

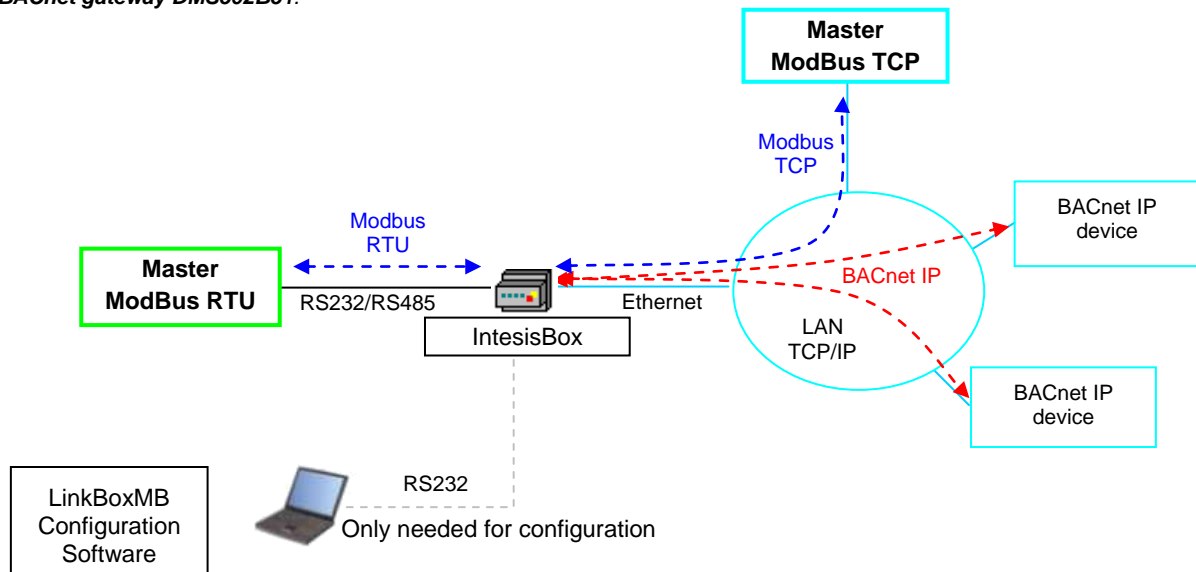


IntesisBox®

Modbus Server - BACnet/IP Client

Gateway for integration of BACnet IP devices into Modbus (RTU and TCP) systems.

Integrate Daikin VRV Air Conditioners into your Modbus system (SCADA, BMS, PLC...). For this, Daikin VRV system must be equipped with Daikin BACnet gateway DMS502B51.



The BACnet side of IntesisBox

IntesisBox is a BACnet IP client device allowing to read/write points of other BACnet IP device(s) connected to a BACnet network, and offering these point's values through its Modbus interface. BACnet interface of IntesisBox supports reading of other BACnet devices by continuous polling or by subscription requests (COV). All the updated readings are maintained in IntesisBox memory ready to be served to Modbus when requested.

The Modbus side of IntesisBox

After the start up process, IntesisBox listen for any read or write request received from Modbus system. If it is read request, IntesisBox serves the updated point's values in its memory. If it is a write request, performs the writing of the remote BACnet device's point associated immediately. Modbus interface of IntesisBox supports Modbus TCP or Modbus RTU (RS232 or RS485), software configurable, and acts as a Modbus slave device.

The configuration of IntesisBox

IntesisBox Modbus Server series are configured using LinkBoxMB, a software tool for windows™ which is supplied along with the purchase of IntesisBox with no additional cost. With the standard installation of LinkBoxMB, a Demo project for integration of BACnet devices is also installed, using this demo project makes the engineering needed for this integration easy and quick, almost plug&play.

IntesisBox capacity

Element	Max. 100 version	Max. A version	Max. B Version	Notes
Type of BACnet devices				Only those supporting <i>BACnet ASHRAE 135 – 2001 Annex J - BACnet/IP protocol</i> , commonly referred as BACnet/IP.
BACnet points supported	100	500	3000	Maximum number of points (BACnet objects) that can be defined into IntesisBox.
BACnet IP devices supported	16	16	16	Maximum number of different BACnet IP devices that can be defined into IntesisBox (to read/write points into them).

There are three different versions of *IntesisBox® Modbus Server - BACnet/IP Client* with different capacity each of them.

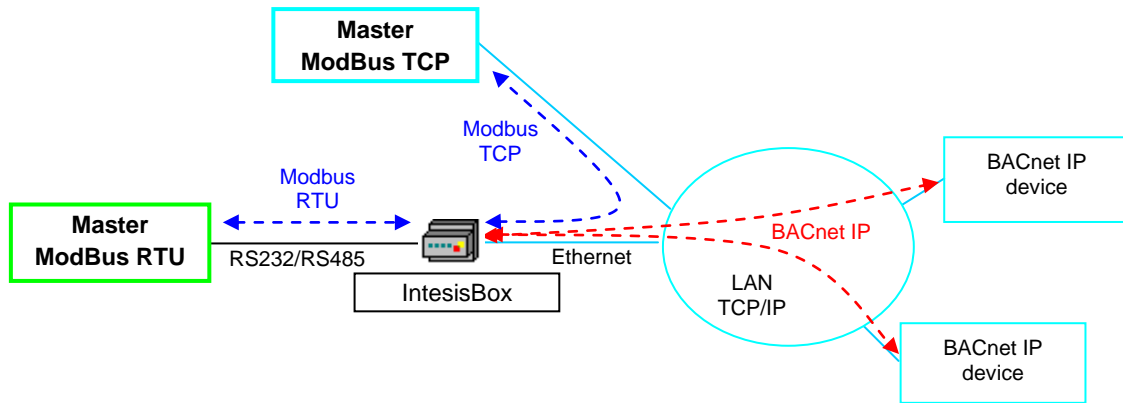
- 100 version with capacity of 100 points*. *Ref. IBOX-MBS-BAC-100.*
- A version with capacity of 500 points*. *Ref. IBOX-MBS-BAC-A.*
- B version with capacity of 3000 points*. *Ref. IBOX-MBS-BAC-B.*

* If 32bit Modbus registers are used, the maximum number of BACnet objects allowed by the LinkBoxMB license is reduced by half. In this case, the maximum number is 50, 250, and 1500 points for the IBOX-MBS-BAC-100, the IBOX-MBS-BAC-A and the IBOX-MBS-BAC-B respectively.

IntesisBox model	Maximum Number of BACnet objects	
	16 bit Modbus registers	32 bit Modbus registers
IBOX-MBS-BAC-100	100	50
IBOX-MBS-BAC-A	500	250
IBOX-MBS-BAC-B	3000	1500

Sample applications

Integration of any BACnet/IP device into Modbus control systems.

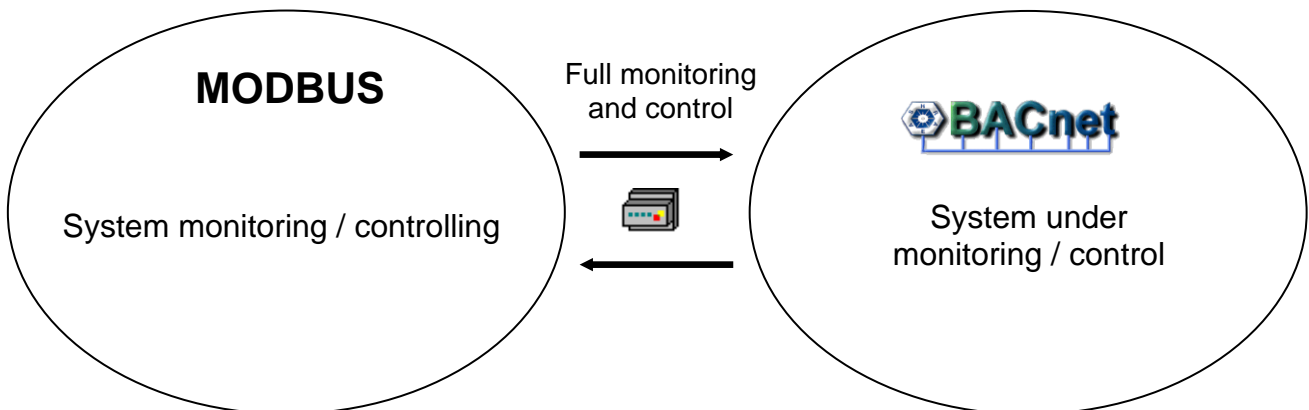


Modbus control system

- Building Management Systems (BMS).
- SCADA packages.
- Human Machine Interfaces (HMI).
- Direct Digital Controllers (DDC).
- Programmable Logic Controllers (PLC).
- ...

Typical BACnet devices or Systems equipped with BACnet interface:

- Heaters.
- Air conditioners.
- HVAC control.
- Access control.
- ...



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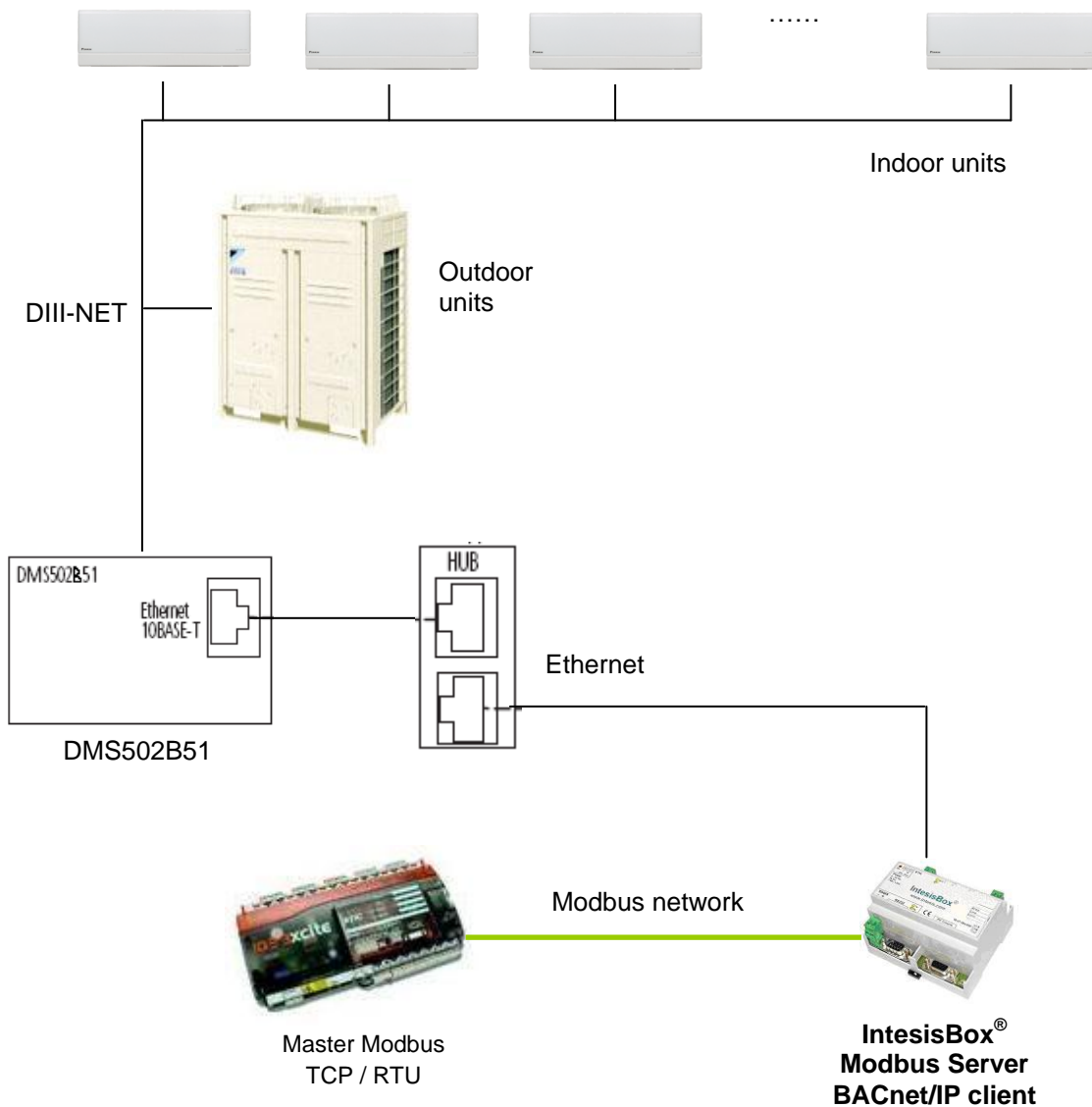
Typical application

Integration of Daikin VRV Air Conditioners into a Modbus enabled control system (BMS, PLC, SCADA, Controller...).

For this application, Daikin VRV Air Conditioning system must be equipped with Daikin BACnet gateway (model DMS502B51), this Daikin gateway is normally commissioned by Daikin technical personnel, contact your nearest Daikin distributor for details.

In the technical documentation of IntesisBox supplied with the device, extended details on how to configure IntesisBox for this application is provided.

Intesis Software provides sample projects for IntesisBox with specific configuration to integrate Daikin VRV system, with these sample projects the configuration and commissioning of IntesisBox for this application becomes easy and quick, almost plug & play.



Modbus interface of IntesisBox

Functions supported

- Modbus functions 03 and 04 (*read holding registers* and *read input registers*) can be used to read Modbus registers.
- Modbus functions 06 and 16 (*Single Multiple Holding Registers* and *Write Multiple Holding Registers*) can be used to write Modbus registers.
- If *poll records* are used to read or write more than one register, it is necessary that the range of addresses requested contains valid addresses, if not the corresponding Modbus error code will be returned.
- Modbus error codes are fully supported, they will be sent whenever a non valid Modbus action or address is required.

Data Formats

The Modbus registers can be of 2 bytes (16 bits) or of 4 bytes (32 bits).

- For 2 bytes (16 bits) registers, its content is expressed always in MSB..LSB.
- For 4 bytes (32 bits) registers, its content (the way IntesisBox handles the byte order) can be one of 3 different options, configurable, this has been implemented to avoid problems reading 32 bits registers, because Modbus master systems handle differently byte order of 32 bits registers depending on manufacturer/device.

Modbus data coding formats supported	<ul style="list-style-type: none"> • 16 bits unsigned • 16 bits signed • 16 bits signed * 10 • 32 bits unsigned • 32 bits signed • 32 bits float
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Modbus RTU

- Baud rate can be selected from 1200, 2400, 4800, 9600, 19200, 38400 and 56700. (Data Bits: 8, parity: none, Stop Bits: 1).
- Modbus slave number can be configured. Physical connection (RS232 or RS485) can also be selected.
- Only the lines RX, TX and GND of the RS232 connector are used (TX/RX+ and TX/RX- for RS485).

Modbus TCP

- The TCP port to use can be configured (by default 502 is used).
- The IP address, subnet mask and default router address to use by IntesisBox can be also configured.

Address Map

The Modbus address map is fully configurable, any point in the IntesisBox can be freely configured with the desired Modbus register address.

BACnet/IP interface of IntesisBox

BACnet interface	
Device type	Client
BACnet modes supported	BACnet/IP
Configuration parameters per BACnet device defined	<ul style="list-style-type: none"> • IP address. • BACnet port. • BACnet device number (device instance number). • Name.
Interactivity with BACnet system	<ul style="list-style-type: none"> • Point's Read/Write allowed. • Reading of BACnet points by Polling or Subscription requests (COV). <p><i>See BACnet interface specifications below for more details.</i></p>

Specifications

BACnet Conformance Class Supported: Class 3

Data Link Layer Option: BACnet IP, (Annex J)

Segmented Requests/Responses Not Supported

BACnet Standard Application Services Supported and more details are explained in BACnet IP Server KNX PICS (protocol implementation conformance statement)

http://www.intesis.com/pdf/IntesisBox_Modbus_Server_Bacnet_IP_Client_PICS.pdf

BACnet Standard Object Types Supported

Object Type	Property	Description
Analog Input	Present Value	Analog signal. i.e. Ambient temperature.
Analog Output	Present Value	Analog signal.
Analog Value	Present Value	Analog signal. i.e. Temperature set point value.
Binary Input	Present Value	Digital signal. i.e. ON/OFF status.
Binary Output	Present Value	Digital signal. i.e. ON/OFF command.
Binary Value	Present Value	Digital signal. i.e. ON/OFF status/command.
Multistate Input	Present Value	Multistate signal. i.e. Working mode status.
Multistate Output	Present Value	Multistate signal.
Multistate Value	Present Value	Multistate signal. i.e. Working mode command.

Configuration tool

LinkBoxMB

- Visual engineering tool, easy of use, for gateway's configuration and supervision compatible with Microsoft Windows operating systems, supplied with the gateway free of charge.
- Multi-window tool allowing to supervise simultaneously the communication activity with both protocols (systems), real time values for all the signals allowing to modify any value (very useful for test purposes), console window showing debug and working status messages, and configuration windows to configure all the gateway's parameters and signals.
- Signals configuration in plain text files (tab separated) for easy and quick configuration using Microsoft Excel (very useful in projects with a lot of points).
- Allows configuring the gateway's parameters and signals while in off-line (not connected to the gateway).
- Connection to the gateway for download the configuration and supervision by using serial COM port of the PC (serial cable supplied with the gateway).
- Allows configuring all the external protocols available for IntesisBox[®] Modbus Server series.
- Upgrades for this software tool available free of charge whenever a new protocol is added to the IntesisBox[®] Modbus Server series.
- Multi-project tool allowing having in the engineer's PC the configuration for all the sites with different IntesisBox[®] Modbus Server series gateways.
- Multi-language tool, all the language-dependent strings are in a plain text file (tab separated) for easy modification or addition of new languages.
- A list of system commands is available to send to the gateway for debugging and adjust purposes (Reset, Date/time consultation/adjust, Firmware version request...).

Configuration Bacnet/IP client - Max.Devices:1 Points:500

Connection Signals

#	Dev	Object Type	Property	Signal	Object instance	Format	Point	R/W	Active
1	1	999-Communication Er	-	Communication Error	-	1-16 bits unsigned	1	0-R	1-Yes
2	1	0-Analog Input	85-Present Value	Test AI		1 3-16 bits signed * 10	2	0-R	1-Yes
3	1	1-Analog Output	85-Present Value	Test AO		1 7-32 bits float	3	2-RW	1-Yes
4	1	2-Analog Value	85-Present Value	Test AV		1 7-32 bits float	5	2-RW	1-Yes
5	1	3-Binary Input	85-Present Value	Test BI		1 1-16 bits unsigned	7	0-R	1-Yes
6	1	4-Binary Output	85-Present Value	Test BO		1 1-16 bits unsigned	8	2-RW	1-Yes
7	1	5-Binary Value	85-Present Value	Test BV		1 1-16 bits unsigned	9	2-RW	1-Yes
8	1	13-Multistate Input	85-Present Value	Test MI		1 1-16 bits unsigned	10	0-R	1-Yes
9	1	14-Multistate Output	85-Present Value	Test MO		1 1-16 bits unsigned	11	2-RW	1-Yes
10	1	19-Multistate Value	85-Present Value	Test MV		1 1-16 bits unsigned	12	0-R	1-Yes

Signal's machine/panel/device number.

↑ ↓ Add Delete Accept Exit

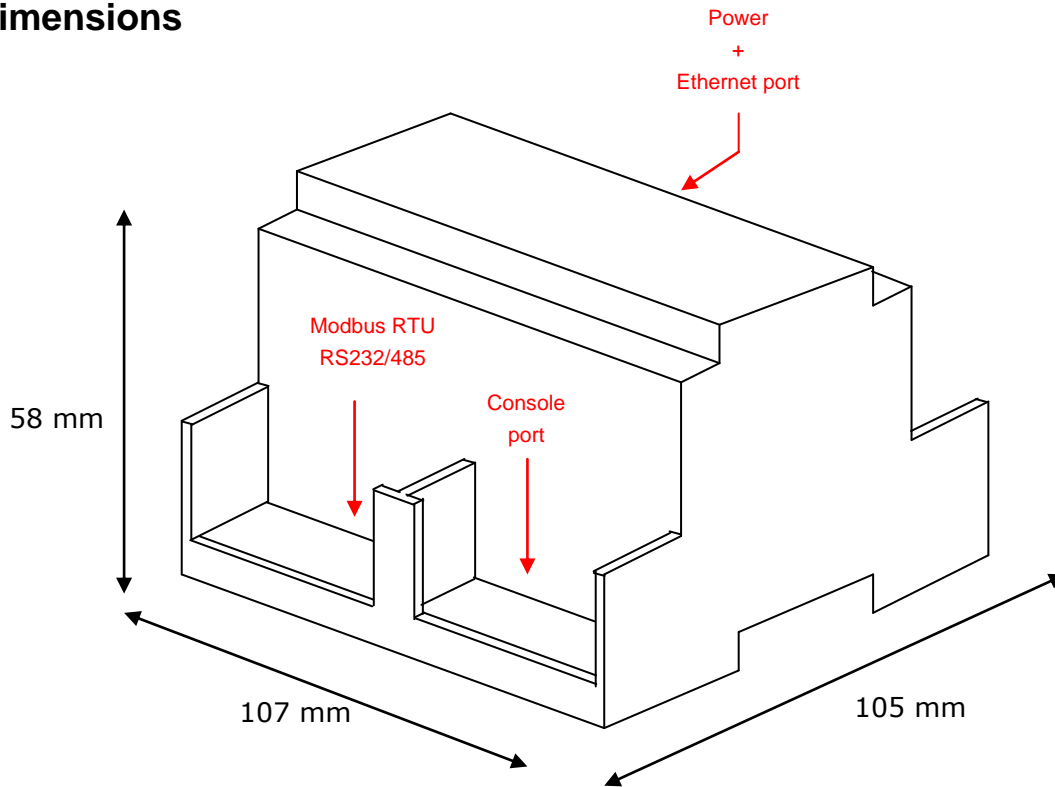
Mechanical & Electrical characteristics



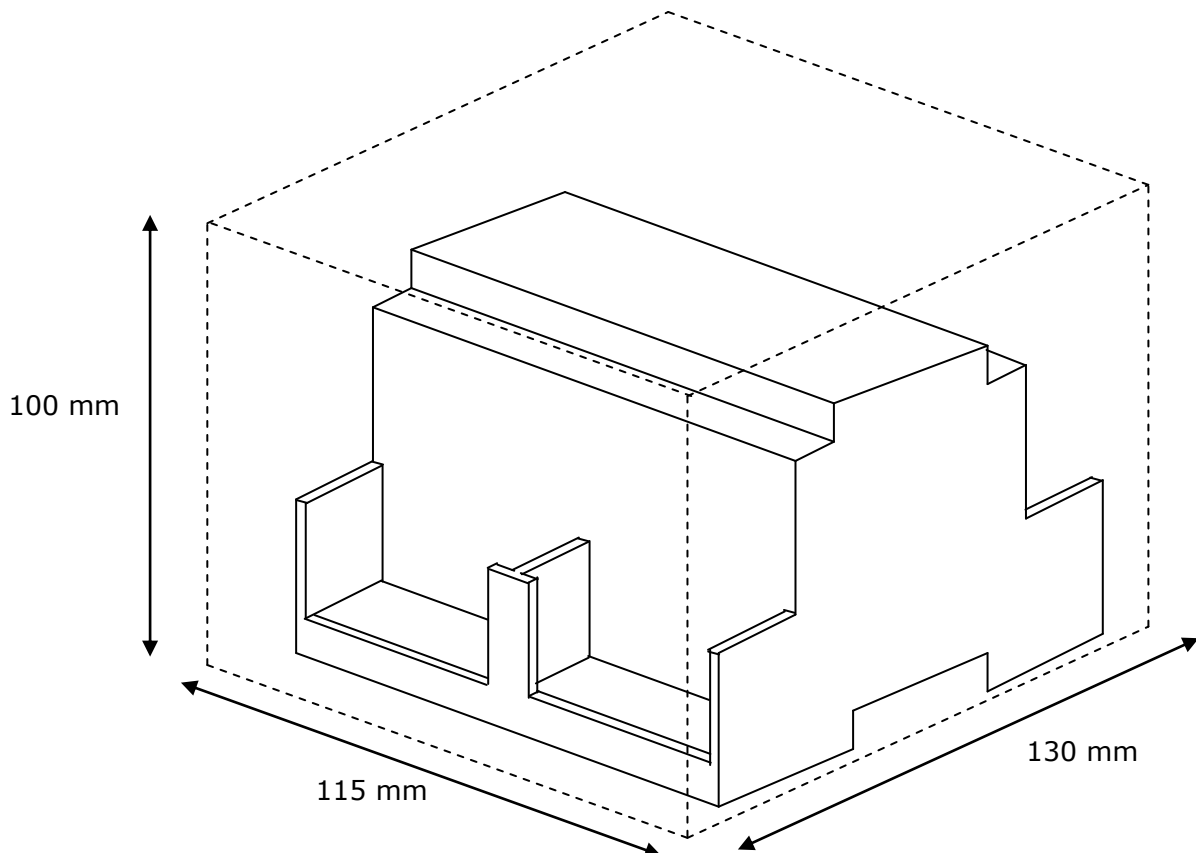
Enclosure	Plastic, type PC (UL 94 V-0). Dimensions: 107mm x 105mm x 58mm.
Colour	Light Grey. RAL 7035.
Power	9 to 30Vdc +/-10% 1.4W. 24Vac +/-10% 1.4VA. Plug-in terminal bloc for power connection (2 poles).
Mounting	Wall. DIN rail EN60715 TH35.
Modbus RTU ports	1 x Serial RS232 (DB9 male DTE). 1 x Serial RS485 (Plug-in screw terminal block 2 poles).
Modbus TCP & BACnet IP port	1 x Ethernet 10BT RJ45.
LED indicators	1 x Power. 2 x Serial port (Modbus RTU) activity (Tx, Rx). 2 x Ethernet port link and activity (LNK, ACT).
Console port	RS232. DB9 female connector (DCE).
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).
Certifications	CE

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.

Dimensions



Recommended available space for its installation into a cabinet (wall or DIN rail mounting), with space enough for external connections



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