STC BACnet IP

EnOcean Receiver/Transmitter with BACnet IP Interface

thermokon
Sensortechnik GmbH

Data Sheet

Subject to alteration
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Application

Bi directional gateway for EnOcean-based sensors and actuators as well as controllers and control systems with BACnet IP interface. Configuration / commissioning with EasySens AirConfig Software tool.

For details of the BACnet protocol please visit http://www.bacnet.org/.

Security Advice – Caution

The installation and assembly of electrical equipment must be performed by a skilled electrician.

The device should only be used for the appropriate application. Unauthorised conversions or alteration are prohibited! The modules must not be used in relation with equipment that threatens, directly or indirectly, human health or life or with applications that can result in danger for people, animals or assets.

Before connecting devices, the installation must be isolated from the power source!

CAUTION! Risk of electric shock due to live components within the enclosure, especially devices with mains voltage supply (usually between 90-265 V).

The following procedure must be carried out:

1. Disconnect the device from power.
2. Ensure the device is secured against reconnection.
3. Verify the device is not powered.
4. Prior to reconnection, ensure that the enclosure is securely closed.

Please verify and consult:

- Laws, standards and regulations.
- The current condition of the device at the time of installation, to ensure safe installation.
- The devices technical data and installation manual.

Notes on Disposal

The product is considered electrical and electronic waste and must be disposed accordingly. Special treatment for specific components may be legally binding or ecologically sensible. The local and current applicable legislation must be followed.

Registration for radio operation

The general registration for the radio operation is valid for all EU-countries as well as for Switzerland.

This device complies with part 15 of the FCC Rules. Operation is subject of the following conditions:
(1) this device may not cause harmful interference and
(2) the device must accept any interference received including interference that may cause undesired operation.

Changes or modifications made to this equipment not expressly approved by Thermokon may void the FCC authorization to operate this equipment.

Transmitting Frequency and Measuring Principle

Sensors send events and / or time controlled telegrams to the receiver.

A: event controlled
By operation of controls, for example, you press the learn button of the device, the internal microprocessor is woken up and sent a telegram. Whish data contained in the telegram is in the EEP (EnOcean equipment profile) defined (http://www.enocean-alliance.org/eep/).

B: time controlled
The sensor wake up at regular intervals (T_wake up) and send the measured values. Provided that the measured values from the last transmission have significantly changed, the current readings are sent. With almost unchanged measured values the sensor goes to sleep-mode without a telegram to send. Is repeatedly sent no unchanged measurements the sensor sends a telegram after a specified number of wake-up-cycles.
A telegram always includes all information (measured data, charging voltage of energy storage,...).

Information about EasySens (Radio)

Transmission Range

As the radio signals are electromagnetic waves, the signal is damped on its way from the sender to the receiver. That is to say, the field strength is removed inversely proportional to the square of the distance between sender and receiver ($E,H \sim 1/r^2$), at twice the distance, only ¼ of the field strength is still present.

Beside these natural transmission range limits, further interferences have to be considered: Metallic parts, e.g. reinforcements in walls, metallized foils of thermal insulations or metallized heat-absorbing glass, are reflecting electromagnetic waves. Thus, a so-called radio shadow is built up behind these parts.

Radio waves can penetrate walls, however signal dampening is increased vs transmitting within the free field.

Penetration of radio signals:

Material	Penetration
Wood, gypsum, glass uncoated	90..100%
Brick, pressboard	65.. 95%
Reinforced concrete	10.. 90%
Metal, aluminium pasting	0.. 10%

This means that the building material used in a building is of paramount importance for the evaluation of the transmitting range. For an evaluation of the environment, please see guide values listed below:

Radio path	Range/penetration
Visual contacts	Typ. 30 m range in passages, corridors, up to 100 m in halls
Plasterboard walls/wood	Typ. 30 m range through max. 5 walls
Brick wall/Gas concrete	Typ. 20 m range through max. 3 walls
Reinforced concrete/-ceilings	Typ. 10 m range through max. 1 ceiling

Supply blocks and lift shafts should be seen as a compartmentalization

In addition, the angle with which the signal sent arrives at the wall is also important. Depending on the angle, the effective wall strength and thus the damping attenuation of the signal changes. If possible, the signals should run vertically through the wall. Recesses should be avoided.
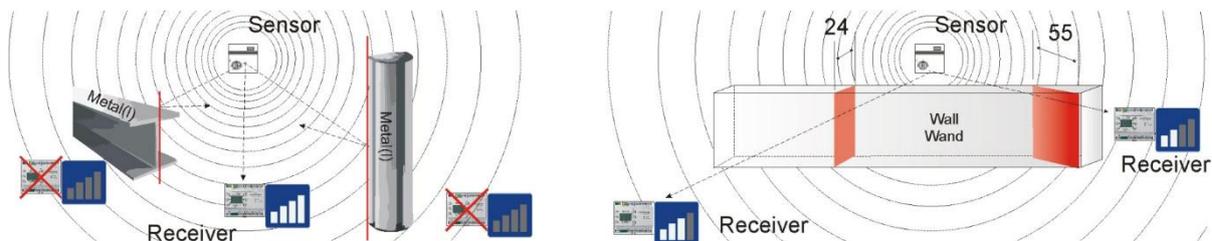
Other Interference Sources

Devices that also operate with high-frequency signals, e.g. computer, audio-/video systems, electronic transformers and ballasts etc. are also considered as an interference source. The minimum distance to such devices should amount to 0,5 m.

Selecting the best Device Mounting Position using field strength measuring instruments (e.g. Thermokon AirScan)

Instruments for measuring and indicating the received field strength (RSSI) of the EnOcean telegrams and interfering radio activity of transmission frequency during the planning phase and enable them to verify whether the installation of EnOcean transmitters and receivers is possible at the positions planned.

For this purpose, a field strength meter, a laptop with the software AirScan for example is placed at the point where the receiver is provided. The USB transceiver from AirScan then logs the messages of the sensors and displays the field strength. Color-coded values indicate the signal quality. By changing the sensor position there can be the best possible mounting position located. Refer to the documentation "range planning EnOcean radio systems"

High-Frequency Emission of Wireless Sensors

Since the development of cordless telephones and the use of wireless systems in residential buildings, the influence of radio waves on people's health living and working in the building have been discussed intensively. Due to incomplete measuring results and long-term studies, very often great feelings of uncertainty exist with the supporters as well as with the critics of wireless systems.

A measuring expert certificate of the institute for social ecological research and education (ECOLOG) has confirmed, that the high-frequency emissions of wireless keys and sensors based on EnOcean technology are **considerably lower** than comparable conventional keys.

Even conventional keys send electromagnetic fields, due to the contact spark. The emitted power flux density (W/m²) is 100 times higher than using a wireless switch considering the total frequency range. In addition, a potential exposition by low frequency magnet fields emitted via used wires are reduced due to wireless keys.

If the radio emission is compared to other high-frequency sources in a building such as DECT-telephones and basis stations, these systems are 1.500 times higher-graded than wireless switches.

Configuration with airConfig

EasySens AirConfig comissioning tool is available free of charge for download from the download centre of www.thermokon.de.

To run AirConfig a Windows operated PC with Java and FlashPlayer is required as well as an EasySens USB transceiver, e.g. same as supplied with the Field Test Tool airScan. Alternatively EnOcean's USB300 may also be used. AirConfig does not require any licenses.

Please also consult the airConfig manual in addition to this data sheet. airConfig offers further explanations of each parameter using guide notes when hovering the mouse above each parameter.

Place the USB stick in one of your computer's USB ports and start airConfig. The driver should be installed automatically from Windows website. In case the driver of the USB transceiver has not been installed properly, this window will appear:

In this case please check in your WINDOWS Device manager whether the USB transceiver has been detected properly and the driver is installed. If the driver is missing, you may download the appropriate driver for your system from http://www.ftdichip.com/Drivers/VCP.htm

The airConfig Screen

For configuring airConfig, you move from the left side to the right (as an example, see the display in the picture below). After airConfig started and the USB transceiver has been detected, click on the device`s icon in the driver list and select "Request devices", or press F11. AirConfig sends a telegram to all devices within the transmission range, to request all IDs of all devices of the selected type.

Note for all sensors: To send and receive configuration-data, must be pressed the "learning"-button so that the device is "visible".
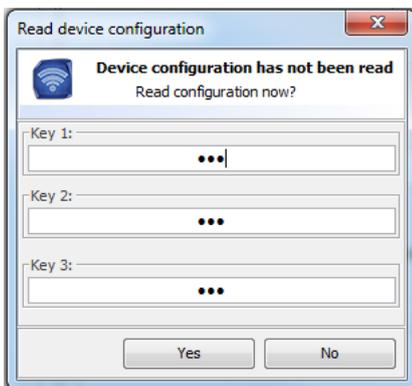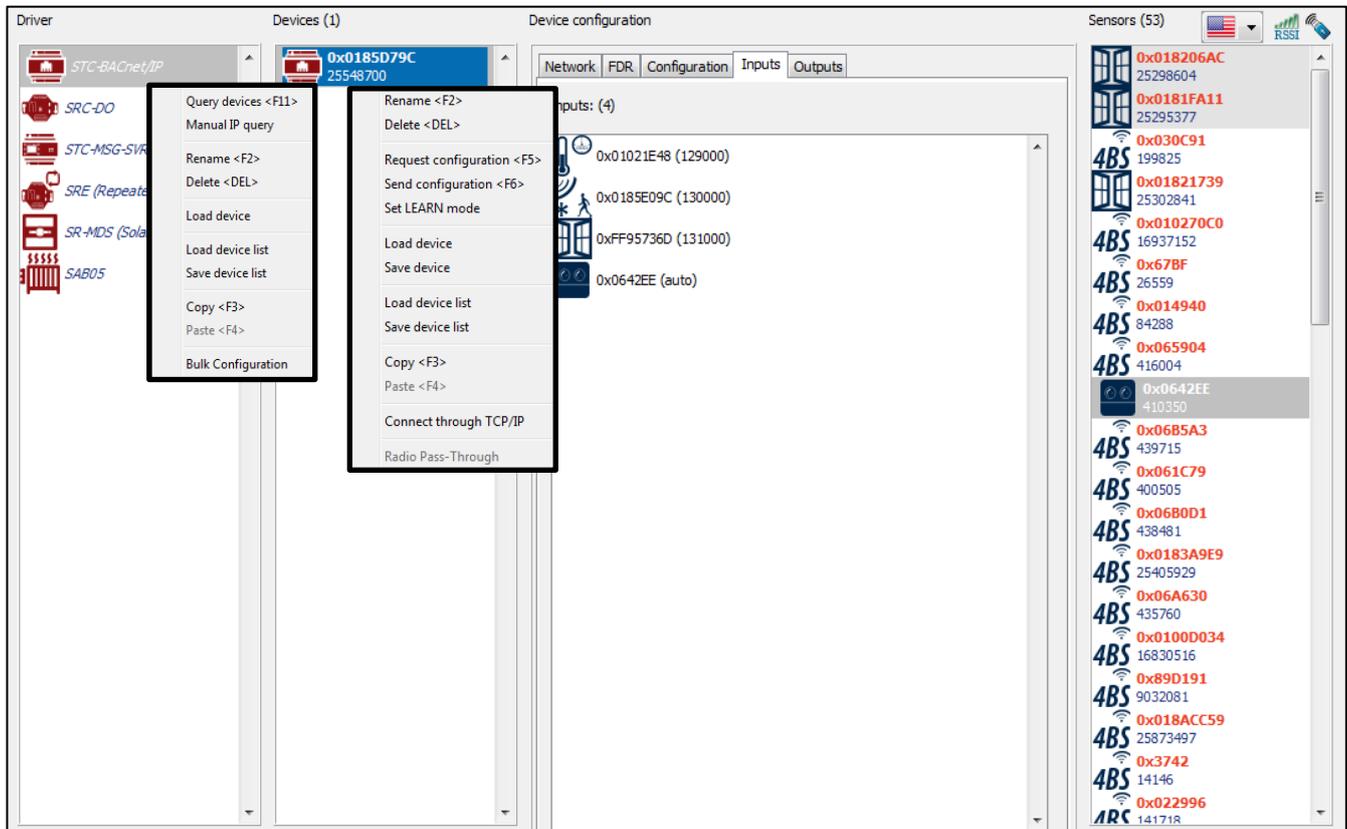
Each product is listed with its EnOcean ID in the device list. To configure a specific device, right click on the icon of the device and select "Request configuration", or press F5.

When airConfig realizes the data being received via a repeater, it is shown on the top edge of the screen, since multiple repetitions occupy the radio channels and may interfere with the configuration.

AirScan will request the PIN which protects the configuration of the device. Fill in the PIN and choose "Yes" to have a look at the devices' configuration. To work with standard settings, select "No".

Configuration takes place through the dialogue field in the centre of the screen. Values that can not be changed are illustrated in grey.

Attention: For all **solar-powered sensors**, make sure, the power state is deposited in "green" (for example the red arrow in the chart below). Especially transmission and reception of configuration data consumes a lot of energy, which can not be guaranteed after unpacking the product from the transportation package. Therefore, a buffer battery should always be inserted for the duration of the configuration, so the sensor is supplied with sufficient energy to send and receive new parameters.
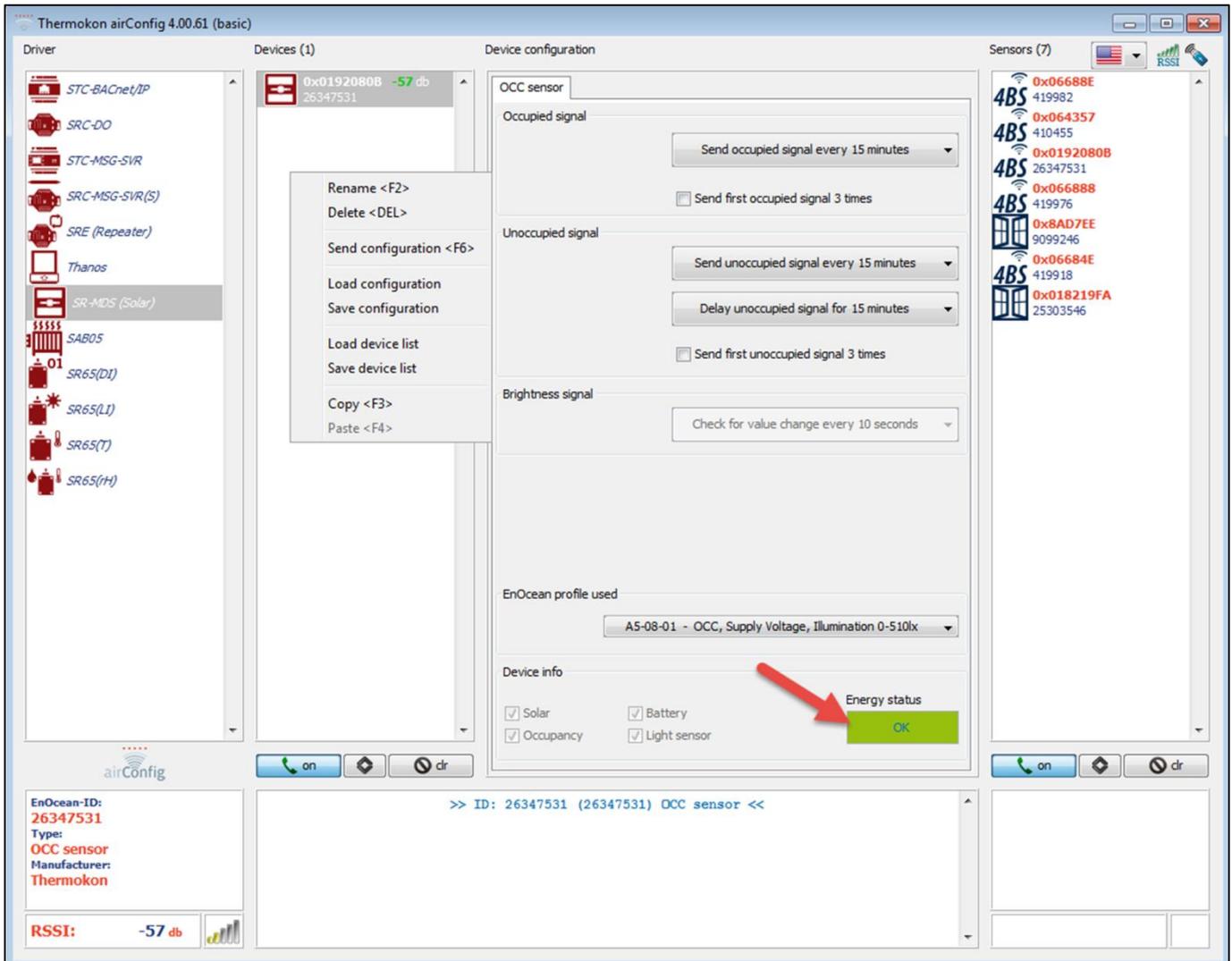
General configuration: Network, FDR, Configuration

Note: If the device is in the same network as the computer which is used to configure the device it can also be accessed via the Ethernet network. In the context menu select the entry "Connect through TCP / IP." This is particularly advantageous when many sensors around send telegrams and the transfer of the extensive configuration file by collisions with other telegrams could be disrupted.

The device is configured using multiple tabs options:
- IP configuration
- BACnet-Foreign device registration (FDR)
- EnOcean gateway settings
- BACnet Inputs (sensor signals received)
- Bacnet Outputs (signals generated by the gateway)

Network settings to configure standard parameters for IP based communication.

For detailed explanation of each parameter, please hover mouse over input box to view an explanation / tooltip for each parameter.

FDR stands for Foreign-Network Device registration which is a special BACnet service to route data between networks. Thus a sensor in one network can communicate with devices in a second network.

The Configuration tab also indicates the EnOcean settings as well as the BACnet address and the buffer size (ADPU length).

Inputs : EnOcean → BACnet

The Inputs section shows the EnOcean devices that will be converted into BACnet data points. To generate data points the gateway needs to know the sensor's EEP as this defines what data point will be created. Therefore only an EnOcean sensor which has been recognized can be assigned. Sensors with icons that indicate the type of message only (i.e. 4BS, VLD, MSC) can not be assigned and will be highlighted in red to indicate the problem.

If the EEP of a particular sensor is already known, the EEP can be set manually by right-clicking on the sensor's icon and selecting the EEP from the "change type" dialogue.

To assign a sensor to the BACnet IP gateway, simply drag and drop the sensor's icon from the EnOcean Sensor list on the right into the Inputs window.

The BACnet IP gateway automatically will generate data points for the sensors in the order shown in the inputs window. The BACnet address of the first data point for each sensor is shown in brackets after the configuration has been transferred to the BACnet IP gateway. "auto" indicates a sensor that has been newly assigned but w/o reading back the BACnet address from the BACnet IP gateway.

Outputs : BACnet -> EnOcean

Outputs define EnOcean telegrams that will be generated by the BACnet IP gateway from BACnet data points.
Select the EEP from the drop-down list and press the "Add"-button to generate the icon and EnOcean device in the Outputs list.
Optionally the manufacturer ID can be specified, which will be included in the Learn-in message.
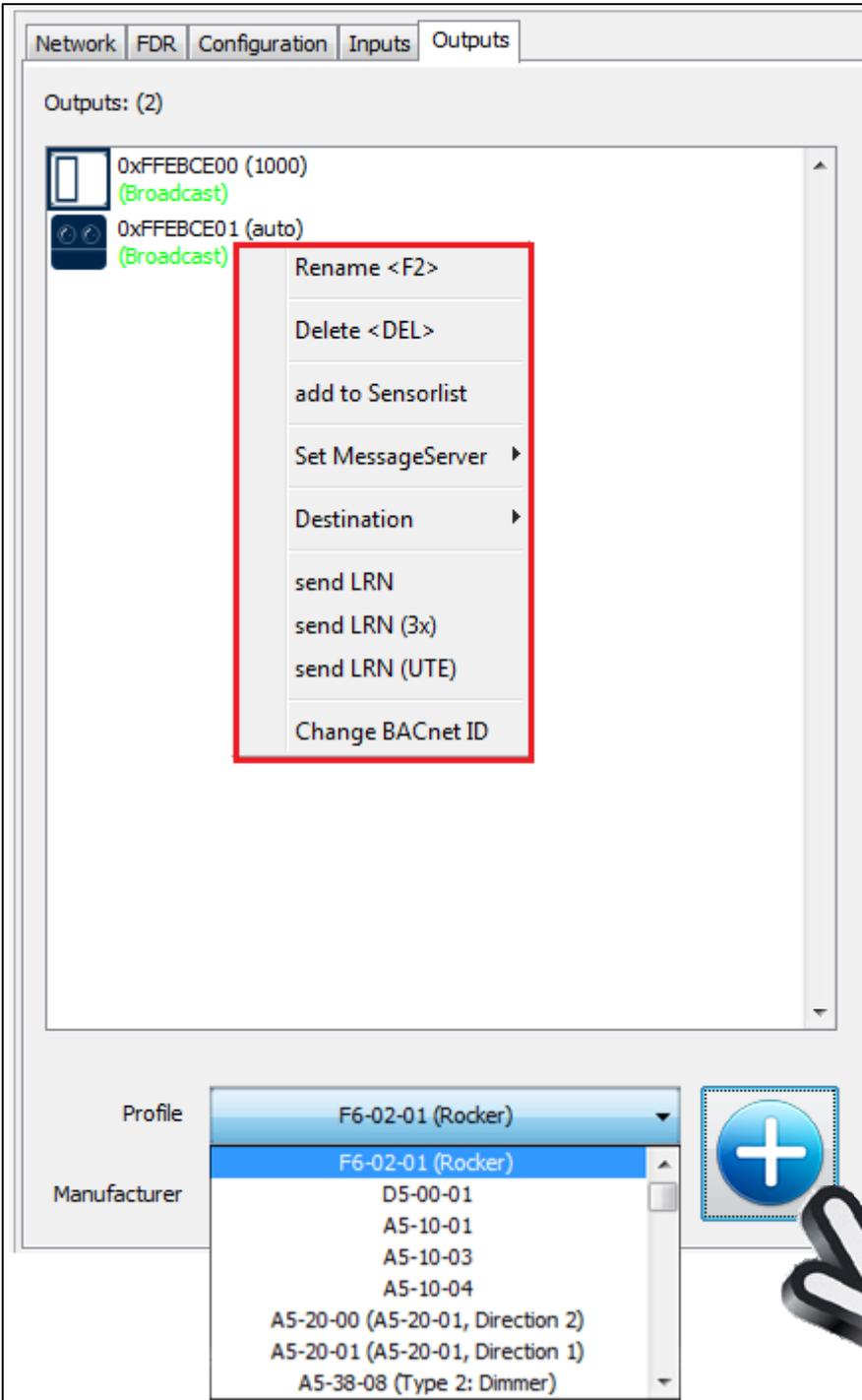
Right-click on a particular sensor icon to open the context menu and select "**send LRN**" or "**send LRN 3x**" to send a Learn-in message to the device that is to be paired with this message.
"send LRN (3x") transmits the teach-in telegram 3x with random pauses in between . This will reduce the risk of a telegram collision in a noisy environment or applications with heavy traffic.

For devices supporting the universal teach-in message (UTE) "**send LRN (UTE)"** should be used.

In case the output signal will be assigned to another device supporting airConfig the signal's ID can be added to the sensor list on the right directly without having to physically send a Learn-in telegram, alternatively by using the "**add to Sensorlist**" by dragging the icon into the sensor list.

Each output telegrams can be addressed to a certain Enocean-ID using the **Destination** dialogue.

When selecting EEP-A5-20-02 direction 2 (from BMS to actuator) the BACnet IP gateway can be the Message Server for a wireless valve actuator SAB-xx.
To activate the Message Server for a particular output signal simply select the SAB's EnOcean-ID from the "**Set Message Server**" dialogue.

MSG-Server – bidirectional teach in with SAB

The teach-in of an valve actuator works in both directions. The SAB does need to learn the IDof the Message Server and the STC-BACnet IP needs to know the SAB'S ID to buffer the messages for it. Therefore the SAB will show up in the iputs section as well as in the outputs.

To teach in a SAB valve actuator press the SAB's LEARN-button first. SAB will show up in the sensor list (icon with an arrow pointing from valve (the left) to the right. Drag this icon into the STC-BACnet's input window:
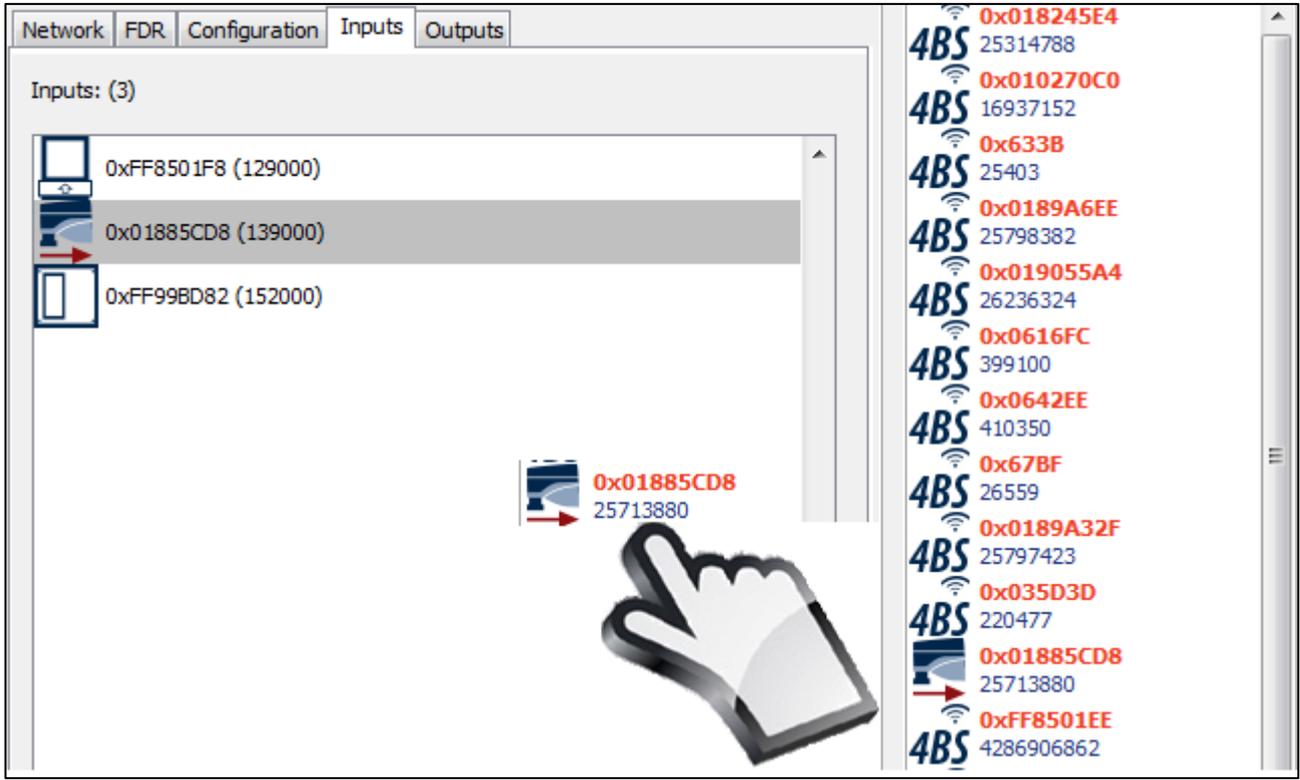
Select the tab "outputs" and select a SAB type telegram (A5-20-00) from the drop-down list and add it to the output list:
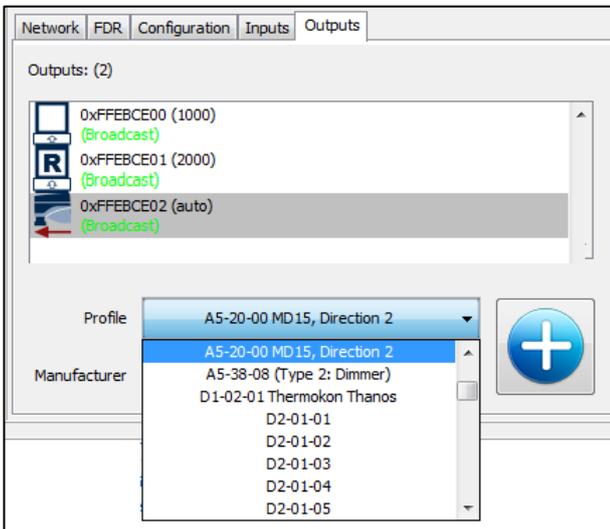
Right click on the SAB-output icon and select Set Message Server and choose the ID of the desired SAB, that the MSG-Server function shall be activated for. This must be the same ID that has been dragged into the Inputs section in Step 1.
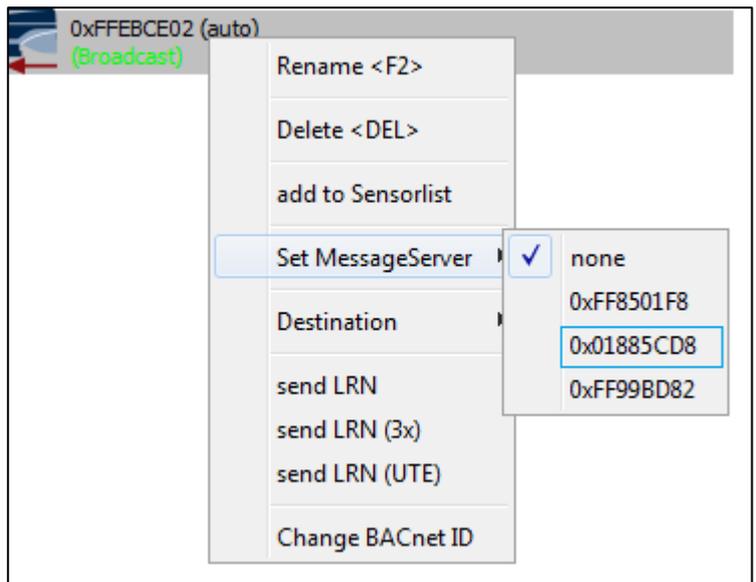
The Message Server does forward data to a particular SAB only, which is done by using addressed telegrams. The address must be set by selecting Destination and the ID of the SAB valve actuator:
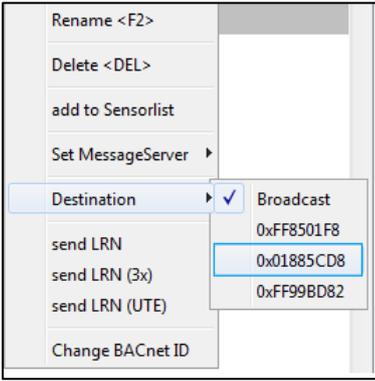
Finish the configuration by sending it to the STC-BACnet:
Right-Click on the BACnet icon and select **Send Configuration**.

Thanos – bidir. Teach-In

Thanos does require a bidirectional teach-in as well to receive data from thanos but to change settings in thanos as well.

Select thanos in the output section and add it to the outputs. You will see that 2 icons will be created, one for requesting data and one for sending commands to thanos.
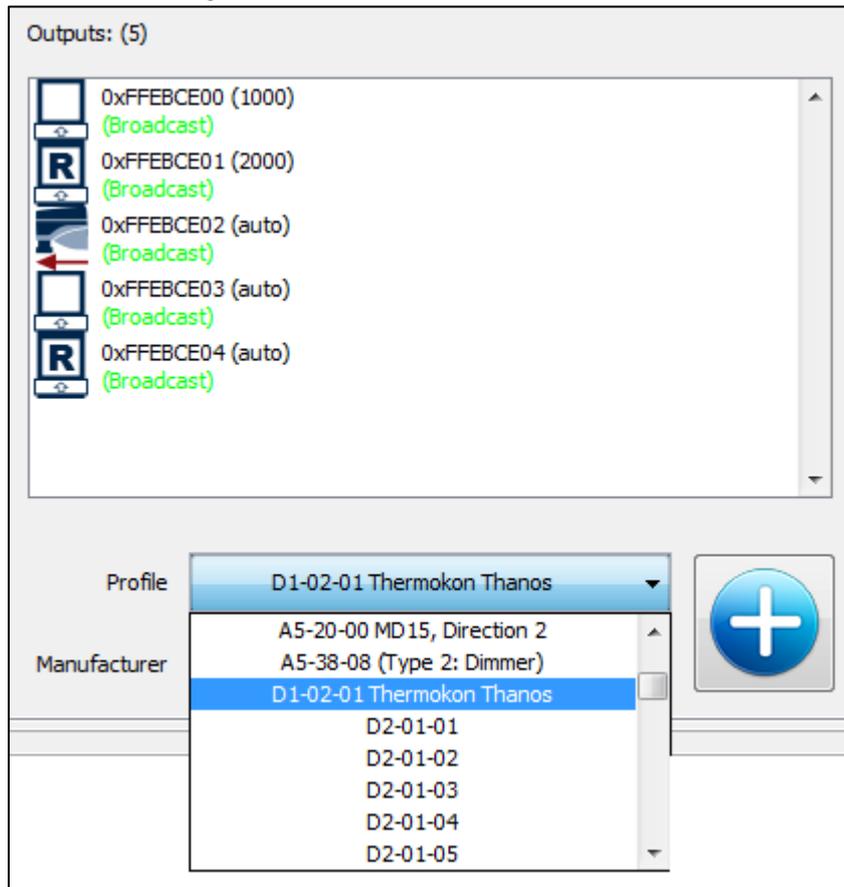
Right Click on the STC-BACnet IP icon and send the configuration to the gateway.

To finalise the teach-in process enter thanos' configuration menu by pressing the 2 buttons in opposite corners (i.e. lower left and upper right) for a few seconds.

Browse to the menu to reach the teach-in of sensor #20 (Superior Control Unit):
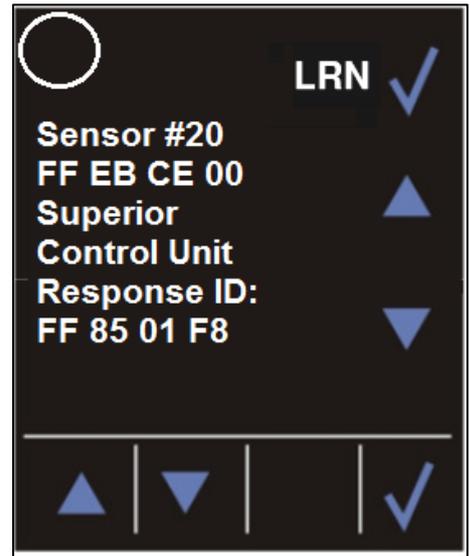
Press LRN to set thanos into LRN mode. To send a LRN telegram from STC-BACnet IP right click on the thanos output icon (the one w/o the **R** (equest) and select send LRN.
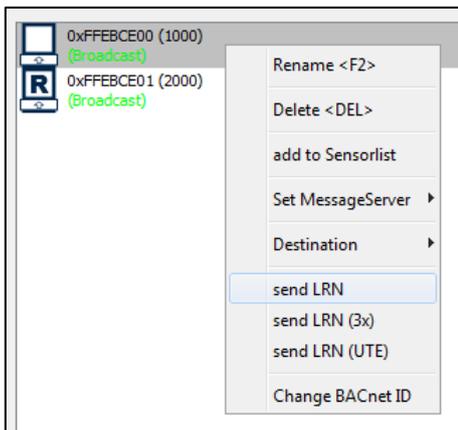
Thanos immediately will answer with it's ID which will be shown in thanos' display and will be added in the sensors list of AirConfig as shown below:

Drag the thanos' icon from the sensor list into the inputs window to create BACnet data points for the data sent by radio by thanos.
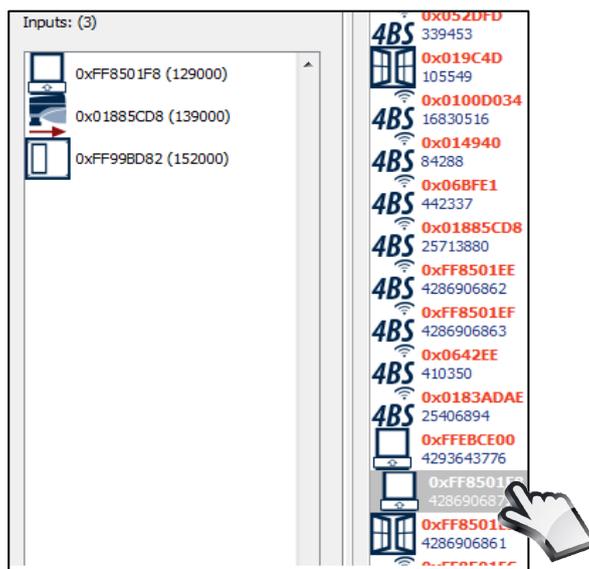
Finish the configuration by sending the settings to STC-BACnet by Right-Clicking on the STC-BACnet icon in Smart Devices and select **Send Configuration**.

Technical Data

Power supply:	15..24 V = (±10%) / 24 V~ (±10%)
Power consumption:	typ. 0,6 W / 1,5 VA peak power 50VA
Trans.-/Receiv.-Freq.:	According to product name plate
Transmitting Power:	max. 10 mW
Antenna:	External receiving antenna with magnetic holding (included in shipment)
Protocol:	EnOcean – IEC 14543-3-10 BACnet IP

Power Connection: Data Connection:	Terminal block < 1,5 mm² RJ45
Enclosure:	ABS Colour light grey (~RAL7035)
Protection:	IP20 according to EN 60529
Ambient temperature:	0..+60 °C
Transport:	-20..+60 °C max. 70% rH, non-condensing
Weight:	110 g (without external Antenna)

Mounting Advices

The housing of the module is designed for an installation on standard mounting rails according to DIN EN 50022. For operation, a separate external receiving antenna is necessary, which is included in shipment as standard.

The antenna has a magnetic flux and must be mounted in the middle of a metal plate with the minimum dimensions 180 mm x 180 mm (material: galvanized sheet steel, please see "accessories"). The ideal mounting place in rooms is found approx. 1 m below the ceiling (optimum radio transmission range). The antenna should be adjusted vertically downwards and should have a minimum distance of approx. 90 mm to the wall. The distance to other senders (e.g. GSM/DECT/Wireless LAN/ EnOcean senders) should be minimum 2 m. To match the color of the room the antenna can be painted accordingly (do not use any metallic lacquers).

Cable Laying Notice

- Cable laying should be done in an electric conduit
- Cable crushing should be avoided
- minimum bending radius of the extension cable amounts to 50 mm
- Do not use an active pull-up device for the cable laying in order to avoid any damages of the sheathing respectively of the connectors.

For an optimum location of the antenna and an optimum radio transmission range, please see "information on radio sensors".

Please also note general notices in our "INFOBLATT THK"

Connection Plan
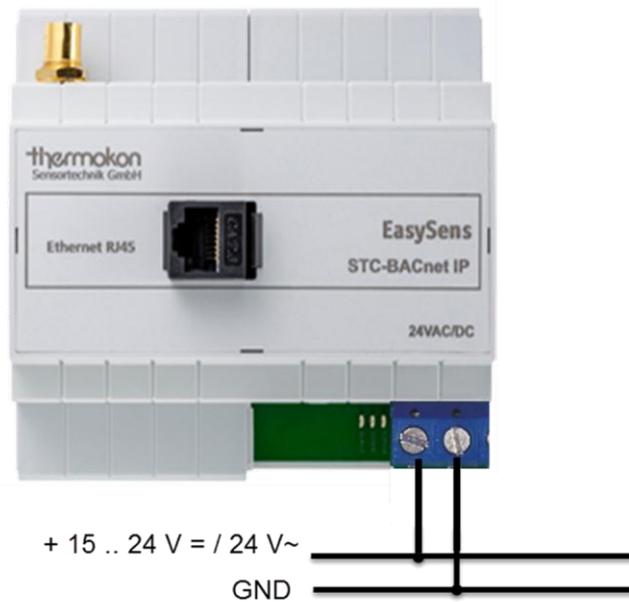
Dimensions (mm)
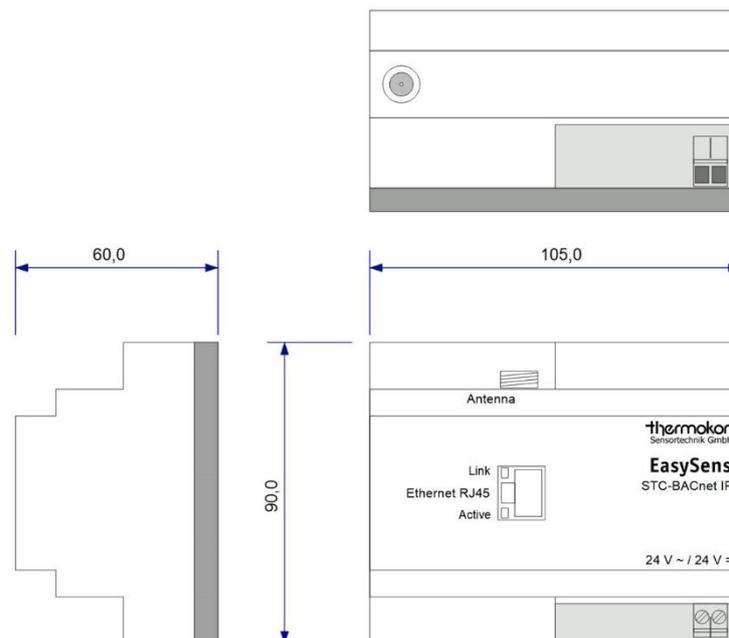
Accessories

(D+S)	1 Set (2 pc) raw plugs and screws
(ANT10)	Antenna wire extension 10 m
(ANT20)	Antenna wire extension 20 m
(AHA180)	Antenna L-shaped base plate, galvanized steel, 180x180 mm

Dimensions accessories (mm)

Antennen-Halterung
Antenna holding

180,0
160,0

90,0

10,0

70,0

R1,5

1,5

180,0

(Platzierung Antenne)

(Mounting place of antenna)

Material: Eisenblech, magnetisch
Material: Iron, magnetic

Connector FME
"m - male"
11,0

Connector FME
"f - female"

Antennen-Verlängerungskabel
Antenna wire extension
ANT10: L=10m
ANT20: L=20m
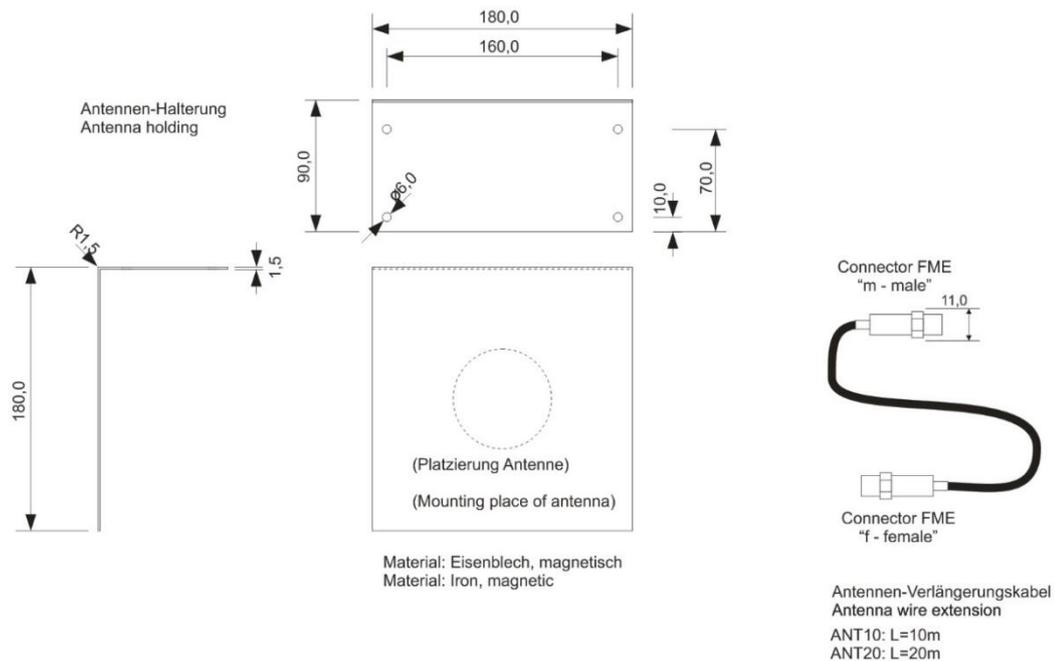
Annex

1. BACnet Protocol Implementation Conformance Statement (PICS)

Date: 10 / 1 / 2014
Vendor Name: Thermokon Sensortechnik GmbH
Product Name: BACnet/IP
Product Model Number: # 593632
Application Software Version: 0.70
Firmware Revision: 0.70
BACnet Protocol Revision: 16

1.1 BACnet Standardized Device Profile

☑ BACnet Application Specific Controller (B-ASC)

Additional BACnet Interoperability Building Blocks Supported: Reference of BIBBs List

1.2 Segmentation Capability

Segmented request supported   ☑   **Yes**   Window Size 16
Segmented response supported   ☑   **Yes**   Window Size 16

1.3 Data Link Layer Options:

☑ BACnet IP (Annex J)
☑ BACnet IP (Annex J, Foreign Device)
☑ ISO 8802-3, Ethernet (Clause 7)

1.4 Data Address Binding:

Static Device Binding is not require.

1.5 Networking Options:

BACnet/IP Broadcast Management Device (BBMD)
Does the BBMD support registrations by Foreign Devices?   **No**

1.6 Character Sets Supported:

Indicating support for multiple character sets does not imply that they can all be supported simultaneously.

▪ ANSI X3.4
▪ ISO 8859-1

1.7 Gateway to EnOcean:

Supported all standard EEP of EnOcean EEP 2.6.1. Please refer https://www.enocean-alliance.org/eep

2. BACnet Interoperability Building Blocks Supported (BIBBs)

2.1 Data Sharing BIBBs

BIBB Type	BACnet Service
DS-RP-B	ReadProperty
DS-RPM-B	ReadPropertyMultiple
DS-RPC-B	ReadPropertyConditional
DS-WP-B	WriteProperty
DS-WPM-B	WritePropertyMultiple
DS-COV-B	SubscribeCOV
	ConfirmedCOVNotification
	UnconfirmedCOVNotification
DS-COVP-B	SubscribeCOV
DS-COVU-A	UnconfirmedCOVNotification
DS-COVU-B	UnconfirmedCOVNotification

2.2 Network Management BIBBs

BIBB Type	BACnet Service
NM-CE-B	Establish-Connection-To-Network
	Disconnect-Connection-To-Network

2.3 Network Management BIBBs

BIBB Type	BACnet Service
DM-DDB-B	Who-Is
	I-Am
DM-DOB-B	Who-Has
	I-Have
DM-TS-A	TimeSynchronization
DM-UTC-B	UTCTimeSynchronization
DM-RD-B	ReinitializeDevice

3. Objects

3.1 Supported Object Types

The supported object types are in the tableau below.

Object Type	ID
Analog-Input	0
Analog-Output	1
Analog-Value	2
Binary-Input	3
Binary-Output	4
Binary-Value	5
Device	8
Group	11
Multistate-Input	13
Multistate-Output	14
Multistate-Value	19