

KNX ENO 630 (16-channel AP)

Unidirectional-Gateway between EnOcean and KNX-Bus

Operating and installation instructions



Fig. 1: KNX ENO 630

Application

The KNX ENO 630 is a unidirectional gateway between EnOcean radio devices and the KNX bus. It transfers commands and measured values of EnOcean wireless sensors to the KNX bus, for example, to control KNX actuators. The EnOcean communication is based on the EnOcean Equipment Profiles (EEP). This profile is usually specified in the data sheet of the EnOcean device. In addition the gateway supports logical and control functions and includes radio-repeater functionality. The KNX ENO 630 is divided in 16 channels. Each channel can be assigned to one of the following functions:

- Link from EnOcean sensor to KNX
 - Switch functions
 - Switching
 - Dimming
 - Shutter
 - Scene
 - Window handles
 - Window contacts
 - Access card switches
 - Press switches
 - Temperature sensors
 - Humidity sensors
 - Light sensors
 - Presence sensors
 - Gas sensors
 - Room control panels
 - Automated meter devices
 - Environmental sensors
 - Digital inputs

- Control / logic
 - Timer
 - Switch-on delay
 - Switch-off delay
 - Control
 - Lighting control
 - Logical functions
 - Gates (e.g. AND, OR, XOR)
 - Flip-flop (Toggle)
 - Special
 - Trigger
 - Valuator
 - Watchdog

The configuration of the device and the channels is performed using the ETS software via the KNX-Bus. To configure the wireless components the keys and the display in the device are used.

Mounting and connection

The mounting can be done on a wall surface (e.g. brick-work or wood). The mounting holes match those of a 55 mm flush-mounted box.

When choosing the installation location the RF range of EnOcean devices to be associated with the gateway has to be considered. Shielding objects (e.g. metal cabinets) or interfering transmitters (e.g. computers, electronic transformers, ballasts) near the gateway should be avoided.

More information on range planning and RF interference can be found in the data sheets of the devices and on www.enocean.com.

The connection to the KNX bus is made with a bus connector. The correct polarity of the terminal referred to the printing inside the unit has to be considered. The device is powered by the bus, and does not require an external or additional power supply.

Settings before commissioning

A gateway ex-factory has the default individual address 15.15.255. There are no group addresses and no connections to RF sensors programmed.

Button functions

The buttons inside the device are only needed for the commissioning phase and are not accessible when closed.

Key press T1 long (Del.): Delete the stored device from the current channel (Refer to chapter “Deleting links for RF sensors”)

Key press T1 short (Exit): Leave channel/linking mode

Key press T2 long (Add): Start linking mode (Refer to chapter “Linking mode for sensors”)

Key press T2 short (Active): Activate or change the channels 1-16

Key press T3: Activate “**KNX Prog. mode**” – The KNX device can now receive a new individual address. (Refer to Chapter “Programming the physical address”)

A long key press is detected when a button is pressed for longer than 2 seconds.

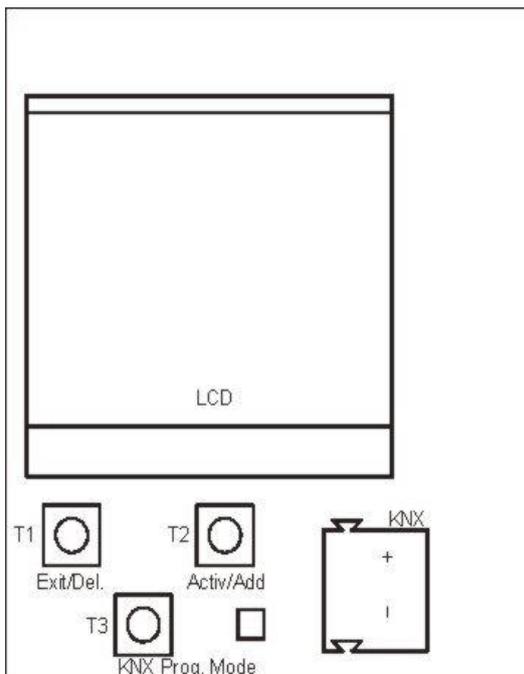


Fig. 2: View of the open unit

LCD Display

The integrated display is used for commissioning and system diagnostics. In normal operation, it is not required and is not visible when the device is closed. The main menu shows the device name, the operation mode (e.g. RUN) and the KNX individual-address (Fig. 3).

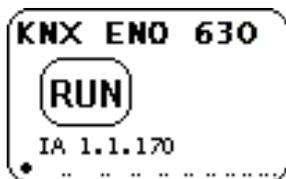


Fig. 3: Main menu display

The signal strength of received radio telegrams is vis-

ualized as a bar at the bottom of the display. If the received telegram corresponds to one or more channels, it will be shown in a channel matrix on the display.

When a channel is selected the first line of the display shows the channel number and the text configured in the ETS (“1 Rocker” in fig. 4). In the second line the channel type (sensor) and associated EnOcean equipment profiles (EEP) is shown.

In the third line, the number of the allocated and available channel links together with a symbol is displayed. The signal strength bar is displayed in the last line.



Fig. 4: Channel setting display

Programming the individual address

Programming the KNX individual address with ETS requires that the programming button T3 (“KNX Prog. mode”) be pressed. If the programming or learning mode is active, the red LED (“KNX Prog. mode LED”) will be on. It turns off once the device has successfully received the individual address. Afterwards, Group Addresses and Parameters can be programmed by the ETS.

Linking to EnOcean-devices

Before linking to EnOcean devices, the functions have to be programmed for each channel with the ETS. Per channel typically only one EnOcean device can be linked. For switches, window handles and window contacts up to four links per channel are possible.

Linking mode for RF sensors

The operation of the gateway during the teach-in of wireless sensors is done using the two buttons below the display.

If the device is in normal mode, the push button T2 activates, by short key presses, the channel mode and changes to the next channel. The display shows the current channel number and the number of connected devices. Also the ETS configured text will be shown for every channel (Fig. 4).

With a long press of T2 on the visible channel, the linking mode is activated. If the device matches the selected function via the parameter configuration, a transmitting device can be connected to the current channel. A connection is created by pressing the

learn-button of the sensor. Window handles and switches must be operated for teach-in because they do not have a separate learn button.

To avoid that other transmitting devices are stored by accidental activation during the programming phase, devices can be programmed only after 3-times activation. For this purpose in the general parameters 'Link switches/handles (RPS) after 3 tel.' must be selected. The sensor has to send three telegrams within 10 seconds to be linked.

The link mode is terminated by a short press of the left key T1, as well as automatically after 5 minutes without operation.

Quick guide linking mode for RF-sensors

1. T2 short press to select the desired channel.
2. T2 long press to activate the learning mode ("Wait for ENO ...").
3. Activate the learning mode in the RF-sensor.
4. The sensor is now programmed

Deleting links for RF sensors

Links with RF sensors can be deleted in several ways. With a long press on T1 the delete mode is activated for the current channel. The sensor can now be deleted from the visible channel by pressing the learn button on the RF sensor. It is also possible to delete all assignments of the selected channel by pressing T2 ("All"). It is not required to operate the RF sensors.

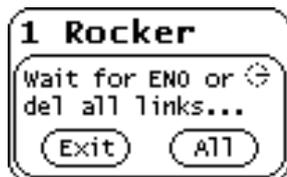


Fig. 5: Deleting links

By programming the application program via the ETS all programmed sensors of all channels will be deleted, when the "Delete all links after download" function in the general parameter is enabled.

If the function of a channel has been changed, programming the parameters with the ETS deletes the links of the modified channel.

The link mode is terminated by a short press of the left key T1, as well as automatically after 5 minutes without operation.

Quick guide linking mode for RF-sensors

1. T2 short press to select the desired channel.
2. T1 long press to activate the delete mode ("Wait for ENO or del all left ...").
3. Activate the learning mode at the desired radio sensor to delete these.

Alternatively:

T2 long press to delete all taught-in wireless sen-

sors from the selected channel.

Normal operation

When in normal operation model, each received EnOcean telegram will be compared to see if it has been assigned to a Channel. If so, the channel is shown shortly in a matrix on the LCD display. Depending on the configured function there will be one or more telegrams sent on the bus. The gateway only sends telegrams to the KNX bus when a corresponding EnOcean telegram has been received. If an EnOcean telegram is not assigned to any channel, only the signal strength is shown in the display with a bar.

Internal links

For some use cases it is necessary to link KNX data points (communication objects) of different channels. Thus, values of sensor channels can be connected with inputs from control channels. Datapoints can be linked in the ETS by assigning the same group address to an output and an input object. In this case the values will also be sent to the bus.

In contrast, the internal links are foreseen to link communication objects directly without sending telegrams via the KNX bus. For this purpose no group addresses have to be assigned in the ETS. Internal links can be created in the parameter dialog of the ETS. In the receiving channel, the communication object number of the output channel can be selected. The value of the selected object is copied internally into the receiving object and implements the associated function.

Gateway functions

For each channel, one of the following functions can be chosen. The selection is made in the parameter dialog of the ETS.

Link from EnOcean sensor to KNX bus

The following functions are available in the sensor parameters:

- RPS switch

Fig. 6: RPS switch (sensor)

There are types of switches from one, two and four rockers. To the Rocker (A...D), the following modes of operation can be assigned:

Switch – On/Off

On/Off (rocker up/down)

A short or long key press on the upper switch will send an off-telegram. A short or long key press on the lower switch will send an on-telegram.

On/Off (rocker up/down)

Function as before, but rocker swapped top and bottom.

Comm.-Object	Type KNX	size
Channel...: switch	1.001	1 Bit

Dimming

On/Off – brighter/darker (rocker up/down)

Short pressing on the top button switches the dimmer on and short pressing on the bottom switches it off. A long press on the top button dims the light brighter and a long press on the bottom button dims darker. Dimming stops by releasing the button.

Off/On – darker/brighter (rocker up/down)

Function as before, but rocker swapped top and bottom.

Comm.-Object	Type KNX	Size
Channel...: switch	1.001	1 Bit
Channel...: dimming	3.007	4 Bit

Shutter – Up/Down

Slats – shutter up/down (Rocker up/down)

After a long press on, the run command is sent for the shutter. With a short press the shutter trip stops. When the shutter is not moving, the slats are rotated by a short press on the switch. The direction of the command is up by pressing the top button. By pressing the lower key the run command is “down”.

Slats – shutter down/up (Rocker up/down)

Function as before, but rocker swapped top and bot-

tom.

Comm.-Object	Type KNX	Size
Channel...: Slats	1.009	1 Bit
Channel...: Shutter	1.008	1 Bit

Scene – a/b

Two scenes can be switched. Depending on the setting, a scene can be saved for a long push if the actuator supports this.

Comm.-Object	Type KNX	Size
Channel...: Scene	18.001	1 Byte

- Other switches and contacts

Fig.7: Other switches and contacts

In the submenu “Other switches and contacts” window contacts, window handles, key card switches and pressure switches can be integrated.

For window handle sensors, three states can be detected. (Window is open, tilted or closed). When turning the handle in a position the corresponding state will be mapped to two communication objects and transmitted. Up to four handles can be taught to a channel.

The gateway calculates a common status of all handles assigned to the channels. Following some examples from the state table:

Window 1	Window 2	Window 3	Window 4	Common status
Open	Open	Open	Open	Open
Open	Tilted	Open	Open	Open
Open	Closed	Tilted	Closed	Open
Closed	Closed	Closed	Tilted	Tilted
Closed	Closed	Closed	Closed	Closed

For window handles are available the following communication objects:

Comm.-Object	Type KNX	Size
Channel...: Status 1	1.001	1 Bit
Channel...: Status 2	1.001	1 Bit

Handle	Closed	Tilted	Open
Status 1	Off	On	On
status 2	Off	Off	On

The position of the handle is dependent on the installation condition. This is described in the datasheet of the window handle. The handle is mounted correctly if two Off-telegrams via both datapoints are sent when the window is closed.

Up to four window contacts can be linked with one channel. The gateway calculates a common status of all contacts assigned to the channel and sends the value "closed only, if all contacts are closed.

For window contacts the following datapoint is available:

Comm.-Object	Type KNX	Size
Channel...:Window group open	1.019	1 Bit

For pressure switches the following datapoint is available:

Comm.-Object	Type KNX	Size
Channel...:Pressed	1.002	1 Bit

For key card switches the following datapoint is available:

Comm.-Object	Type KNX	Size
Channel...:Key card inserted	1.002	1 Bit

- Temperature sensors

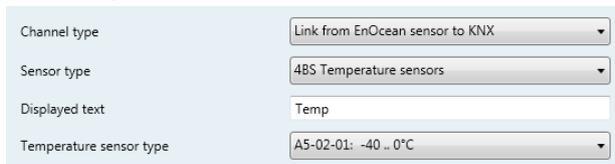


Fig. 8: Temperature sensors

Temperature sensors with various value ranges are supported. The temperature value is mapped to a 2-byte floating-point value. For all temperature sensors the following communication object is available:

Comm.-Object	Type KNX	Size
Channel...: Temperature	9.001	2 Byte

- Temperature and humidity sensors

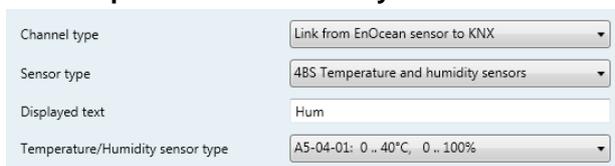


Fig. 9: Temperature and humidity sensors

Two different combined sensors can be selected. The measured values are stored in two different communication objects.

Comm.-Object	Type KNX	Size
Channel...: rel. humidity	9.007	2 Byte
Channel...: Temperature	9.001	2 Byte

- light sensors

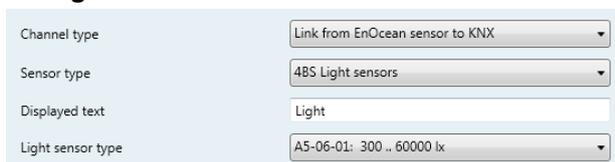


Fig. 10: light sensors

The measuring of light intensity is done in lux (lx). The measured value is available as a 2-byte float value.

Comm.-Object	Type KNX	Size
Channel...: Lux	9.004	2 Byte

- Presence sensors

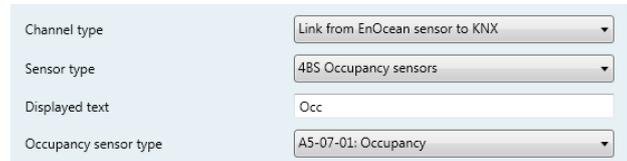


Fig. 11: Occupancy sensors

In this section presence sensors and motion detectors can be integrated.

Comm.-Object	Type KNX	Size
Channel...: presence	1.018	1 Bit

- Light-/Temperature- und occupancy sensors

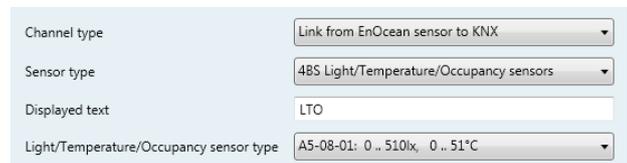


Fig. 12: Light-/Temperature- und occupancy sensors

Light intensity and temperature are each mapped to a communication object with a 2 bytes float value. Presence and motion detectors send 1-bit values.

Comm.-Object	Type KNX	Size
Channel...: Lux	9.004	2 Byte
Channel...: Temperature	9.001	2 Byte
Channel...: Presence	1.018	1 Bit
Channel...: Occupancy	1.001	1 Bit

- Gas sensors



Fig. 13: Gas sensors

Sensors for CO and CO2 can be connected. The CO sensor can measure the gas concentration and the temperature (2 bytes each values).

The CO2 sensor can measure gas concentration, temperature and relative humidity (each 2 byte values).

Comm.-Object	Type KNX	Size
Channel...: Gas	9.008	2 Byte
Channel...: Temperature	9.001	2 Byte

Channel...: Humidity	9.007	2 Byte
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- Room operation panel

Channel type	Link from EnOcean sensor to KNX
Sensor type	4BS Room operating panels
Displayed text	Room
Room control panel type	A5-10-01: Temperature/Setpoint/Fan/Occupancy
Left limit value [°C]	-3
Right limit value [°C]	3
Fan speed I [%]	33
Fan speed II [%]	66
Fan speed III [%]	100

Fig. 14: Room operation panel

Various room controls with temperature, presence, and day / night switches can be a linked. Depending on the type, setpoint values, temperature limits and multiple fan speeds can be set.

Comm.-Object	Type KNX	Size
Channel...: Fan speed	5.001	1 Byte
Channel...: Temp. setpoint	9.001	2 Byte
Channel...: Humidity	9.007	2 Byte
Channel...: Temperature	9.001	2 Byte
Channel...: Occupancy	1.018	1 Bit
Channel...: Night	1.001	1 Bit
Channel...: Automatic Fan	1.001	1 Bit

- Automated meter reading

Channel type	Link from EnOcean sensor to KNX
Sensor type	4BS Automated meter reading (AMR)
Displayed text	AMR
AMR type	A5-12-00: Counter
Measurement channel A	Channel 0
Measurement channel B	disabled
Measurement channel C	disabled

Abb. 15: Automated meter reading

Each channel can read up to three meters. For each counter, there are two communication objects of 4 bytes available: One value for the current consumption and one value for the total consumption.

Comm.-Object	Type KNX	Size
Channel...: Count	12.001	4 Byte
Channel...: Count rate [1/s]	12.001	4 Byte
Channel...: Total energy [kWh]	13.013	4 Byte
Channel...: Current Energy [W]	9.024	2 Byte
Channel...: Total gas [m³]	14.076	4 Byte
Channel...: Current Gas [l/h]	9.025	2 Byte
Channel...: Total water [m³]	14.076	4 Byte
Channel...: Current water [l/h]	9.025	2 Byte

- Environmental and weather sensors

Channel type	Link from EnOcean sensor to KNX
Sensor type	4BS Environmental applications
Displayed text	Env.App.
Environmental application type	A5-13-01: Weather station

Fig. 16: Environmental sensors

The following environmental sensor types can be programmed: Weather station, sunlight (northern hemisphere), date, time and day, direction and geographic position. Depending on the setting, there are different communication objects for each sensor type.

Weather station:

Comm.-Object	Type KNX	Size
Channel...: Dawn	9.004	2 Byte
Channel...: Temperature	9.001	2 Byte
Channel...: Wind speed	9.005	2 Byte
Channel...: Night	1.001	1 Bit
Channel...: Rain	1.001	1 Bit

Sun intensity, northern hemisphere:

Comm.-Object	Type KNX	Size
Channel...: Sun west	9.004	2 Byte
Channel...: Sun south	9.004	2 Byte
Channel...: Sun east	9.004	2 Byte

Date:

Comm.-Object	Type KNX	Size
Channel...: Date	11.001	3 Byte

Time and Day:

Comm.-Object	Type KNX	Size
Channel...: Time	10.001	3 Byte

Direction:

Comm.-Object	Type KNX	Size
Channel...: Elevation	8.011	2 Byte
Channel...: Azimuth	8.011	2 Byte

Geographic position:

Comm.-Object	Type KNX	Size
Channel...: degree of longitude	14.007	4 Byte
Channel...: degree of latitude	14.007	4 Byte

- Digital input

Channel type	Link from EnOcean sensor to KNX
Sensor type	4BS Digital input
Displayed text	Dig. inp
Digital input type	A5-30-01: Single input contact, Battery monitor

Fig. 17: Digital input

It supports digital inputs with and without battery monitor. The digital inputs with battery monitor send

an additional telegram when the battery is weak.

Comm.-Object	Type KNX	Size
Channel...: Contact	1.019	1 Bit
Channel...: Low battery	1.020	1 Bit

Control/Logic

Control / logic functions can be selected. They include time, control, logic, encoder, trigger and watchdog functions.

- Timer

Fig. 18: Timer

It is possible to realize a switch-on and switch-off delays. The time is set in seconds.

Comm.-Object	Type KNX	Size
Channel...: Switch-on delayed input	1.001	1 Bit
Channel...: Switch-on delayed output	1.001	1 Bit

Comm.-Object	Type KNX	Size
Channel...: Switch-off delayed input	1.001	1 Bit
Channel...: Switch-off delayed output	1.001	1 Bit

- Controller

Fig. 19: Controller

Lighting control

Several functions can be realized:

- Full-automatic control

A typical application for the fully automatic control is the lighting of a corridor.

The light is turned on in presence when the current brightness value is below the threshold. By manual operation, the light can be switched on or off for a specific time.

- Semi-automatic control

The semiautomatic mode allows the user or residents to turn the lights on and off manually. The semi-automatic only intervenes when the light was 'forgotten'. A typical application is an office room with several desks.

The light will not be switched on automatically. The semi-automatic switches the light off when the current brightness value is above the threshold or when for a defined time presence is no longer detected.

- Simple control

The simple control only evaluates the brightness and can be used, for example, for a store window.

The light turns on if it is too dark, and automatically turns off when the brightness limit is reached.

Comm.-Object	Type KNX	Size
Channel...: Controller on/off	1.001	1 Bit
Channel...: Light on/off	1.001	1 Bit
Channel...: Presence	1.019	1 Bit
Channel...: Light actual value	9.004	2 Byte
Channel...: Switch	1.001	1 Bit
Channel...: Dimm value	5.001	1 Byte

- Logic element

Fig. 20: Logic element

AND-, OR-, XOR-, NAND-, NOR-, XNOR-Gate

Two different logic functions can be selected independently for Type A or Type B.

Comm.-Object	Type KNX	Size
Channel...: Gate input A1	1.001	1 Bit
Channel...: Gate input A2	1.001	1 Bit
Channel...: Gate output A	1.001	1 Bit
Channel...: Gate input B1	1.001	1 Bit
Channel...: Gate input B2	1.001	1 Bit
Channel...: Gate output B	1.001	1 Bit

Inverter

Four signals can be inverted. (Input and output A-D)

Comm.-Object	Type KNX	Size
Channel...: Inverter input A-D	1.001	1 Bit
Channel...: Inverter output A-D	1.001	1 Bit

Toggle flip-flop

Per channel, up to 4 flip-flops can be used. If the input receives "1", the output changes its value ("0" to "1" or "1" to "0").

Comm.-Object	Type KNX	Size
Channel...: Toggle flip-flop input A-D	1.001	1 Bit
Channel...: Toggle flip-flop output A-D	1.001	1 Bit

- Special

Fig. 21: Special

Valuator (byte)

Up to 4 byte-valuators can be implemented on one channel. If the values "0" or "1" are received on the input datapoint, the configured value will be sent via the output datapoint.

Comm.-Object	Type KNX	Size
Channel...: Valuator binary-in A-D	1.001	1 Bit
Channel...: Valuator value out A-D	5.000	1 Byte

Valuator (float)

Up to 2 float-valuators can be implemented on one channel. If the values "0" or "1" are received on the input datapoint, then the configured value will be sent via the output datapoint.

Comm.-Object	Type KNX	Size
Channel...: Valuator binary-in	1.001	1 Bit

Comm.-Object	Type KNX	Size
A-B		
Channel...: Valuator value out A-B	9.000	2 Byte

Trigger (byte)

Up to 4 byte-triggers can be implemented on one channel. The trigger compares input value with the configured trigger level corresponding to the configured condition. Is this condition is fulfilled, the value "1" will be sent via the output datapoint.

Comm.-Object	Type KNX	Size
Channel...: Trigger value in A-D	5.000	1 Byte
Channel...: Trigger binary out A-D	1.001	1 Bit

Trigger (float)

Up to 2 float-triggers can be implemented on one channel. The trigger compares the input value with the configured trigger level corresponding to the configured condition. Is this condition is fulfilled, the value "1" will be sent via the output datapoint.

Comm.-Object	Type KNX	Size
Channel...: Trigger value in A-B	9.000	2 Byte
Channel...: Trigger binary out A-B	1.001	1 Bit

Watchdog

Up to 4 group objects can be monitored on one channel. If the associated group object (GO) does not send a value within the configured time, then the value "1" will be sent via the output (alarm) datapoint. For the connecting of the group objects only the internal links can be used.

Comm.-Object	Type KNX	Size
Channel...: Watchdog A-D alarm	1.001	1 Bit

Repeater function

The repeater function is used for extend distances between sensors and actuators. The KNX ENO 630 is a level-1 radio repeater. This means, that only telegrams that come directly from a transmitter will be repeated. Telegrams sent by other repeaters are not repeated again.

The repeater function of the KNX ENO 630 is activated by the general parameters in the ETS. If the function is enabled it will be displayed in the main menu of the display (Fig. 26).



Fig. 22: Active repeater function

Bus monitor function

The integrated bus monitor function is used for system diagnostics directly on the device. The device can display both EnOcean and KNX telegrams.

A short press of T1 in menu activates the dual EnOcean and KNX bus monitor ("E+K BUSMON"). The last five incoming and outgoing messages are displayed at the bus monitor. With a long press of T2 can be switched between the EnOcean bus monitor ("ENO BUSMON"), the KNX bus monitor ("KNX BUSMON") and the dual E+K bus monitor.

To return to the main menu of the gateway, the T1 button is used. The bus monitor is automatically closed after 5 minutes of inactivity.

EnOcean bus monitor

If a telegram is received from an EnOcean device, the signal strength (RSSI) value is shown in the first position of the line. The RSSI (Received Signal Strength Indication) is represented by a value between 1 and 4 (1 = min., 4 = best). The first 8 digits of numeric value is the hexadecimal ID of the sending device. The transmitted data is displayed also in hexadecimal coding in the second numeric part.

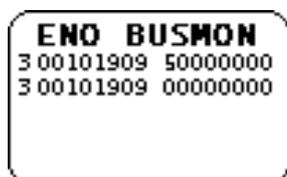


Fig. 23: EnOcean bus monitor

KNX bus monitor

The KNX bus monitor displays the messages at the object level. Therefore, only group telegrams are visible which address the gateway or which are sent by it. If a telegram is received from KNX bus, it will be shown in the KNX bus monitor with an "I". Behind it the decimal group object number and the data packet will be shown with up to 4 hexadecimal bytes.

If a KNX group address is associated with several group objects in the gateway, then one line will be shown for each link.

When sending a message to the KNX bus, an "O" is displayed with the decimal object number and the data packet in hexadecimal coding.

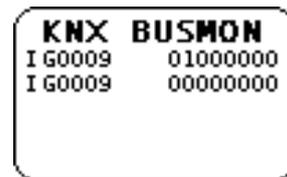


Fig. 24: KNX bus monitor

Representation of the messages on the display:

Receiving of EnOcean-telegram

(1-4) Device ID Data packet

Receiving of KNX-telegram

I GO-No. Data packet

Sending of KNX-telegram

O GO-No. Data packet



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