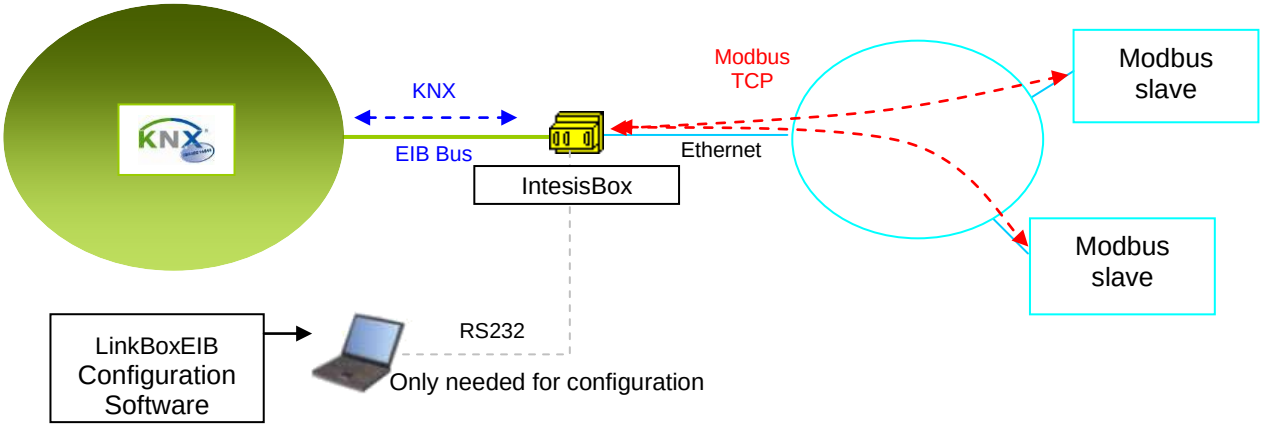
IntesisBox®
KNX – Modbus TCP master

Gateway for integration of Modbus TCP slave devices into KNX control systems.

Integrate any Modbus TCP slave device into KNX.



IntesisBox is a Modbus TCP master device that reads/writes points of Modbus TCP slave device(s), and offers these point's values through its KNX interface, acting in the KNX side as one more device of the KNX system. ***The KNX interface of IntesisBox connects directly to the EIB bus and is opto-isolated from the rest of the internal electronics.***

IntesisBox reads Modbus slave device's points by continuous polling (simultaneous polling to all slave devices, up to 5). If a non response of the Modbus slave device is detected, the corresponding virtual signal inside IntesisBox will be activated indicating communication error with the Modbus device.

Every one of the Modbus points defined in IntesisBox is associated to a KNX group address, with this, all the Modbus slaves' points are seen as KNX group addresses from the KNX system. ***And when a change in any Modbus point occurs, a write request is sent to KNX, of the associated KNX Group.***

IntesisBox KNX series are configured using *LinkBoxEIB,* a software tool for windows™ which is supplied along with the purchase of IntesisBox with no additional cost. ***With the standard installation of LinkBoxEIB, a Demo project for integration of Modbus TCP slave devices is also installed, using this demo project makes the engineering needed for this integration easy and quick.***

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IntesisBox capacity

Element	100 version	A version	B version	Notes
Type of Modbus slave devices				Those supporting *Modbus TCP/IP protocol*. Communication over Ethernet network.
Points	100	500	4000	Maximum number of points that can be defined into IntesisBox.
Modbus TCP slave devices	5	5	5	Maximum number of Modbus TCP slave devices that can be defined in IntesisBox.
Modbus slave address	1 to 254	1 to 254	1 to 254	Modbus slave address that can be defined in IntesisBox for each point. *For each point defined in IntesisBox, a Modbus TCP device to which belongs (1 to 5), and a Modbus slave address to which belongs (1 to 254) can be defined, with this, the integration of a number of Modbus RTU slave devices through a Modbus TCP to RTU converter is also possible.*
Virtual signals	1 per device	1 per device	1 per device	1 communication error signal per Modbus TCP slave device defined. All available from KNX.

There are three different versions of *IntesisBox® - KNX Modbus TCP master,* with different capacity every one of them.

- Version allowing up to 100 points and 5 slave devices. *Ref.: IBOX-KNX-MBTCP-100*
- Version allowing up to 500 points and 5 slave devices. *Ref.: IBOX-KNX-MBTCP-A*
- Version allowing up to 4000 points and 5 slave devices. *Ref.: IBOX-KNX-MBTCP-B*.

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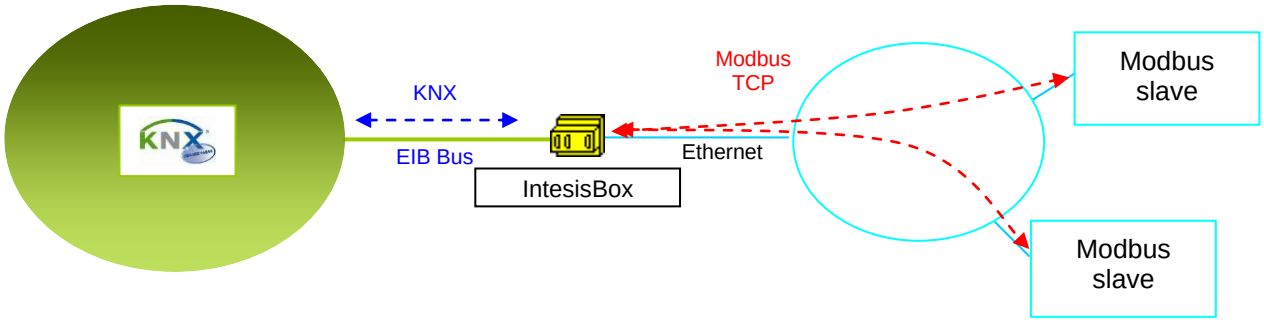
Sample applications

Integration of any Modbus TCP slave device into KNX control systems.



KNX control system:

- Building Automation.
- Home Automation.
- …

Typical Modbus slave devices:

- Chillers.
- Heaters.
- Air conditioners.
- Thermostats.
- Fan coil controllers.
- Room controllers.
- Power meters.
- Energy meters.
- Building Management Systems (BMS).
- Programmable Logic Controllers (PLC).
- Other protocol based systems available using *IntesisBox Modbus Server* series gateways.

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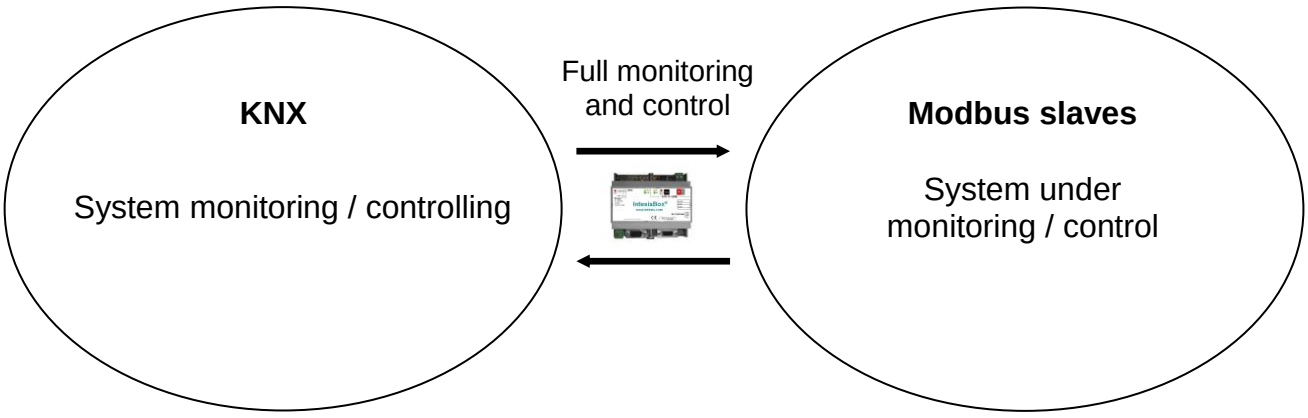

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KNX interface of IntesisBox

KNX/EIB interface		
Bus coupler	Internal KNX TP1 (EIB) opto-isolated bus coupler unit for direct connection to EIB bus. Connector: 2 poles plug-in screw terminal bloc.	
Configuration parameters	• Physical address.	
Interactivity with KNX/EIB system	• The points can be read from KNX. *Configurable individually per point.* • The points can be written from KNX. *Configurable individually per point.* • A write request can be sent to KNX following a change in the point's value. *Configurable individually per point.* • The point value can be updated with a read request sent to KNX when the IntesisBox starts up or after a bus reset detection. *Configurable individually per point.* • Multiple EIB group addresses can actuate on the same IntesisBox's point.	
Points		
Configuration parameters per point	Generic fields. • Point description. Useful to identify the point's location into the Modbus system. • Active (Yes/No). Useful to deactivate points maintaining the configuration for later use. KNX/EIB related fields. • Group address (in format P/I/S or P/S). *Is the sending group address.* • Listening addresses (in format P/I/S or P/S separated by comma). The gateway will listen for write requests for these listening addresses, when received then it will act as if they where for the main group address defined. This is very useful to translate actions to the Modbus system coming from different KNX commands, for example from an individual start/stop button and also from a general start/stop button. *Up to 1000 listening addresses can be defined in total. Up to 255 listening addresses can be defined per point.* • R. Specifies if the point accepts read requests from KNX. • W. Specifies if the point accepts write requests from KNX. • T. Specifies if a write request will be sent to KNX when the point's value changes. • U. Specifies if the point's value must be updated with a read request sent to KNX when the gateway starts up or after a bus reset detection. *If U is specified in this field, the read request will be of the main group address. If U2 is specified in this field, the read request will be of the first listening address defined.* • EIS (Datapoint). *See EIS supported below.* *The configuration of this part must be done in co-operation with the engineer in charge of setting up the whole KNX system. Some of the data to introduce in this part must be supplied by the KNX engineer.*	
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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Modbus interface of IntesisBox

Modbus interface	
Device type	Master.
Modbus modes supported	TCP.
Modbus TCP configuration parameters	• IP address of the gateway. • Subnet mask of the gateway. • Default router address of the gateway. • IP address of every Modbus TCP device defined. • TCP port of every Modbus TCP device defined. • Timeout for TCP wait for connection and retries. • Timeout for TCP wait for response.
Interactivity with Modbus system	• Read: Continuous polling of Modbus TCP devices and points defined. Updated values are available from KNX/EIB. • Write: Whenever a point's value is changed from KNX/EIB system, the new value received is written into the Modbus device/register related. In the gateway you can configure, per each point: 1. The Modbus TCP device to which the point belongs. 2. The slave address into the Modbus TCP device. 3. And the register address into the slave. What does it mean? This means that, apart of accessing points inside typical Modbus TCP slave devices, you could also use IntesisBox to talk to a typical Modbus TCP/RTU converter and access the points into Modbus RTU slave devices connected to this converter, all from KNX/EIB.
Points	
Configuration parameters per point	Generic fields. • Point description. Useful to identify the point's location into the building. • Active (Yes/No). Useful to deactivate points maintaining the configuration for later use. Modbus related fields. • Modbus TCP device number (from the previously defined Modbus TCP devices list). • Slave number into the TCP device. • Register address into the slave. • Bit inside the register (optional). IntesisBox allows bit decoding from generic 16 bits input/holding Modbus registers. *Bit coding into 16 bit input/holding Modbus registers is used for some devices to encode digital values into this type of registers, being these registers normally accessible using Modbus function codes 3 and 4 (read holding/input registers).* • Modbus function code. *See Modbus function codes supported below.* • Modbus data coding format. *See Modbus data coding formats supported below.* *This info. must be extracted from the technical documentation of the Modbus devices to integrate.*

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Modbus interface of IntesisBox (continue).

Modbus function codes supported	For every point, one of the following Modbus function codes can be used: • 1- Read coils. • 2- Read discrete inputs. • 3- Read holding registers. • 4- Read input registers. • 5- Write single coil. • 6- Write single register. • 15- Write multiple coils. • 16- Write multiple registers.
Modbus data coding formats supported	For every point, one of the following Modbus data coding formats can be used: • 1 bit. • 16 bits unsigned. • 16 bits signed. • 16 bits signed (two's complement). • 32 bits unsigned. • 32 bits signed. • 32 bits signed (two's complement). • 32 bits IEEE. • 32 bits IEEE inverted. • Bit coded into 16 bits register. • *And many more which are device specific.*

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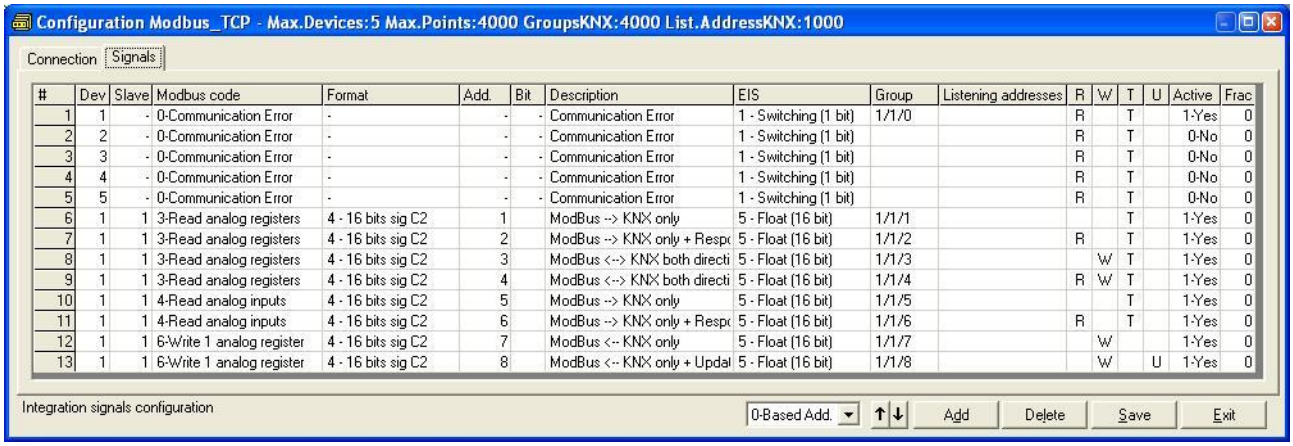
Configuration tool

LinkBoxEIB	• Visual engineering tool, easy of use, for IntesisBox's configuration and monitoring compatible with Microsoft Windows operating systems, supplied with the purchase of IntesisBox with no additional cost. • Multi-window tool allowing to monitor simultaneously the communication activity with both protocols (systems) and the real time values for all the points allowing to modify any value (very useful for test purposes), console window showing debug and operation status messages, and configuration windows to configure all the IntesisBox's parameters and points. • Point's 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 IntesisBox's parameters and points while in off-line, this is, not connected to the gateway. You can configure/modify the IntesisBox's parameters comfortably in the office and later download the configuration to the IntesisBox in the field. • Connection to the IntesisBox for download the configuration and monitoring by using a serial COM port of the PC (serial cable also supplied). • Allows configuring all the external protocols available for IntesisBox® KNX series. • Upgrades for this software tool available free of charge whenever a new protocol is added to the IntesisBox® KNX series. • Multi-project tool allowing to have in the engineer's PC the configuration for all the sites where different IntesisBox® KNX series gateways have been installed. • 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 IntesisBox, for debugging and adjust purposes (Reset, Date/time consultation/adjust, Firmware version request…).



#	Dev	Slave	Modbus code	Format	Add.	Bit	Description	EIS	Group	Listening addresses	R	W	T	U	Active	Frac
1	1	-	0-Communication Error	-	-	-	Communication Error	1 - Switching (1 bit)	1/1/0		R		T		1-Yes	0
2	2	-	0-Communication Error	-	-	-	Communication Error	1 - Switching (1 bit)			R		T		0-No	0
3	3	-	0-Communication Error	-	-	-	Communication Error	1 - Switching (1 bit)			R		T		0-No	0
4	4	-	0-Communication Error	-	-	-	Communication Error	1 - Switching (1 bit)			R		T		0-No	0
5	5	-	0-Communication Error	-	-	-	Communication Error	1 - Switching (1 bit)			R		T		0-No	0
6	1	1	3-Read analog registers	4 - 16 bits sig C2	1		ModBus --> KNX only	5 - Float (16 bit)	1/1/1				T		1-Yes	0
7	1	1	3-Read analog registers	4 - 16 bits sig C2	2		ModBus --> KNX only + Respc	5 - Float (16 bit)	1/1/2		R		T		1-Yes	0
8	1	1	3-Read analog registers	4 - 16 bits sig C2	3		ModBus <--> KNX both directi	5 - Float (16 bit)	1/1/3			W	T		1-Yes	0
9	1	1	3-Read analog registers	4 - 16 bits sig C2	4		ModBus <--> KNX both directi	5 - Float (16 bit)	1/1/4		R	W	T		1-Yes	0
10	1	1	4-Read analog inputs	4 - 16 bits sig C2	5		ModBus --> KNX only	5 - Float (16 bit)	1/1/5				T		1-Yes	0
11	1	1	4-Read analog inputs	4 - 16 bits sig C2	6		ModBus --> KNX only + Respc	5 - Float (16 bit)	1/1/6		R		T		1-Yes	0
12	1	1	6-Write 1 analog register	4 - 16 bits sig C2	7		ModBus <-- KNX only	5 - Float (16 bit)	1/1/7			W			1-Yes	0
13	1	1	6-Write 1 analog register	4 - 16 bits sig C2	8		ModBus <-- KNX only + Updal	5 - Float (16 bit)	1/1/8			W		U	1-Yes	0

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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.
Modbus TCP port	1 x Ethernet 10Base-T (RJ45).
KNX port	1 x KNX TP1 (EIB) port opto-isolated. Plug-in terminal bloc (2 poles). TNV-1
LED indicators	1 x Power. 2 x KNX port activity (Tx, Rx). 2 x Ethernet port link and activity (LNK, ACT). 1 x KNX programming/bus.[1]
Push buttons	1 x KNX programming.[1]
Console port	EIA232. DB9 female connector (DCE). SELV
Configuration	Via console port.[2]
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] Not operational for the moment. Reserved for future use.

[2] 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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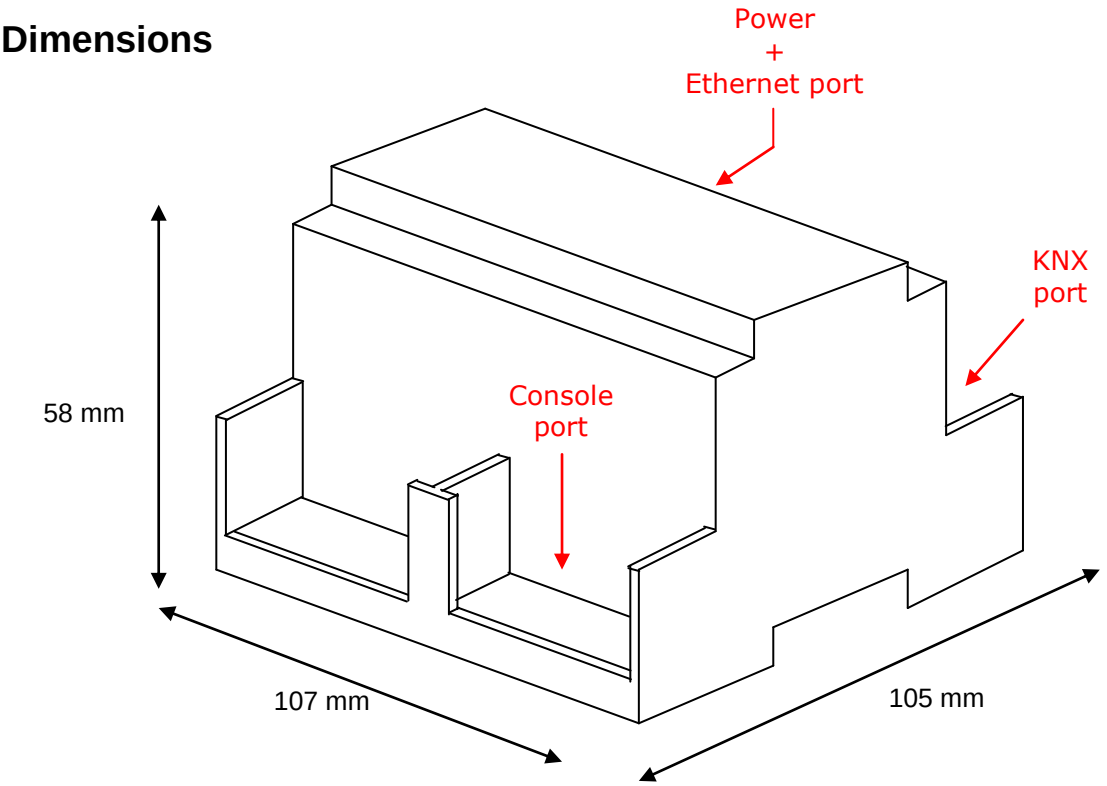
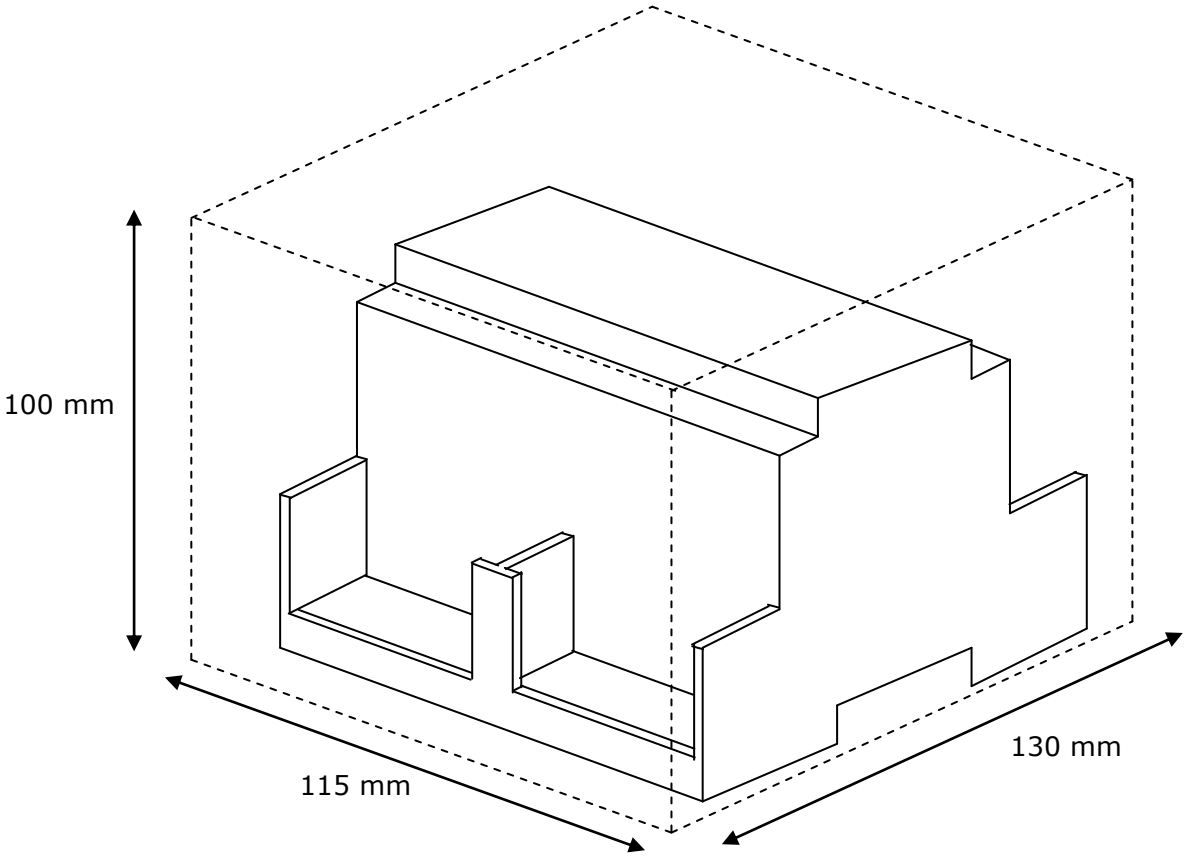
Dimensions



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



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