or down inside the grid. To move up or down inside the grid a single row or a group of consecutive rows, just select the row or rows using the left button of the mouse and push the desired up or down button.
Comments	This can be done also using the key combinations *ALT+arrow up* or *ALT+arrow down* instead of up or down buttons

Add	
Description	Button that adds a row under the selected one.

Delete	
Description	Buttons to delete the selected row (or rows).

Save	
Description	Save the configuration (details in section 5.1.3)

Exit	
Description	Exits the configuration window (details in section 5.1.3)

5.1.3 Saving the configuration

When the configuration of the project is finished follow the next steps:

1. Click the button *Save.* Once accepted the pop-up message, that will save the project in the folder on hard disk (more information in LinkBoxBacnet Manual).

2. You will be prompted to generate the configuration file to be sent to the gateway,

    a. If *YES* is selected, the binary file (M-Bus.LBOX) containing the configuration for the gateway will be generated and saved also into the project folder.

    b. If *NO* is selected the binary file needs to be created before following the next steps. To do so open the Configuration window (section 5.1) and restart from step 1

3. A pop-up message will show up asking if you want to **preserve the Object instance numbers. BE CAREFUL** using this feature.

    a. If ***NO*** is selected all the object instance numbers for the points will be automatically reconstructed and thus loosing previous instance numbers, if defined. **ONLY** USE this option **for a brand new configuration** not previously running in the gateway and therefore not yet integrated into the BACnet system

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b. Select **Yes** for configurations **previously running** in the gateway and **already integrated into the BACnet system** that had been extended with a few more points that **must respect the previously defined object instance numbers**. All the points with object instance numbers defined will be respected. LinkBoxBacnet will automatically assign object instance numbers to ones without it.

4. As the final step, a pop-up message will ask if you want to see the BACnet points list report, If you select *Yes,* a text file called *M-Bus- BACNET OBJECT LIST.TXT* will be generated and saved into the project folder containing a report of all the point's BACnet information (for informative purposes at user level). The file will be also opened in the notepad, it looks like this:

ObjIdent	ObjType	OInst	ObjName
00000000	0-AI	0000	Status M-Bus Dev.1
00000001	0-AI	0001	Status M-Bus Dev.2
00000003	0-AI	0003	Dev1- Reg 1
00000004	0-AI	0004	Dev1- Reg 2
00000005	0-AI	0005	Dev1- Reg 3
00000006	0-AI	0006	Dev2- Reg 1
00000007	0-AI	0007	Dev2- Reg 2
12582912	3-BI	0000	General communication error
12582913	3-BI	0001	Bus activity
12582914	3-BI	0002	Communication Error Dev.1
12582915	3-BI	0003	Communication Error Dev.2
12582916	3-BI	0004	Communication Error Dev.3
16777216	4-BO	0000	Force bus reading
16777217	4-BO	0001	Activate continuous Polling
16777218	4-BO	0002	Force device reading 1
16777219	4-BO	0003	Force device reading 2

5. Once in the configuration window again, click on exit. The configuration is ready to be sent to the IntesisBox (check LinkBoxBacnet Manual)

The configuration cannot be received from the gateway to* LinkBoxBacnet*, it can only be sent.

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6. Mechanical & electrical characteristics

Enclosure	Plastic, type PC (UL 94 V-0). Dimensions: 107mm x 105mm x 58mm.
Colour	Light Grey. RAL 7035.
Power	9 to 30Vdc +/-10%, Max.: 125mA. 24Vac +/-10% 50-60Hz, Max.: 127mA Must use a NEC Class 2 or Limited Power Source (LPS) and SELV rated power supply. Plug-in terminal block for power connection (2 poles).
Terminal wiring (for power supply and low-voltage signals)	Per terminal: solid wires or stranded wires (twisted or with ferrule) 1 core: 0.5mm^2… 2.5mm^2 2 cores: 0.5mm^2… 1.5mm^2 3 cores: not permitted
Mounting	Wall. DIN rail EN60715 TH35.
M-Bus ports	1 x Serial EIA232 (DB9 male DTE). SELV 1 x Serial EIA485 (Plug-in screw terminal block 2 poles). SELV *Requires external EIA232 or EIA485 to M-Bus level converter to connect to the Meter's bus.*
BACnet/IP port	1 x Ethernet 10Base-T (RJ45).
LED indicators	1 x Power. 2 x M-Bus port activity (Tx, Rx). 2 x Ethernet port link and activity (LNK, ACT).
Console port	EIA232. (DB9 female connector, DCE). SELV
Configuration	Via console port.[1]
Firmware	Allows upgrades via console port.
Operational temperature	0°C to +70°C
Operational humidity	5 to 95%, non condensing
Protection	IP20 (IEC60529).
RoHS conformity	Compliant with RoHS directive (2002/95/CE).
Norms and standards	CE conformity to EMC directive (2004/108/EC) and Low-voltage directive (2006/95/EC) EN 61000-6-2, EN 61000-6-3, EN 60950-1, EN 50491-3

[1] Standard cable DB9male-DB9female 1,8 meters long is supplied with the device for connection to a PC COM port for configuring and monitoring the device. The configuration software, compatible with Windows® operating systems, is also supplied.

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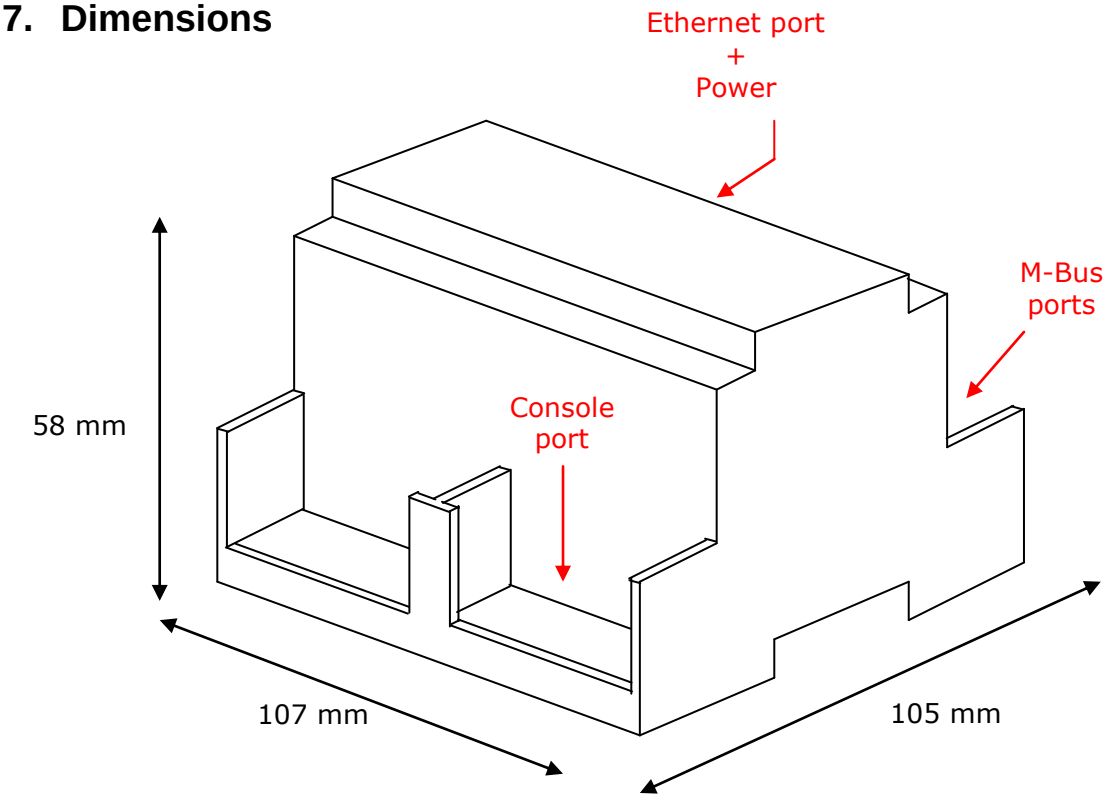
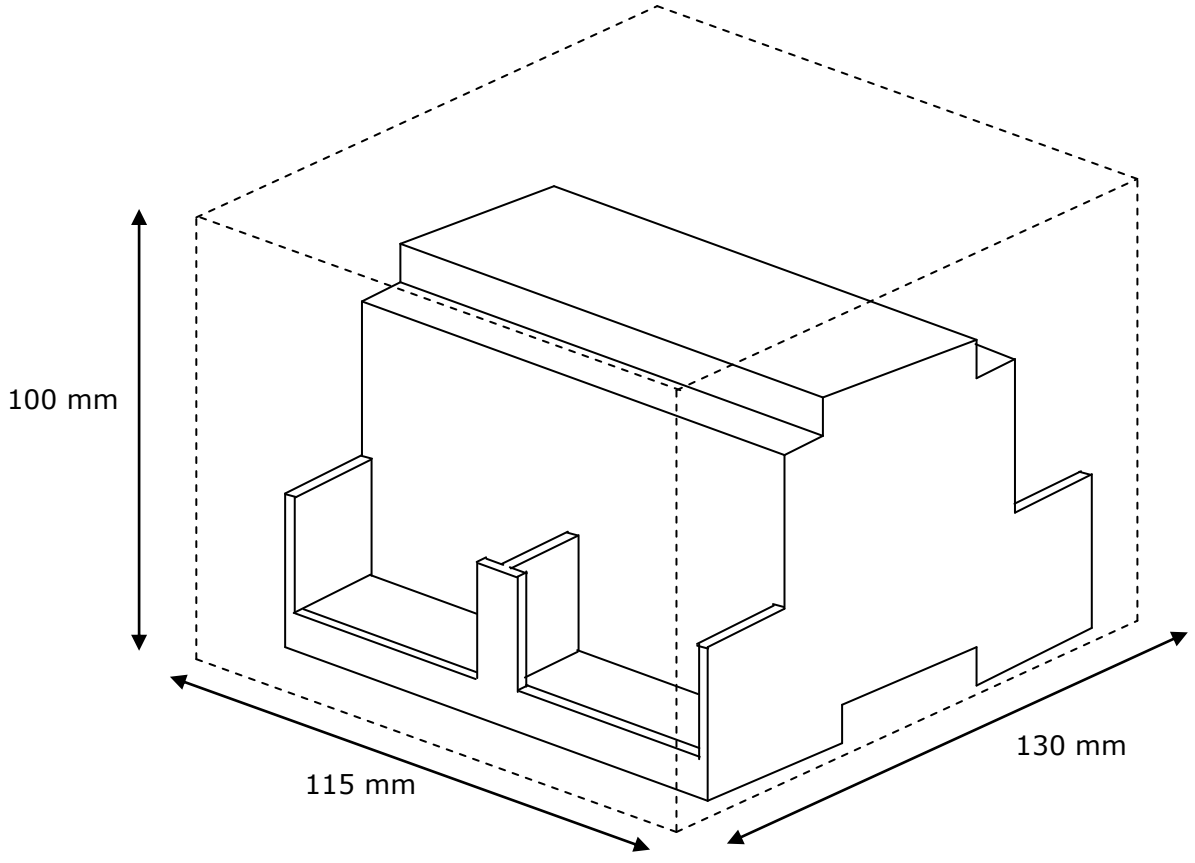
7. Dimensions



Free space recommended to install the device into a cabinet (wall or DIN rail mounting), with space enough for external connections:



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8. ANNEX I. Identification of a meter available registers

In the configuration of the signals to integrate, in the column *Reg* of the points list, it must be entered the M-Bus register number corresponding to the signal wanted to integrate (from all the signals offered by the M-Bus meter). In case that the signals offered by a given meter are unknown, they can be obtained along with the correct register number value to put in the column *Reg* in the points list. To do so, follow these steps (details in how to perform the actions can be found in the LinkBoxBacnet Manual):

1- Open the *External protocol communication viewer*

2- From the list of system commands to send to IntesisBox, select DEBUG=3* and send the command to the IntesisBox.

3- Open the signal Viewer

4- Force the reading of the desired meter using the special point for this purpose in the configuration. Double click on the signal *force device reading* for the desired meter and enter 1 for this signal in the Data Test window. This will force a polling of the meter and a list of all the registers offered by the meter will be showed in the external protocol communication viewer window (see Figure 8.1).

5- Once identified the registers to integrate, deactivate the debug option of IntesisBox, sending the command DEBUG=0

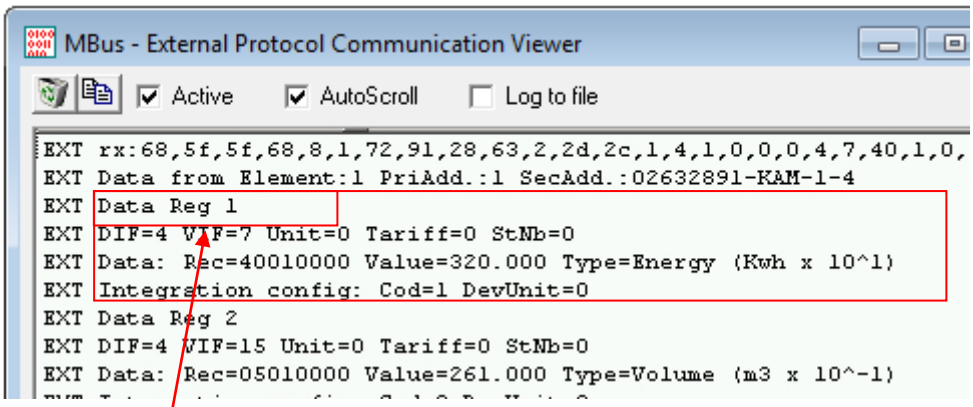

Figure 8.1 Example of a device response with DEBUG=3 activated

In case you want to integrate this meter's register, enter this value (**1** in this case) in the column *Reg* for this signal in the points list.

NOTE: If in the type variable you get the message "VIFE not recognized", please visit the M-BUS device manual to check the expected units for that signal. This is usually associated to proprietary data types that need to be specified by the manufacturer itself, therefore more information must be found in the M-BUS device or meter.

* **IMPORTANT:** Debug=3 applies for firmware versions V.42.0.14 and above. For previous versions, please use DEBUG=1.

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