theben

Manual for Training Case
KNX & KNX Programming with ETS

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Contents

1 Further information on Theben KNX is available at:

Further information on Theben KNX is available at:
https://www.theben.de/

The functions of the operating controls of individual devices are described in the operating instructions provided at https://www.theben.de/

2 Case views

2.1 Case lid showing rooms / functions

2.2 Case base with view of devices

3 Safety information and instructions on preparing the case safely

3.1 Setting up the case

 Please make sure that the case is placed fully on a stable work surface.

 This helps to avoid any injuries which could occur if the training case were to fall from the work surface as well as any associated damage to the training material.

 Also make sure there is enough space to use a laptop and mouse.

You can then open the lid. The lid of the training case has been purposely designed with two hinges that lock into place so that the lid cannot fall down if someone inadvertently touches or knocks the case as they walk past, thereby preventing people from being injured when they are working with the case.

 Plug the power cable firmly and securely into the IEC socket inside the case. The case is equipped with an internal fuse (1.25 A T) right next to the IEC socket, which can also be replaced by the customer (not by the learners).

 Only the supplied power cord may be used.

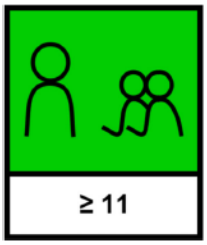
 The mains plug may only be plugged into an earthed socket.

 The earthed plug **or** the IEC plug of the mains cable must always remain accessible, so the mains cable can be disconnected in an emergency.

 The device is suitable for use in schools for supervised pupils aged 11 years or older.

To avoid personal injury, an operating voltage must not be applied to the case if it is damaged. In the event of damage, the case must be inspected by qualified personnel and repaired before it is used again.

3.2 Key to symbols



Intended for use in schools by learners aged 11 years or older under the supervision of the operator.

Caution: Observe operating instructions! Installations/system extensions must not be carried out by LEARNING USERS!

3.3 Technical Data

Operating voltage:	230 V AC, 50 Hz, +10/-15 %
Input power:	140 mA/23 W
Ambient temperature:	5 °C ... 45 °C
Protection rating:	IP 40
Pollution degree:	2
Protection class:	I (if the device is used in a manner not specified by the manufacturer, the protection provided by the device may be impaired)

Theben AG herewith declares that this type of radio installation complies with Directive 2014/53/EU. The complete text of the EU Declaration of Conformity is available at the following Internet address:
www.theben.de/red-konformitaet

3.4 Proper use

The case
- may only be used inside buildings.
- may only be used at altitudes up to 2000 m.
- may only be used in environments with a relative humidity up to 80 % RH (non-condensing).

3.5 Cleaning device

Only clean the training case with a damp cloth when it is open.

4 The KNX bus system

Intelligent bus systems are used to improve the quality of buildings in terms of operating costs, safety and flexibility.

4.1 How did KNX originate?

was a system developed and marketed by the EIB Association (EIBA). In 1999, the EIBA, the Batibus Club International (BCI, France) and the European Home Systems Association (EHSA, Netherlands) joined forces. In this fusion, the new name KNX was created and the KNX Association was founded with its headquarters in Brussels.

4.2 What is a KNX system?

A KNX system is a bus system for building control. This means that all devices use the same transmission method and can exchange data via a common bus line. This means:

- Access to the bus line must be clearly controlled (bus access procedure).
- A large share of the transmitted data is not user data (e.g. light on/light off), but address information (from where does the data come, where is it directed to?).

Another important feature of the KNX bus system is its decentralised structure. A central control device is not necessary. The "intelligence" of the system is distributed across all participants. However, central devices are not excluded. If required, e.g. for very special applications, central devices might be used as an option. Each device, or each bus sharing unit, has its own microprocessor. One major advantage of decentralisation is that if one device fails, the remaining devices continue to function. Only the applications relating to the failed device are disturbed.

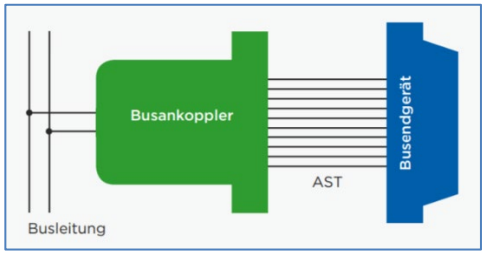
Apart from system devices (power supply, programming interface, etc.), a general distinction is made in the KNX system between sensors and actuators. Sensors are devices which detect events in the building (button actuation, motion, exceeding/falling below a temperature value, etc.), convert these into telegrams and then transmit them (data packets). Devices receiving telegrams and converting the commands they contain into actions are called actuators. Sensors represent the command transmitters, actuators the command receivers.

4.3 KNX devices

KNX systems distinguish between system devices and terminal devices. System devices are, for example, power supplies, couplers and programming interfaces. Terminal devices are, for example, sensors and actuators.

4.3.1 Terminal devices: sensors, actuator sans bus coupling units

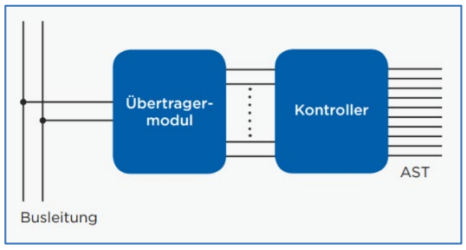
Bus sharing unit
All standard bus sharing units consist of two parts: bus coupling unit and bus terminal device.



Structure of a bus sharing unit

If separable, the two devices are connected via the standardised ten- or twelve-pin user interface (AST). Instead of the abbreviation AST, the abbreviation PEI (Physical External Interface) is often used. For bus coupling unit, the first letters of the term (BCU) are often used as an abbreviation.

Bus coupling unit
For bus coupling units permanently installed in devices, manufacturers can use a ready-made bus interface module (BIM) or a KNX chipset. The basic structure of the bus coupling unit is always the same. It consists of the two function modules: bus coupling unit controller and transformer module.



Structure of a bus coupling unit

The transformer module determines the medium for which the bus coupling unit is used. Common variants are bus coupling units with transformer module for KNX TP (twisted pair) and for KNX PL (power line).

4.3.2 System devices

KNX system devices are devices that predominantly perform special tasks, e.g.

- Structuring of KNX topology
- Power supply
- Programming

4.4 What can KNX be used for?

The KNX bus controls the lighting and blinds or shading devices, the heating, as well as the locking and alarm system of the building. KNX can also be used for remote monitoring and control of a building. Control is performed by the user or by a computer, which is equipped with the appropriate software. Originally focussed on commercial buildings, KNX is increasingly being used in residential buildings and especially single-family homes.

A control device, called "actuator", is installed between the consumer (e.g. electrical appliance, lamp, window opener, etc.) and the Mains voltage. The actuator is connected to the KNX bus and receives data from it in the form of Telegrams. These telegrams come either directly from a sensor (e.g. switch, brightness, temperature or CO2 sensor) or indirectly from a computer, which controls time-controlled circuits and other evaluations of sensor data, depending on the programming, and controls actuators accordingly.
If an actuator receives the command to supply voltage to the consumer, it switches the mains voltage through to the device.

4.5 ETS software

A single manufacturer-independent engineering tool software ETS® allows planning, configuration and commissioning of all KNX-certified products. The tool allows the system integrator to combine different applications with products from different manufacturers in one installation.

4.5.1 Tasks of the ETS

Usually, a KNX system is configured in S-mode, i.e. by using a computer and the ETS installed on it. Here, the ETS is used to edit the application programmes provided by the manufacturers for their products. Among other things, the following can be done:

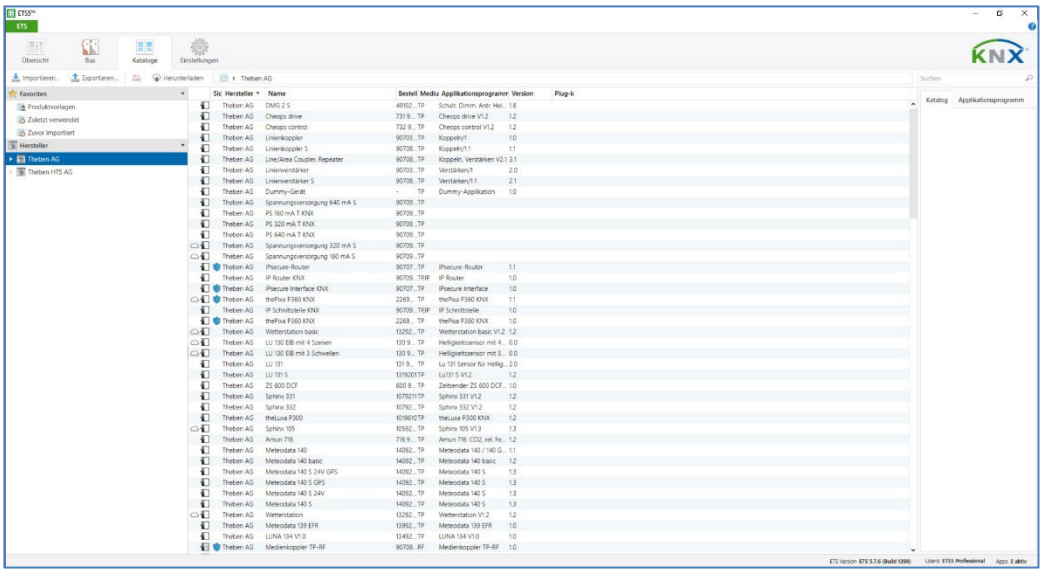
- Downloading the manufacturer's application programmes from the Internet (online catalogue) or from the database provided by the manufacturer (e.g. via their website).
- Setting the parameters of the application programmes.
- Connecting the appropriate communication objects of the individual application programmes by means of group addresses.

- Downloading the application programmes from the ETS to the KNX devices.

In addition to the configuration and commissioning tools, the ETS also contains extensive programme components for diagnosis and troubleshooting.

4.5.2 Structure of the ETS

The ETS is a software created according to Windows design rules. The ETS has different work windows (main work window, group address window, topology window) displaying the KNX installation to be edited in different ways.



4.5.3 Configuration

After installing the ETS on the computer, a system cannot yet be configured. First of all, the manufacturer's product data have to be loaded into the ETS. The manufacturers of KNX products provide these data free of charge. They are available either directly from the manufacturer or on the internet. Alternatively, the ETS online catalogue can be used. After importing these data into the ETS, the actual configuration can begin.

4.6 KNX Secure

ETS 5 Version 5.5 and higher support secure communication in KNX systems. A distinction is made between secure communication via the IP medium using KNX IP Secure and secure communication via the TP and RF media using KNX Data Secure.
In the ETS catalogue, KNX products supporting "KNX Secure" are clearly identified :

As soon as a "KNX-Secure" device is included in the project, the ETS requests a project password. If no password is entered, the device is included with Secure Mode deactivated. However, the password can also be entered or changed later in the project overview.

4.6.1 Start-up with KNX Data-Secure

For secure communication, the FDSK (Factory Default Setup Key) is required. If a KNX product supporting "KNX Data Secure" is included in a line, the ETS requires the input of the FDSK. This device-specific key is printed on the device label and can either be entered by keyboard or read by using a code scanner or notebook camera.

Example of FDSK on device label

After entering the FDSK, the ETS generates a device-specific tool key. The ETS sends the tool key to the device to be configured via the bus. The transmission is encrypted and authenticated with the original and previously entered FDSK key.
Neither the tool key nor the FDSK key are sent in plain text via the bus.
After the previous action, the device only accepts the tool key for further communication with the ETS.
The FDSK key is no longer used for further communication, unless the device is reset to the factory setting: In this case, all set safety-related data will be deleted.

The ETS generates as many runtime keys as needed for the group communication you want to protect. The ETS sends the runtime keys to the device to be configured via the bus. Transmission takes place by encrypting and authenticating them via the tool key. The runtime keys are never sent in plain text via the bus.

The FDSK is saved in the project and can be viewed in the project overview. All keys for this project can also be exported (backup).
During configuration, it can be defined subsequently which functions/objects are to communicate securely. All objects with encrypted communication are identified by the "Secure" icon in the ETS :

Keep the FDSK key safe, because if it is lost, it is impossible or difficult to reproduce.

4.6.2 Start-up without KNX Data-Secure

Alternatively, the device can also be put into operation without KNX Data Secure. In this case, the device is unsecured and behaves like any other KNX device without KNX Data Secure function.

To start up the device without KNX Data Secure, select the device in the 'Topology' or 'Devices' section and set the 'Secure start up' option in the 'Properties' area of the 'Settings' tab to 'Disabled'.

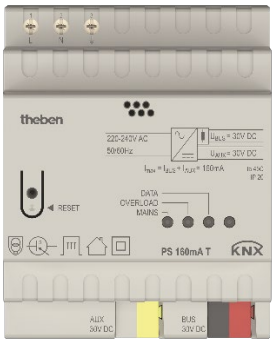
5 KNX devices used in the case

The devices installed in the case are divided into system devices and terminal devices.

5.1 System devices

5.1.1 KNX power supply PS 160 mA

https://www.theben.de/de/ps-160-ma-t-knx-9070956



- Power supply 160 mA with auxiliary voltage of 30 V DC
- Supply and monitoring of KNX system voltage
- This voltage supplies the bus coupling units via which each KNX device communicates with the other networked KNX devices

5.1.2 KNX USB interface

https://www.theben.de/de/schnittstelle-usb-knx-9070397

- For communication between PC and KNX system to be programmed
- Support of KNX Data Secure communication

5.1.3 KNX IPsecure Router

https://www.theben.de/de/ipsecure-router-knx-9070770

- Router/interface/line coupler IP and KNX
- For data exchange between KNX and IP networks
- Support of KNX IP Secure
- The KNX IPsecure Router allows telegrams to be forwarded between different lines via a LAN (IP) as a fast backbone (main line). The device can also serve as a programming interface to connect a PC to the KNX bus (e.g. for ETS programming)

5.2 Terminal devices

5.2.1 RM 8 S KNX

https://www.theben.de/de/rm-8-s-knx-4940220

- The 8-way switch actuator from the FIX1 series switches electrical loads (lamps)
- Manual operation on the device (even without bus voltage)
- Links, type of contact (opening contact/NO contact) and participation in central commands such as permanent on, permanent off, central switching and save/load scene

- Adjustable switch functions: e.g. on/off, pulse, on/off delay
- Staircase light with pre-warning

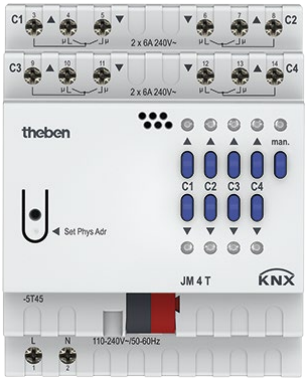
5.2.2 BM 6 T KNX

https://www.theben.de/de/bm-6-t-knx-4940230

- The 6-way binary input of the FIX1 series is used to connect 10 V – 240 V AC/DC contacts or similar
- 2 additional channels operable by buttons on the device, but without input
- Manual operation on the device (even without bus voltage)
- All inputs can be operated with different voltages and at different potentials
- Free allocation of functions: switch/push button, dimming, blinds/roller blinds, counter, repeat telegram, sequences

5.2.3 JM 4 T KNX

https://www.theben.de/de/jm-4-t-knx-4940250



- The 4-way blinds actuator of the FIX1 series switches electrically-driven blinds, roller blinds, awnings or similar hangings as well as ventilation flaps for mains voltage
- Manual operation on the device (even without bus voltage)
- With LED Up and Down switching status display for each channel

5.2.4 DMG 2 T KNX

https://www.theben.de/de/dmg-2-t-knx-4930270

- The 2-way universal dimmer actuator of the MIX2 series switches and dims the brightness of incandescent lamps, high-voltage and low-voltage halogen lamps, dimmable compact fluorescent lamps (energy-saving lamps) or dimmable LED lamps for 230 V
- For extension to up to 6 channels
- Dimming range 0-100%
- Also suitable for controlling fans
- Up to 2 MIX or MIX2 extension modules can be connected to a base module
- Device and KNX bus module can be exchanged independently of each other

- Manual start-up and operation of the switch actuators is also possible without the removable KNX bus module
- Manual operation on the device (even without bus voltage)

5.2.5 HME 6 T KNX

https://www.theben.de/de/hme-6-t-knx-4930245

- The 6-way heating actuator (extension module) of the MIX2 series controls electronic actuators for heaters or cooling surfaces
- With 6 temperature controllers (P/PI) for heating and cooling
- For extension to up to 18 channels
- With the modes: comfort, standby, night as well as frost/heating protection
- Up to 2 MIX or MIX2 extension modules can be connected to a base module
- Device and KNX bus module can be exchanged independently of each other
- Removable KNX bus module allows devices to be exchanged without reprogramming
- Manual start-up and operation of the actuators are also possible without KNX bus module
- LED switching status indicator for each channel
- Manual operation on the device (even without bus voltage)

5.2.6 Meteodata 140 S 24V KNX

https://www.theben.de/de/meteodata-140-s-24v-knx-1409201

- The weather station detects wind, rain, brightness and temperature. Additionally, a rain sensor is installed on the top
- For fully automatic blinds and sun protection control with automatic sun position tracking
- Sun protection for up to 8 façades via 3 integrated brightness sensors

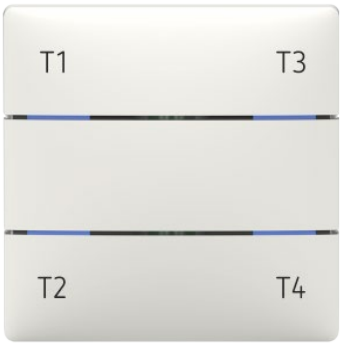
5.2.7 TA 8 S KNX

https://www.theben.de/de/ta-8-s-knx-4969228

- Binary input/binary output push button interfaces: With the 8-way push button interface, the inputs can detect binary states (via potential-free contacts) and control indicator lights (LEDs) via the outputs
- Free allocation of functions: switch/push button, dimming, blinds, valuator, sequences, temperature measurement, LED control
- 2 NTC inputs for actual temperature measurement from -5 °C to +100 °C
- They can be installed with conventional push buttons/switches in flush-mounted boxes.

5.2.8 iON 104 KNX und iON 108 KNX

iON 104 KNX
https://www.theben.de/de/ion-104-knx-4969234



The tactile sensor iON 104 KNX can be used in residential buildings, meeting rooms and offices, as well as in commercial buildings.

It has 4 buttons, which can be used to switch and dim the light, raise and lower blinds, or trigger and save scenes. Furthermore, it is possible to measure the temperature, control colours and display the status.
You can assign various functions to the individual buttons via the ETS application, such as switching the light on/off and dimming; raising and lowering blinds, triggering and saving scenes etc., and assign different colours to the LEDs.

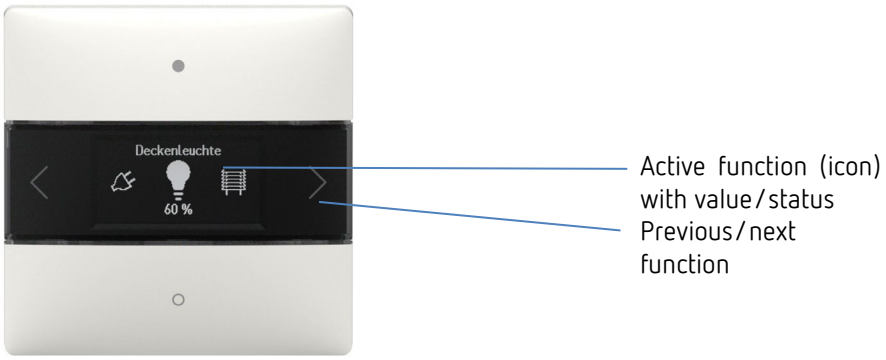
Raumcontroller iON 108 KNX

https://www.theben.de/de/ion-108-knx-4969238

The iON 108 KNX room controller with integrated temperature sensor can be used in residential buildings, meeting rooms and offices, as well as in commercial buildings. It is mounted on a standard junction box using the supplied mounting plate. Combinations of two iON KNX are possible with a 2-way mounting plate available as an accessory. The integrated bus coupling unit makes installation and connection to the bus system quick and easy.

The iON 108 KNX room controller has 20 functions, an LC display and a BLE module for operation with the iONplay app via smartphone or tablet. It can be used to switch and dim lights, raise and lower blinds, trigger and save scenes, regulate temperature, control colours and display the status. The room controller also supports heating and cooling operating modes, as well as the control of the fan stages.

You can select a suitable icon from a library for each of the 20 functions on the ION 108 KNX room controller. The icon is supplemented by individual function names (for example "ceiling spots" or "terrace blinds") and the current status (on/off/dimming value/position). This makes the room controller easier to use and navigate. The brightness of the LC display adjusts itself depending on the surrounding brightness. If it is dark in the room, the display lighting is dimmed down to prevent disturbing light effects. During the day, the display shines brighter and thus remains optimally readable.
The iON 108 KNX room controller is a multi-touch sensor with 4 buttons (up/down/right/left).



Selecting functions

- Press the right/left arrow button.
- A function is selected (switching on/off, dimming, blinds, function, move 0-255, percent list, floating point 2 byte, floating point 4 byte, HVAC, scenes, colour temperature, RGB, RGBW, XY colour, sequence, actual temperature).

Further settings in the functions

- Press buttons up/down.
- Operating the selected functions. The LEDs light up to confirm.

Favourites

If more than one function or the room temperature controller (RTC) is activated, up to three functions can be selected as favourites A, B, C. This allows the three most frequently required functions to be called up directly one after the other.

Parameters		Long button push	
Activate room temperature controller	*Favourite A*	Left	Right
yes	F1..F20	Display RTC	Jump between favourites
yes	RTC	Jump between favourites	
no	F1..F20	Jump between favourites	

Room temperature controller (RTC) function

If the room temperature controller is selected, the measured actual temperature is displayed in this level. Depending on the configuration in the ETS parameters, the left/right buttons can be used to go to the settings of setpoint temperature, operating mode, fan stage, etc.
If required, the respective setting can be changed with the up/down buttons.

Operation via iONplay app

The iON 108 KNX room controller can be controlled via Bluetooth using the iONplay app. The smartphone or tablet will be connected to the room controller via the integrated Bluetooth module. The duration of pairing can be set individually.

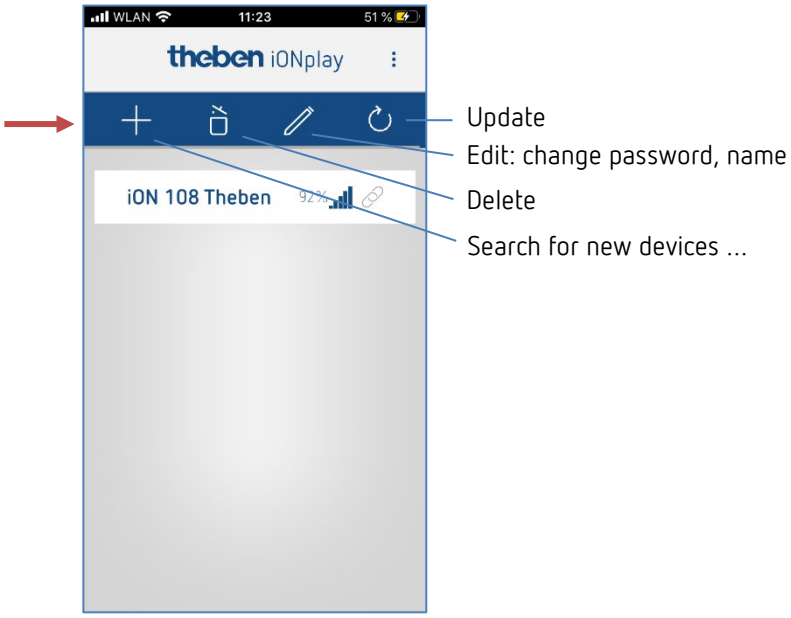
ⓘ Up to 30 room controllers can be managed via the app. The app visualises and controls up to 20 functions.

The app control of the iON 108 KNX room controller is especially suitable for living rooms, meeting rooms or hotels. When used in a hotel, the pairing is automatically terminated after an adjustable period.

Connecting smartphone/tablet to the room controller
The iON is connected to the app on the smartphone using the buttons on the device. The duration of the pairing can be set in the ETS.

➢ Download the iONplay app from the App Store or Google Play Store.

➢ Open iONplay app and press + in the menu bar.

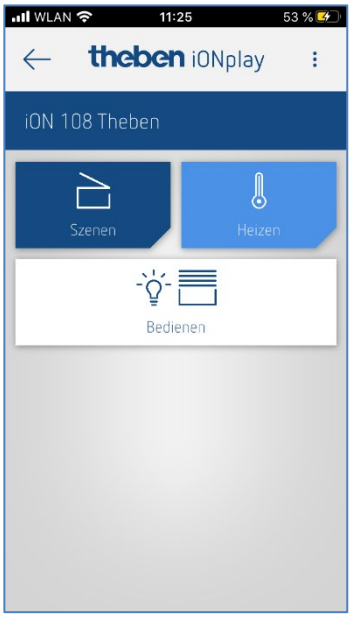


Device list of available iON devices appears.

- Select the device and confirm with OK.
- Tap on displayed device.
- Enter the PIN that appears on the iON display.

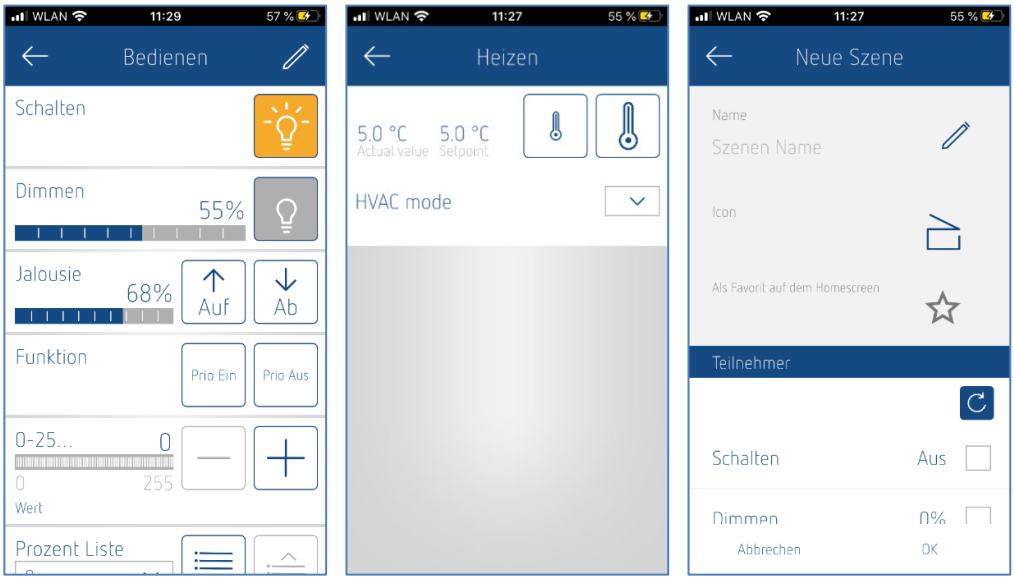
- Press OK.

The following window opens:



Here, you can use the button

- **Operate** → to switch, dim, raise or lower blinds etc. or use the button
- **Heating** → for comfort temperature, temperature reduction at night etc. or use
- **Scenes** → to enter new lighting scenarios



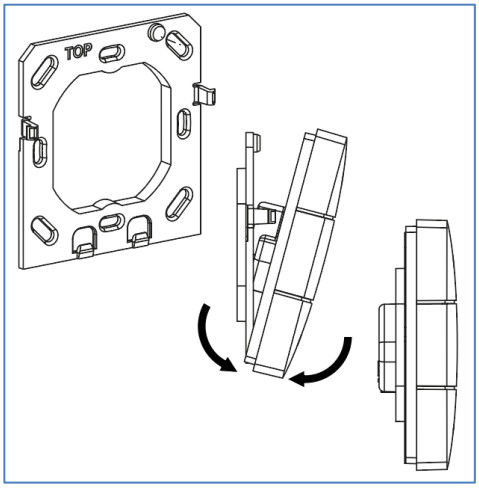
ⓘ If the time set in the ETS application is exceeded, the connection is not established automatically. The devices must be paired again.

In the event of a device failure, "---" appears in the temperature display (either RTC display or function=actual value).

Dismounting iON 104 – iON 108 devices

Since the button for programming the physical address is located on the back of the device, the iON 104 KNX or iON 108 KNX devices may have to be dismounted from the base plate.

This is necessary if
- a master reset is carried out on the device, or
- a new physical address is assigned to the device.



When dismounting, the device must be pulled - **firmly but carefully** - out of the upper bracket and tilted slightly forwards.
Then it must be removed upwards from the snap-fit.

6 Start-up

You will need a PC with a current ETS licence. This ETS licence is not included in the training case.

6.1 KNX IP connection

The **KNX IP** connection is connected to the KNX IPsecure Router. The connection can be used as follows:

- To connect a PC via Ethernet (IP tunneling) to the KNX IPsecure Router (programming with the ETS via Ethernet possible).
- To connect several cases with each other via KNX IP (backbone = IP). This allows crossline KNX communication between different cases (simulating communication between different floors, for example). The KNX IPsecure Router functions as a line coupler.

6.2 XLR connection

Further KNX devices can be connected to the XLR socket (BUS input).

6.3 Actual start-up

- First install the latest ETS software on the PC.
- Then connect the training case to the power supply by using the provided cable.

- **Recommendation**: Connect the PC to the training case using the provided USB cable.
- Now the case, or the devices inside, can be configured via the ETS. For programming via the ETS, the KNX USB interface (if necessary, also the KNX IPsecure router) is used.

7 Resetting devices to factory settings

The **programming button** (Set Phys Adr) for resetting the devices is clearly visible/accessible on all devices (exception: the two iON devices, see image below).

The KNX power supply cannot be reset. If the RESET button on the device front is pressed, the bus voltage will be interrupted for 20 seconds.

7.1 BUS reset

By pressing the **BUS reset**, the bus line is short-circuited, and all connected devices change to the "bus failure" state.
When released, the bus voltage is stabilised again, and all connected devices will be restarted.

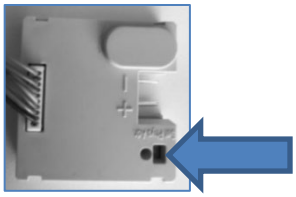
7.2 Resetting devices

- Press and hold BUS reset.
- With a pointed object, also hold down the respective **programming button**.
- Release BUS reset and after approx. 3 seconds, also release the device programming button.
- This step must be carried out for every device.

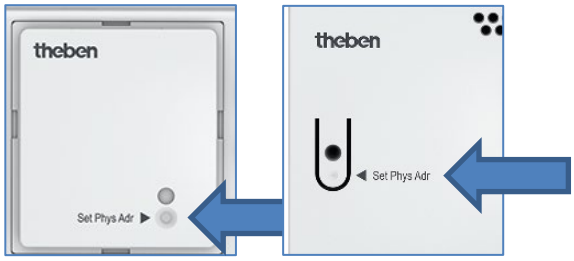
Afterwards, all parameters and programming settings for the KNX devices will have been deleted and the physical address will once again be 15.15.255.

7.2.1 The programming button of the devices used

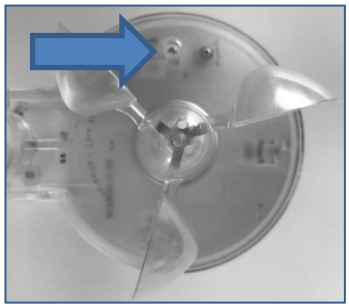
Push button interface TA 8 S KNX



Actuators



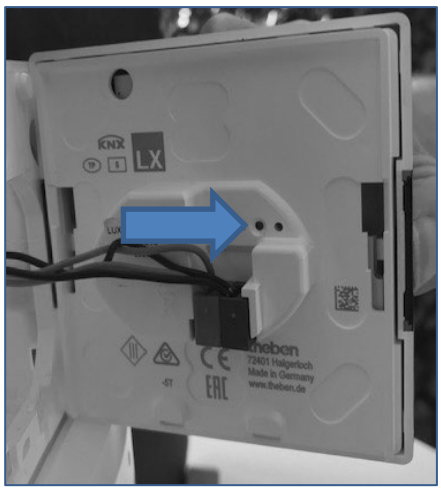
Weather station (on the bottom)



KNX IPsecure Router

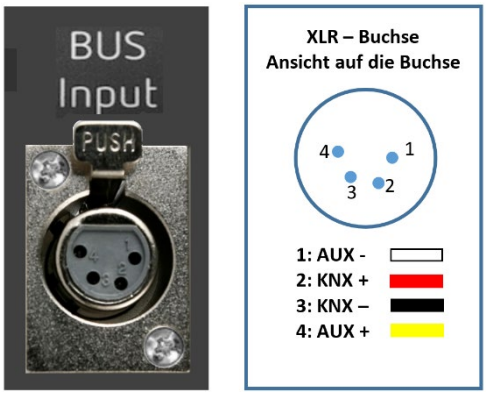
iON 4/iON 8

The device must be lifted (disengaged) at the top as shown. On the back, the programming button must be pressed.



8 Extending the case with further devices

To extend the functions, additional KNX devices can be connected to the BUS Input XLR socket by using a provided XLR adapter.



In KNX mode, KNX devices from competitors can of course also be connected and operated.

Only devices complying with the safety extra-low voltage guidelines for KNX bus and KNX auxiliary voltage may be connected.

9 Support

If you require technical assistance, our colleagues from the service would be happy to help you.

Hotline@theben.de
Telephone: +49 7474 692369

10 Contact

Theben AG
Hohenbergstr. 32
72401 Haigerloch
GERMANY
Tel. +49 7474 692-0
Fax +49 7474 692-150

Hotline
Tel. +49 7474 692-369
hotline@theben.de
Addresses, telephone numbers etc.
www.theben.de