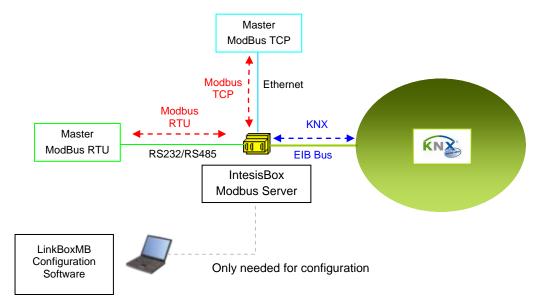# IntesisBox®
ModBus Server - KNX

Gateway for integration of KNX equipment into Modbus (RTU and TCP) control systems.

Integrate KNX based lighting control into your SCADA, BMS, PLC… "talking" Modbus.

IntesisBox acts as one more device into the KNX system, maintaining always in memory an updated mirror of the KNX points declared in its configuration table, ready to be served to Modbus when requested. *Points in KNX can be read and written from a Modbus master device.*

Modbus interface of IntesisBox supports Modbus TCP or Modbus RTU (RS232 or RS485), software configurable, and acts as a Modbus slave device. *The IntesisBox's KNX TP-1 (EIB) interface connects directly to the EIB bus and is opto-isolated from the rest of internal electronics.*

When starting-up or after an EIB bus reset, IntesisBox can read into KNX the current values for those points required (critical signals needed to be updated in every moment in Modbus). This is configurable per point. *More than one EIB group address can actuate on the same ModBus Address register.*

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 KNX systems is also installed, using this demo project makes the engineering needed for this integration easy and quick.*

Intesis software

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IntesisBox capacity

Element	100 Version	A Version	B Version	Notes
KNX communication objects	100	500	3000	Maximum number of different KNX communication objects that can be defined.
KNX (EIB) listening group addresses	1000	1000	1000	Maximum number of different KNX group addresses that can be defined as listening group addresses, one or more of these listening group addresses can be assigned to each point. With this, more than one KNX group address can actuate on the same IntesisBox's point.

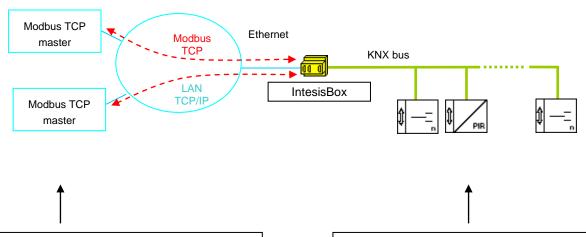There are different versions of *IntesisBox® Modbus Server - KNX* with different capacity every one of them:

- 100 version with capacity of 100 KNX communication objects*. ***Ref. IBOX-MBS-KNX-100***.
- A version with capacity of 500 KNX communication objects *. ***Ref. IBOX-MBS-KNX-A***.
- B version with capacity of 3000 KNX communication objects *. ***Ref. IBOX-MBS-KNX-B***.

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

IntesisBox model	Maximum Number of Communication Objects	
	16 bit Modbus registers	32 bit Modbus registers
IBOX-MBS-KNX-100	100	50
IBOX-MBS-KNX-A	500	250
IBOX-MBS-KNX-B	3000	1500

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Sample applications

Integration of KNX and Modbus using *IntesisBox Modbus Server - KNX* gateway.
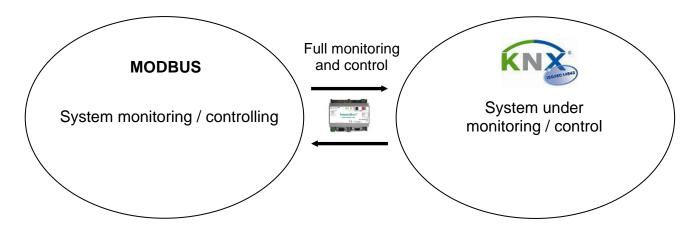

Modbus control system

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

Typical KNX (EIB) devices

- Lighting/blind control systems
- Building Automation devices.
- Home Automation devices.
- …

MODBUS

System monitoring / controlling

Full monitoring and control

System under monitoring / control

Intesis software

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Typical applications

Integration of KNX based lighting control into Building Management Systems "talking" Modbus

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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	16 bits unsigned 16 bits signed 16 bits signed * 10 32 bits unsigned 32 bits signed 32 bits float

Modbus RTU

- Baud rate can be selected from 1200, 2400, 4800, 9600, 19200, 38400 and 57600. (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.

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KNX interface of IntesisBox

IntesisBox connects directly to the EIB bus (KNX TP-1) thanks to its internal EIB bus coupling unit, and acts as one more device of the KNX system with the same behavior and configuration characteristics. Internally, the bus coupling circuitry is opto-isolated from the rest of the electronics of the device to prevent damage of all the system in case of electrical pulse or over-voltage coming from the EIB bus.

IntesisBox manages all the communication with the EIB bus according to its configuration.

- On receiving read requests from KNX, if they are destined to the KNX groups associated to internal points, the gateway updates its point's values in memory, ready to be served to Modbus when requested.

- When a change in a configured Modbus point is received, the corresponding write request will be sent to KNX, to the associated KNX group of the point (only if the point is configured to do so, this means if the point is configured as "T" - Transmit).

- IntesisBox continuously checks the status of the KNX bus, if a bus loss is detected, due to a bus power failure for example, on restoration of the bus IntesisBox will re-transmit the status of all the groups configured as "T" (transmit) and also will perform the *Updates* for the groups configured as "U" or "U2".

Every point defined in IntesisBox has the following KNX features associated to it:

Feature	Description
EIS (DataPoint) *	KNX data type to encode the signal's value. It will depend on the Modbus type of signal associated to it in every case.
Group *	It's the EIB group address associated to the point. It is also the EIB group to which will be applied the reading(R), writing (W), transmit (T) and update (U or U2) features. It's the EIB sending group or main group.
Listening addresses	These are the EIB group addresses that will also actuate on the point, apart of the main EIB group address mentioned above.
R	Read. If this flag is activated means that this point accepts read requests from KNX.
W	Write. If this flag is activated means that this point accepts write requests from KNX.
T	Transmit. If this flag is activated means that when the value of this point changes in the gateway, a write request will be sent to KNX indicating the new value for this EIB group.
U or U2	Update. If flag "U" is activated means that when the gateway starts up or after an EIB bus reset, a KNX read request will be sent to KNX (of the main EIB group), then the received value will update the point's value in the IntesisBox's memory as it would happen for a normal write of this EIB group from KNX. If flag "U2" is activated means that when the gateway starts up or after an EIB bus reset, a KNX read request will be sent to KNX (of the first EIB group listening address defined), then the received value will update the point's value in the IntesisBox's memory as it would happen for a normal write of this EIB group (the first listening address defined) from KNX.

* Configuration for this feature is mandatory.

All the mentioned flags (R,W,T,U,U2) related to the KNX part are configurable per point in the IntesisBox.

KNX EIS (Datapoints) supported	• Switching (1 bit). • Dimming (4 bits). • Float (16 bits). • Scaling (8 bits). • Drive control (1 bit).	• Priority (2 bits). • Float IEEE (32 bits). • Counter (8 bits). • Counter (16 bits). • Counter (32 bits). • ASCII char (8 bits).

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Configuration tool

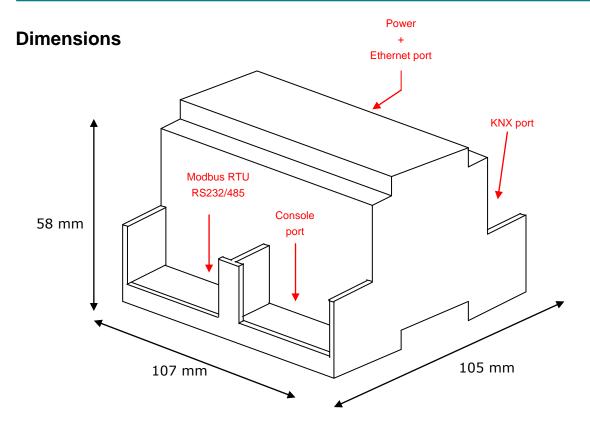| LinkBoxMB	
	• Visual engineering tool, easy of use, for gateway's configuration and supervision compatible with Microsoft Windows operating systems, supplied with the gateway free of charge.
	• Multi-window tool allowing to supervise simultaneously the communication activity with both protocols (systems), 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…).

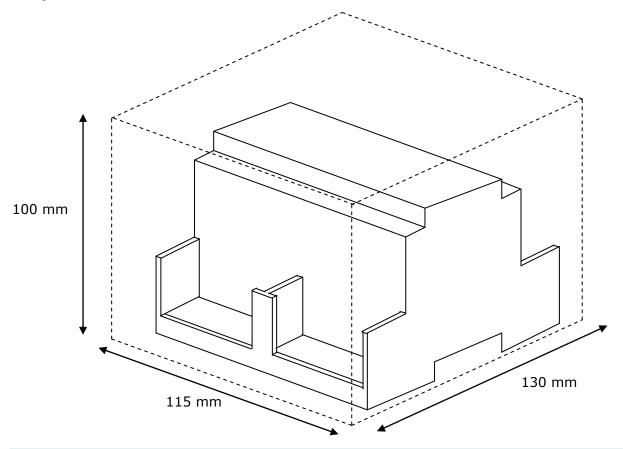Configuration KNX - Max.Regs.ModBus:500 GroupsKNX:500 List.AddressKNX:1000

#	Data type	Description	EIS	Group	Listening addresses	R	W	T	U	Format	Point	R/W	Active
1	0-Error co	Error com. KNX								1-16 bits usigned	1		1-Yes
2	1-Data		1 - Switching (1 bit)	1/0/1			W			1-16 bits unsigned	2	0-R	1-Yes
3	1-Data		2 - Dimming (4 bit)	1/0/2			W			2-16 bits signed	3	0-R	1-Yes
4	1-Data		1 - Switching (1 bit)	1/0/3			W			3-16 bits signed * 10	4	0-R	1-Yes
5	1-Data		1 - Switching (1 bit)	1/0/4			W			5-32 bits unsigned	5	0-R	1-Yes
6	1-Data		1 - Switching (1 bit)	1/0/5			W			6-32 bits signed	6	0-R	1-Yes
7	1-Data		1 - Switching (1 bit)	1/0/6			W			7-32 bits float	7	0-R	1-Yes
8	1-Data		10 - Counter (16 bit)	1/1/2			W	T		1-16 bits unsigned	12	1-RW	1-Yes
9	1-Data		1 - Switching (1 bit)	1/1/3			W	T		2-16 bits signed	13	1-RW	1-Yes
10	1-Data		1 - Switching (1 bit)	1/1/4			W	T		3-16 bits signed * 10	14	1-RW	1-Yes
11	1-Data		5 - Float (16 bit)	1/1/5			W	T		5-32 bits unsigned	15	1-RW	1-Yes
12	1-Data		1 - Switching (1 bit)	1/1/6			W	T		6-32 bits signed	16	1-RW	1-Yes
13	1-Data		1 - Switching (1 bit)	1/1/7			W	T		7-32 bits float	17	1-RW	1-Yes

Integration signals configuration

Add   Delete   Save   Exit

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Intesis software	email	info@intesis.com
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Technical characteristics

Enclosure	Plastic, type PC (UL 94 V-0). Dimensions: 107mm x 105mm x 58mm.
Color	Light Grey. RAL 7035.
Power	9 to 30Vdc +/-10% 1.4W. 24Vac +/-10% 1.4VA. Plug-in terminal block 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	1 x Ethernet 10BT RJ45.
KNX port	1 x KNX TP1 (EIB) port opto-isolated. Plug-in terminal block (2 poles).
LED indicators	1 x Power. 2 x Serial port (Modbus RTU) activity (Tx, Rx). 2 x Ethernet port link and activity (LNK, ACT). 2 x KNX port activity (Tx, Rx). 1 x KNX programming/bus.[1]
Push buttons	1 x KNX programming.[1]
Console port	RS232. DB9 female connector (DCE).
Configuration	Via console port.[2]
Firmware	Allows upgrades via console port.
Operational temperature range	0°C to +70°C
Operational humidity range	5% to 95%, non condensing
Protection	IP20 (IEC60529).
RoHS conformity	Compliant with RoHS directive (2002/95/CE).
Certifications	CE

[1] Not operational for the moment. Reserved for future use.
[2] Along with the device it is also supplied a standard DB9 male - DB9 female 1.8 m. cable for configuring and monitoring the device using a PC via serial COM port. The configuration software LinkBoxMB, compatible with MS Windows® operating systems, is also supplied.

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Dimensions

Power
+
Ethernet port

KNX port

Modbus RTU
RS232/485

Console
port

58 mm

107 mm

105 mm

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

100 mm

115 mm

130 mm

Intesis software

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