

KNX Generation 6

Application description for Basic (BA) devices

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1. General

1.1 KNX bus basics

To understand these instructions, it is assumed that a KNX commissioning or configuration course has been taken.

In order to work with the B.E.G. applications, you must first import them into ETS. ETS is supported from version 4.

1.2 Symbols

In the following application description, various symbols are used for clarity. These symbols are briefly explained here.

Attention:

This symbol denotes sections of text which absolutely must be read, in order to avoid mistakes in project configuration and commissioning.

Recommendation:

This symbol denotes parameter settings which experience has shown to lead to optimal usage of the equipment.

1.3 Overview

The KNX Gen6 family from B.E.G. comprises a large number of detectors. The family is divided into series: PD2N, PD4N, PD9, PD11 are series with different detection areas and designs. In addition, there are specially designed series for wall mounting (Indoor 180, Indoor 140-L) and a series for outdoor use (RC-plus next). Within a series, there may also be detectors with special properties. For example, there is PD4 detector that is specially designed for corridors (C) and one for large mounting heights (GH).



The individual series are available in up to three different software versions. The BA- (Basic) variant has basic functions, the ST- (Standard) variant offers a wider range of functions and the DX- (Deluxe) variant offers the greatest functionality. For example, presence simulation is only available in the DX version.

	Device variants		
	BA	ST	DX
Switching mode	X	X	X
Regulation mode		X	X
Offset switching mode		X	X
Number of HVAC outputs	1	3	3
Remote control (bidirectional)		X	X
End-customer remote control			X
Temperature sensor			X
Sound sensor			X
Logic module			X
Presence simulation			X
Internal push button			Indoor 140-L
Internal orientation light			Indoor 140-L
Slave output		X	X
Slave input		X	X
Burn-in function		X	X
Parameter change via object		X	X

	Device variants		
	BA	ST	DX
Self-adjusting follow-up time		X	X
Short presence		X	X
Direction detection		X	X
Daylight-dependent switch-off		X	X

Software version and functions

Most series are available for various installation modes. A ceiling mount version (FC-) and a flush-mounting version (FM-) are available. In addition, a surface-mount (SM-) base can also be used with the FM version to make it suitable for surface mounting (see table below). The range of functions is not limited by the different installation variants but depends on the software version selected.

		Installation variants		
		FC	FM	SM
93380	PD2N-KNX-BA-FC	X		
93381	PD2N-KNX-BA-FM		X	
93304	Accessory: SM assembly kit		X	X

Installation variants

There are three different ETS applications for the KNX Gen6 family. These are based on the variants BA, ST and DX. They are independent of the series. The BA application can be used for the BA device variants PD2N and Indoor 180. The ST application can be used for the ST series PD2N, PD4N and Indoor 180. The DX application can be used for the DX device variants PD2N, PD4N, PD9, PD11, Indoor 180, Indoor 140-L and RC-plus next.

		Application		
		BA	ST	DX
93360	PD2N-KNX-DX-FC			X
93361	PD2N-KNX-DX-FM			X
93362	Indoor 180-KNX-BA-FM	X		
93363	Indoor 180-KNX-ST-FM		X	
93364	Indoor 180-KNX-DX-FM			X
93380	PD2N-KNX-BA-FC	X		
93381	PD2N-KNX-BA-FM	X		
93382	PD2N-KNX-ST-FC		X	
93383	PD2N-KNX-ST-FM		X	
93384	PD4N-KNX-ST-FC		X	
93385	PD4N-KNX-ST-FM		X	
93386	PD4N-KNX-DX-FC			X
93387	PD4N-KNX-DX-FM			X
93388	PD4N-KNX-C-DX-FC			X
93389	PD4N-KNX-C-DX-FM			X
93390	PD9-KNX-DX-FC			X
93391	PD9-KNX-GH-DX-FC			X
93392	PD11-KNX-FLAT-DX-FC			X
93393	Indoor 140-L-KNX-DX-FM			X
93394	RC-plus next 230-KNX-DX white			X

		Application		
		BA	ST	DX
93395	RC-plus next 230-KNX-DX black			X
93399	PD4N-KNX-GH-DX-SM			X
93802	PD11-KNX-FLAT-ST-FC		X	
93803	PD11-KNX-FLAT-BA-FC	X		

Version overview

2. The basic principles of motion detection

2.1 Introduction


In order to ensure a simple introduction to this application description, the general functions of occupancy and motion detectors will first be explained. These are motion detection and light analysis.

2.2 Motion detection by B.E.G.'s KNX detectors

The KNX detectors work on a passive infrared system, which registers heat movements and converts them to signals that can be analysed by a processor. The most important factor in motion detection is the right choice of the mounting location.


Mounting location


The occupancy detector should be mounted so that the main direction of motion is always tangential (side-to-side across the device). The light analysis should always take place at the darkest point of the room. This is the only way to be sure that there is enough light in the room.

 The following sources of interference can lead to unwanted triggering, since they can also produce differences in temperature:

1. radiant heaters,
2. ventilation systems which emit hot or cold air,
3. lights directly in the detection area.

Accordingly, the detector must be positioned far from these sources.

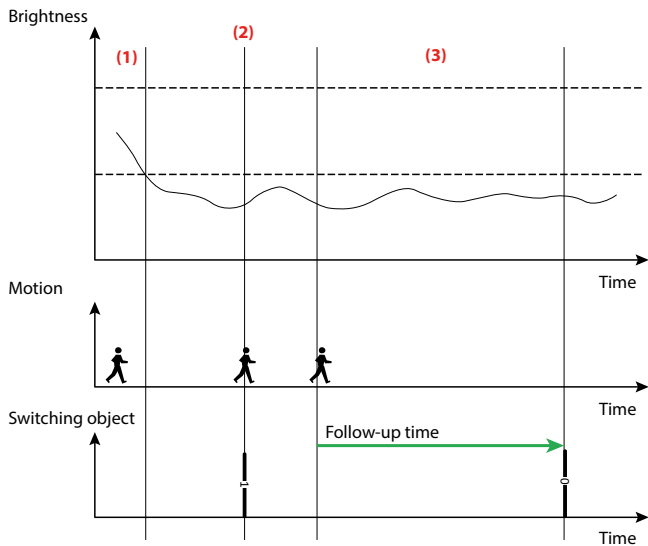
 If even the smallest movements are to be recognised (e.g. working at a computer keyboard), we recommend that you choose a mounting location directly above the desk. This means that detection can be assured.

 Please always follow the mounting height given for the devices. Smaller mounting heights reduce the range. Higher mounting heights increase the range while reducing the detection sensitivity.

2.3 Function of a motion detector

A motion detector automatically switches the light on when a person is present (2). The ambient brightness level must be below the preset switch-on threshold for this to happen. If it is above the threshold, the light is not switched on (1).

After the detector has detected the last movement, the preset follow-up time begins. Once this time has elapsed, the light is automatically switched off (3). If the detector detects another movement within the follow-up time, the follow-up time is restarted.



2.4 Difference between occupancy and motion detectors

Occupancy and motion detectors both automatically control the light, depending on people being present (motion) and on ambient light levels.

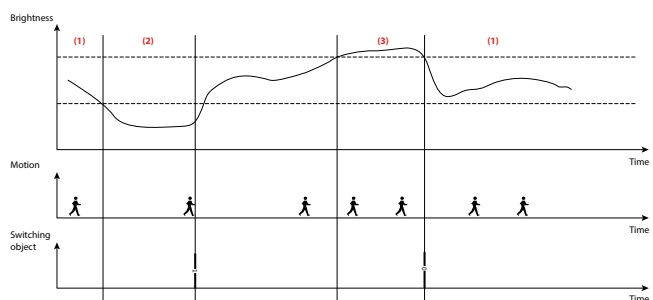
Both detector types switch the light on if ambient light levels are below a switch-on threshold (which can be set on the device) and movement is detected.

A motion detector switches the light off again once no more movement is detected after a follow-up time, i.e. the light remains switched on so long as movements are detected (independent of the lighting level) plus follow-up time. By contrast, an occupancy detector additionally switches the light off, independently of movement, once the ambient light level has been above the calculated switch-off threshold for a minimum time (see section 2.5).

2.5 Light analysis

The occupancy detector switches the light automatically, depending on the people being present (movements) and on ambient light. The light sensor integrated into the detector continually measures ambient light and compares it with the preset switch-on threshold or set value in the detector. If the ambient light is sufficient, the lighting is not switched on (1). If the ambient light is below the preset set value brightness, any movement in the room will cause the lighting to switch on (2).

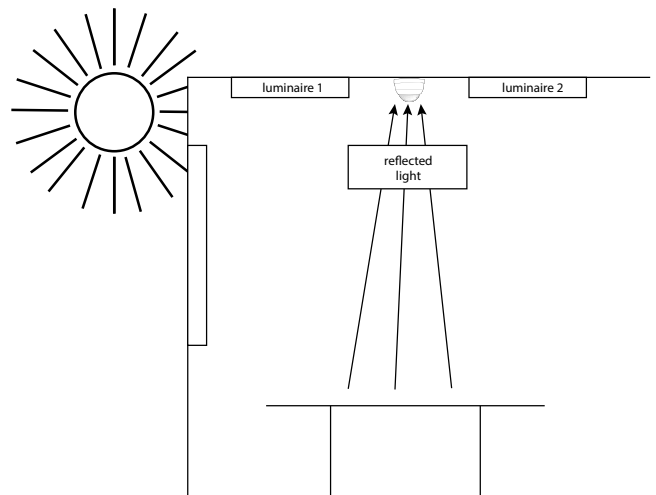
The occupancy detector switches the lighting off even if a person is present if there is enough natural light (3) or no movement is detected in the room for a given follow-up time.



Light measurement

A detector conducts light measurement at the ceiling of the room, because this is where it is installed. This means that it measures light which is present in the room as sunlight and artificial light and is reflected onto the ceiling. However, not all the light is reflected, as the

reflection factor depends greatly on the surfaces and furnishings. The light value measured on the ceiling does not therefore represent the room brightness. A reflection factor is stored in the detector in order to compensate for this.



2.6 Detector functional groups

The occupancy detector has two outputs: the light output (A1) and the HVAC output (A2). To enable the automatic switching function to be realised, all outputs access the sensors. The light measurement is set the same way for all the outputs, but each output can have its own switch-on threshold.

The light output (A1) performs the basic function of the occupancy detector which is lighting control. In addition, one HVAC output (heating, ventilation and air conditioning) is available. This output is for the control of energy-intensive systems such as air conditioning. Additional functions can be configured in the relevant group. The division of the groups is shown in the structure of the ETS parameter tree.

Commonly, the light is to be switched in a room depending on the daylight and the presence of persons. This requires the light output A1. The room also contains further HVAC (heating, ventilation and air conditioning) devices that are also to be automatically switched on by a detector. The HVAC output A2 must be activated for this purpose.

2.7 Light output A1

The light output A1 (block) contains all the functions of an occupancy detector. It is used to automatically switch the light depending on the ambient brightness and on whether movement is detected.

Detector outputs	
Light output A1	activated
	deactivated

2.8. HVAC output (A2)

The detector has an HVAC output A2 (HVAC = heating / ventilation / air conditioning). This output is a switching channel and can be operated based on movement independent of the ambient brightness. It can also operate depending on the ambient brightness, such as light output A1, but without daylight-dependent switch-off. The channel is separate and can be used individually.

Detector outputs	
HVAC output	deactivated
A2	activated

3. Basic settings of the detector

In the basic settings, certain additional functions can be activated or settings configured that apply to the detector as a whole. Specifically, this includes the following functions:

- Start delay for the detector (section 3.1)
- Test mode (section 3.2)
- Motion LED (section 3.3)

3.1 Start delay for the detector

When the KNX bus is switched on (power is returned to the bus), all the participants connected on one line are immediately ready for operation. If there are several sensors in a line that want to send initialisation or start telegrams, it is possible for the telegram load to be too high when power is returned to the bus and for telegrams to potentially go missing.

This switch-on behaviour can be avoided by using the start delay. The detector only sends its first telegrams once the start delay has elapsed.

Start delays of different lengths should be set for the sensors/detectors within a line.

Basic settings	
Start delay in seconds	0 – 255 [0]

3.2 Test mode

Test mode is for checking the detection area. If movement is detected, the lighting switches on for 2 seconds and then off again. The duration until the next switch-on depends on the length that was set up for the safety delay.

Test mode can be activated as follows:

- with a 1-bit "1" telegram on the group object 0 "General: Input – Test mode"

Test mode is deactivated:

- automatically after 3 minutes,
- with a 1-bit "0" telegram on the group object 0 – "General: Input – Test mode"

Basic settings	
Test mode	deactivated
	via group object

No.	Name	Function	C	R	W	T	U
0	General: Input (DPT 1.001)	Test mode	C	-	W	-	-

3.3 Motion LED

Since the integrated LED for motion, red, can be perceived as a source of disturbance in some locations, for example in the bedroom, there is an option to switch it off after programming with ETS.

Basic settings	
Motion LED	deactivated
	activated

4. Detector outputs

Here, the outputs can be chosen. Available are the light output A1 as occupancy detector in switching mode and HVAC output A2. In standard mode, the light output is defined as brightness-dependent switching channel, the HVAC output as brightness-independent switching channel. These settings can be modified for both channels.

4.1 Occupancy detector (switching)

If light output A1 is used, the lights are switched depending on movement and the switch-on threshold. After elapse of the follow-up time and if no further movement has been detected during this period, the lights are switched-off again.

5. Follow-up time

i The follow-up time defines the duration during which the connected load remains switched on even if no more movements have been detected. If a new movement is detected during the follow-up time, it is restarted.

5.1 Setting the follow-up time

The "Follow-up time" menu provides options for determining the duration as well as the type of triggering.

Follow-up time	
in seconds	0 ... 59 (0)

Follow-up time	
in minutes	0 ... 59 (10)

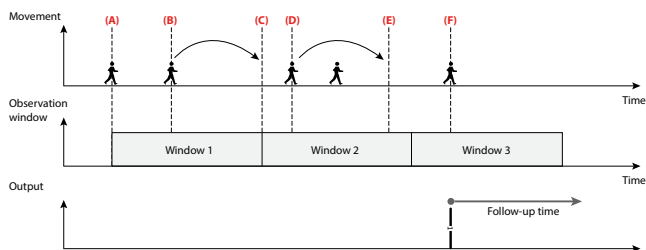
Follow-up time	
in hours	0 ... 23 (0)

5.2 Triggering

Here it is determined when triggering should take place:

- Immediately upon detected movement
The telegram is sent immediately when movement is detected and the brightness value drops below the threshold.
- After observation time
If this option is chosen, further parameters become visible. One observation time and a number of observation windows can be defined. At least one movement must be detected in each window to allow the channel to switch on.
Example: Three monitoring windows each with a monitoring time of 10 seconds.

After the first detected movement (A), the detector starts window 1. If no movement is detected during the observation time, the evaluation is ended. If at least one movement (B) is detected during the window, after the first window (C) has elapsed, the second observation window is started. Here too, evaluation is terminated if no movement is detected within the duration of the window. If at least one movement is detected (D), the third window is started (E). If more than three windows are set in the parameters, this is repeated for the total number of observation windows. The detector switches on, as soon as the last window has detected its first movement (F). So in this example, this will result in a delay time of 21-30 seconds (depending on when the last movement is detected). If there is no movement in a window, all windows are reset.



Follow-up time	
Triggering	immediately upon detected movement
	after observation time

6. Switch-on threshold

In the "Switch-on threshold" menu, settings can be configured that relate to the automatic switching on and off of the lights. The brightness value set here becomes the switch-on threshold. If the brightness level drops below this threshold and the detector detects movement, the lights are switched on.

6.1 Adjust the switch-on threshold

The user can first select whether the lights are to be switched on depending on the brightness. If this parameter is activated, the input brightness value becomes the switch-on threshold.

Switch-on threshold	
in lux	5 ... 2000 (500)

Switch-on threshold	
Brightness dependent switching	deactivated
	activated

7. Switching output

The "Switching output" menu defines what the detector sends as soon as a triggering has taken place and what is sent after the follow-up time has elapsed.

Switching output	
Telegram upon triggering	is sent
Value	1

Switching output	
Telegram at end of follow-up time	is sent
Value	0

No.	Name	Function	C	R	W	T	U
52	A1: Output (DPT 1.001)	Switching	C	-	-	T	-

8. Additional functions

The "Additional functions" menu contains settings that concern manual control.

8.1 Central OFF

The "Central OFF" parameter enables the lights to be switched off with an optional time delay. This can be defined in the "Central OFF" menu when the parameter is activated.

If a "0" telegram is sent to this object, the detector switches off the light if no motion is detected. Otherwise, the light remains switched on. If, after the light has been switched off by the central OFF function, movement is detected and the brightness level is below the threshold, the light is switched back on. If a movement is detected within the delay period, the light remains switched on. This ensures that lights are only switched off in unoccupied rooms.

Additional functions	
Central OFF	deactivated
	activated

Central OFF	
Delay time central OFF function in seconds (0 = directly OFF) <i>(visible for activation)</i>	0 ... 60 (0)

No.	Name	Function	C	R	W	T	U
1	General: Input (DPT 1.001)	Central OFF	C	-	W	-	-

8.2 Lock

If the "Lock" parameter is activated, a new "Lock" menu appears on the left. Locking can be effected with a "1" or "0" telegram.

The parameter "Behaviour upon activation of lock" has the following selection options:

- No switching back on
The light remains switched on until no more movement is detected during a follow-up time. The lock becomes active after switching off.
- Lock only
The current status of the light is preserved for the duration of the lock.
- Lock and send value
A defined status (on or off) is set upon locking.

"Behaviour upon deactivation of lock" has the following options:

- Unlock
The lock is simply removed.
- Unlock and send value
The lock is removed in a defined manner (on or off).

8.2.1 Apply time limit to lock

As a rule, the lock remains in place until it is removed by an unlocking telegram.

There is the option to enter a duration for the lock using the parameter "Apply time limit to lock", after which the lock is automatically removed.

The lock can be modified without ETS. A sent "1" telegram activates the lock and a sent "0" telegram deactivates it.

8.2.2 Upon bus voltage return (lock)

The user can decide whether or not the device is to be locked upon bus voltage return.

Additional functions	
Lock	deactivated
	activated

Lock	
Lock with	1
	0

Lock	
Behaviour upon activation of lock	no switching back on
	lock only (current status is preserved)
	lock and send value(s)

Lock	
Behaviour upon deactivation of lock	unlock
	unlock and send value(s)

Lock <i>(only visible for "unlock and send value(s)")</i>	
Value	„1“
	„0“

Lock	
Apply time limit to lock	deactivated
	activated

Lock time-limited	
Locking time in minutes <i>(visible for activation)</i>	0 ... 59 (0)

Lock time-limited	
Locking time in hours <i>(visible for activation)</i>	0 ... 24 (12)

Lock	
Upon bus voltage return	not locked
	locked

No.	Name	Function	C	R	W	T	U
29	A1: Input (DPT 1.001)	Lock	C	-	W	-	-

8.3 Behaviour upon bus voltage recovery

Here you define how the detector behaves when the bus voltage returns.

Additional functions	
Behaviour upon bus voltage recovery	as when deactivating the channel
	as when activating the channel
	as before bus voltage failure

9. HVAC channel (A2)

The detector has one HVAC channel A2. The channel is a switching output and can be activated due to movement independently of the ambient light, but also depending on the ambient light, in other words in the same manner as light output A1.

9.1 Follow-up time

See section 5 for a description of the "Follow-up time" menu.

9.2 Switch-on threshold

See section 6 for a description of the "Switch-on threshold" menu.

9.3 Switching output

See section 7 for a description of the "Switching output" menu.

9.4 Central OFF

See section 8.1 for a description of the "Central OFF" menu.

9.5 Lock

See section 8.2 for a description of the "Lock" menu.

No.	Name	Function	C	R	W	T	U
73	A2: Output (DPT 1.001)	Switching	C	-	-	T	-
62	A2: Input (DPT 1.001)	Lock	C	-	W	-	-

10. List of data point types

No.	Name	Function	DPT	Flags				
General								
0	General: Input	Test mode	1.001 (on/off)	C	-	W	-	-
1	General: Input	Central OFF	1.001 (---/off)	C	-	W	-	-
Switching								
29	A1: Input	Lock	1.001 (on/off)	C	-	W	-	-
52	A1: Output	Switching	1.001 (on/off)	C	-	-	T	-
62	A2: Input	Lock	1.001 (on/off)	C	-	W	-	-
73	A2: Output	Switching	1.001 (on/off)	C	-	W	-	-

