Operation and installation manual

KNX IP BAOS 777

(Art. # 5193)
Interface and ObjectServer between LAN and KNX Bus

WEINZIERL

Picture 1: Photo of the device · Picture 2: Typical application

Application

The KNX IP BAOS 777 from WEINZIERL is a universal IP Interface and IP Gateway for the KNX Installation Bus. BAOS stands for "Bus Access and Object Server" and provides an interface to KNX installations both on the telegram level (KNXnet/IP Tunneling) as well as on datapoint level (KNX Group Objects / KNX Application Layer) with semantic meta-data for rooms and functions. With its integrated web server, the device allows the visualization of buildings, rooms and functions in a standard web browser on a PC or mobile device.

The device provides these possibilities to access an installation:

As **Programming Interface**

- On telegram level (KNXnet/IP Tunneling)
- Can be used as bus interface for ETS® (Version 4.2 or higher)

As **Residential Gateway**

- Via KNX IP BAOS Binary Protocol
- Via KNX IP BAOS Web Services
- Via KNX IP BAOS RESTful Web Services

Via **Web Application**

- Using a standard web browser

KNX IP BAOS 777 as Programming Interface

The KNX IP BAOS 777 can be used as interface to the KNX Bus on the telegram level. It is compatible with the KNXnet/IP specification and can be used as bus interface for ETS® or other programs that support the KNXnet/IP Tunnelling. It supports up to 8 simultaneous connections. The settings for the interface (e.g. IP configuration) can be done with all the ETS product entries that are available for this device.

KNX IP BAOS 777 as Residential Gateway

The KNX system is based on a specific protocol that is difficult to implement for non-KNX devices. The KNX IP BAOS 777 maps KNX data to an IT-friendly API (Application Programming Interface). It greatly reduces the effort to connect e.g. control or visualization tools to KNX. Also helpful is the storage of all data point values – even if the device is not connected.

The KNX BAOS architecture not only allows access to the runtime data, but also to the structure of the KNX installation. All information about rooms in a building and the available functions can be read as metadata from a client. With the ETS, the rooms and the functions are defined, which should be available to the user.

The KNX IP BAOS protocol is available in three different versions:

- *KNX IP BAOS Binary*: A binary protocol that is especially suitable for small microcontroller.

- *KNX IP BAOS Web Services*: A URL-based protocol with JSON syntax compatible with KNX IP BAOS 771 and 772.

- *KNX IP BAOS RESTful Web Services*: A URL-based protocol with RESTful JSON syntax, which can be integrated into browser-based web applications.

The KNX IP BAOS 777 also features time and recording functions available on the BAOS protocol.

KNX IP BAOS 777 via Web Browser

The KNX IP BAOS 777 has an integrated web server that allows access to the device settings in a standard web browser.
With the help of the ETS product entry with building structure the web server also offers visual representations of the entire KNX installation including visualization of the building, rooms and functions.
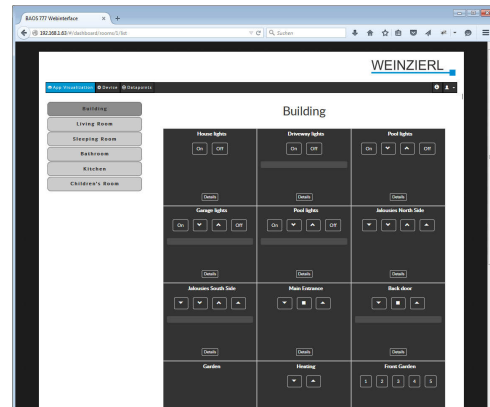
The data from the Residential Gateway are graphically displayed in the browser and the functions can be operated directly via the web interface. Timers are also available via the web server.

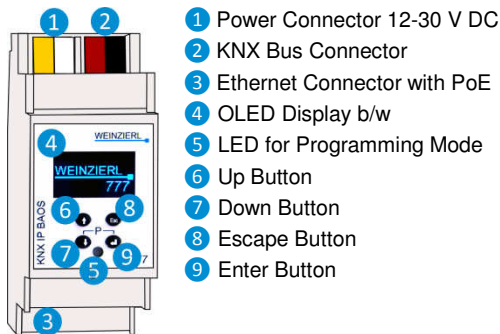## KNX IP BAOS 777 as application specific Gateway

To connect to non-KNX systems, the KNX IP BAOS 777 can be used as an application specific Gateway (e.g. to connect heating devices, audio applications and many more). In this case the generic ETS product entry (with up to 2000 data points) can be used for development purposes. Of course, individual product entries can be developed. The datapoint types can be individually configured via ETS parameters.

BAOS SDK

Both for the use of the KNX IP BAOS 777 as a Residential Gateway as well as for the development of application-specific solutions the BAOS protocol must be implemented in the client. For a quick and easy integration of BAOS Binary Services a free SDK is available. More information about the BAOS SDK and the free download can be found at www.weinzierl.de

Installation and Connection

The KNX IP BAOS 777 is designed for installation on DIN rail with a width of 2 units (36 mm). It features the following controls (⑥ ⑦ ⑧ ⑨) and displays (④ ⑤):

① Power Connector 12-30 V DC
② KNX Bus Connector
③ Ethernet Connector with PoE
④ OLED Display b/w
⑤ LED for Programming Mode
⑥ Up Button
⑦ Down Button
⑧ Escape Button
⑨ Enter Button

An external power supply only needs to be connected if the IP switch in use does not support Power over Ethernet (PoE).

Access of settings

The settings of the device can be accessed via

1. Direct setting on the device
2. Internet browser and web interface
3. ETS (Version 4.2 or higher)

1. Direct setting on the device

Programming mode: The KNX programming mode is activated / deactivated by pressing the buttons ⑦ + ⑨ simultaneously.

A. Startup and idle display

During startup of the device, the actual IP address is displayed (if the device is connected correctly). When display is idle after startup, the IP address, physical address and database are displayed.

After 5 minutes of inactivity the display will turn into screensaver mode (blank screen) to safe power. Press any key to turn the display on again.

B. Main menu

By pressing ⑦ (arrow down) you enter the **main menu** of the device. By pressing ⑨ (enter) you enter the **submenus**. Within the menus you can use ⑥ (arrow up) and ⑦ (arrow down) for **navigation**; ⑨ (enter) is for **confirmation** and ⑧ (escape) is to cancel / **go back** / one level higher.

C. Submenu IP Config

Select **DHCP** or **Manual** for IP configuration. Within **Manual** you can set the IP, subnet and gateway. Use ⑥ and ⑦ to navigate/set and ⑨ to select.

Changing the IP address makes a new login necessary for the web interface.

D. Submenu IP TUNNEL

The KNX IP BAOS 777 supports 8 simultaneous KNXnet/IP tunneling connections. You can display them in the submenu IP Tunnel including their actual status.

E. Submenu IP BAOS

In this submenu, you can display Binary UDP and Binary TCP connections including their actual status.

F. Submenu INFO

This submenu gives you information about the device's serial number, App ID, App status, Firmware revision, and MAC address.

G. Submenu RESET

This submenu allows you to restart your device or to make a reset to factory settings (master reset). Select one option and then keep ⑨ pressed until the small animation is finished and the option is executed.

The **factory default settings** after a master reset are:

|	
Physical device address:	15.15.255
Physical addresses of tunneling connections	15.15.240-247
IP address allocation:	DHCP

Master reset will make a new ETS download necessary.

2.   Internet browser and web interface

Thanks to an integrated web server, the KNX IP BAOS 777 can be accessed by its own web interface. The **address of the web interface** is `http://XXX.XXX.XXX.XXX` (the `XXX` stand for the device's IP address which is displayed on the device.)

> *User name* and *password* for the web interface are both `admin` by default and should be changed in the ETS via a download.
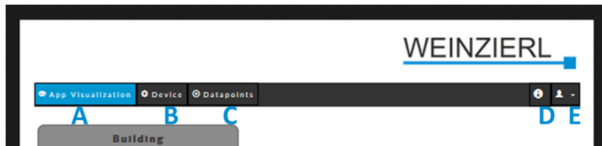
The web interface consists of (up to) **5 main menu points** in the navigation (depending on the loaded database – structured or generic):

A.   **App Visualization**
B.   **Device**
C.   **Data Points**
D.   **Info and Help**
E.   **Logout**

A. App Visualization

If the standard (structured) database is loaded the device will automatically generate the complete visualization of the building including all rooms and functions. You can open the building, control and set and also take a look at further details of your individual functions such as history and timers.

> *For a detailed description of the functions and their visualization, please see page 5ff of this manual.*

B. Device

This is the "settings" menu: it allows general settings of the device such as name, individual address, time and date and switching the device into programming mode.

Networks settings such as IP address, IP assignment, Sub Net Mask and Default Gateway can be set in this menu.

> *A new IP address makes a new client login necessary with the new IP address.*

"ETS section" contains information regarding the actual loaded ETS application.

"Connections" allow settings and monitoring of BAOS Binary UDP- and TCP-Client connections, BAOS Web Services, BAOS REST Services and KNXnet/IP Tunneling connections.

> *By deactivating the BAOS REST Services the Web interface will become inaccessible as well.*
> *To use the Web interface again a reactivation by ETS application download has to be done.*

The "Device" section allows you to enable and disable the configuration via the control buttons on the device itself. If disabled, the device menu will still be accessible to read information but changes cannot be done on the device itself.

Within "Web Application" section, the Webserver of the device can be enabled/disabled.

> *By deactivating the devices Webserver, which is also hosting the Web interface, the Web interface will become inaccessible.*
> *To use the Web interface again a reactivation of the Webserver by ETS application download has to be don.*

The "Hardware/Versions" section gives you an overview about the Hardware and Firmware version of the device and you can restart the application or reboot the device.

As the device can be updated by the user, you can drag and drop the latest firmware file to update the KNX BAOS IP 777 (updates can be found on the product homepage at www.weinzierl.de)

> *An update, a restart or reboot logs you out of the web interface and you have to manually log into again.*

C. Data Points

Within this menu, all active set data points within your project can be monitored.

D. Info and Help

Here you can find additional information regarding the device and ETS database.

E. Logout

The user can logout off the Web interface in this section.

3.   ETS – Connection Manager

Factory default settings:

IP address: DHCP

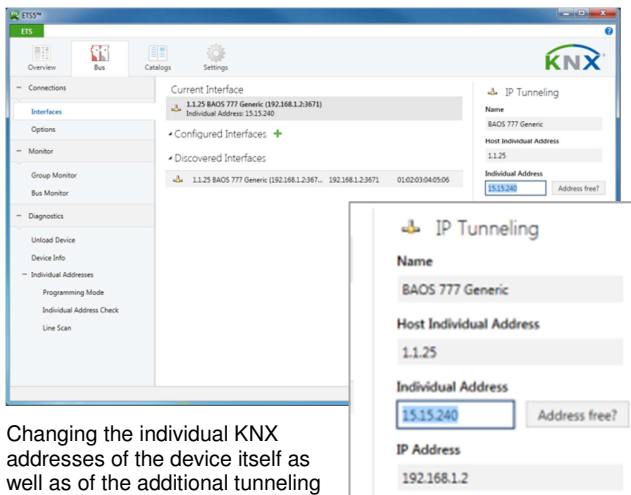Individual KNX addresses:

Device address: 15.15.255
Tunneling 1:   15.15.240
Tunneling 2:   15.15.241
Tunneling 3:   15.15.242
Tunneling 4:   15.15.243
Tunneling 5:   15.15.244
Tunneling 6:   15.15.245
Tunneling 7:   15.15.246
Tunneling 8:   15.15.247

After connecting the interface to your LAN as well as to your KNX bus and power supply, the ETS will discover the interface automatically within its bus section.

By clicking on the discovered KNX IP BAOS 777 it will become your current interface and the connection specific information will appear in the right column of the ETS window.

The Device Name and the Host Individual Address can only be changed within your ETS project.

Section 'Individual Address' enables you to change the physical KNX address of the currently used KNXnet/IP tunneling connection. To check if the address you want to assign is unique within your KNX installation you can click the button 'Address free?'.

Changing the individual KNX addresses of the device itself as well as of the additional tunneling connections can be done within your ETS project after adding the KNX IP BAOS 777 to your ETS device tree.

By clicking on the KNX IP BAOS 777 device entry within your ETS projects topology view, an information column 'Properties' will appear on the right side of the ETS window.

Within the 'Settings' overview, you can change the name of the device. The 'Individual Address section contains a list of all assigned individual KNX addresses. The Device address is the address of the device itself. This address is also visible within the topology tree view of your ETS project.

Additional address 1 to 8 are the individual KNX addresses of the KNXnet/IP tunneling connections the KNX IP BAOS 777 provides.

Each individual KNX address can be changed by clicking on the list entry and typing in the desired address into the 'Individual Address' text-field.

If the text-field frame switches to color red after entering the address, the address is already taken within your ETS project.

Make sure that none of the addresses above are already present in your KNX installation.

Within the 'IP' overview the IP network specific options of the KNX IP BAOS 777 can be changed. Switching the radio button from 'Obtain an IP address automatically' (by DHCP) to 'Use the following IP address' (static IP address assignment) enables you to change the devices IP address to a static one of your choice.
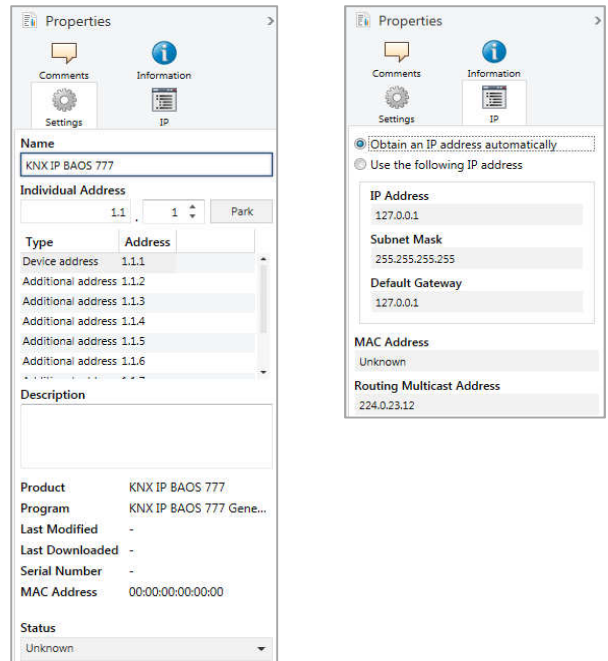

All changes made in ETS Properties section are only active after an application download.

Faster downloads over IP

As with all devices on the KNX bus (twisted pair) a download can be carried out the via the bus. However, the KNX IP BAOS 777 also has a LAN interface, which can be used for a quick download directly via IP. In this case, no additional KNX interface is required. The download over IP must be activated in the connection options of the ETS.).

Due to the significantly shorter transmission times it is recommended to perform downloads via IP.
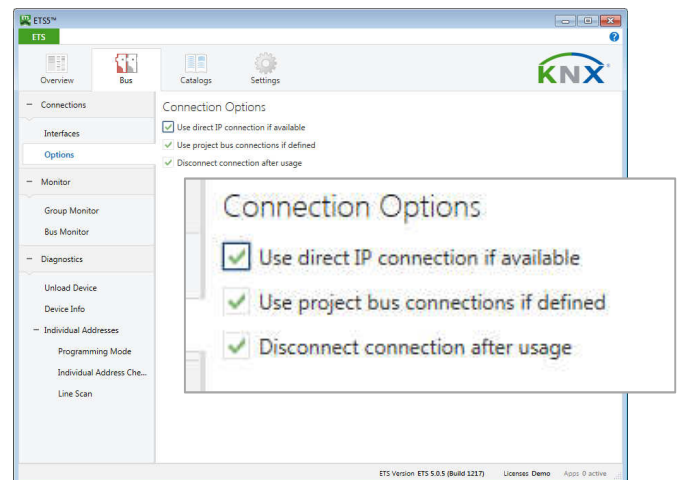
The setting '"Use direct IP connection if available" significantly speeds up the transfer between the ETS and the device as IP is used and not TP.

Configuration of the object server and web visualization

The functional core of the KNX IP BAOS devices is the so-called object server. The object server provides KNX group objects for the communication with the building installation via the KNX bus. The linking to other KNX devices is done via group address assignment in ETS.

The object server has storage for the values of all configured group objects. Technically speaking it holds process image for the building control system. For client access the KNX IP BAOS device provides a set of APIs (application programming interfaces) to read and write to the object values. So the client application is decoupled from timing constrains on the physical bus.

The default ETS entry for the KNX IP BAOS 777 allows configuring the group objects in the context of the structure of the building. This way semantic meta-data is generated which can be used by the client application.

The data configured in the KNX IP BAOS 777 represents the interface or even 'face' of the installation system to the user or to the non-KNX part of the installation. While in a complex installation many devices and functions are present, only a subset should be presented for the user.

With the parameter set of the KNX IP BAOS 777 the installer configures the functions to be exported. A function is not limited to a single group object, typically it is a set of objects. For example a light which has a status feedback is realized by a function holding two objects: one to control the light and a second receiving the current state. This relation is very important for using the data.

All functions are related to rooms or to the building as such. This is regardless of the real devices in the network. For example for the user it is important to know that a light is in the living room, he is not interested to know that the switching is done by a specific actuator in the electrical cabinet.

For the complete configuration only ETS® is required. There is no additional editor needed. All the information configured in KNX IP BAOS 777 is available for the connected client application. Typical applications are visualization tools provided by third parties.

The KNX IP BAOS 777 has an integrated web visualization, which uses the exactly the same configuration for its auto-generated graphical user interface. It can be used by the installer to immediately test all functions even if no client is connected.

Using the KNX IP BAOS 777 with the Default Application (Database with Building Structure)

The KNX IP BAOS 777 has a very flexible architecture and can cope with different ETS product entries. The following describes the default application with building structure

> *For development purpose a generic product entry is available as well and it is documented in a separate document. Please see the download section at www.weinzierl.de for more info.*

The following chapter describes the configuration of the object server and the relation to the integrated web visualization.

When inserting a new device instance into a project no group objects are visible. All functions can be enabled via parameter settings. Via the device settings in ETS all functions and group objects can be configured. This information can be used by any client of the KNX IP BAOS 777 device. It is also used internally to setup the visualization app in the web frontend. As the controls of the visualization are directly related with the functions selected in the ETS parameters, screen shots show the corresponding controls.

A. General

This page allows the general settings of the device.
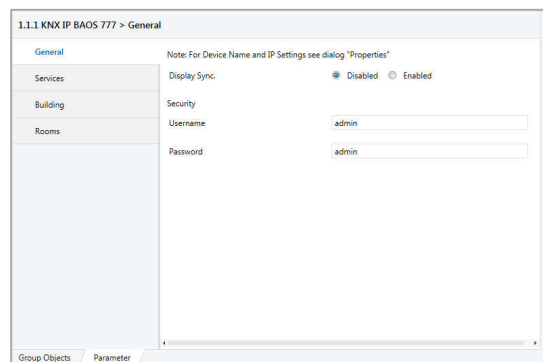
Display Sync

If enabled a group object will appear which allows the synchronization of all displays of this device family. It will send a '1' if the display is switched on. Vice-versa it switches the display on if a '1' is received on this group object. This function is helpful to get a quick overview of the states of all devices without touching one after another.

Security / Username and Password

This is the login data to access the web interface of the device in a web browser. To open the web page of the device, just enter the IP address, which is visible on the display, as URL into the address field of your web browser.
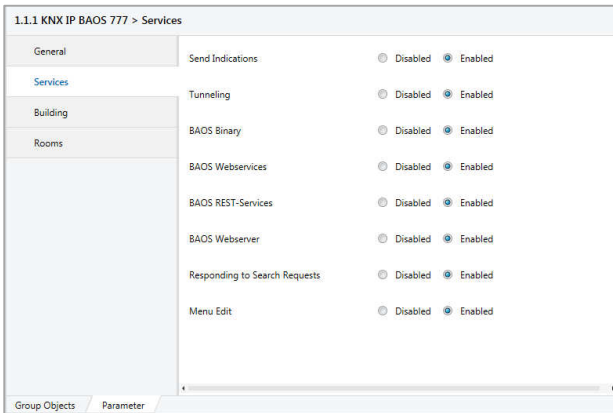
> *Username and password are both `admin` by default and should be changed*

B. Services

This page allows enabling or disabling the access to the device via different ways such as Tunnelling, BAOS Binary, BAOS Webservices, and many more.
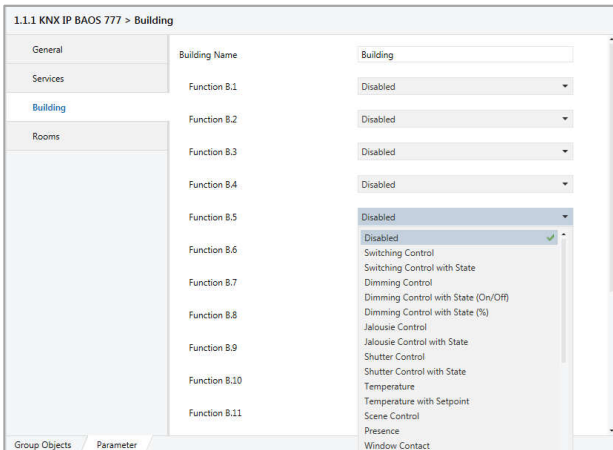
ℹ️ *For security reasons, unused features should be disabled.*

C. Building

This page is provided for *all functions of a building* which *are not related with a single room*. For example, date and time is valid for the whole building. The same is true for wind and rain warning. Also the control for exterior lights can be configured here.

Building Name

The name of the building is used by the web frontend and available via web services.

Function B.1, B.2, B.X

On the page Building 16 functions are provided which can be configured individually. Depending on the setup, the web interface visualizes the building functions:
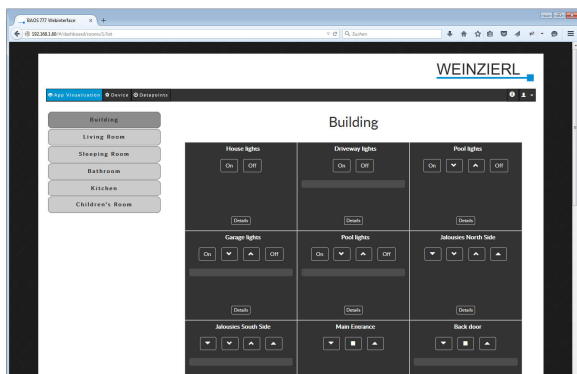
D. Rooms

This page is provided for *all functions related to specific rooms.* Up to *24 rooms* can be set up – each room with a maximum of *10 basic functions* and *6 extended functions*.
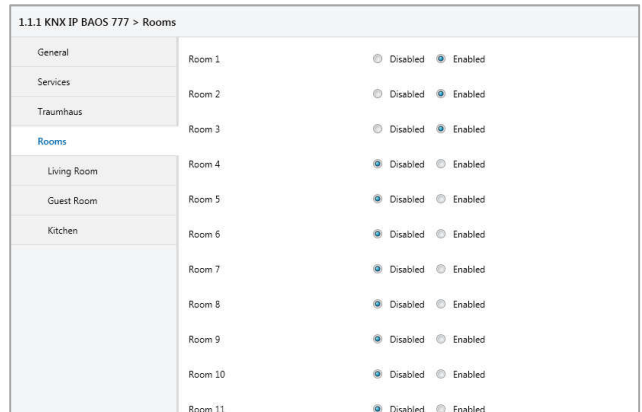
E. General functions overview

**Building functions
(max. 16 per building)**

Switching Control
Switching Control with State
Dimming Control
Dimming Control with State (On/Off)
Dimming Control with State (%)
Jalousie Control
Jalousie Control with State
Shutter Control
Shutter Control with State
Temperature
Temperature with Setpoint
Scene Control
Presence
Window Contact
Door Contact
Smoke Alert
Water Alert
RGB Control with State
Time
Date
HVAC Mode
Door Bell / Opener
Burglary Alert
Rain Alert
Wind Alert
Outdoor Temperature
Universal 1 Bit State
Universal Scaling Control
Universal Scaling State
Universal Scaling Control State
Universal 2 Byte Floatvalue State
Universal 4 Byte Floatvalue State

**Basic room functions
(max. 10 per room)**

Switching Control
Switching Control with State
Dimming Control
Dimming Control with State (On/Off)
Dimming Control with State (%)
Jalousie Control
Jalousie Control with State
Shutter Control
Shutter Control with State
Temperature
Temperature with Setpoint
Scene Control
RGB Control with State

**Extended room functions
(max. 6 per room)**

Switching Control
Switching Control with State
Dimming Control
Dimming Control with State (On/Off)
Dimming Control with State (%)
Jalousie Control
Jalousie Control with State
Shutter Control
Shutter Control with State
Temperature
Temperature with Setpoint
Scene Control
Presence
Window Contact
Door Contact
Smoke Alert
Water Alert
RGB Control with State
Universal 1 Bit State
Universal Scaling Control
Universal Scaling State
Universal Scaling Control State
Universal 2 Byte Floatvalue State
Universal 4 Byte Floatvalue State

1. Switching Control

This function controls a switching actuator. The following group object will be available:

Group Object	Type KNX	Size	Direction
Function B.X : Switching – On/Off	1.001	1 Bit	To KNX

In the visualization app of the **Web interface** this selection generates this control:
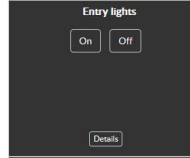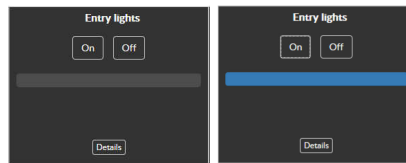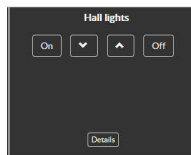

2. Switching Control with State

This function controls a switching actuator with state feedback. The following group objects will be available:

Group Object	Type KNX	Size	Direction
Function B.X : Switching – On/Off	1.001	1 Bit	To KNX
Function B.X : Switching – State	1.001	1 Bit	From KNX

Web interface
(including indication of "off" and "on")

3. Dimming Control

This function controls a dimming actuator. The following group objects will be available:

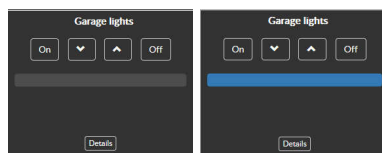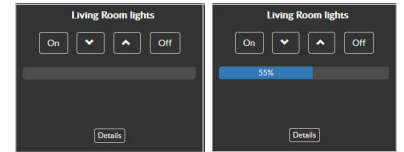| Group Object	Type KNX	Size	Direction
Function B.X : Dimming – On/Off	1.001	1 Bit	To KNX
Function B.X : Dimming – Relative	3.007	4 Bit	To KNX

Web interface

4. Dimming Control with State (On/Off)

This function controls a dimming actuator with state feedback. The following group objects will be available:

Group Object	Type KNX	Size	Direction
Function B.X : Dimming – On/Off	1.001	1 Bit	To KNX
Function B.X : Dimming – Relative	3.007	4 Bit	To KNX
Function B.X : Dimming – On/Off	1.001	1 Bit	From KNX

Web interface
(including indication of "off" and "on")

5. Dimming Control with State (%)

This function controls a dimming actuator with state feedback. The following group objects will be available:

Group Object	Type KNX	Size	Direction
Function B.X : Dimming – On/Off	1.001	1 Bit	To KNX
Function B.X : Dimming – Relative	3.007	4 Bit	To KNX
Function B.X : Dimming – Value St.	5.001	1 Bit	From KNX

Web interface
(including indication of state in percent)

6. Jalousie Control

This function controls a jalousie actuator. The following group objects will be available:

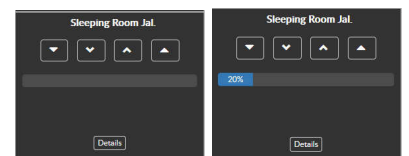| Group Object	Type KNX	Size	Direction
Function B.X : Jalousie - up/down	1.008	1 Bit	To KNX
Function B.X : Jalousie - step/stop	1.007	1 Bit	To KNX

Web interface

7. Jalousie Control with State

This function controls a jalousie actuator with state feedback. The following group objects will be available:

Group Object	Type KNX	Size	Direction
Function B.X : Jalousie - up/down	1.008	1 Bit	To KNX
Function B.X : Jalousie - step/stop	1.007	1 Bit	To KNX
Function B.X : Jalousie - Value St.	5.001	1 Bit	From KNX

Web interface
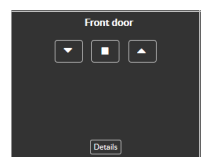(including indication of state in percent)

8. Shutter Control

This function controls a shutter actuator. The following group object will be available:

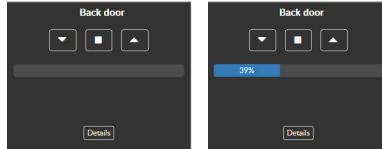| Group Object	Type KNX	Size	Direction
Function B.X: Shutter – up/down	1.008	1 Bit	To KNX
Function B.X : Shutter: – Stop	1.010	1 Bit	To KNX

Web interface

9. Shutter Control with State

This function controls a shutter actuator with state feedback. The following group object will be available:

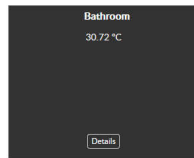| Group Object	Type KNX	Size	Direction
Function B.X: Shutter – up/down	1.008	1 Bit	To KNX
Function B.X : Shutter – Stop	1.010	1 Bit	To KNX
Function B.X : Shutter – Value St.	5.001	1 Bit	From KNX

Web interface
(including indication
of state in percent)

10. Temperature

This function monitors a temperature sensor. The following group object will be available:

Group Object	Type KNX	Size	Direction
Function B.X : Temp. – State	9.001	2 Bytes	From KNX

Web interface

11. Temperature with Setpoint

This function monitors a temperature sensor with controls. The following group object will be available:

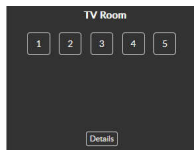| Group Object	Type KNX	Size	Direction
Function B.X : Temp. – State	9.001	2 Bytes	From KNX
Function B.X : Temp. – Set Point	9.001	2 Bytes	To KNX

Web interface

12. Scene Control

This function controls scenes. The following group object will be available:

Group Object	Type KNX	Size	Direction
Function B.X : Scene - Number	18.001	1 Byte	To KNX

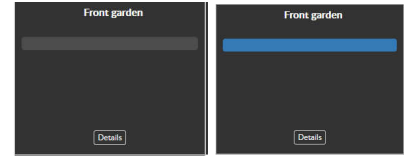**Web interface**
(5 scenes are available)

13. Presence

This function monitors a presence detector. The following group object will be available:

Group Object	Type KNX	Size	Direction
Function B.X : Presence – State	1.002	1 Bit	From KNX

Web interface
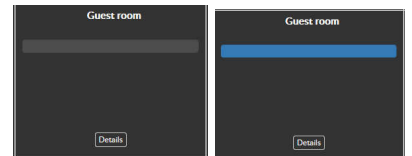(indication of "inactive"
and "active")

14. Window Contact

This function monitors a window contact. The following group object will be available:

Group Object	Type KNX	Size	Direction
Function B.X : Contact – State	1.019	1 Bit	From KNX

Web interface
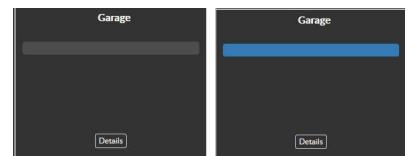(indication of "closed"
and "open")

15. Door Contact

This function monitors a door contact. The following group object will be available:

Group Object	Type KNX	Size	Direction
Function B.X : Contact – State	1.019	1 Bit	From KNX

Web interface
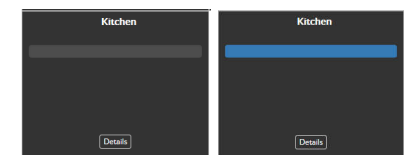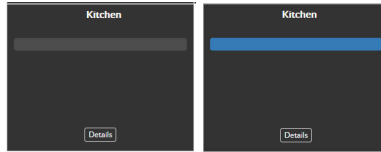(indication of "closed"
and "open")

16. Smoke Alert

This function monitors a smoke alert sensor. The following group object will be available:

Group Object	Type KNX	Size	Direction
Function B.X : Smoke Alert – State	1.002	1 Bit	From KNX

Web interface
(indication of "off" and
"on")

 17. Water Alert

This function monitors a water alert sensor. The following group object will be available:

Group Object	Type KNX	Size	Direction
Function B.X : Water Alert – State	1.002	1 Bit	From KNX

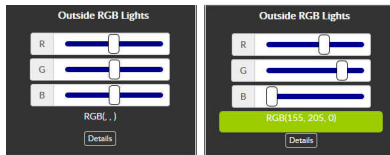**Web interface**
(indication of "off" and "on")

 18. RGB Control with State

This function controls a RGB light. The following group objects will be available:

Group Object	Type KNX	Size	Direction
Function B.X: RGB – control	232.600	3 Bytes	To KNX
Function B.X : RGB – state	232.600	3 Bytes	From KNX

Web interface
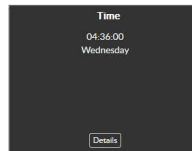(including a setting and display of the RGB values)

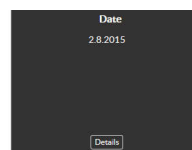 **19. Time**

This function displays a clock. The following group object will be available:

Group Object	Type KNX	Size	Direction
Function B.X :Time	10.001	3 Bytes	From KNX

Web interface

 20. Date

This function displays a clock. The following group object will be available:

Group Object	Type KNX	Size	Direction
Function B.X : Date	11.001	3 Bytes	From KNX

Web interface

 21. HVAC Mode

This function controls an air conditioning or heating. The following group object will be available:

Group Object	Type KNX	Size	Direction
Function B.X : HVAC – State	20.102	1 Byte	To KNX

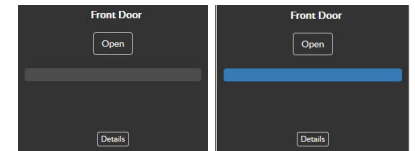**Web interface**
(including display of actual setting)

 22. Door Bell / Opener

This function controls a door opener and monitors the door bell. The following group objects will be available:

Group Object	Type KNX	Size	Direction
Function B.X : Door opener	1.009	1 Bit	To KNX
Function B.X : Door bell	1.001	1 Bit	From KNX

Web interface
(indication of "closed" and "open")

 23. Burglary Alert

This function monitors an alert system or motion detection sensor. The following group object will be available:

Group Object	Type KNX	Size	Direction
Function B.X : Burglary Al. – State	1.002	1 Bit	From KNX

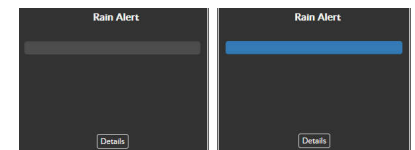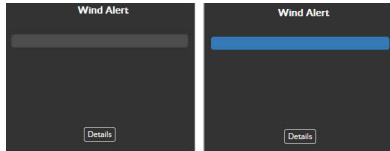**Web interface**
(indication of "inactive" and "active")

 24. Rain Alert

This function monitors a rain sensor. The following group object will be available:

Group Object	Type KNX	Size	Direction
Function B.X : Rain Alert – State	1.002	1 Bit	From KNX

Web interface
(indication of "inactive" and "active")

25. Wind Alert

This function monitors a wind sensor. The following group object will be available:

Group Object	Type KNX	Size	Direction
Function B.X : Wind Alert – State	1.002	1 Bit	From KNX

Web interface
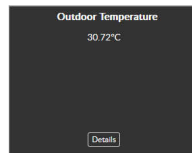(including indication
of "inactive" and "active")

26. Outdoor Temperature

This function monitors an outdoor temperature sensor. The following group object will be available:

Group Object	Type KNX	Size	Direction
Function B.X : Temp. – State	9.001	2 Bytes	From KNX

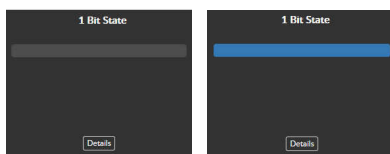**Web interface**

Further functions

With 26 predefined functions, the KNX IP BAOS 777 is offering powerful control and monitoring solutions for a broad variety of home automation applications.

However, if you need to implement further individual applications the device offers 6 universal functions which can be configured individually according to your needs:

27. Universal 1 Bit State

Group Object	Type KNX	Size	Direction
Function B.X : State	1.XXX	1 Bit	To KNX

Web interface

28. Universal Scaling Control

Group Object	Type KNX	Size	Direction
Function B.X : Various	5.XXX	8 Bit	To KNX

Web interface

29. Universal Scaling State

Group Object	Type KNX	Size	Direction
Function B.X : State	5.XXX	8 Bit	From KNX

Web interface
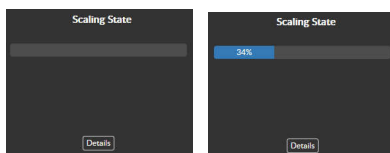
30. Universal Scaling Control State

Group Object	Type KNX	Size	Direction
Function B.X : State	5.XXX	8 Bit	From KNX
Function B.X : Control	5.XXX	8 Bit	To KNX

Web interface

31. Universal 2 Byte Floatvalue State

Group Object	Type KNX	Size	Direction
Function B.X : State	9.XXX	2 Byte	From KNX

Web interface

32. Universal 4 Byte Floatvalue State

Group Object	Type KNX	Size	Direction
Function B.X : State	14.XXX	4 Byte	From KNX

Web interface
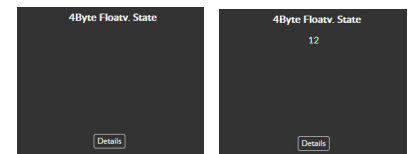
⚠️ **WARNING**

- The device may be built into distribution boards (230/400V).
- The device must be mounted and commissioned by an authorized electrician.
- The prevailing safety rules must be heeded.
- The device must not be opened.
- For planning and construction of electric installations, the relevant guidelines, regulations and standards of the respective country are to be considered.