enertexbayern gmbh
simulation entwicklung consulting

Manual and Configuration

SynOhr® MultiSense KNX™

Advice

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Inhalt

Advices

Supply

For the operation the Enertex® SynOhr MultiSense KNX there is no need for an external voltage supply. The device gets the power supply from the bus (depending on the lighting max. 850 mW)

Please note the installation and commissioning instructions on page 6.

Helpfunction

This pdf-document uses the division into sections of the Acrobat Readers, which are also referred a „Bookmark“. Click in the left margin on the Bookmark tab to view this.

Safety

This document is linked. When you read a page number, simply click on the page number and the reader skips ahead to this point.

- The installation and assembly of electrical equipment may only be performed by qualified electricians.
- When connecting KNX/EIB-interface specialists skills are required by KNX™-training.
- Failure to observe the instructions may cause damage to the unit, fire or other hazards may occur.
- These instructions are part of the product and must remain with the end user.
- The device must not be used for applications with potential danger (malfunction).
- The measurement of the sound pressure is not suitable for monitoring hazardous sound levels.
- The photometry of the built-in sensors depends on the site and the incident light. For the monitoring of relevant building this measurement is only conditionally suitable.
- The built-speech operates with high reliability. Safety-critical operations may still use the speech recognizer not be executed (improper user). Due to noise in the enviroment and the unclear speech of the speaker, it may be misinterpreted. For security-related of hazardous applications to humans this product is not suitable.

Disclaimers

- The manufacturer is not liable for any costs or damages incurred by the user or third parties through the use of this device, misuse or malfunction of the connection, malfunction of the device or the subscriber equipment.
- Unauthorized changes and modifications to the unit will void the warranty!
- The manufacturer is not liable for improper use.

Introduction

Basic Features

Keyword:	KOMMANDO
Command1	SHADING ON
Command2	CEILING LIGHT
Command3	SCENE WINDOW
Command4	TV ON
Command5	TV OFF
Command6	WALL LIGHT

Table 1: Delivery state

SynOhr MultiSense KNX is the world's first KNX room controller with integrated voice recognition. The room controller measures the temperature, humidity and coler intensity.

With the aid of a dot-matrix KNX-compliant 14-byte strings can be displayed.

A built-in speaker outputs the audio signals that can be stored by the user on the included SD card. The output is initiated via a 14-byte group address from the KNX bus representing the file name on the SD card. The SD card is formatted in the FAT file system. The data in the delivery state are listed in Table 1.

The vocabulary of the built-in speech includes about 250 words and must not be taught separately.

The parameterization of the triggered commands is done via ETS . Thus commands such as „COMPUTER LIGHT 30 PERCENT“ are realized. The word sequence can be changed by the user via the free software SynOhrStudio.

The central button is illuminated in color and gives also a visual feedback for the detected sequence (see page 36). At the lateral edges a colored ambient lighting is installed. The brightness of the lighting can be adjusted automatically via built-in brightness sensor to the ambient light be adjusted or turned off. The same applies for the display backlight.

SynOhr MultiSense KNX is fed directly from the KNX Bus and requires no external power supply.

Model Variants

The three available models of SynOhr MultiSense KNX enable the use of the following functiones:

	Starter	**Standard**	**Premium**
Room controller heating and cooling	Yes	Yes	Yes
Measurement of temperature and humidity	Yes	Yes	Yes
Measuring of the light color and light incoming	Yes	Yes	Yes
Two touch buttons and one push button	Yes	Yes	Yes
Output of a 14-byte text message on the dot matrix	Yes	Yes	Yes
Speech with number of commands	6	12	40
Freely definable colors of the luminous ring	-	Yes	Yes
Playing of WAV files from SD card	-	Yes	Yes
Monitoring of noise levels e.g. for use as a „baby monitor“	-	-	Yes
Display of 28 characters with auto-scrolling on the dot matrix	-	-	Yes

Use of the dot matrix for the display of symbols (from Q3/2014)	-	-	Yes
Speech wildcard commands One command „DIMMER_PERCENT“ can control in this way the brightness of a KNX™ Dimmers completely	-	-	Yes
Conversion of the color change	-	-	Yes
Master/Slave mode, if multiple switching points in larger rooms available (Enertex® EibPC required)	-	-	Yes

The variants are software options that are enabled on the serial number of the device and have to be licensed for the device.

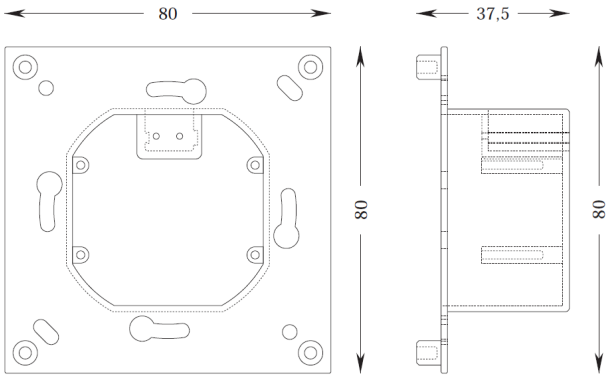
KNX

This device is a product of the KNX-system and complies with the KNX directives. Detailed technical knowledge obtained in KNX training courses is a prerequisite to understanding. The software for the KNX™ part is in the product data base. Planning, installation and commissioning are carried out with the help of KNX-certified software. The built-in speech is parameterized using the freely available program SynOhrStudio. You will find the required data under www.synohr.com. The device is powered only from the bus and does not require additional auxiliary power supply.

If reducing the bus voltage below 23V, then a flicker of light occurs if this is set to maximum value. Reduce in this case the illumination (s. p.11).

Installation

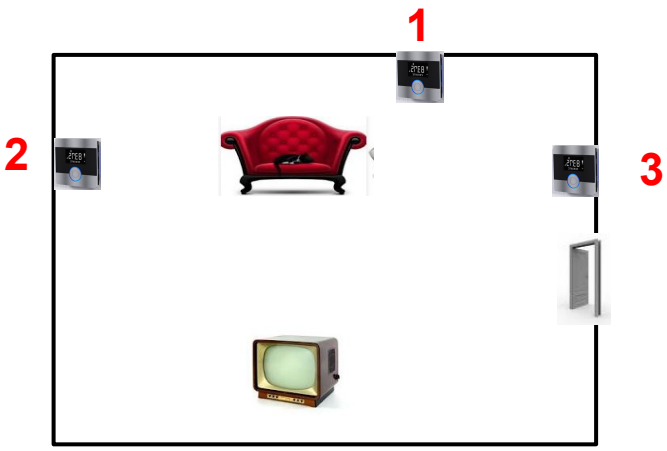
In the installation box (Picture 2), which is installed in a standard hollow wall box, the bus coupler is integrated. This is in addition to the communication to KNX™ bus also produces the power to the SynOhr MultiSense KNX main module. The exact procedure in the assembly, refer to the Quick Start Guide.



Picture 2: Dimensions of the Installation Box – Bus Coupler

Placement

The max. range of speech recognition is 7 m at normal volume. The range is specified in SynOhrStudio via the parameter slider (see page 36). Increased range means that under certain circumstances also a reduced quality of the speech recognition e.g. if additonal noise sources are close to the SynOhr MultiSense KNX and the speaker is a few meters away. For larger living rooms we therefore recommend the master-slave operation with multiple stations which are set to a standard range of about 4 m. The ideal placement is between 1.1 m and 1.5 m in height, so that radios and televisions etc. are as far away from SynOhr MultiSense KNX but close to the „normal“ location of the speaker.



Picture 3: Placement Examples

Picture 3 shows examples of placement for SynOhr MultiSense KNX. Place 1 is optimal from the perspective of speech recognition. Assuming that the TV emits sounds directly and not via sound system, is at No. 1 the distance to the most probable location of the users (sofa) the lowest. If there is no possibility behind the sofa place 2 should be preferred instead of place 3, because at the door are presumed noises or speaking people.

The max. range depends on room acoustics, the place of installation (e.g. acoustic shadow behind the wall), the speaker volume, and (to a lesser extent on) the number of used words. Up to a distance of 4 m it is possible under difficult conditions to have a every day suitable parameterization. In addition the similarity of the selected commands and the room acoustics plays a large role in theses distances. If noise sources (radio) on SynOhr are louder and closer than the speaker, a detection is not possible. If larger areas in an open building are acoustically to be „listened“ you need more slaves.

The parameter „Sensitivity“ in SynOhrStudio (comp. p. 36) sets the range. Because in hallways or in tiled rooms and without wallpapers resonances or hall are present, you have to work with smaller „room size“ as in rooms with sound-absorbing elements (wood walls, wallpaper, carpets).

Recommendation: In difficult conditions – do not change any other parameters – but choose the range small in order to gradually bring this to the desired sensitivity. It the sensitivity is set too high the key word recognition reacts on wrong words or is not responding robust.

Keys

Picture 4 Shows the arrangement of the two capacitive touch buttons and their sensitivity fields and the central pressure button. The touch keys are equipped with a repeat function which ends after about 8 seconds. After that key must be „released“ and pressed again. Optimal operation is achieved by gentle pressure with the thumb on the pad.

Picture 4: Controls

The optimum pressure point of the central button is as indicated in Picture 4 at the top of the button.

SD Card

The parameterization of the speech is on the SC card. For the parameterization the free software SynOhrStudio is required. The software is under

www.enertex.de/downloads/synohr/SynOhrStudio-win.zip for download.

The current German language data record („Sprachschatz”) you will find under

www.enertex.de/downloads/synohr/SprachSchatz-DE.zip. On delivery the speech of SynOhr MultiSense KNX is parameterized as shown in Table 1.

For changing the card insert the card vertically with the printed side to the visible side, comp. Picture 5.

Picture 5: SD Card Placement

There is a file *.key on the supplied card. This file defines with which model variant (see page 5) SynOhr MultiSense KNX is operated and might not be deleted. The data contained in the file represent a software key for the features that are enabled for the device with that serial number.

Please be sure to make a backup copy of the key file. If you lose the key file, the regeneration is not free.

After placing the aperture (see installation instructions) the capacitive touch keys must be calibrated. This is done automatically by the reboot of SynOhr MultiSense KNX. After the installation you press the central button for 10 seconds. The reset process can be detected on the short-term disappearance of the numeric display.

The speaker is installed directly below the central button.

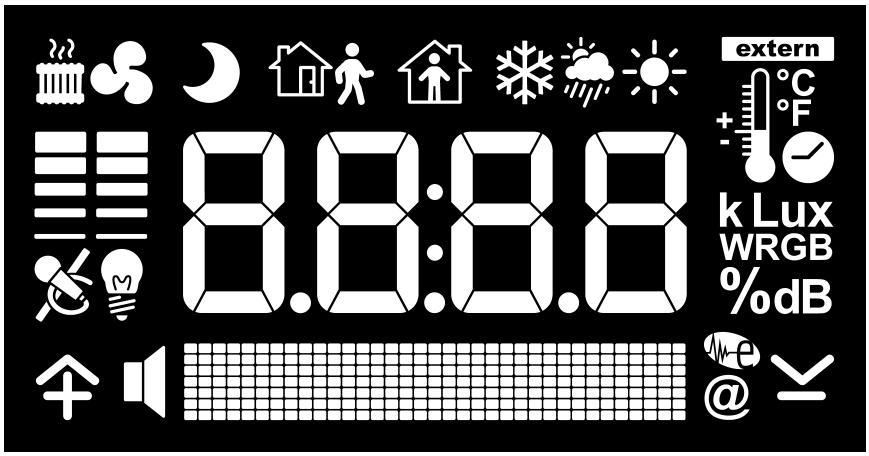
Sound-Output

The volume of the sound output is via the ETS or the internal menu parameterized (comp. p. S. 16). It is also possible to control them by group addresses.

Security

The built-speech operates with high reliability. Safety-critical operations should not be performed (non-intended use) with speech.

Display



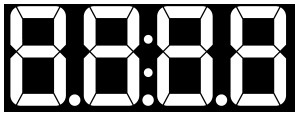
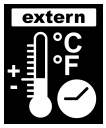
Picture 6: The SynOhr MultiSense KNX Display

The display options of the SynOhr MultiSense KNX room controller are shown in Picture 6 in the overview. The display can be devided into the following areas:

- Display of numerical values, time
- Symbols
- Dot matrix to the text display

Display of numerical Values

In addition to time up to five different values can be displayed alternately (time is parameterized) are shown.

Symbol	Description
	– Time display: Colon – Numerical value/temperature „.“ (Dot) according to the numerical value
	– For display of °C or °F: internally measured or externally measured temperature, at external temperature additionally `extern`-symbol. – Clock symbol for indicating a time
	– `Lux` display o the brightness value in Lux – `kLux` display of the brightness in Kilolux – `W`: Display of the measured value for white light – `R`: Display of the measured value for red light – `G`: Display of the measured value for green light – `B`: Display of the measured value for blue light – `%`: Display of humidity – `dB`: Display the measured sound pressure Note: This measurement is not suitable for the monitoring of hazardous noise

Display of Symbols

The display of symbols is partly set due to the operating mode (heating, cooling, standby, etc.) some are switchable via this group address.

Symbol	Description

	Room controller is in standby mode
	Room controller in comfort mode
	Room controller in night mode
	The internal controller of the room controller indicates a heating size greater than 0% to the bus. The height of the bar indicates the value of the controller quantized on 5 levels (20% steps).
	The internal controller of the room controller indicates the cooling size greater than 0% to the bus. The height of the bar indicates the value of the controller quantized on 5 levels (20% steps).
	Weather symbols. These can be controlled separately by group address.
	If the speech is in active mode the microphone is automatically displayed. If the speech is deactivated the microphone is displayed by „strikeout“-symbol.
	– Plus (+) for the operation/adjustment value – High-symbol for usage the menus – Speaker symbol will be turned on automatically while sound output (playing a song)
	– Minus (-) for the operation/adjustment value – Down-symbol for usage the menus – Enertex symbol and @ symbol for displaying errors
	The lamp symbol is switched on if switched off automatic dimming of the LCD-displays, the ring or ambient light.

Text Messages

In the dot matrix can be displayed any text. However, the representation of 14 bytes (14 characters) long text messages are not always possible in one line depending on the characters used, in this particular SynOhr MultiSense KNX scrolls the text message.

In addition, the Premium-Edition can also process 28 bytes long messages. These are automatically scrolled.

Measuring Sensors

Temperature

The built-in SynOhr MultiSense KNX temperature sensor is used as input to the room controller, the cooling and heating mode.

Humidity

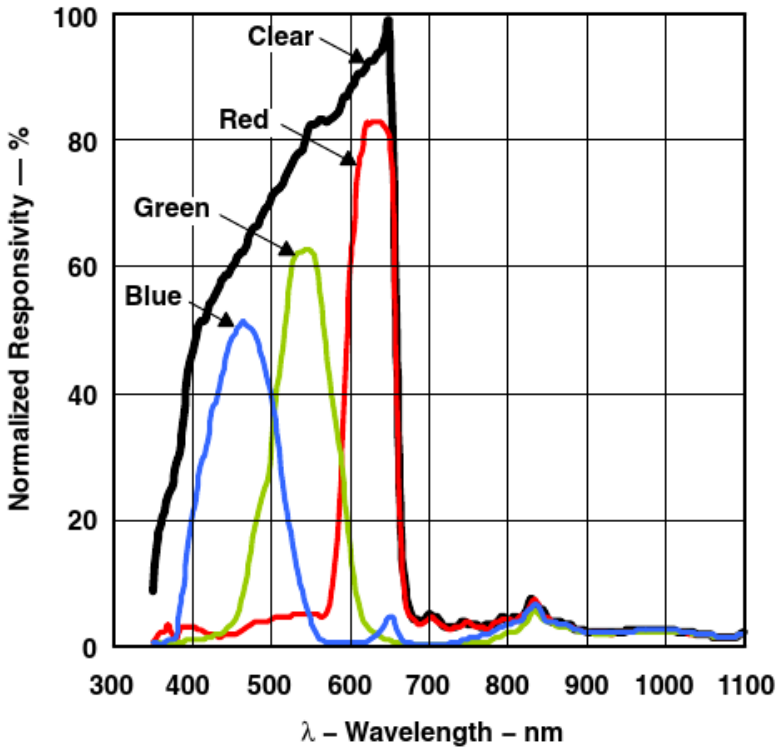
SynOhr MultiSense KNX allows the measurement of the humidity.

Sound Level

The measurement of sound pressure takes place via the built-in microphones and is relative to the selected „room size“ (comp. p. 36).

Light Measurement

The built-in light measurement is taken in four areas: red, green, blue and white. The measurement in performed as shown in Picture 7 (clear = white).



Picture 7: Light Measurement

Lighting Control

Automatic Control

For each of the three lights (ambience, ring, display) an automatic lighting control depending on the ambient lighting, can be turned on. Starting from the max. illumination is specified via the ETS or the internal menu (comp. page 16), will increase the backlight with increasing ambient light to the maximum.

Display

The intensity of the display backlight can be set by the user in steps from 0 to 100 %. This will be parameterized by the ETS or the internal menu (comp. page 16). It is also possible to regulate the brightness of light on the sensor automatically.

Ring

The intensity of the ring illumination of the central speaker button can be specified by the user in

steps from 0 to 100 %. This will be parameterized by the ETS or the internal menu (comp. page 16). It is also possible to regulate the brightness of light on the sensor automatically. The color can be changed via a group address. If the speech recognizer is active the color changes automatically to the fixed values.

The color of the ring illumination can be set via a group address if the recognizer is not active (not in Starter Edition).

In the Premium-Edition the brightness of the ring illumination and the lighting effects can be changed via a group address. The pulsation of the color can be converted into a pulsation of the brightness or the pulsation can be completely deactivated.

If the pulsation of the color is selected only the green component of the illumination is changed.

Ambiance

The intensity of the side ambient lighting of the center speaker button can be specified by the user in steps from 0 to 100 %. This will be parameterized by the ETS or the internal menu (comp. page 16). It is possible to regulate the brightness of light on the sensor automatically. The color can be specified via a group address.

Operation by Voice

Each operation of the speech must be initiated with predetermined command word (see page 36). Is the keyword recognized, a confirmation sound is output depending on the parameterization. The speech remains for about three seconds in this mode and waits for speaking the actual command e.g. to turn on the light. During this waiting period the ring flashes in yellow. The operator must necessarily wait to speak until the ring lights in yellow (respectively the sound was played). The ambient lighting is turned off during this phase.

If this active state of the speech a command is spoken and recognized a confirmation sound is output depending on parameterization. The ring will light green for a moment. The ambient lighting then turns on and the ring illuminates in the selected primary color.

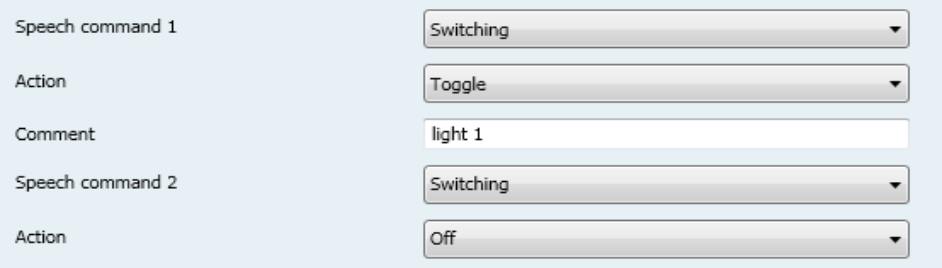
Quick Start

In the following section we show you how the speech parameterization of SynOhr MultiSense KNX is implemented.

In a few steps to the individual language data set.

1. Speech commands parameterized via ETS
2. With the SynOhrStudio assigning to each speech command a command sequence
    1. Load vocabulary
    2. Choose keyword
    3. Define command sequences
    4. Create SD-data
    5. License key
    6. Restart

ETS



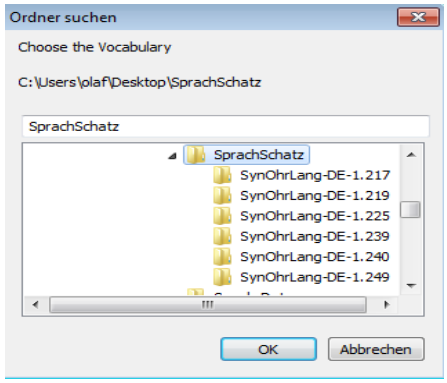
Picture 8: ETS Parameterization

In the ETS each speech command is assigned to an action and linked to the corresponding group address (see page 39).

Load Vocabulary

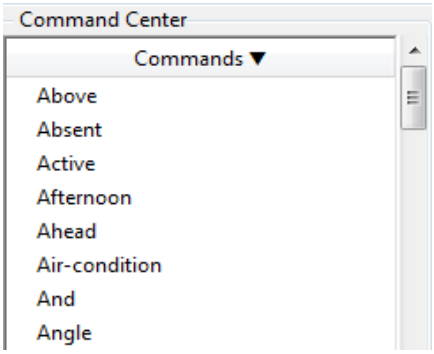
At the first start of SynOhrStudio it will be asked for the vocabulary (see picture 9). This is contained in the same zip-file, in which the SynOhrStudio is to be found.

Select the appropriate directory.



Picture 9: Select ETS Vocabulary

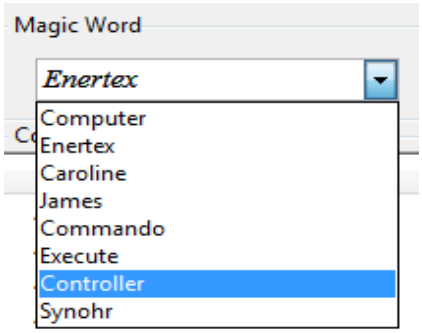
After the file was successfully loaded the possible commands are located in the left side (see picture 10).



Picture 10: Successfully loaded Vocabulary

Choose Keyword

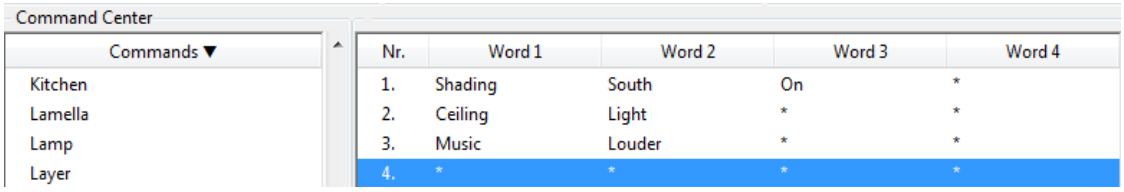
You can choose one of seven keywords (see picture 11). With the selected word the SynOhr® MultiSense KNX for the speech control is focused.



Picture 11: Choose Keyword

Define Command Sequences

Using Drag and Drop command sequences can be set for each speech command (see picture 12).



Picture 12: Define Command Sequences

The following applies:

No. 1 = ETS speech command 1

No. 2 = ETS speech command 2

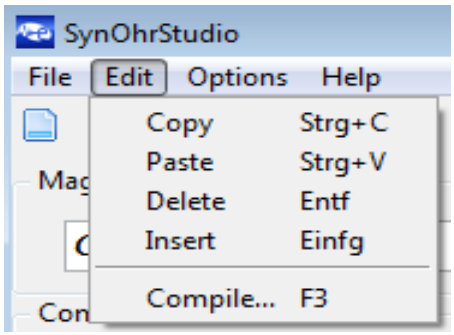
etc.

Each command consists of up to four individual commands.

For a sensible parameterization refer to the chapter „Setting Rules“ on page 43.

Create SD-Data

If all required command sequences are specified, they must be compiled (see picture 13).



Picture 13: Compile Data

Here a directory „SD“ is created and filled with all for the SynOhr MultiSense KNX necessary data.

Then copy the contents of this directory into the top level directory of the supplied already pre-configured SD card. The configuration in the SynOhrStudio can be saved and reloaded.

License Key

There is a file*.key on the supplied card. This file defines with which model variant (see page 5) SynOhr MultiSense KNX is operated and might not be deleted. The data contained in the file represent a software key for the features that are enabled for the device with that serial number.

Please be sure to make a backup copy of the key file. If you lose the key file, the regeneration is not free.

Restart

Insert the SD card into the the SynOhr MultiSense KNX and restart while pressing the central button for about 10 seconds.

Your SynOhr MultiSense KNX can now be addressed by *keyword – command sequence* and executes the parameterized switching commands.

Menu Structure on the Device

Operation

On the device some settings can be made directly, for that are in each case the main menu and sub menu items.

With a long keystroke (approximately 3 seconds) of the central button you get to the menu level which is left automatically after 2 minutes without input respectively via the menu item „Exit“. If the central button is pressed longer than 1 second, so a bargraph appears in the dot matrix. If this is filled out completely, the three seconds have elapsed for changing the menu level and takes you on release automatically to the second menu level.

With the touch button as you scroll in the first menu level. The scrolling is endless at the upper and lower end, i.e. reaching the last point so start pressing again at the first respectively the other way round.

Pressing the central button to access the submenu that you leave by long button-press. By pressing again you get into the setting of the submenu item. There the values are displayed or changed.

If you are in the menu level, the numeric display shows each the level and the submenu in the form Mainmenu. Submenu e.g. 1.02.

The touch buttons work per step function (with small dead time) and key repeat. The key repeat is switched off after about 7 seconds and there will be a relaese and possibly re-touching of the touch keys necessary.

Menu Structure

Numerical display	**Display 1. Menu level**	**Display 2. Menu level**	**Explanation**	**Displayed values** (bold values are default settings)
1	CONTROL			
1.01		SETPOINT	Basic setpoint	Adjustment from 7°C to 40°C (**21°C**)
1.02		NIGHT H	Heating temperature at night	Setting of 0K to 25,5K in 0,1 K steps (**2K**)
1.03		STBY H	Heating temperature in the standby mode	Setting from 0K to 25,5K in 0,1 K steps (**2K**)
1.04		NIGHT C	Cooling temperature at night	Setting of 0K to 25,5K in 0,1 K steps (**2K**)
1.05		STBY C	Cooling temperature in the standby mode	Setting of 0K to 25,5K in 0,1 K steps (**2K**)
1.06		UP	Exit the menu	Up one level
2	DISPLAY			
2.01		LCD	LCD-brightness	LCD dimming of 0 to 100% (**25%**)
2.02		AUTO	LCD dim depending on the ambient light	**ON** / OFF
2.03		AMBIENT	Ambiente-RGB LEDs light intensity	0 to 100 % (**50%**)
2.04		RGB	RGB light intensity of the front lighting	0 to 100 % (**50%**)
2.05		AUTOAMB	Control ambiente-RGB LEDs on the ambient light level	**ON** / OFF

2.06		AUTORGB	Control RGB light intensity of the front lighting via ambiente light intensity	**ON** / OFF
2.07		DOT	Adjustment of the display (text below). In automatic normally the date is displayed in speech recognition respectively more info.	Date / Recog / Auto / None
2.08		UP	Exit the menu	Up one level
3	NUMBER			
3.01		LEVELS	Number of ads which alternate in the numeric display	1 .. 5 (**3**)
3.02		TIME	Time between two displays	1 .. 10 s (**5**)
3.03		NUM1	Display options for the first exchange	**CLOCK** /TEMP / HUM / EXT / R / G / B / W
3.04		NUM2	Display options	CLOCK / **TEMP** / HUM / EXT / R / G / B / W
3.05		NUM3	Display options	CLOCK / TEMP / **HUM** / EXT / R / G / B / W
3.06		NUM4	Display options	CLOCK / TEMP / HUM / EXT / R / G / B / W
3.07		NUM5	Display options	CLOCK / TEMP / HUM / EXT / R / G / B / W
3.08		UP	Exit menu	Up one level
4	RECOG			
4.01		ACTIVE	On and Off of the speech recognition	**ON** / OFF
4.02		REBOOT	Restart the speech recognition after update of the SD card	ON / **OFF**
4.03		TRAINER	Setting the language trainer (respectively not on all versions)	**Male /** Female
4.04		UP	Exit menu	Up one level
5	AUDIO			
5.01		AMP	Volume of output	0 bis 100 % (**25%**)
5.02		DEMO	Playing a demo wave file	**ON** / OFF
5.03		CONFIRM	Confirm-Sound turn ON and OFF	ON / OFF / **PARAM** The Confirm-Sound (confirmation of the command word) can be turned off. Default is the value of the parameterization.
5.04		EXEC	Execute-Sound turn ON and OFF	ON / OFF / **PARAM** The Execute-Sound (confirmation of the command word) can be turned off. Default is the value of the parameterization.
5.05		UP	Exit menu	Up one level
6	FW		Firmware	
6.01		DSP A	Firmware recognizer, Dualcore A	Firmware version of the speech recognizer in the format X.xxx.
6.02		DSP B	Firmware recognizer, Dualcore B	Firmware version of the speech recognizer in the format X.xxx
6.03		MC	Firmware KNX	Firmware version of the KNX™ Moduls
6.04		OPTION	Enabled options	**STARTER** /STANDARD/ PREMIUM
6.05		UP	Exit menu	Up one level
7	EXIT			Exit menu

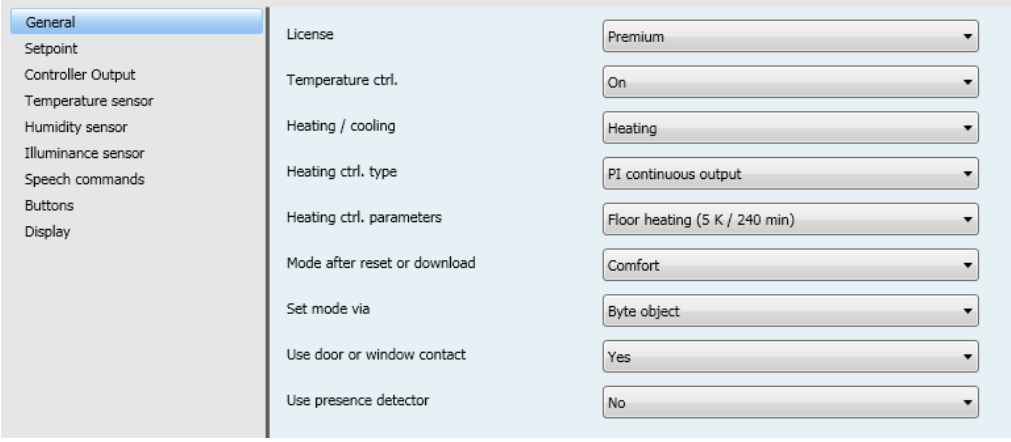
KNX

ETS Database

For project design and commissioning of the equipment at least the ETS3.0 from version d patch A is required. Only if this ETS-version or later versions are advantages with regard to the download (significantly shorter loading times) and for parameter configuration through the integrated database PlugIn usable.The required product database ist available in *.VD4-format. For the ETS2 and older versions of ETS3 is no product database available.

ETS Application

Overview

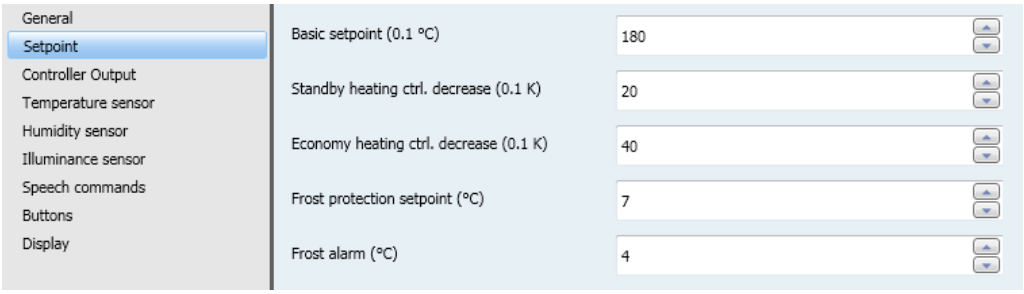


Picture 14: Main Dialog of the ETS Application

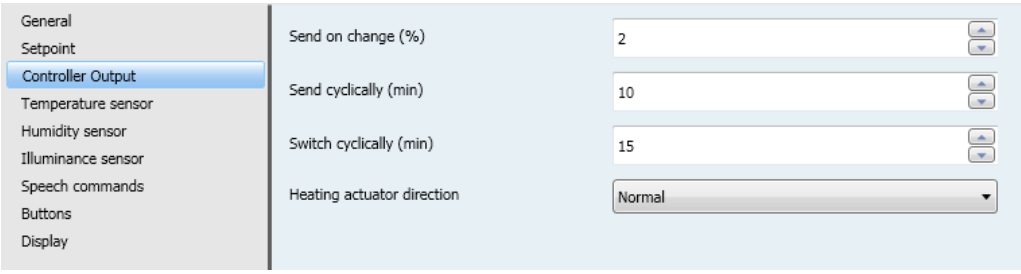
The ETS application must be included on the product database and does not require the integration of Plugins.

Room Controller

The room controller has the following features (comp. Picture 14, Picture 15 and Picture 16):



Picture 15: Setpoints in the ETS



Picture 16: Setpoints in the ETS

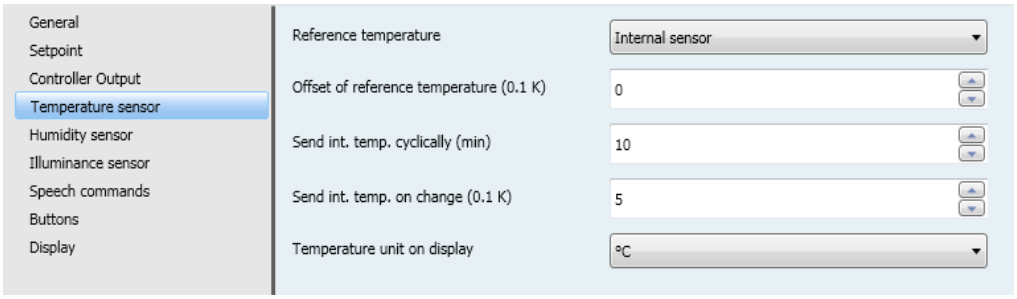
- Different operating modes can be activated for the room controller: comfort, standby, night- and building protection.
- Each operating mode can be its own temperature setpoints (for heating and/or cooling) assigned.
- Parameterizable duration of comfort prolongation.
- Changing of the operating modes by 1byte object to KONNEX or by up to 4 individual 1 bit objects.
- Frost-/heat protection switching by window status.
- Display of the room temperature controller information on the device display.
- Modes „Heating“, „Cooling“, „Heating and Cooling“ with or without auxiliary step.
- For each heating or cooling stage are different types of control configurable. PI-control (continuous or switching PWM) or 2-point control (switching).
- Control parameters for PI-controller (if desired: proportional band, reset time) and 2-point controller (hysteresis) is adjustable.
- The temperature setpoints for the additional stage are derived via a configurable level distance from the values of the basic level.
- Automatic or object oriented switch-over between „Heating“ and „Cooling“.
- Setpoint shift temporarily or permanently possible by operating the function keys on the device or via communication objects (e.g. by a controller extension).
- Complete (1 byte) or partial(1 bit) status information about objects parameterized and transmitted to the bus.
- Deactivation of the control or of the additional stage via separate 1 bit objects possible.
- Internal and external temperature sensor for room temperature measurement is possible.
- The room temperature measurement (actual value) can be adjusted via parameter separately for internal and external sensor.
- The actual and desired temperatures can be issued after a configurable deviation on the bus (also cyclic).
- Separate or joint alternate size output in heating and cooling mode. Thereby one or two variables objects per level.
- Normal or inverted alternate size output configurable.
- Automatic transmission and cycle time for alternate size output configurable (Note: the parameter „Cyclical Turn (min)“ is only relevant if a PI-controller is configured with switching alternate size).

Sensors

The built-in sensors can be parameterized as follows:

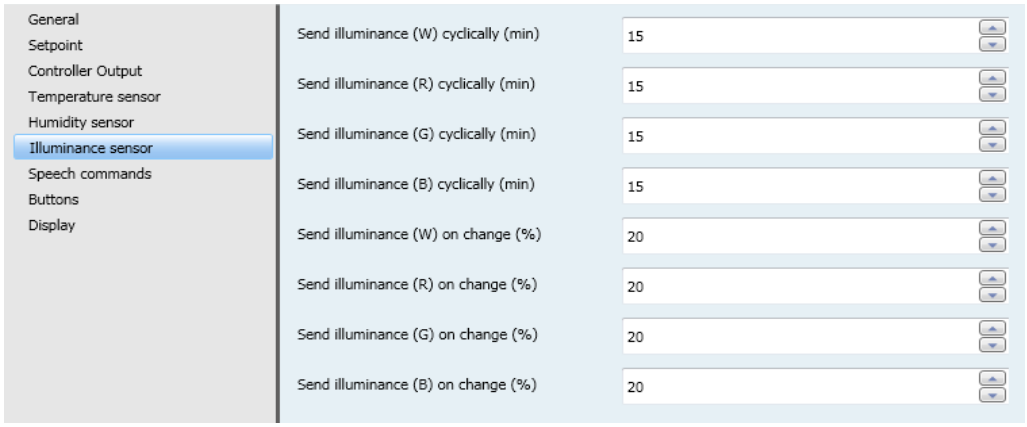
- Automatic transmission and cycle time for output configurable (0 = function deactivated
- Measurement of the ambient temperature
- Measurement of the humidity
- Measurement of the light in the colors white, red, green, blue
- Measurement of luminous intensity (areas 0,0 to 9,9 Lux and 10 to 9999 Lux)
- Measurement of the sound level (Premium Edition only in association with Enertex® EibPC) with setting a threshold.

The default values can be taken from the pictures 17-19.



Picture 17: Temperature Sensor in the ETS

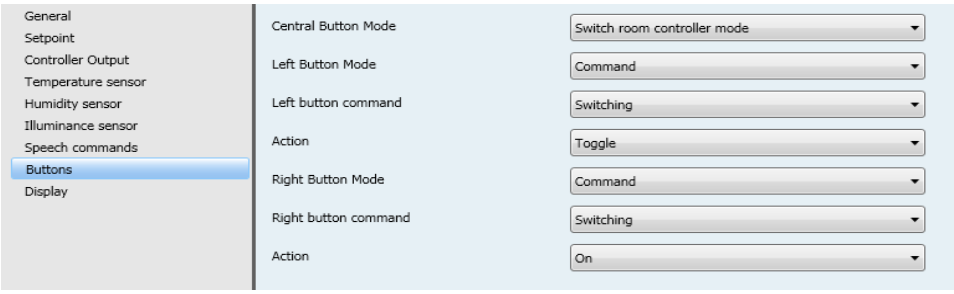
Picture 18: Humidity Sensor in the ETS



Picture 19: Lighting Sensor in the ETS

Taster

The device has two touch buttons (left, right) and a central switch which can also trigger telegrams. Picture 4 Shows the arrangement, Picture 20 the configuration.



Picture 20: Key Configuration

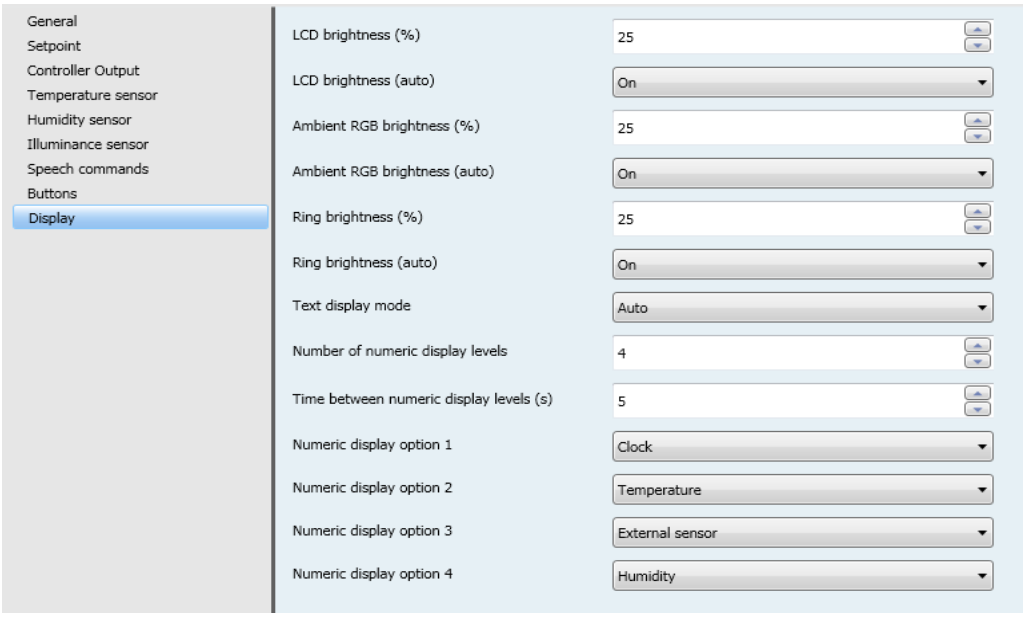
It is possible

- 1-bit switching (To/On/Off)
- Dimming
- Blinds
- Percent value output
- Scene

to put on the button. In additon can be selected,

- Change in the basic setpoint temperature
- Enable/disable speech recognition.

Display



Picture 21: Configuration Display in the ETS

- Up to 5 display levels with variable presentation time on the numeric display
- Representation of external temperature values
- Separate switching on or off of the brightness control for the ambience-, ring- and LCD backlight.

Object Table

ID	Function	Name	Length	Type	Flags
0	Setpoint	Base Setpoint Temperature	16 bits (f16)	DPT_Value_Temp	RWCT--
At the setpoint temperatures for comfort-, standby-, night-mode is always to observe that all reference values are in a fixed relation to each other. All values are derived from basic setpoint temperature. This value can also be set in the ETS. Defaults are shown Picture 15. With this 2 byte object the basic setpoint temperature and therefore all dependent setpoint temperatures can be changed. Additionally or alternatively the basic setpoint can also be changed by an on-site operation in the second operating level. The basic setpoint represents the single „heating“ or „cooling“ directly the representative comfort temperature. In the combined „heating and cooling“ the basic setpoint adjusts depending of the configured dead-band in the ETS either directly (asymmetrical dead-band) or indirectly (symmetrical dead band) the comfort temperature for heating. The dead-band is the temperature zone in which is neither heating nor cooling. It is the difference between the comfort setpoint temperatures for heating and cooling. The comfort setpoint temperature for cooling is then derived taking into account the dead zone from the comfort setpoint temperature of the heating mode. **Licenses:** Starter, Standard, Premium					

ID	Function	Name	Length	Type	Flags
1	Setpoint	Current Setpoint Temperature	16 bits (f16)	[9.1] DPT_Value_Temp	R-CT--
At the setpoint temperatures for comfort-, standby-, night-mode is always to observe that alle reference values are in a fixed relation to each other. Due to the setting of the operation mode the set temperature is changed. The calculated setpoint temperature of the regulator can queried with this object. **Licenses:** Starter, Standard, Premium					

ID	Function	Name	Length	Type	Flags
2	Measurement	Internally Measured Temperature	16 bits (f16)	[9.1] DPT_Value_Temp	R-CT--
This object contains the current temperature measured by the room controller. The temperature can be sent cyclically and/or by change. **Licenses:** Starter, Standard, Premium					

ID	Function	Name	Length	Type	Flags
3	Manipulated variable	Heatingactor (analog)	8 bits (u08)	[5.1] DPT_Scaling	R-CT--
This object gives out the setpoint for the heatingactor by linear control. **Note:** This object is only available if the parameter „General → Heating / Cooling“ is set on *Heating, Heating (2-stage), Heating respectively Cooling and Cooling (2-stage).* **Licenses:** Starter, Standard, Premium					

ID	Function	Name	Length	Type	Flags
4	on/off	Status of Heatingactor	1 bit (b01)	[1.1] DPT_Switch	R-CT--
This object specifies whether to be heated. Telegrams are sent automatically when the state changes. The object value is 1 if object „Heatingactor (analog)“ > 0. The object value is 0 if object „Heatingactor (analog)“ = 0. For example the message can be used for controlling a flow pump. **Note:** This object is only available if the parameter „General → Heating / Cooling“ is set on *Heating, Heating (2-stage), Heating and Cooling respectively Heating and Cooling (2-stage).* **Licenses:** Starter, Standard, Premium					

ID	Function	Name	Length	Type	Flags
5	Setpoint	Coolingactor (analog)	8 bits (u08)	[5.1] DPT_Scaling	R-CT--
This object gives out the setpoint for the coolingactor by linear control. **Note:** This object is only available if the parameter „General → Heating / Cooling“ is set on *Cooling, Cooling (2-stage), Heating and Cooling respectively Heating and Cooling (2-stage).* **Licenses:** Starter, Standard, Premium					

ID	Function	Name	Length	Type	Flags
6	on/off	Status of the Coolingactor	1 bit (b01)	[1.1] DPT_Switch	R-CT--
This object specifies whether to be cooled. Telegrams are sent automatically when the state changes. The object value is 1 if the „coolingactor (analog)“ > 0. The object value is 0 if the coolingactor (analog)“ = 0. For example the message can be used for controlling a flow pump. **Note:** This object is only available if the parameter „General → Heating / Cooling“ is set on *Cooling, Cooling (2-stage), Heating and Cooling respectively Heating and Cooling (2-stage)*. **Licenses:** Starter, Standard, Premium					

ID	Function	Name	Length	Type	Flags
7	Setpoint	Add. Heatingactor (analog)	8 bits (u08)	[5.1] DPT_Scaling	--CT--
This object gives out the setpoint for the additional heatingactor by linear control. **Note:** This object is only available if the parameter „General → Heating / Cooling“ is set on *Heating (2-stage) respectively Heating and Cooling (2-stage)*. **Licenses:** Starter, Standard, Premium					

ID	Function	Name	Length	Type	Flags
8	on/off	Status of the additional Heatingactors	1 bit (b01)	[1.1] DPT_Switch	--CT--
This object specifies whether to be heated. Telegrams are sent automatically when the state changes. The object value is 1 if object „Add. Heatingactor (analog)“ > 0. The object value is 0 if object „Add. Heatingactor (analog)“ = 0. For example the message can be used for controlling a flow pump. **Note:** This object is only available if the parameter „General → Heating / Cooling“ is set on *Heating (2-stage) respectively Heating and Cooling (2-stage)*. **Licenses:** Starter, Standard, Premium					

ID	Function	Name	Length	Type	Flags
9	Setpoint	Add. Coolingactor (analog)	8 bits (u08)	[5.1] DPT_Scaling	--CT--
This object gives out the setpoint for the additional coolingactor by linear control. **Note:** This is only available if the parameter „General → Heating / Cooling“ is set on *Cooling (2-stage) respectively Heating and Cooling (2-stage)*. **Licenses:** Starter, Standard, Premium					

ID	Function	Name	Length	Type	Flags
10	on/off	Status of the additional Coolingactors	1 bit (b01)	[1.1] DPT_Switch	--CT--
This object specifies whether to be cooled. Telegrams are sent automatically when the state changes. The object is 1 if object „Add. Coolingactor (analog)“ > 0. The object is 0 if object „Add. Coolingactor (analog)“ = 0. For example the message can be used for controlling a flow pump. **Note:** This object is only available if the parameter „General → Heating / Cooling“ is set on *Cooling (2-stage) respectively Heating and Cooling (2-stage)*. **Licenses:** Starter, Standard, Premium					

ID	Function	Name	Length	Type	Flags
11	Choice	Operating Mode of the Controller	8 bite (u08)	[20.102] DPT_HVACMode	RWCT--
For the operating modes comfort, standby, night- and building-protection exists a common 1 byte change over. While running time the operating mode switching can be done after receiving a single telegram. The operating mode is determined by the following values. 0 = Automatic 1 = Comfort 2 = Standby 3 = Night 4 = Building Protection **Note:** This object is only available if the parameter „General → Operating mode specified via“ is set on *Byte-Object*. **Licenses:** Starter, Standard, Premium					

ID	Function	Name	Length	Type	Flags
12	on/off	Comfort Mode	1 bit (b01)	[1.1] DPT_Switch	-WC---
This object can be switched to the „Comfort“ mode. Thus the current setpoint temperature is set to the basic setpoint temperature. The telegram can be triggered e.g. by presence detector or a presence button. **Note:** This object is only avaible if the parameter „General → Operating mode specified via“ is set to 1 bit object. **Licenses:** Starter, Standard, Premium					

ID	Function	Name	Length	Type	Flags
13	on/off	Standby-Mode	1 bit (b01)	[1.1] DPT_Switch	-WC---
This object can be switched to the „Standby“ mode. Thus the current setpoint temperature is lowered in the heating mode minus the configurable standby-reduction. In the cooling mode the current setpoint temperature is raised to the basic setpoint temperature plus the standby-raising. The telegram can be triggered e.g. by a timer. **Note:** This object is only available if the parameter „General → Operating mode specified via“ is set on *1-bit-object.* **Licenses:** Starter, Standard, Premium					

ID	Function	Name	Length	Type	Flags
14	on/off	Night Mode	1 bit (b01)	[1.1] DPT_Switch	-WC---
This object can be switched to the „Night“ mode. Thus the current setpoint temperature is lowered in the heating mode to the basic setpoint temperature minus the configurable night-reduction. In the cooling mode the current setpoint temperature is raised to the basic setpoint temperature plus the night-raising. The telegram can be triggered e.g. by a timer. **Note:** This object is only available if the parameter „General → Operating mode specified via“ is set on *1-bit-objects*. **Licenses:** Starter, Standard, Premium					

ID	Function	Name	Length	Type	Flags
15	on/off	Building Protection Mode	1 bit (b01)	[1.1] DPT_Switch	-WC---
This object can be switched over to the „Building Protection“ mode. Thus the temperature should not fall below the configurable setpoint frost protection respectively in the cooling mode should not exceed the configurable setpoint heat protection. If the parameter is „General → Use Door- or Window-Contact“ is set on *Yes* the building protection mode can automatically activated, if a monitored door or a monitored window are opened. This occurs the immediate closing of the heating and cooling valve. On the one hand the waste of heating or cooling energy is avoide on the other hand is ensured that the temperature controller remains active and the room does not freeze or and heat up any. **Note:** This object is only available if the parameter „General → Operating mode specifies via“ is set on *1-bit-objects*. **Licenses:** Starter, Standard, Premium					

ID	Function	Name	Length	Type	Flags
16	on/off	Dew-Point Mode	1 bit (b01)	[1.1] DPT_Switch	-WC---
This object can be switched over to the „Dew-Point“ mode. Thus the heating or cooling is turned off unconditionally. **Note:** This object is only available if the parameter „General → Operating mode specifies via“ is set on *1-bit-objects.* **Licenses:** Starter, Standard, Premium					

ID	Function	Name	Length	Type	Flags
17	Status	Controller Status	8 bits (u08)	[non-standard]	R-CT--
This object contains the current controller status that is automatically sent when the status changes. The controller status adds the following values: 1 = Comfort 2 = Standby 4 = Night 8 = Building Protection 16 = Dew Point 32 = Heating 64 = Dead Zone (Controller inactive) 128 = Frost Alarm **Licenses:** Starter, Standard, Premium					

ID	Function	Name	Length	Type	Flags
18	open/close	Door- and Window Status	1 bit (b01)	[1.019] DPT_Window_Door	-WC---
This object is due to monitoring of a door- or window contacts for switching in „Building Protection“ mode. **Note:** This object is only available if the parameter „General → Use Door- or Window Contact“ is set on *Yes.* **Licenses:** Starter, Standard, Premium					

ID	Function	Name	Length	Type	Flags
19	Measured value (external)	External Temperature Sensor	16 bits (f16)	[9.1] DPT_Value_Temp	-WCTU-
If there is written in the object, the room controller regulates with the external transmitted temperature. See parameter „Temperature Sensor → Reference Temperature“. **Licenses:** Starter, Standard, Premium					

ID	Function	Name	Length	Type	Flags
20	Heating/cooling	Switch between Heating and Cooling	1 bit (b01)	[1.100] DPT_Heat/Cool	-WC---
With this object can be changed manually between heating- and cooling-mode: 0 = Cooling 1 = Heating After loading the application a mode has to be specified because by default both heating and cooling is disabled. **Note:** This object is only available if the parameter „General → Heating / Cooling“ is set on C*ooling, Cooling (2-stage), Heating and Cooling respectively Heating and Cooling (2-stage)*. In addition then the parameter „General → Switch between Heating and Cooling“ has to be set on *Object.* **Licenses:** Starter, Standard, Premium					

ID	Function	Name	Length	Type	Flags
21	Measured Value	Internal measured Humidity	16 bits (f16)	[9.007] DPT_Value_Humidity	R-CT--
This objects contains the current humidity measured by the room controller, which can be sent cyclically and/or changed. **Licenses:** Starter, Standard, Premium					

ID	Function	Name	Length	Type	Flags
22	Measured Value	Illumination Intensity	16 bits (u16)	[9.4] DPT_Value_Lux	R-CT--
This object contains the current illumination intensity measured by the room controller, which can be sent cyclically and/or changed. **Licenses:** Starter, Standard, Premium					

ID	Function	Name	Length	Type	Flags
23	Measured Value	Illumination Intensity (red)	16 bits (u16)	[9.4] DPT_Value_Lux	R-CT--
This object contains the current illumination intensity (red) measured by the room controller, which can be sent cyclically and/or changed. **Licenses:** Starter, Standard, Premium					

ID	Function	Name	Length	Type	Flags
24	Measured Value	Illumination Intensity (green)	16 bits (u16)	[9.4] DPT_Value_Lux	R-CT--
This object contains the current illumination intensity (green) measured by the room controller, which can be sent cyclically and/or changed. **Licenses:** Starter, Standard, Premium					

ID	Function	Name	Length	Type	Flags
25	Measured Value	Illumination Intensity (blue)	16 bits (u16)	[9.4] DPT_Value_Lux	R-CT--
This object contains the current illumination intensity (blue) measured by the room controller, which can be sent and/or changed. **Licenses:** Starter, Standard, Premium					

ID	Function	Name	Length	Type	Flags
26	Time of Day	Time of Day	3 bytes (t24)	[10.1] DPT_TimeOfDay	-WCTU-
This object can set the time of day from the room controller. **Licenses:** Starter, Standard, Premium					

ID	Function	Name	Length	Type	Flags
27 - 66	Speech Command	Speech Command	1 bit	1.xxx	-WCTU-
Using these objects the speech commands are configured, which were previously defined in the program SynOhrStudio. Via the 1 bit objects e.g. switching commands can be executed. **Note:** These objects are only available if corresponding parameters „Speech Commands → Speech Command X“ are set on *Switching.* **Licenses:** Starter, Standard, Premium. The number varies depending on the license.					

ID	Function	Name	Length	Type	Flags
67 - 106	Speech Command	Speech Command	4 bits	[3.7] DPT_Control_ Dimming/ [3.8] DPT_Control_Blinds	-WCTU-
Using these objects the speech commands are configured, which were previously defined in the program SynOhrStudio. Via the 4 bits objects e.g. dimming commands can be executed. **Note:** These objects are only available, if the corresponding parameters „Speech Commands → Speech Command X“ are set on *Dimming* or Blinds. **Licenses:** Starter, Standard, Premium. The number of varies is depending on the license.					

ID	Function	Name	Length	Type	Flags
107 - 146	Speech Command	Speech Command	8 bits	[5.1] DPT_Scaling/ [18.001] DPT_SceneControl	-WCTU-
Using these objects the speech commands are configured, which were previously defined in the program SynOhrStudio. Via the 8 bits objects e.g. percent values can be sent. **Note:** These objects are only available if the corresponding parameters „Speech commands → Speech Command X“ are set on *Percent Value*, *Scene* or *SynOhr-Value*. **Licenses:** Starter, Standard, Premium. The number of varies is depending on the license.					

ID	Function	Name	Length	Type	Flags
147	Display	Display Symbols	8 bits (u08)	[non-standard]	-WC---
With this object different symbols can be displayed on the display of the room controller. The value for the displayed symbols are added from the following list: 1 = Sun 2 = Rain 4 = 1/2 Sun 8 = Cloud 16 = Frost 32 = @ 64 = Lamp A 0 disables all symbols. Also note: To see a rain cloud, rain as well as cloud must be activated. (2+8=10). **Lizenzen:** Starter, Standard, Premium					

ID	Function	Name	Length	Type	Flags
148	Date	Date	3 bytes (d24)	[11.1] DPT_Date	-WCTU-
Via this object the date of the room controller can be set. **Licenses:** Starter, Standard, Premium					

ID	Function	Name	Length	Type	Flags
149	Display	Display-Text	14 bytes (c14)	[16.0] DPT_String_ASCII	-WC---
Via this object a 14-character long text can be sent to the room controller to output it in the dot matrix area of the display. For text lengths that do not fit in the line of the display, scrolling is enabled. Spaces on the end of the string will be ignored i.e. no „scrolling“. **Licenses:** Starter, Standard, Premium					

ID	Function	Name	Length	Type	Flags
150	on/off	Command Central Button / 1 bit	1 bit (b01)	1.xxx	-WCTU-
Via this object switching telegrams can be sent when pressing the central button. Depending on the configuraton On-, Off- or Shift-telegrams are possible. **Note:** This object is only available if the parameter „Button → Mode Central Button“ is set on *Command* and the parameter „Button → Command Central Button“ is set on auf *Switching*. **Licenses:** Starter, Standard, Premium					

ID	Function	Name	Length	Type	Flags
151	on/off	Command Button left / 1 bit	1 bit (b01)	1.xxx	-WCTU-
Via this object switching telegrams can be sent when pressing the left touch button. Depending on the configuration On-, Off- or Shift-telegrams are possible. **Note:** This object is only available if the parameter „Button → Mode Button left“ is set on *Command* and the parameter „Button → Command Button left“ is set on *Switching.* **Licenses:** Starter, Standard, Premium					

ID	Function	Name	Length	Typ	Flags
152	on/off	Command Button right / 1 bit	1 bit (b01)	1.xxx	-WCTU-
Via this object switching telegrams can be sent when pressing the right touch button. Depending on the configuration On-, Off- or Shift-telegrams are possible. **Note:** This object is only available if the parameter „Button → Mode Button right“ is set on *Command* and the parameter „Button → Command Button right“ is set on *Switching*. **Licenses:** Starter, Standard, Premium					

ID	Function	Name	Length	Type	Flags
153	Dimming/Blind	Command Central Button / 4 bits	4 bits	[3.7] DPT_Control_ Dimming/ [3.8] DPT_Control_Blinds	-WCTU-
Via this object 4 bits telegrams can be sent when pressing the central button. Depending on the configuration dimming increase / decrease or blind up / down are possible. **Note:** This object is only available if: • the parameter „Button → Mode Central Button“ is set on *Command* and the parameter „Button → Command Central Button“ is set on *Dimming,* • the parameter „Button → Mode Central Button“ is set on *Command* and the parameter „Button → Command Central Button“ is set on *Blind.* **Licenses:** Starter, Standard, Premium					

ID	Function	Name	Length	Type	Flags
154	Dimming/Blind	Command Button left / 4 bits	4 bits	[3.7] DPT_Control_ Dimming/ [3.8] DPT_Control_Blinds	-WCTU-
Via this object 4 bits telegrams can be sent when pressing the left touch button. Depending on the configuration dimming increase / decrease or blind up / down are possible. **Note:** This object is only available if: • the parameter „Button → Mode Button left“ is set on *Command* and the parameter „Button → Command Button left“ is set on *Dimming,* • the parameter „Button → Mode Button left“ is set on *Command* and the parameter „Button → Command Button left“ is set on *Blind.* **Licenses:** Starter, Standard, Premium					

ID	Function	Name	Length	Type	Flags
155	Dimming/Blind	Command Button right / 4 bits	4 bits	[3.7] DPT_Control_ Dimming/ [3.8] DPT_Control_Blinds	-WCTU-

Via this object 4 bits telegrams can be sent when pressing the right touch button. Depending on the configuration dimming increase / decrease or blind up / down are possible.
Note: This object is only available if:
- the parameter „Button → Mode Button right“ is set on *Command* and the parameter „Button → Command Button right“ is set on *Dimming,*
- the parameter „Button → Mode Button right“ is set on *Commando* and the parameter „Button → Command Button right“ is set on *Blind*.

Licenses: Starter, Standard, Premium

ID	Function	Name	Length	Type	Flags
156	Percent Value Scene	Command Central Button / 1 byte	8 bits (u08)	[5.1] DPT_Scaling/ [18.001] DPT_SceneControl	-WCTU-

Via this object 8 bits telegrams can be sent when pressing the central button. Depending on the configuration a percent value or a scene are possible.
Note: This object is only available if:
- the parameter „Button → Mode Central Button“ is set on *Command* and the parameter „Button → Command Central Button“ is set on *Percent Value,*
- the parameter „Button → Mode Central Button“ is set on *Command* and the parameter „Button → Command Central Button“ is set on *Scene*.

Licenses: Starter, Standard, Premium

ID	Function	Name	Length	Type	Flags
157	Percent Value Scene	Command Button left / 1 byte	8 bits (u08)	[5.1] DPT_Scaling/ [18.001] DPT_SceneControl	-WCTU-

Via this object 4 bits telegrams can be sent when presseing the left touch button. Depending on the configuration a percent value or a scene are possible.
Note: This object is only available if:
- the parameter „Button → Mode Button left“ is set on *Command* and the parameter „Button → Command Button left“ is set on *Percent Value,*
- the parameter „Button → Mode Button left“ is set on *Command* and the parameter „Button → Command Button left“ is set on *Scene.*

Licenses: Starter, Standard, Premium

ID	Function	Name	Length	Type	Flags
158	Percent Value Scene	Command Button right / 1 byte	8 bits (u08)	[5.1] DPT_Scaling/ [18.001] DPT_SceneControl	-WCTU-

Via this object 8 bits telegrams can be sent when pressing the right touch button. Depending on the configuration a percent value or a scene are possible.
Note: This object is only available if:
- the parameter „Button → Mode Button right“ is set on *Command* and the parameter „Button → Command Button right“ is set on *percent value*,
- the parameter „Button → Mode Button right“ is set on *Command* and the parameter „Button → Command Button right“ is set on *Scene.*

Licenses: Starter, Standard, Premium

ID	Function	Name	Length	Type	Flags
159	on/off	Speech Recognition active	1 bit (b01)	[1.1] DPT_Switch	RWCT--

This object specifies whether the speech recognition is active or inactive. Telegrams are sent automatically when the state changes. In addition the speech recognition can be activated or deactivated via this object.
The object value is 1 if the speech recognition is active.
The object value is 0 if the speech recognition is inactive.
Licenses: Starter, Standard, Premium

ID	Function	Name	Length	Type	Flags
160	Audio Output	Audio-File	14 bytes (c14)	[16.0] DPT_String_ASCII	-WC---
Via this object a WAV-audio file can be played from the SD card. The string must include the filename of the WAV-file in the main directory of the SD card. Only the first eight characters are evaluated, the rest are discarded. The file must have the extension „.wav“ as well as the following format: 24kHz sampling frequency, 16 bits, mono. To convert the files the free program Audacity (for Windows®, Mac®, GNU/Linux®) can be used. During the audio output the speech recognition and the touch buttons are deactived. **Note:** The read value of the object is only defined if the object at least has been written once. **Licenses:** Standard, Premium					

ID	Function	Name	Length	Typr	Flags
161	Audio Output	Confirmation Keyword	1 bit (b01)	[1.1] DPT_Switch	-WC---
Via this object the confirmation tone for the keyword can be activated or deactivated. 0 = Confirmation tone deactivated 1 = Confirmation tone activated **Note:** The read value of the object is only defined if the object at least has been written once. **Licenses:** Starter, Standard, Premium					

ID	Function	Name	Length	Type	Flags
162	Settings	Brightness LCD	8 bits (u08)	[5] 5.xxx	-WC---
Using the object the brightness of the display illumination can be adjusted. Values from 0 % (minimum brightness) up to 100 % (maximum brightness) are possible. **Note:** The read value of the object is only defined if the object at least has been written once. **Licenses:** Starter, Standard, Premium					

ID	Function	Name	Length	Type	Flags
163	on/off	Presence Detector	1 bit (b01)	[1.1] DPT_Switch	-WC---
Via this object the presence of people can be reported to th room controller in order to prolong the comfort mode. **Note:** This object is only available if the parameter „General → Use the Presence Detector“ is set on *Yes*. **Licenses:** Starter, Standard, Premium					

ID	Function	Name	Length	Type	Flags
164	Master/Slave	Master-Slave-Data	8 bytes	[non-standard]	--CT--
With the help of this object several speech recognitions can be summarized in a master-slave operation. For evaluation of the data a Enertex EibPC is necessary. In the 8 bytes object is contained: Switching group address (16 bits value), value of group address (16 bits), quality (32 bits). **Licenses:** Premium					

ID	Function	Name	Length	Type	Flags
165	Display	Dot Matrix 1	14 bytes	[non-standard]	-WC---
In the object (and in the following two objects) is a bit reserved for each pixel of the dot matrix display. Via an external program can be created a bit pattern which then can be displayed in the room controller. Furthermore the objects 166 and 167 must be written. **Licenses:** Premium					

ID	Function	Name	Length	Type	Flags
166	Display	Dot Matrix 2	14 bytes	[non-standard]	-WC---
Continuation to object 165. **Licenses:** Premium					

ID	Function	Name	Length	Type	Flags
167	Display	Dot Matrix 3	14 bytes	[non-standard]	-WC---
Continuation to object 165 and 166. **Licenses:** Premium					

ID	Function	Name	Length	Type	Flags
168	Measured Value	Noise Level	1 byte	[non-standard]	--CT--
In this object is written the measured noise level when the parameterized noise level is exceeded. **Licenses:** Premium					

ID	Function	Name	Length	Type	Flags
169	on/off	Energy Saving Mode	1 bit (b01)	[1.1] DPT_Switch	-WC---
With this object the room controller can be put into sleep mode. The display and the lighting will be deactivated. **Licenses:** Starter, Standard, Premium					

ID	Function	Name	Length	Type	Flags
170	Display	Display-Text 21	14 bytes (c14)	[16.0] DPT_String_ASCII	-WC---
About this and the next object a 28 characters text can be sent to the room controller in order to output it in the dot matrix area of the display. For text length that do not fit in the line of the display scrolling is enabled. The display appears as soon as the object 171 is received. **Licenses:** Premium					

ID	Function	Name	Length	Type	Flags
171	Display	Display-Text 22	14 bytes (c14)	[16.0] DPT_String_ASCII	-WC---
See object 170. **Lizenzen:** Premium					

ID	Function	Name	Length	Type	Flags
172	Measured Value (external)	Temperature for the Display	16 bits (f16)	[9.1] DPT_Value_Temp	-WCTU-
To this object the current temperature from an external sensor can be sent to the room controller to show it on the display. See under parameter „Display → Numeric Display - ...“ the value *External Sensor*. **Licenses:** Starter, Standard, Premium					

ID	Function	Name	Length	Type	Flags
173	Audio Output	Confirmation Command	1 bit (b01)	[1.1] DPT_Switch	-WC---
Via this object the confirmation tone for the command can be enabled and disabled. 0 = Deactivated Command Tone 1 = Activated Command Tone **Note:** The read value of the object is only defined if the object at least was written once. **Licenses:** Starter, Standard, Premium					

ID	Function	Name	Length	Type	Flags
174	Audio Output	Threshold for Level	8 bits (u08)	[non-standard]	-WC---
This object defines the threshold of the noise level in dB, at its exceeding a value is sent (see object ID 168) respectively on the display for a cycle time of change is shown (during this the dB-Symbol is active). **Note:** The read value of the object is only defined if the object at least was written once. **Licenses:** Premium					

ID	Function	Name	Length	Type	Flags
175	Audio Output	Threshold for Noise Level active	1 bit (b01)	[1.1] DPT_Switch	-WC---
Via this object the threshold for noise level display can be activated and deactivated. Only with activated threshold a value is sent or shown on the display. 0 = Threshold deactivated 1 = Threshold activated **Note:** The read value of the object is only defined if the object at least was written once. **Licenses:** Premium					

ID	Function	Name	Length	Type	Flags
176	Audio Output	Stop Audio File	1 bit (b01)	[1.1] DPT_Switch	-WC---
Via this object can be stopped playing of an audio file from the SD card. 0 = No Function 1 = Stop Playing **Note:** The read value of the object is only defined if the object at least was written once. **Licenses:** Standard, Premium					

ID	Function	Name	Length	Type	Flags
177	Audio Output	Speaker Volume	8 bits (i08)	[5.1] DPT_Scaling	-WC---
This object defines the colume of the speaker from 0 to -31 dB (0 dB = maximum volume, -31 dB = minimum volume. **Note:** The read value of the object is only defined if the object at least was written once. **Licenses:** Starter, Standard, Premium					

ID	Function	Name	Length	Type	Flags
178	Settings	Brightness „Ambiente“	8 bits (u08)	[5] 5.xxx	-WC---
With the help of this object the brightness of the „Ambiente“ lighting can be adjusted. Values are from 0 % (minimum brightness) to 100 % (maximum brightness) are possible. **Note:** The read value of the object is only defined if the object at least was written once. **Licenses:** Starter, Standard, Premium					

ID	Function	Name	Length	Type	Flags
179	Settings	Brightness Ring	8 bits (u08)	[5] 5.xxx	-WC---
With the help of this object the brightness of the ring light can be adjusted. Values are from 0 % (minimum brightness) to 100 % (maximum brightness) are possible. **Note:** The read value of the object is only defined if the object at least was written once. **Licenses:** Starter, Standard, Premium					

ID	Function	Name	Length	Type	Flags
180	Settings	Modulation	2 bits	[2.2] DPT_Bool_Control	-WC---
Using this 2 bits object the light effects of the room controller can be configured. The following values are possible. 0 = Pulsation deactivated 1 = Pulsation deactivated 2 = Pulsation in the mode „Warp Core Effect“ deactivated (the brightness of the green components varies) 3 = Pulsation in the mode „Brightness“ activated (the brightness of all color components varies) **Note:** The read value of this object is only defined if the object at least was written once. **Licenses:** Premium					

ID	Function	Name	Length	Type	Flags
181	Status	Controller status RHCC	16 bits (u16)	[22.101] DPT_StatusRHCC	R-CT--
This object represents parts of the controller status. For the most users however the more common object 17 is interesting for the controller status. The controller status adds the following values: 128 = Heating off 256 = Heating/Cooling 2048 = Cooling off 4096 = Dew Point 8192 = Frost Alarm **Licenses:** Starter, Standard, Premium					

Communication flags according to the KNX specification with the following functions (see ETS24 manual):

- C = Communication: bus communication possible
- R = Read: Enables reading of a value from the communication object

- W = Write: Enables writing of a value from a communication object
- T = Transmit: Enables transferring of a value (normally shows this flag the sending GA)
- U = Update: Enables the updating of a communication object value at any feedback ("listen and synchronize" - functionality)

Speech Recognizer

Downloads

In order to parameterize the recognizer, the free software Software SynOhrStudio is required. The software is available under www.enertex.de/downloads/synohr/SynOhrStudio-win.zip for download. The current German language data record („Vocabulary“) can be found at www.enertex.de/downloads/synohr/SprachSchatz-DE.zip.

The ETS data bank see www.enertex.de/downloads/synohr/SynOhr-ETS.vd4.

SD Card

The SD card may not be formatted with the tools of MS-Windows 7 or 8 supplied for compatiblity reasons. Under https://www.sdcard.org/downloads/formatter_4/ is a tool which provides the formatting suitable for SynOhr MultiSense KNX. For changing the card insert the card vertically with the printed side to the visible side, comp. Picture 5.

SprachSchatz

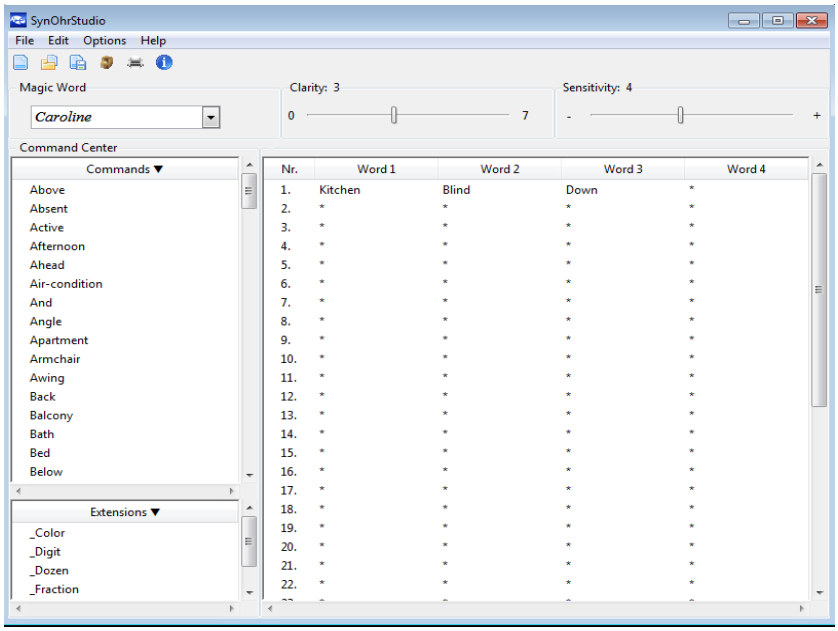
SynOhr MultiSense KNX must be configurated for the command recoginition. For configuration in the ETS the group addresses are configured for word commands as command 1 to command 40 (depending on the model variant). The word commands are composed of the given vocabulary. This vocabulary is provided by the Enertex® Bayern GmbH. A SprachSchatz (= essence of language features) includes approximately 250 words, they were recorded in advance by different speakers (male / female). The SprachSchatz is speaker-independent and therefore SynOhr MultiSense KNX must not be taught by the end customer.

SynOhrStudio

Execution

The application„SynOhrStudio“ is an executable exe-file that can be run by double click. Starting for the first time this file creates an additional directory named „SynohrData“. In this is a configuration file loacted for the SynOhrStudio as well as the main program to generate the data for SynOhr MultiSense KNX. The user interface after start is shown in Picture 22 .

The software is available for download under www.enertex.de/downloads/synohr/SynOhrStudio-win.zip.. The current German language date record („Vocabulary“) can be found under www.enertex.de/downloads/synohr/SprachSchatz-DE.zip .

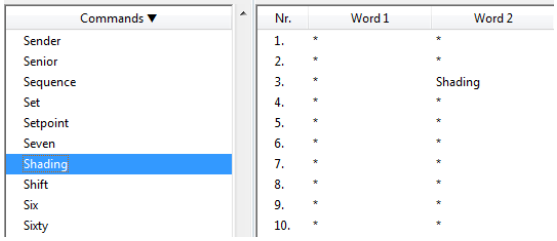


Picture 22: User Interface when Starting the Program

On the user interface the command sequence is edited in the command area. For this purpose one pulls a displayed term out of one of the two with headings *Commands* or *Extensions* to one of the starts in the big right field.

While pressing the left mouse button a desired term out of these lists is marked. Now keep the left mouse button pressed and move the marked term to the desired location in the editing area and it will be placed by releasing the button. For the formation of commands are approximately 250 words available in the command list.

The asterisks in the editing area serve as placeholders and are replaced by the selected command. Commands sequences can be assembled with maximum four words as in a modular system. As an example Picture 23 the term 'Shading' with the help of the described method was moved to third line of command on the second place.



Picture 23: Transmission of a Term through Drag & Drop

Depending on the license are up to 40 command sequences are assigned. Please pay attention to the setting rules when creating the commands (see page 43).

Using the right mouse button or the menu item *Edit* you can copy marked rows from the right field via *Copy* *and Insert* in to the clipboard and then paste it into another row. It is also possible to delete marked rows or insert one row between two rows.. If a middle mouse button is available, with it individual terms can be deleted.

Above the command area there is a selection box for the Keyword (see Picture 22). By means of the slider the required Clarity can be adjusted on a scale from 0 to 7 and the Range via the slider 'Sensitivity' from 0 to 9.

The edited file can then preferable be stored in the directory with the main program and reopened later. If the command area is finished editing the SD-files can be created via compilation tool in the toolbar. The SD data are then in the directory *SD* in the application file. The contents of this directory can then be copied to the delivered SD card which is then

connected via the SD slot to the SynOhr MultiSense KNX main unit.

Under the menu *Options* the path can be set to the most important directories (*Path Settings).* Choosing English as main language is possible as well as setting German. Note that changing the language requires a restart of the program..

Configuration SynOhrStudio

The commands are processed by the help of SynOhrStudio for the speech recognizer independent of the user via the KNX™ Parameterization of the ETS.

Setting the SynOhrStudio a vocabulary is required. This includes the SprachSchatz for the language, the necessary configuration data, audio files for output etc. This vocabulary must be located in a selectable directory preferable in the same directory as the application „SynOhrStudio“. In Picture 24 an example of directory is to be seen which includes the application the directory with the vocabulary. The path to the vocabulary directory can be set under *Options / Path Setting*.

Picture 24: Example of Directory

Configuration of the Speech Recognizer

Range

The maximum range of the speech recognition is 7 m at normal speaker volume. The range is specified in SynOhrStudio via parameter slider „Sensitivity“ (see Picture 22). The larger the room size is set the more sensitive are the microphones. This is noticeable in accordance with the sound level monitoring. Increased range means under circumstances decreased quality of the speech recognition, e.g. if a playing radio is close to the SynOhr MultiSense KNX but the speaker a few meters away.

Master Slave

For larger living rooms we therefore recommend a master slave operation with multiple stations, each set only to a standard range of about 4 m. Via the KNX™ Bus and an additonal required Enertex® EibPC the signals can be evaluated and the speech recognitions can be synchronized with each other.

Keyword

Operation

In „SynOhrStudio“ the independent application from ETS the SprachSchatz for the commands is put together respectively compiled. One command consists of maximum four words. Under one command is understandable e.g. WALL LAMP BRIGHTER. So that SynOhr MultiSense KNX does not recognize a command during a conversation and falsely enables an action, the SynOhr®SynOhr MultiSense KNX must be placed in the active mode first. This is also done with the help of speech recognition using the „Keyword“. This keyword is intensively checked by the recognizer and must be spoken isolated (pause at the end). If the recognizer has realized the keyword, so it gives a visual feedback through yellow flashing the ring and audible feedback by playing a short ring tone. During the phase of blinking and after playing the feedback sound the actual command must be spoken within three seconds.

Selection of Keywords

The keywords are selected so that these have different properties for recognition and stability. The artificial word ENERTEX or the word COMMAND are from our experience as particularly suitable. Should children operate the SynOhr MultiSense KNX by speech recognition before voice break, so is probably SYNOHR the best choice.

Sensitivity

With this setting the maximum range for speech recognition is set. The maximum range depends mainly on the room acoustics, the place of installation (e.g. acoustic shadow behind a wall), the speaker volume and (but less) of the number of used words. Up to a range of 4 m should a suitable everyday use parameterization even under difficult circumstances. For the range it is important whether it is spoken frontally or from one side. Spoken laterally the signal is more than 50 % degraded. Therefore the human being automatically turns the head towards the speaker.

Additionally the similarity of the selected words and the room acoustic plays a large role in theses distances. If the noise sources (radio etc.) are louder and closer to the SynOhr than the speaker a recognition is not possible. If two people have a conversation a third person cannot operate the SynOhr from the same distance. Also note the chapter in the manual for choosing a suitable location. In order to „listen“ acoustically larger areas, it definitely takes more than one slave.

The following table specifies the operating range adjustment. The situation with a lot of resonances are often to be found in the corridor or rooms with lots of tiles and no wallpaper. Incorrect parameter here means that very probably a recognition about possibly greater distances are possible, but this is not robust against interference noise.

Because in hallways or tiled rooms and without wallpapers echo and resonances are existing, you have to work with smaller „Room Size“ as in rooms with sound-absorbing elements (wooden

walls, wallpapers, carpets). Under difficult conditions – do not change any other parameters – but choose the range small in order to adjust gradually the desired sensitivity. If the sensitivity is set too high, usually the keyword recognition responds on wrong words or not robust.

The higher the echo in a room is the more important is for a good quality of recognition, that the speaker inserts between each word of a command sequence a little break (<0,4s). This is also dependent on the similarity of the used words respectively increases a break at similar phrases distinctness of the words.

Setting	Range less Echo/Resonances	Range more Echo/Resonances
9	7 m	Not usable
8	6 m	Not usable
7	5 m	Not usable
6	4 m	7 m
5	3 m	6 m
4	2 m	5 m
3	1 m	4 m
2	<1 m	2 m
1	<75 cm	1 m
0	<50 cm	1 m

Clarity

In addition to these basic properties the needed clarity of the pronunciation can be reduced by software, this is done to disadvantage of the robustness. This can be selected by SynOhr MultiSense KNX with the help of the parameter slider in SynOhrStudio (see Picture 25). It can be scaled between zero to seven. The higher the value is selected the more the user must speak the activation word.

The parameter „Clarity“ has only an effect on the keyword.

Picture 25: Parameter Slider to determine the Clarity

The following table shows again the possibilities. It means

+++ *Totally agree*

++ *Is almost always fully true*

\+ *True*

\- *Is less true*

\- - *Not applicable*

Word	Robust	Recognition for of inaccurate pronunciation	Robustness even at lower value for „Clarity“	Children < 12 years are recognized
COMMAND	+++	-	+	-
SYNOHR	+	+++	- -	+++
ENERTEX	+++	+	++	+++
COMPUTER	++	+	+	- -
CLARE	+	++	+	+
SPEECH RECOGNITION	+	+	-	- -
CONTROL	++	++	+	-

The possible values for the clarity:

Value	Effect
0	All pronunciations of the keyword are accepted. Here even remotely similar words can be recognized as keyword.
1	Gradual increase of the necessary clarity of pronunciation.
2	
3	Default Value
4	From this stage the word must be relatively spoken accurate. With increasing quality interference noises have a diminishing effect on the quality of recognition.
5	
6	

Important relationship between clarity and keyword

The lower the number of vowels and syllables of a keyword are the higher we recommend to choose the value of clarity in order to avoid a false triggering.

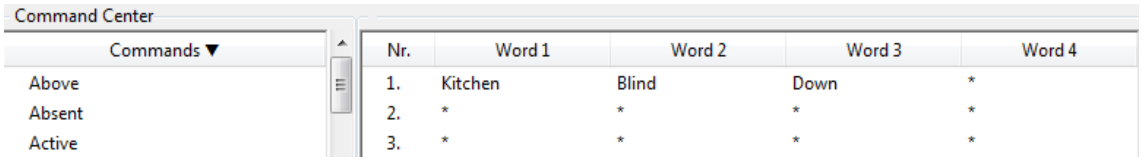
Commands

SynOhrStudio

In addition to the initializing of the keyword the individual commands must be parameterized. Depending on the license you can assign up to 40 commands. The possible words from which a command can be put together are displayed in SynOhrStudio in the window „Commands“. Via drag and drop up to four words can be put together to one command (see Picture 26). After compiling the complete firmware must copied to the SD card and then put into the SynOhr slot (see Picture 4). For this purpose the content of the SynOhrStudio generated SD directory is copied to the top directory of the SD card. Then the SynOhr MultiSense KNX must be rebooted. The speech recognizer works independently from the ETS.

A boot process can be triggered by pressing the central button for ten seconds respectively via the ETS in the device view „Reset Device“.

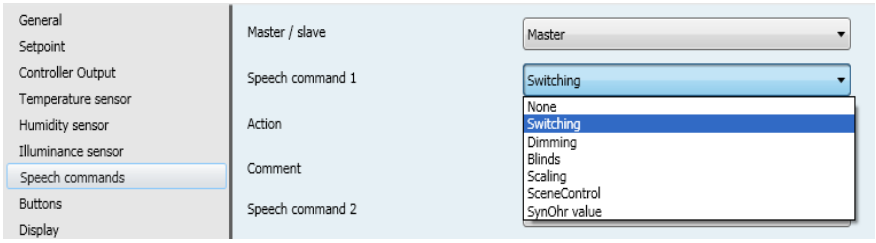
Word order and commands can be changed without relying on the ETS e.g. by the user himself.



Picture 26: Example of a Command Sequence (Excerpt)

ETS

Independent of the SynOhrStudio must assigned to each speech command an action in the ETS (see Picture 27):



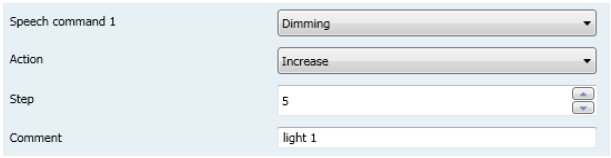
Picture 27: Light Measurement

Here you can choose:

- Switch: On/Off/At
- Dimming: Lighter/Darker
- Blinds: Up/Down
  Level 0 .. 7
- Dimming: Increase/Decrease
  Level 0 .. 7
- Percentage: Transmit the fixed value on the bus
  0 to 255 (0 bis 100%)
- Scene: 0 to 63
- SynOhr-Value: 0 to 255 (only in **Premium** edition)

Example: Command WALL-LAMP-BRIGHTER should dim at GA

For the command WALL LAMP BRIGHTER the words must be accordingly entered in SynOhrStudio. Remember the command number to which you assign this command e.g. Command 1. A KNX dimmer can vary die lighting in different stages. In the example the stage 5 is to be selected. Therefore the Command1 must be chosen as in Picture 28 . Note: The comment field is only used for overview of the user. Subsequently the GA in the ETS must now be specified with the communication object for the Speech Command 1.



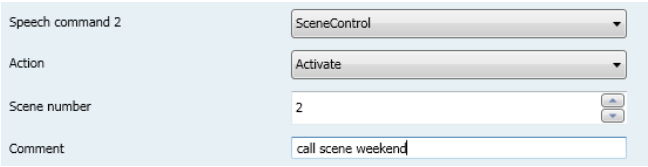
Picture 28: Dimming

In the processing of speech commands and ETS commands are separated, the link is internal only via the command number.

Figuratively spoken: If the recognizer in the example identifies the command WAND LAMP BRIGHTER the speech recognizer „informs“ the KNX™ part, Command1 was identified. The KNX™ part follows its parameterization.

Speaker		Recognizer		KNX
WALL LAMP BRIGHTER	→	Command1	→	Switch KNX group address

In addition to Brighter/Darker dimming can be set with a command of KNX™ part so that a specific value is written to the bus or call a scene. If on command2 the scene2 is to be called on the scene group address, so this has to be accordingly configured in the ETS. In SynOhrStudio can for command2 then e.g. SCENE WINTER GARDEN be defined.



Picture 29: Call Scene 2

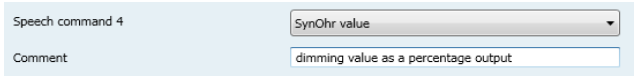
Value Commands

If the command DIMMER SEVENTY PERCENT assigned to a command with SynOhrStudio so this can now also switch a corresponding value on the bus. The complete control of a dimmer in 10%-steps „needs“ in this way 10 Commands. In the **Premium**-edition value groups can now be combined into one command.

Here is the command _PERCENT (note the underscore at the beginning of the word). If this indicated the percentage is also passed by the recognizer to the KNX™ part of the device. The possible extensions can be found in SynOhrStudio in the lower left window under „Extensions“.

Percentage Output

With these extensions can be put e.g. the command DIMMER _PERCENT in SynOhrStudio on Commando4 and then the KNX-part can be parameterized via the ETS as in Picture 30 .



Picture 30: Value Output directly

In speech recognition _PERCENT is always to speak as value in increments of 10 plus the word „PERCENT“:

Extension	Word	KNX- BUS
_PERCENT	ZERO PERCENT	0
	TEN PERCENT	25
	TWENTY PERCENT	51
	THIRTY PERCENT	76
	FOURTY PERCENT	102
	FIFTY PERCENT	127
	SIXTY PERCENT	153
	SEVENTY PERCENT	178
	EIGHTY PERCENT	204
	NINETY PERCENT	229
	HUNDRED PERCENT	255

Not KNX compliant Extensions

The following extensions are depending on the version of the loaded SprachSchatz part of their vocabulary. However these are not included in the offical KNX-SprachSchatz.

Color Choice

Extension	Word	Value on KNX- BUS
_COLOR	RED	0
	WHITE	1
	YELLOW	2
	BLACK	3
	ORANGE	4
	LILAC	5
	BLUE	6
	GREEN	7
	VIOLET	8
	MAGENTA	9
	CYAN	10

Digits

Extension	Word	Value on KNX- BUS
_DIGIT	ZERO	0
	ONE	1
	TWO	2
	THREE	3

	FOUR	4
	FIVE	5
	SIX	6
	SEVEN	7
	EIGHT	8
	NINE	9

Numbers

Extension	Word	Value on KNX- BUS
_DOZEN	ZERO	0
	ONE	1
	TWO	2
	THREE	3
	FOUR	4
	FIVE	5
	SIX	6
	SEVEN	7
	EIGHT	8
	NINE	9
	TEN	10
	ELEVEN	11
	TWELVE	12

Fraction

Extension	Word	Value on KNX- BUS
_FRACTION	HALF	0
	ONE THIRD	1
	A QUARTER	2
	ONE FIFTH	3

Heating/Cooling

Extension	Word	Value on KNX- BUS
_HEATING	ACTIVE	1
	STANDBY	2
	NIGHT	3

Settings

Using the speech recognizer some rules must be followed, if an optimal result of the recognition and the acceptance of the user is to be achieved. An important rule in the parameterization is:

1. **Avoid monosyllabic word command**

   Example: CEILING LIGHT instead of LIGHT

   If a command is very short, the recognition quality decreases.

2. **Avoid strong similarities**

   Example1:
   WINTER GARDEN SHADING ON
   WINTER GARDEN SHADING OFF
   Here a relatively long phrase differs (good for recognition) only by ON or OFF.
   Additional both words have a determining vocal („O“) in common. Commands must differ well from each other, so that the recognition quality remains high especially over long distances.

   Counting here the sounds so get to about 22 different sounds, the similarity of the two expressions is about 21/22 nearly 95 %.

   Example2:

   LAMELLA UP

   LAMELLA OFF

   Here are P and F plosive or fricative sounds. Compared to these vowels in the signal about -20..-30 dB lower or the signal level is only 3 .. 10 % of a vowel. As a human being „listens“ to the P in UP although very clear but in this case the human brain takes care for it. Note also the next setting rule.

3. **Use the switching function of the KNX-part**

   Example:
   WINTER GARDEN SHADING

   This command is placed on a switching object with switching. The window will ascend when it is closed and vice versa. This avoids problems with the recognition and it is easy to handle.

4. **Avoid too long phrases for the user**

   Example:
   WALL LIGHT instead of WINDOW WALL LIGHT

   Even it it is used for recognizing quality, a user does not want to talk too long phrases. Especially if there is only a wall light in the room, the additon WINDOW in the example is unnecessary.

5. **Concern alternatives**

   Example:
   Is has been parameterized WALL LIGHT and CEILING LIGHT. An improvement of the recognition quality can be achieved by simply changing to WALL LAMP and CEILING LIGHT.

6. **Use relative commands of the KNX-part**

   Example:
   With the Premium-edition absoluta values can be written directly on the bus, e.g. to set a lamp on a brightness value. Usually the user will know the value, which he wants to set not absolute but only relative.
   Therefore a DIMMER BRIGHTER / DIMMER DARKER pair for the user is better to use as a DIMMER _PERCENT. This needs to be clarified with the user.

7. **Display bookmarks for commands**

   During the adaptation phase the user is not knowing all commands. Please put e.g. on

the table a corresponding list.

Background on the Functioning

Keyword Similarities

Important for a trouble-free operation in practice is, that the recognizer does not realize unasked the keyword. Basically always confusions in the spoken word are possible, e.g. for ENERTEX there is a great similarity to „A lot tax!“ or for the COMMANDO „Tornado“.The difference between the word ENERTEX and „A lot tax!“ seems to be enormous for the user, but especially because the human brain „knows“ , that only ENERTEX represents a valid activation word. The brain finds easily the critical point „lot“ and „NER” and distinguishs the desired word.

Parameter Clarity

SynOhr MultiSense KNX has user-configurable specifications: The value for the clarity can be changed or in the expert options of the parameter speech quality activation. If the value is raised for clarity, the user needs to speak much more clearly, so that the recognizer accepts the activation word. Here should be noted, that the clarity values always depend on the activation word. The word ENERTEX can achieve mostly with level 3 a good robustness., however at level 7 the COMMAND is often better.

It should be noted, that then it will be more difficult for the user under circumstances to activate the recognition, especially for longer distances or ambient noises. Compared with vowels are e.g. sibilants 10 to 25 times weaker than in the speech signal. Therefore also the distance to the speaker, besides noise like radio etc. plays a role for recognition.

Parameter Room Size

Another parameter affects the robustness of the recognition: The parameter „Room Size“, which basically corresponds to the microphone gain. If SynOhr MultiSense KNX is operated in a short distance (1...4 m), but was configured on large room size so the confusion rate of the recognizer can slightly increase. In unstable ambients the recognition should only be possible to activate via keyword, if at least it is spoken with a significant volume. In this case the room size should not be chosen too large. Additionally can be activated a pulse suppression with the experts setting „Noise Level“. It is unfavorable in any case, if an activation of the keyword in a low voice is possible in rooms with high level of interference noises or conversations.

Override

Important: Blue flashing of the ring means „overridden“. Then the recognizer is acoustically overridden. If this is very often the case please reduce the room size.

Range and Master Slave

The maximum range depends mainly on the room acoustics, the place of installation (e.g. acoustic shadow behind a wall), the speaker volume and also (but less strongly) on the number of used words. Up to a range of 4 m a everyday use parameterization should be possible even under difficult circumstances. For the range it is important that it is frontally spoken or from one side. At lateral coupling the signal over 50 % is worse – therefore a human being is turning automatically his head towards the speaker. Additionally the similarity of the selected words as well as the room acoustics are playing a major role. If the noise sources (radio etc.) are louder and closer to the SynOhr as the speaker a recognition is impossible. If larger areas are acoustically to be „listened“ it takes several slaves.

Room Acoustics

Relationships with resonances or room echo are often existing in hallways or tiled rooms and without wallpaper. With unfavorable parameterization a recognition is possible over long distances (7..10 m), but this is in practice not robust against inference noises. The parameter „Room Size“ in SynOhrStudio (comp. page Fehler: Referenz nicht gefunden) adjusts the range. Finding the optimal range under difficult conditions do not change any other parameters, but choose the range small in order to adjust gradually the desired sensitivity. At high sound level the tendency of distorting the signal is internally limited by a limiter. This allows a stable operation for seldom overrides. If the limiter is constantly active so the keyword recognition responds on wrong words or is generally not robust. Therefore please avoid a „too large“ room size.

Commands

The recognition of commands is processed differently than that of the keyword. Here the recognizer chooses the solution that comes closest to the configured command, this is a similarity strategy. The strategy provides a great tolerance of speech of commands at their recognition. If very few commands are used, the tolerance is automatically greater. For example „LAMELLA DOWN“ can be initiate by the statement „A-HA“. Because of the similarity strategy it is important that the keyword recognition is robust.

A model representation of the similarity strategy is that of a human being who learns a new language, but is just knowing „LAMELLA DOWN“. He can only differentiates slightly similar words more severe than a human being who knows the total vocabulary of a language.

To parameterize the similarity strategy, please change in SynOhrStudio the experts setting „Speech Quality Command“. If the SynOhr MultiSense KNX should work only with one or two commands and the similarity strategy is still bothering although the corresponding parameterization, then we recommend to fill the „unused“ commands with unused words.

The higher the echo in a room is the more important is a good quality of recognition, that the speaker inserts between each word of a command sequence a little break (<0,4s). This is also dependent on the similarity of the used words respectively increases a break at similar phrases distinctness of the words. The recognition quality is to be understood in context of numbers with their similarity such as between FORTY and SEVENTY in German. The user can improve this problem by significant pronunciation of the single words even at greater distances.

In summary:

1. The keyword must be parameterized robust, so that
2. the command recognition guarantees with the help of the similarity strategy a high rate of recognition.
3. The room size may not be chosen too large in reverberant ambient, otherwise the keyword recognition is wrong.

Both the similarity strategy including the robustness can be customized by the user to his own needs.

Experts Settings

Basics

In addition the menu *Options* an expert mode (*Experts)* is adjustable. This opens up additional settings. With an unfavorable choice of settings the recognition of words can be impossible. Therefore the change of parameters is recommend only to experts. In addition the parameter may be modified only in small steps and their effect can be directly tested in the object.

Noise Level

The noise level of background noise in the room can be adjusted via the menu item *Noise Level* From silent (Silent) up to very loud (Extreme) are nine levels adjustable. This setting chances the dynamics of the recognition. Basically the speaker must stand out in the higher level significant from his surrounding, so that a good recognition is guaranteed. Conversely it may be easier for the user in a soundproofed rooms and very quiet rooms (Silent) the speech recognition to operate at an appropriate parameterization.

In rare cases and depending on the room acoustics there will be false alarms in children's- or women's voices. In this case set *Noise Level* on Talking or – if necessary – Loud.

Feedback Time

The length of time until the confirmation to the command is set via the menu item „Feedback Time“. Overall five levels are adjustable from time-lag (Paralyzed) up to fast (Fast). The feedback time is the time of break, which the user must wait after spoken the keyword until the speech recognizer switches in the active mode. A longer feedback time means a higher robustness for the recognizer against disturbing ambient noises.

Ready Signal

In this menu item can be set whether an audible signal upon activation of the SynOhr MultiSense KNX (Ready Signal) is to be output. The default value is set to 'Yes'. The sound can be adjusted by individual modifying the file `t_ready.wav` on the SD card.

Feedback Signal

In this menu item can be set whether an audible signal to confirm a command sequence (feedback signal) is to be output. The default value is set to 'Yes'. The sound can be adjusted by individual modifying the file `t_exec.wav` on the SD card.

Dynamics

Speakers tend to have a certain dynamics, that means they get lower after the keyword. In order to counteract this, SynOhr MultiSense KNX can automatically increase the sensitivity of the microphone after the spoken keyword from Off (no increase) up to maximum (maximum increase). This improves the recognition of commands in a rather quiet ambient.

Speech Quality Activation

In the menu item „Speech Quality Activation“ can be adjusted, how precisely the keyword for the activation of the speech switch must be spoken and indeed from the value „Everything“ up to „Exact“ with increasing accuracy. Similar to the parameter „Clarity“ (comp. page 37) causes this in the speech recognizer a increased accuracy requirement when speaking the keyword.

Here is used a deviating algorithm, which has an influence mainly on the recognition of

emphasis and the composition of syllables. The robustness can be increased further with this parameter. In combination with the parameter „Clarity“ a modified threshold of accuracy can be achieved. This is especially helpful with short keywords such as CLARE or SYNOHR.

If the algorithm is active the display shows from the level HIGH (and larger) „not exact“. Therefore if the spoken keyword was not recognized and in the display this message appears, so you should reduce the „Speech Quality Activation“.

Speech Quality Command

In the menu item „Speech Quality Command“ can be determined how exactly the subsequent command sequence must be spoken and indeed of the value „Everything“ up to „Exact“ with increasing accuracy. In contrast to the parameter „Clarity“ (comp. Page 37) and „Speech Quality Activation“ this parameter affects only on the commands. At lower accuracy the words of a command can be fluently spoken, at high accuracy the words must be clearly spoken. In addition the recognizer is more tolerant at low level, e.g. CEILINGLIGHT would be recognized as CEILING LIGHT. The disadvantage at a too low level is, that at a worse signal-to-noise-ratio (large range, interference noises, softly spoken) under circumstances the spoken command is incorrectly assigned, e.g. SCENE THREE instead of SCENE TWO.

Failure Symptoms

Symptom	Solution
Frequent false triggering of the keyword	• Set the slider „Room Size“ in SynOhrStudio to smaller values • Set the slider „Clarity“ in SynOhrStudio to higher values • Use another keyword • Adjust experts-parameter „Speech Quality Activation“
Commands are not recognized	• Insert between the words of a command short breaks • Minimize interference noises • Note setting rules • Adjust the experts-parameter „Speech Quality Command“

Acoustic Feedback

A sound for confirmation of the command word or for the confirmation of the execution can be enabled and disabled. The sound of this itself is a Wave-file, which must be placed under the name `t_ready.wav` or `t_exec.wav` into the main directory of the SD card. The Wave-files must have the following format: 24kHz sampling frequency, 16 bits, mono.

If the keyword is recognized, then the sound is played `t_ready.wav` so far this has been configured or has been chosen with the group address. In this case the ring is flashing yellow for about 2 seconds. During this time the acutal command has to be spoken.

If the command is recognized, the sound is played `t_ready.wav` so far this has been configured or has been chosen with the group addresse. The ring changes to green.

List of Changes

1: 4.12.2012 , Dr.-Ing. M. Schuster

- Initial Version

2: 3.5.2013 , Dr.-Ing. M. Schuster

- Extensions and Modes

3: 1.7.2013 , Dr.-Ing. M. Schuster

- Group Addresses
- Description Installation

4: 31.10.2013 , Dr.-Ing. M. Schuster

- Description SynOhrStudio
- Objects of the KNX™ Communication
- ETS Description of Application
- Adaption Format Template

5: 21.11.2013 , Dipl.-Ing. (FH) T. Mühlfelder, Dr.-Ing. M. Schuster

- Objects of theKNX™ Communication
- Corrections
- Chapter Placement added

6: 5.12.2013 , Dipl.-Ing. (FH) T. Mühlfelder

- Objects of the KNX™ Communication revised
- Licenses at Objects of the KNX™ Communication completed

7: 09.12.2013 , Stefanie Meier

- Chapter Quick Start added

8: 10.1.2014 , Dr.-Ing. M. Schuster

- Chapter Functions
- Supplements for Plugging in the SD-Card
- Chapter Download

9: 31.1.2014 , Dr.-Ing. O.Henze, Dr.-Ing. M. Schuster

- Complete Revision Guide (Part 1)
- Supplements to Room Size and Range
- Supplements to Chapter Functions

10: 7.2.2014 , Dr.-Ing. O.Henze, Dipl.-Ing. (FH) T. Mühlfelder

- Complete Revision Guide (Part 2)
- Corrected Object 181
- Short Description of Communication Flags

12: 17.4.2014 , Uta Jahn-Sykosch

- English Translation

13: 29.4.2014 , Dr.-Ing. O.Henze

- Revision of screenshots