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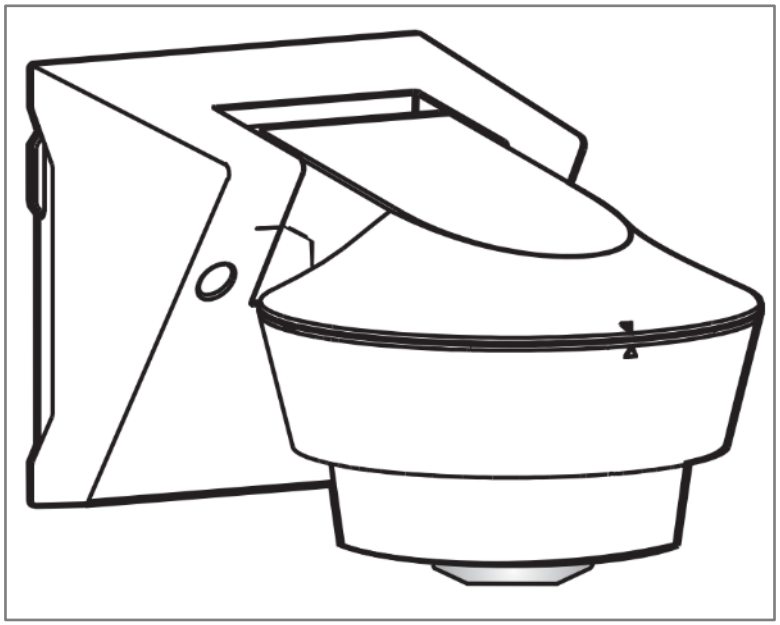
Application manual



Outdoor presence and movement sensor EK-DH4-TP

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1.0	**First issue**	**11/12/2019**	**G. Croci C.**	**G. Schiochet**
1.1	**Removed reference to CO 4 – Lux value**	**23/03/2023**	**G. Schiochet**	**C. Baldini**

1 Scope of the document

This application manual describes application details for the ekinex® presence and movement sensor **EK-DH4-TP**.

The document is aimed at the system configurator as a description and reference of device features and application programming. For installation, mechanical and electrical details of the device please refer to the technical description datasheet.

Application manual and application programs for ETS are available for download at www.ekinex.com.

Item	*File name (## = release)*	*Version*	*Device rel.*	*Update*
Technical datasheet	STEKDH4TP_IT.pdf	-	A1.0	11 Dic 2019
Application manual	MAEKDH4TP_IT.pdf	-		
Application program	APEKDH4TP##.knxprod	-		

You can access the most up-to-date version of the full documentation for the device using following QR codes:

EK-DH4-TP

2 Product description

The ekinex® presence and movement sensor **EK-DH4-TP** are wall / ceiling mount passive infrared (PIR) motion detectors, for the detection of movement / presence of people in outdoor environments in order to drive lighting and HVAC systems.

The detection area, which has a coverage angle of 360°, can be extended using other sensors configured as slave devices.

An integrated light sensor, combined with the motion detector, can manage light switching depending on brightness level as well as presence.

The device has two distinct output channels for lighting, with independent parameters; the operation can be automatic or semi automatic.

The device is also capable of maintaining a constant brightness level in the room by controlling a dimmable light source.

All of the above parameters can be set by the user either through ETS or by means of a dedicated IR remote during installation.

The device has two additional HVAC channels, which act in a similar way as the Light Control channels but without the standby time and light level dependence.

An additional alarm channel can switch the load on or off depending on the number of trigger events (movements) detected in a time frame of configurable duration.

3 Main features

- Semi-automatic or fully automatic operation
- Two independent Light control channels
- Two independent HVAC control channels
- One alarm channel
- An additional device can be used as slave for any of the channels
- Detection span of 360°, sectors can be masked through optical shields
- Adjustable Sensitivity, with "Walk test" to verify detection range
- Most parameters can be set from ETS or through an IR remote

4 Technical data

- Rated voltage: 24 Vdc (21 - 30 Vdc) supplied by KNX bus
- Current consumption (on KNX bus): max 10 mA (operation) / 5 mA (Standby)
- Detection range: 360° circular (maskable), up to 32m diameter at 2.5m mounting height
- Light measurement range: 10..2000 Lux
- Housing, lens and frame in plastic material
- Safety standards: IEC 61000-6-1 / IEC 61000-6-3 / EN 55014 / EN 50491
- Dimensions:
    - Body diameter Ø 90 mm
    - Body height (wall mount position) 79 mm
    - Body length (wall mount position) 150 mm
- Environmental conditions:
    - Operating temperature: - 20 ... + 50°C
    - Environmental protection: IP55 (Wall mount) / IP54 (ceiling mount)

5 Switching, display and detection elements

The device is equipped with:

- on the rear side, a programming pushbutton
- visible through the plastic lens, a blue programming LED, a red signalling LED, a PIR sensor, a brightness sensor and an IR receiver.

6 Operation

The sensor reacts to the thermal radiation emitted by moving bodies; the detection area is optically divided in small sections through a composite lens. A person walking in the detection area across the sections triggers the sensor.

6.1 Brightness measurement

The measurement of the room brightness is carried out by an integrated light sensor with linear output and optical filter set on the profile of the human eye.

6.2 Lighting control channels

The lighting channel has two operation modes, Automatic or Semi-automatic. The automatic mode controls both switch-on and switch-off; the semi-automatic mode only controls switch-off after a manual switch-on.

The lighting source can be controlled through two different types of communication objects: On-Off switch or Absolute dimming percentage.

In automatic mode, a load connected to a lighting channel will be switched on when movement is detected and (if desired) the ambient light level is below a preset brightness value.

When no movement has been detected for a programmable time duration, a stand-by phase can be entered, during which the light can be dimmed to a lower intensity; if no further movement is detected, once stand-by time has expired, the light will be automatically switched off.

Both the light level threshold and stand-by time functions can be disabled if not required.

6.3 Constant ambient brightness regulation

The internal brightness sensor can be used to maintain a constant ambient brightness if a dimmable light source is available. The light source must be capable of being controlled through a Relative dimming communication object.

6.4 HVAC control channels

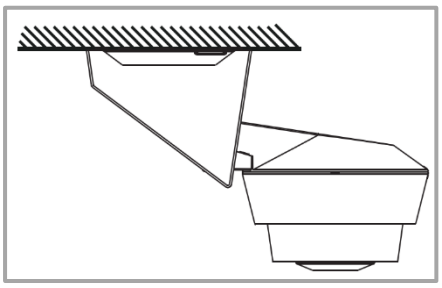
The HVAC channels act in a similar way as the Light Control channels, but without the standby time and the dependence from the light level.

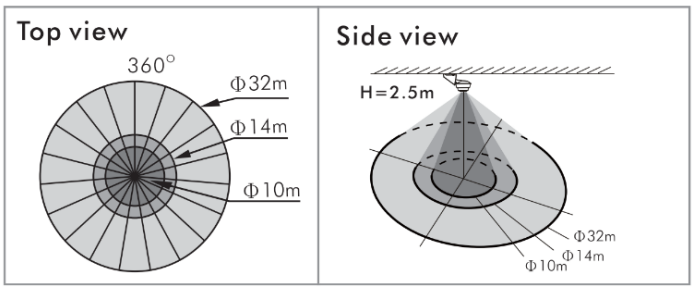
7 Positioning

The actual detection range of the sensors depends on the mounting height.

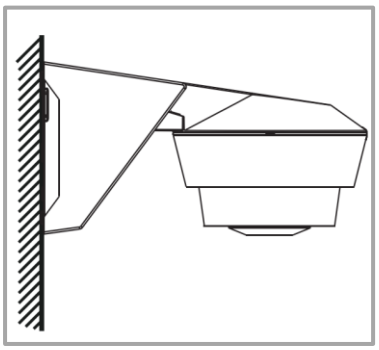
For the EK-DH4-TP sensor, at a standard mounting height of 2.5 m, presence detection range (for small movements) is about 10 to 14 meters of diameter, while movement detection range (person walking through the detection area) is about 32 meters of diameter.

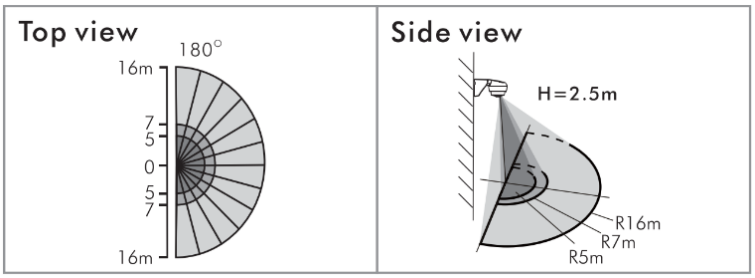
Ceiling mount



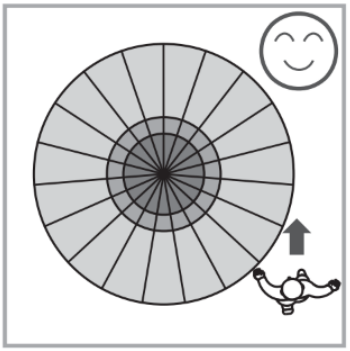


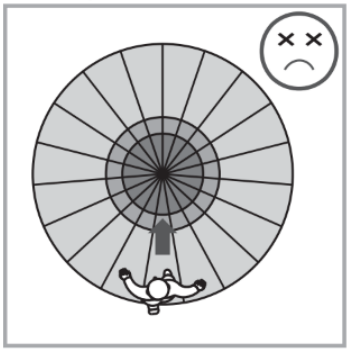
Wall mount





The optimal range is achieved walking through several portions of the detection area.





Since the detector responds to temperature change, be aware that following conditions may cause lower sensitivity:

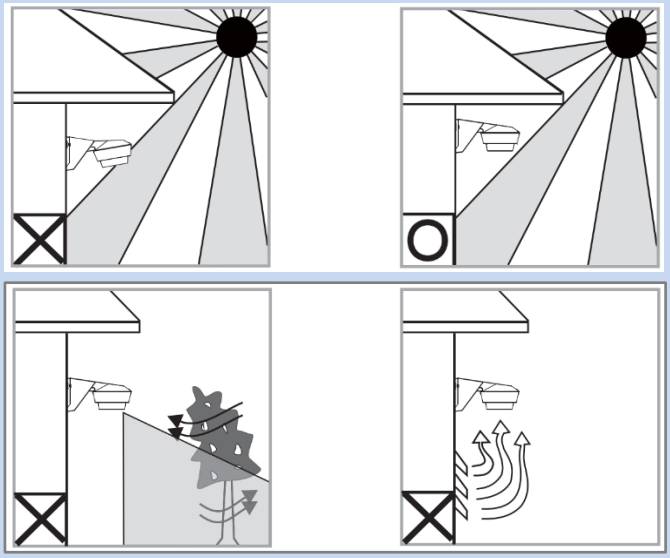
- In very foggy days, the sensitivity may be less due to moisture collecting on the lens.
- In very hot days, the sensitivity may be less since high ambient temperature is close to body temperature.
- In very cold days when heavy clothing is worn, especially if the facial area is covered, very little heat will be emitted from the body causing the unit to be less sensitive.

Please also verify following conditions during installation:

- Avoid pointing the detector toward objects with highly reflective surfaces,

such as mirrors, glass, etc.

- Avoid mounting the detector very close to heat sources, such as heating vents, air conditioners, lights, etc.
- Avoid pointing the detector toward objects which may sway in air currents, such as curtains, tall plants, etc.

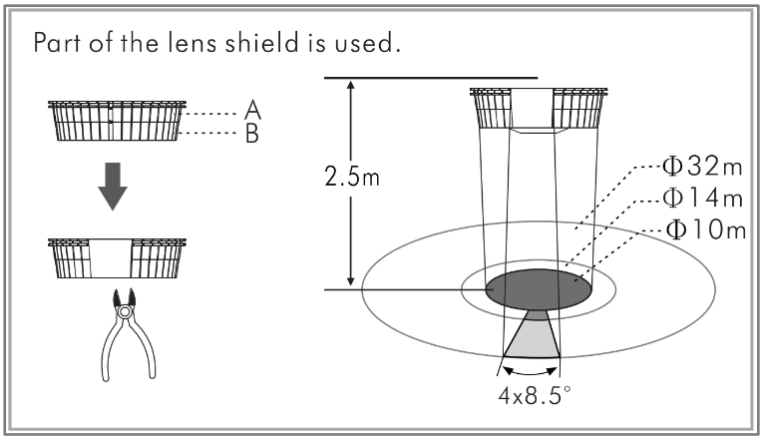


8 Limitation of the detection area

The detection area can be limited, in order to avoid unwanted activations, by means of the supplied optical shielding filters.

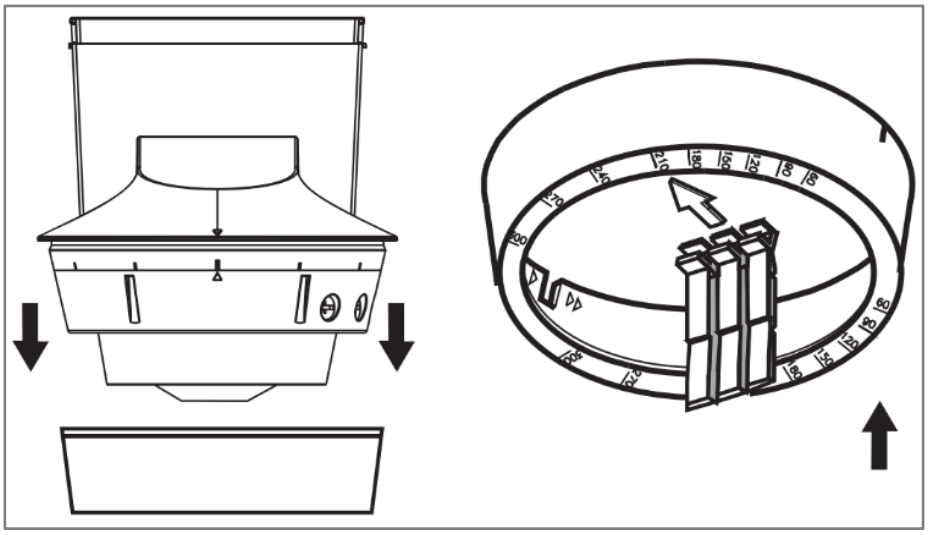
Cut the supplied shield to limit the detection area as in following figure.

The shield can be cut both in sections (for radial limitation) and in length (for range diameter limitation):



Section of shield applied	*Active range (h = 2.5m)*
Angular section	-8.5° per section
A + B	Ø 10 m
A	Ø 14 m
None	Ø 32 m

In order to apply the shield, first remove the decorative bezel from the body. Insert the clip of the shield section on the edge of the bezel, so that it extends below. Reapply the bezel making the shield cover part of the lens; the bezel secures the shield edge against the body.



When the device is installed in place, make sure that the shield is in the correct position according to the required area masking.

9 Installation

Warning! *The electrical connection of the device can be carried out only by qualified personnel. The incorrect installation may result in electric shock or fire. Before making the electrical connections, make sure the power supply has been turned off.*

Warning!

- *In order to supply the KNX bus lines use only KNX bus power supplies (e.g. ekinex EK-AB1- TP or EK-AG1-TP). The use of other power supplies can compromise the communication and damage the devices connected to the bus.*
- *The sensor is a low voltage circuit; never connect it with the 230V line network.*
- *Do not run the KNX wiring in the same conduit used by line network wiring.*

The device has degree of protection IP55 (Wall mount) / IP54 (Ceiling mount), and is therefore suitable for use in an outdoor environment.

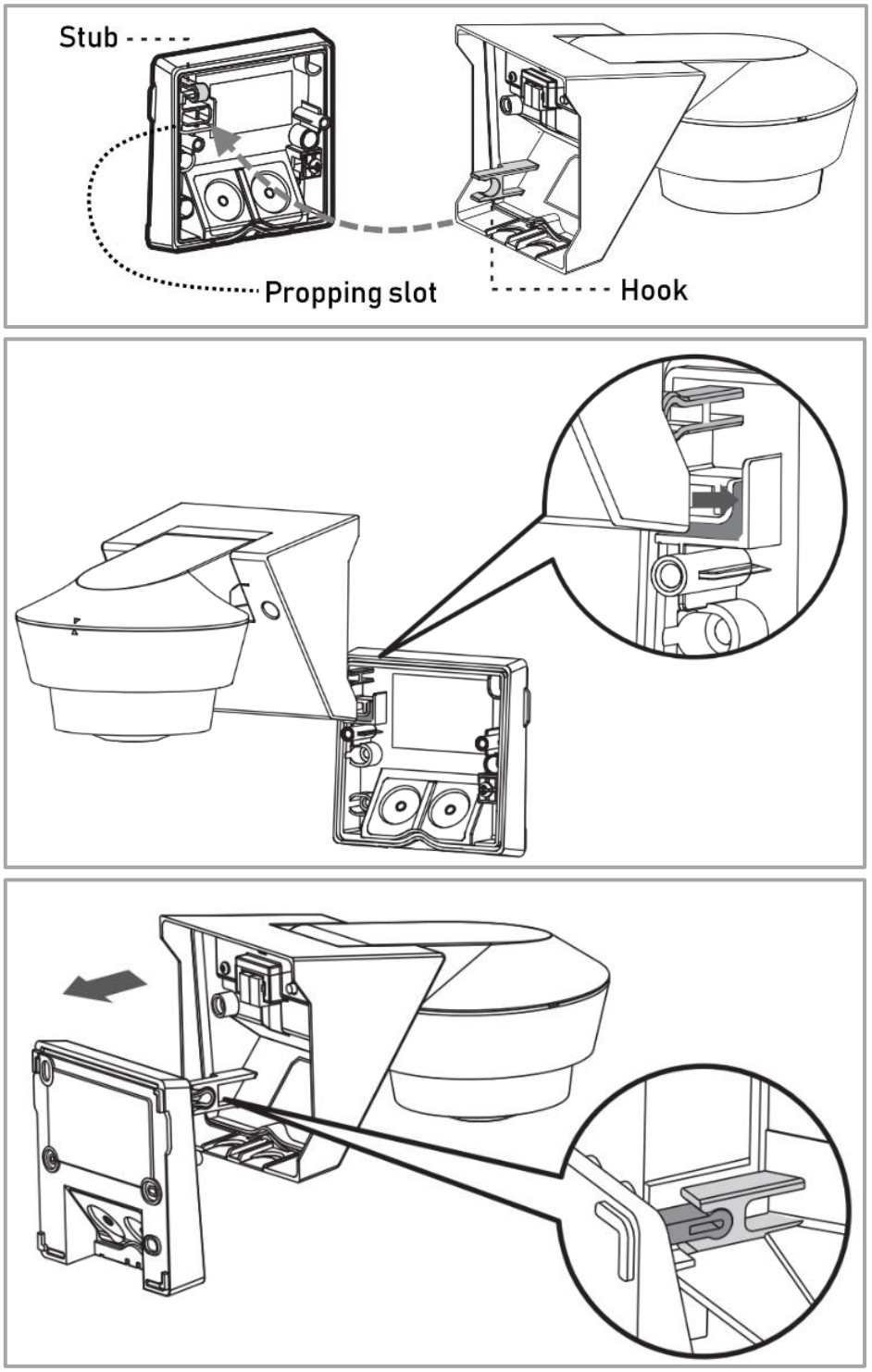
During the fixing of the base plate, until the wiring is connected and possibly the sensor is tested for accuracy and correct positioning, the device can be temporarily mounted by locking it on the baseplate through a plastic hook.

Once all adjustments have been made, the sensor can be eventually mounted on the base plate.

For application on inner or outer corners, a corner mounting support is available as an accessory.

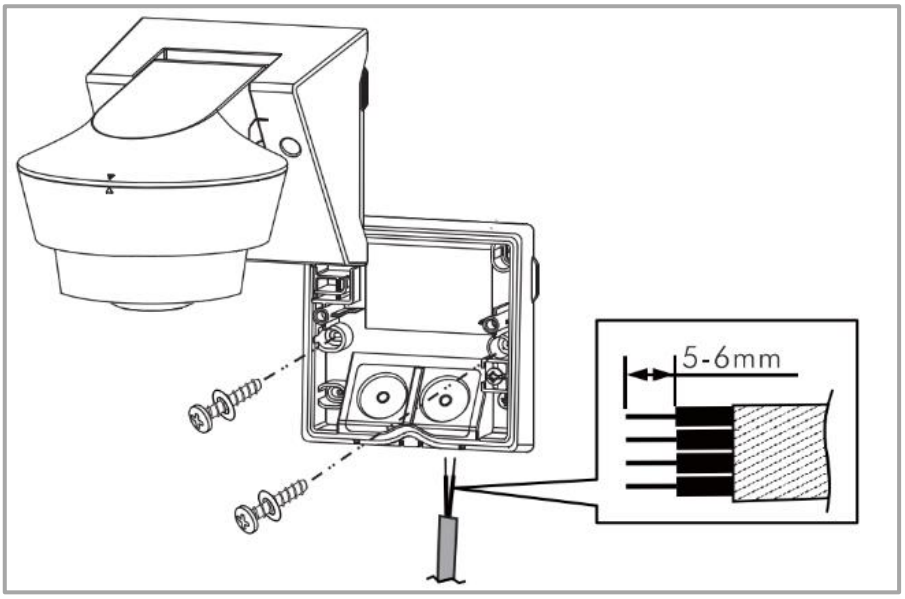
9.1 Installation procedure - Standard mount

Apply the device body to the base plate by means of the support hook:



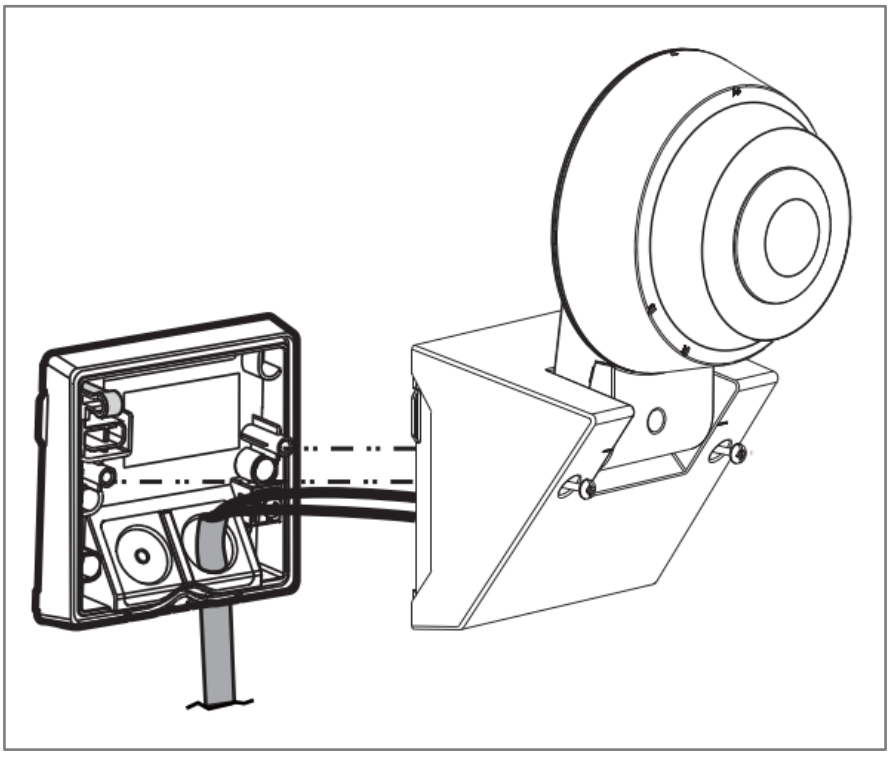
Mount the base plate on the wall / ceiling in the desired position by means of the supplied screw anchors.

Drive the incoming bus cable through the rubber perforation cable guides and connect the device.

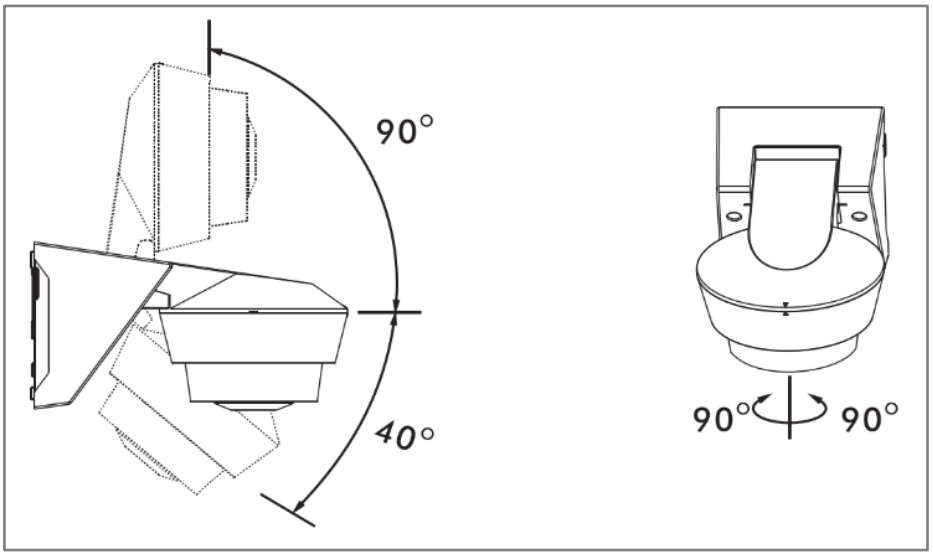


At this point it is recommended to carry out the commissioning of the device (see "Commissioning"), or at least the download of the physical address, using the programming button placed close to the bus connector; alternatively, programming mode can be activated later when the device is already installed by means of the EK-QR6-IR remote controller.

Fix the sensor body to the base plate securely through its own mounting screws and finally adjust the position of the sensor head.

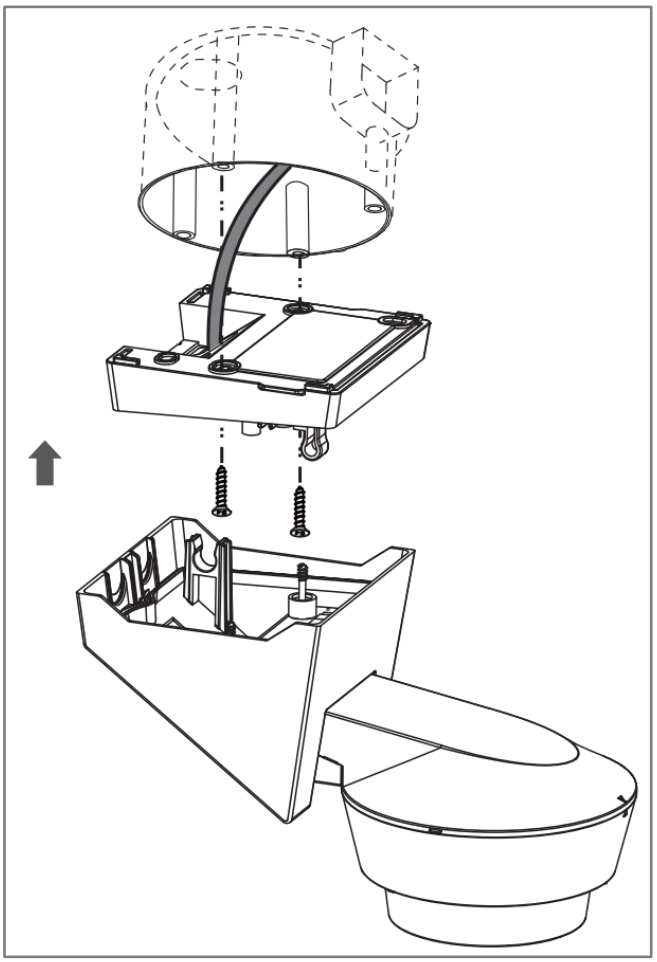


The sensor head can be adjusted up to 40° downward and 90° upward, and rotated horizontally max. 90° in either direction.



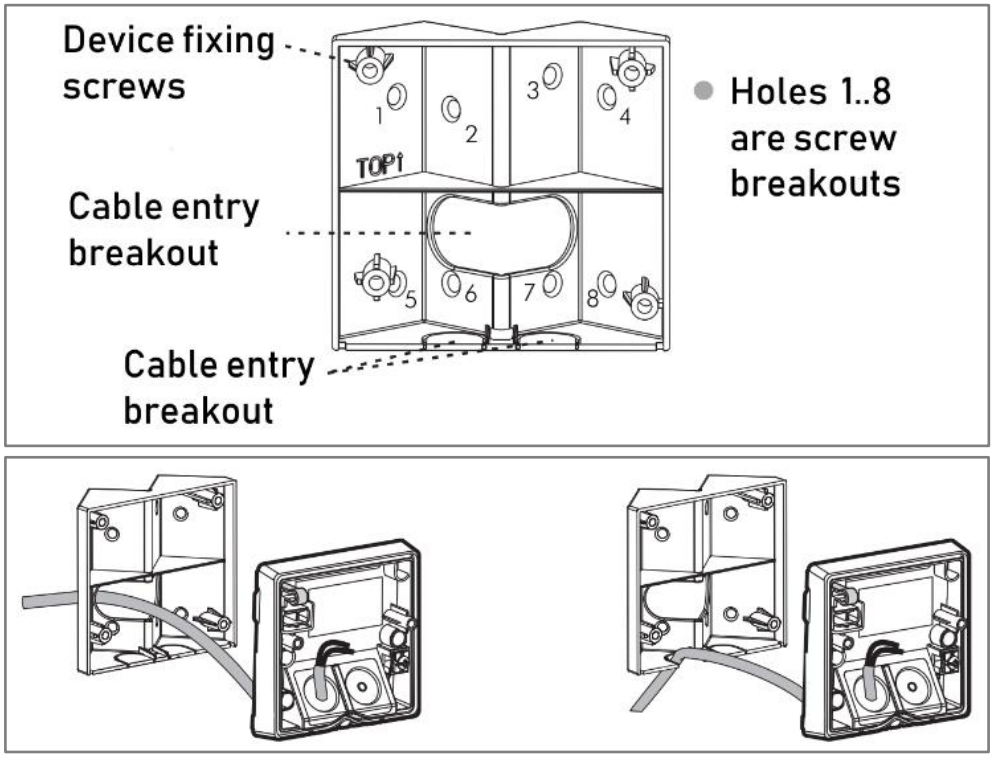
9.2 Installation procedure - European standard junction box

The standard base plate also fits the screw seats of a European standard junction box. In this case, the plate must be mounted by using two screws using the holes in the central position matching two diametrally opposite holes on the box.



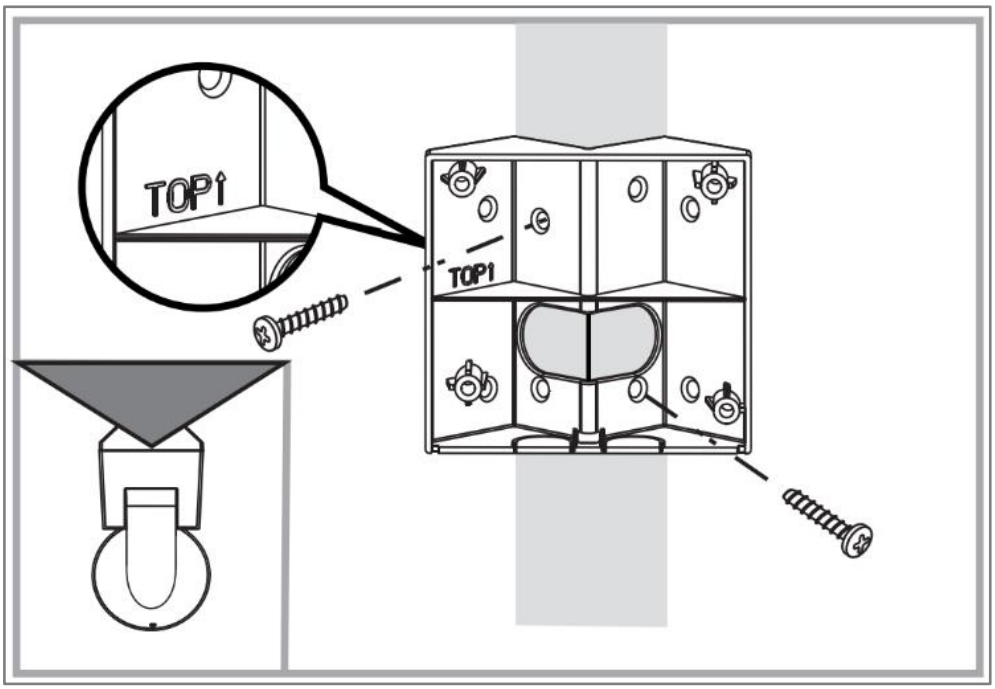
9.3 Installation procedure - Corner mount

The corner support is fitted with breakout entry holes for cables and fixing screws; identify the ones most suitable to your mounting position and pry the holes open.

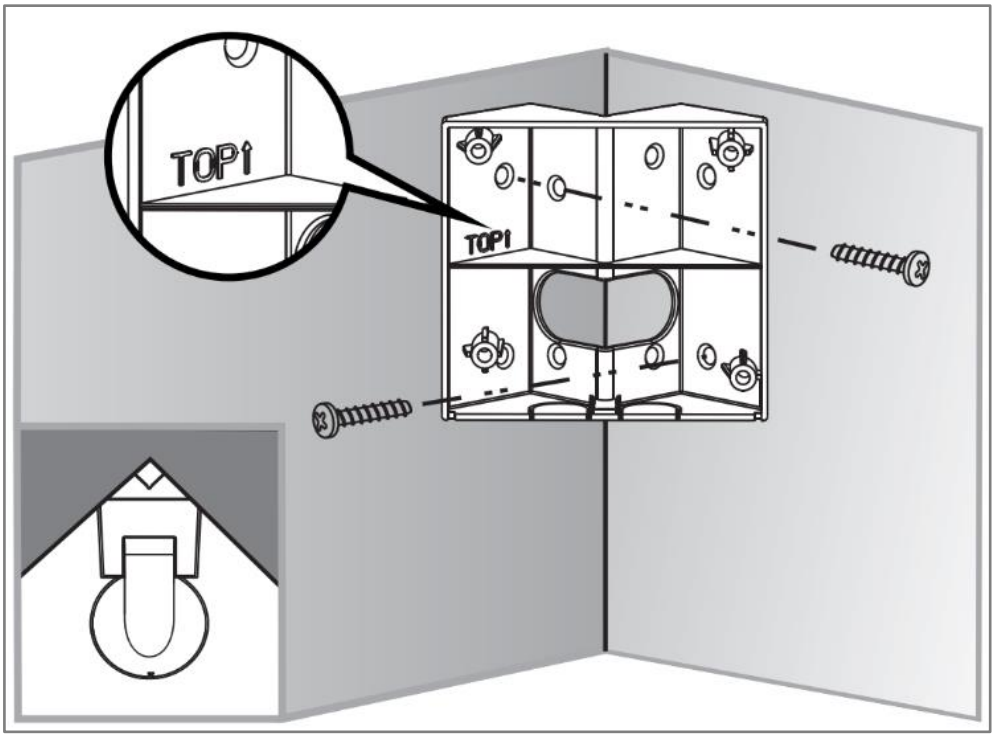


Fix the corner support on two sides either on an outer or inner corner.

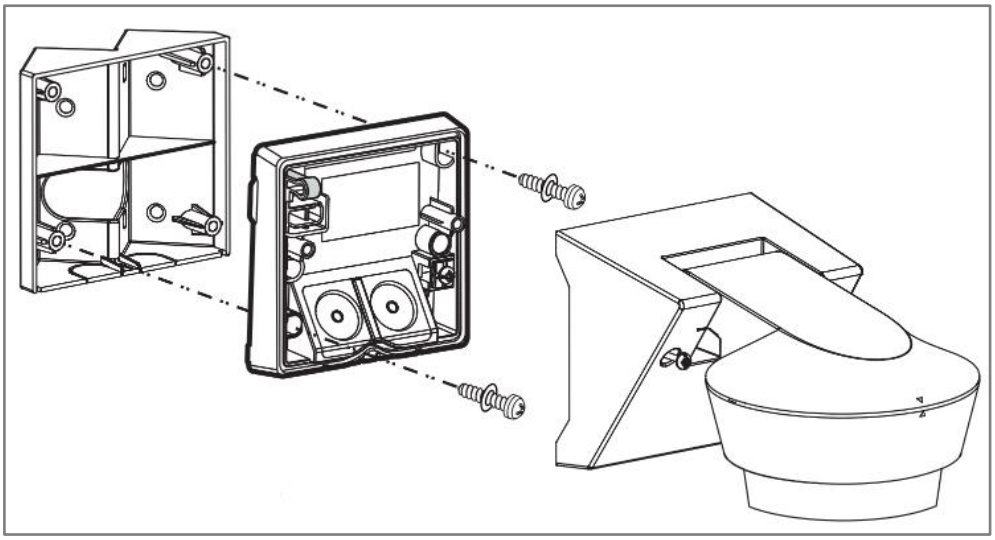
Outer corner mounting:



Inner corner mounting:



Fix the sensor body to the base plate securely through its own mounting screws and finally adjust the position of the sensor head.



10 Configuration and commissioning

Note: *The configuration and commissioning of KNX devices require specialized skills. To acquire these skills, you should attend the workshops at KNX certified training centers.*

Configuration and commissioning of the device require the use of the ETS® (Engineering Tool Software) program V4 or later releases. These activities must be carried out according to the design of the building automation system done by a qualified planner.

For the configuration of the device parameters the corresponding application program or the whole ekinex® product database must be loaded in the ETS program.

For detailed information on configuration options, refer to the application manual of the device available on the website www.ekinex.com.

Code	*Application program (## = release)*
EK-DH4-TP	APEKDH4TP##.knxprod

For the commissioning of the device the following activities are required:

- make the electrical connections as described above;
- turn on the bus power supply;
- switch the device operation to the programming mode by pressing the programming pushbutton; the blue programming LED (visible through the device lens) turns ON;
- download into the device the physical address and the configuration with the ETS program;
- at the end of the download, the operation of the device automatically returns to normal mode. During the programming process, the programming LED is turned off.

Now the bus device is programmed and ready for use.

IMPORTANT:

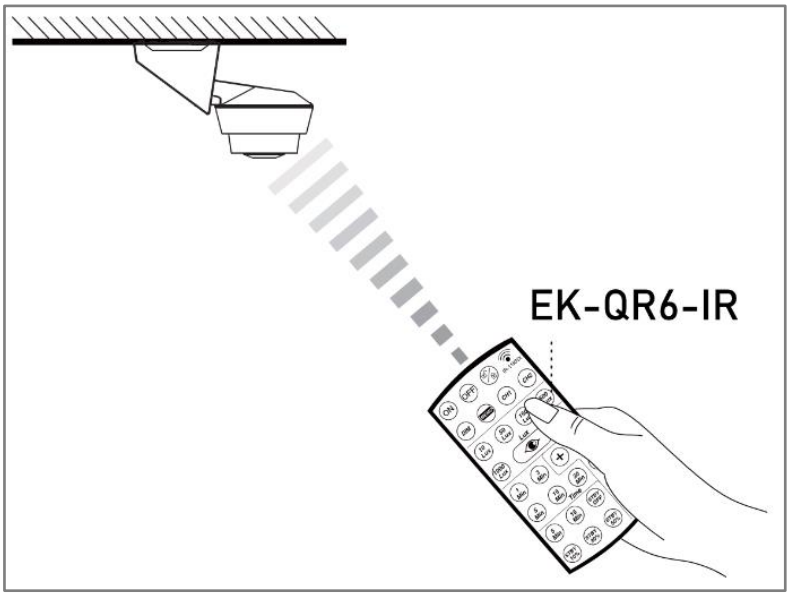
After a download, it takes approximately 60 s for the sensor to stabilize before it enters normal operation mode.

Both the light output channels and the red LED are steady ON during the warm-up phase, and they are switched OFF at the end.

During this settling period, the sensor may not appear to react or perform its programmed functions.

The programming pushbutton is placed on the rear side of the device, close to the KNX connector; it is therefore recommended to program at least the physical address before the device is installed on the ceiling. Once the physical address has been assigned, the device configuration can be later downloaded without pressing the programming pushbutton.

If a further activation of the programming button should become necessary, the device can be switched in programming mode through the IR remote (available separately).



11 Walk test

The purpose of the walk test is to select a proper location and verify the desired detection coverage. Lux setting value is not regarded during this process.

First of all, make sure the sensor is connected to the powered KNX bus and allow the 60 s warm-up time to pass.

Set the operating mode to “Test” via ETS or IR remote control EK-QR6-IR, then refer to the following steps:

- Walk from outside across to the detection pattern until red LED and load turn on for approx. 2s, then turn off again
- If required, adjust the sensitivity setting through ETS or IR remote to reach desired coverage.
- Also if required, adjust the time setting through ETS or IR remote to change the switch-off delay.
- Repeat the procedure in other selected radial directions, particularly if a shield is applied on the lens.
- Repeat the above steps until desired performance is achieved.

12 List of ETS parameters

The paramters available in ETS are the same for both types of sensor..

12.1 Menu: General

Parameter name	*Conditions*	*Values [Default]*
Device type		**Master** Slave
When the sensor is configured as master, all features are available; it can also receive the trigger signal from one or more slave sensors for only one of the 4 output channels available. *When the sensor is configured as slave, it can only be used to extend the field od dcoverage for a master sensor.*		
Input slave	Device type = Master	**Light output C1** Light output C2 HVAC output C3 HVAC output C4
Assign the signal from the slave to one of the device channels.		
Light control output C1	Device type = Master	**Disable** Enable
Enable the control channel and show the respective group of parameters.		
Light control output C2	Device type = Master	**Disable** Enable
Enable the control channel and show the respective group of parameters.		
HVAC output C3	Device type = Master	**Disable** Enable
Enable the control channel and show the respective group of parameters.		
HVAC output C4	Device type = Master	**Disable** Enable
Enable the control channel and show the respective group of parameters.		
Alarm function	Device type = Master	**Disable** Enable
Enable the alarm function and show the respective group of parameters.		

12.2 Menu: Motion sensors

Parameter name	*Conditions*	*Values [Default]*
External switch as ON / OFF / Dim input	Device type = Master	**No** Yes
If enabled, each channel can also be controlled from the KNX bus through communication objects #5-6-7-8. *For Light control channels, the CO (which is of 1-bit Switch type) also controls the dimming function.* *This pushbutton is required to switch those channels On for which semi-auto mode is selected.*		

Parameter name	*Conditions*	*Values [Default]*
Lux / Time / Sensitivity(Meter)/ STBY selected by	Device type = Master	**ETS** IR
Selects the source for the main device parameters: Brightness threshold, activation delay, sensitivity, standby delay. If the source is "ETS", the IR remote has no effect on these parameters. *This setting is only relevant for the two Light Control channels (C1-C2).*		
Test mode	Device type = Master	**Disable** Enable
If enabled, starts the test mode at the end of the download. Test mode automatically exits to normal operation after 10 min. or upon command from the IR remote.		
Sensor sensitivity		**Maximum** High Medium Low OFF
Used to increase or decrease the sensitivity of the PIR according to user's requirement. *This setting is available both for master and slave configurations.*		
LED turns on when PIR is triggered		Disable **Enable**
When enabled, the red LED will turn on for 1 s every time movement is detected. This indication can be suppressed; however, all other indication functions of the LED remain enabled.		

12.3 Menus: Light control output C1 / C2

Following parameters are repeated for each of the two Light Control channels C1 and C2.
Although not specified below, these options are only listed if the corresponding channels are active.

Parameter name	*Conditions*	*Values [Default]*
Auto / Semi-auto select	Device type = Master	**Auto** Semi-auto
The automatic mode controls both switch-on and switch-off; the semi-automatic mode only controls switch-off after a manual switch-on through the external control pushbutton.		
Output type	Device type = Master	**Switching** Dimming
Switching mode is used to control an On/Off actuator through a Switch-type object; in this mode, Standby function and Constant light control are not available. *Dimming mode controls a dimming-capable actuator through an Absolute dimming object (for the Standby function) and a Relative dimming object (for Constant light control).*		
Dimming value during ON phase	Device type = Master Output type = Dimming	1...100% **[100%]**
Sets the light output level when the channel is active.		
Constant light control	Device type = Master Output type = Dimming	**Disable** Enable
Enables light control for constant ambient brightness		

Parameter name	*Conditions*	*Values [Default]*
Preset setpoint	Device type = Master Output type = Dimming Constant light control = enable	10...2000 Lux **[300 Lux]**
Sets target value for constant ambient brightness		
Lux deviation	Device type = Master Output type = Dimming Constant light control = enable	0...255 Lux **[10 Lux]**
Allowed deviation from target value (plus or minus) for constant ambient brightness		
Time after switch-on until constant light control starts	Device type = Master Output type = Dimming Constant light control = enable	1 s ... 5 min **[1 min]**
After switching the light On, a time period might be necessary for the light to warm up or reach a stable condition before brightness regulation starts.		
Switch ON Lux value	Device type = Master Lux / Time etc. selected by = ETS	5...2000 Lux **[2000 Lux]**, Infinity
Sets the reference brightness for the sensor light level threshold. *The "Infinity" value disables the threshold, i.e. makes detection independent from light level.*		
Lighting delay time	Device type = Master Lux / Time etc. selected by = ETS	5 s...60 min **[5 min]**
Sets the delay before the output is switched off (or to standby level, if enabled) in absence of detected movement.		
Lighting standby time	Device type = Master Lux / Time etc. selected by = ETS	**Disable** Enable
Enables the standby phase before the output is switched off in absence of detected movement.		
Standby time	Device type = Master Lux / Time etc. selected by = ETS Lighting standby time = enabled	30 s...60 min **[5 min]**
Duration of the Standby phase		
Standby brightness	Device type = Master Lux / Time etc. selected by = ETS Lighting standby time = enabled	1...60% **[10%]**
Light brightness level during the Standby phase		

12.4 Menus: HVAC control output C3 / C4

Following parameters are repeated for each of the two HVAC Control channels C3 and C4.
Although not specified below, these options are only listed if the corresponding channels are active.

Parameter name	*Conditions*	*Values [Default]*
Auto / Semi-auto select	Device type = Master	**Auto** Semi-auto
The automatic mode controls both switch-on and switch-off; the semi-automatic mode only controls switch-off after a manual switch-on through the external control pushbutton.		
HVAC switch-'ON' delay	Device type = Master	0...30 min **[1 min]**

Parameter name	*Conditions*	*Values [Default]*
Sets the delay before the output is switched ON whenever movement is detected; this is required to prevent immediate activation when a person is present in the coverage area for just a brief period of time.		
HVAC delay time	Device type = Master	5 s...60 min **[5 min]**
Sets the delay before the output is switched OFF whenever movement is no longer detected.		
Behaviour at switching on lock by communication object	Device type = Master	**No reaction** Switch off Switch on
Value used as output when movement / presence is detected and confirmed.		
Behaviour at switching off lock by communication object	Device type = Master	**No reaction** Switch off Switch on
Value used as output when absence of movement / presence is detected and confirmed.		

12.5 Menus: Alarm function

Although not specified below, these options are only listed if the alarm function is active.

Parameter name	*Conditions*	*Values [Default]*
Duration of one switch-on window	Device type = Master	0.5 s...60 min **[0.5 s]**
Duration of the period in which the specified number of movements (see next parameter) must occur in order to cause the alarm to be switched ON		
Number of switch-on windows	Device type = Master	0...100 min **[10]**
Number of movements in the specified period (see previous parameter) that cause the alarm to be switched ON		
Duration of one switch-off window	Device type = Master	0.5 s...60 min **[0.5 s]**
Duration of the period in which the specified number of movements (see next parameter) must occur in order to cause the alarm to be switched OFF		
Number of switch-off windows	Device type = Master	0...100 min **[10]**
Number of movements in the specified period (see previous parameter) that cause the alarm to be switched OFF		
Behaviour at switching on lock by communication object	Device type = Master	**No reaction** Switch off Switch on
Value used as output when the alarm status is switched to ON.		
Behaviour at switching off lock by communication object	Device type = Master	**No reaction** Switch off Switch on
Value used as output when the alarm status is switched to OFF.		

13 Elenco oggetti di comunicazione ETS

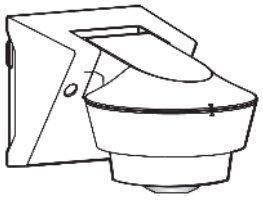
CO number	Object name	Conditions	Size	Flags	DPT
1	Slave input - Slave motion	Device type = Master	1 bit	C-W--	[1.017] Trigger
2	Slave output - Slave motion	Device type = Slave	1 bit	CR-T-	[1.001] Switch
3	Test output	Device type = Master	1 bit	CR-T-	[1.001] Switch
4	C1 Manual Input	Device type = Master External Switch = Yes Light Control Output C1 = enabled	1 bit	C-W--	[1.001] Switch
5	C2 Manual Input	Device type = Master External Switch = Yes Light Control Output C2 = enabled	1 bit	C-W--	[1.001] Switch
6	C3 Manual Input	Device type = Master External Switch = Yes HVAC Output C3 = enabled	1 bit	C-W--	[1.001] Switch
7	C4 Manual Input	Device type = Master External Switch = Yes HVAC Output C4 = enabled	1 bit	C-W--	[1.001] Switch
8	C1 Light Control Output	Device type = Master Light Control Output C1 = enabled	1 bit	CR-T-	[1.001] Switch
9	C1 Light Control Dimming value	Device type = Master Light Control Output C1 = enabled	1 byte	CR-T-	[5.001] Percentage (0..100%)
10	C1 Constant Light Control	Device type = Master Light Control Output C1 = enabled	4 bit	CR-T-	[3.007] Dimming control
11	C2 Light Control Output	Device type = Master Light Control Output C2 = enabled	1 bit	CR-T-	[1.001] Switch
12	C2 Light Control Dimming value	Device type = Master Light Control Output C2 = enabled	1 byte	CR-T-	[5.001] Percentage (0..100%)
13	C2 Constant Light Control	Device type = Master Light Control Output C2 = enabled	4 bit	CR-T-	[3.007] Dimming control
14	C3 HVAC Control Output	Device type = Master HVAC Output C3 = enabled	1 bit	CR-T-	[1.001] Switch
15	C4 HVAC Control Output	Device type = Master HVAC Output C4 = enabled	1 bit	CR-T-	[1.001] Switch

16	Lock Alarm	Device type = Master Alarm function = enabled	1 bit	C-W--	[1.003] Enable
17	Alarm Output	Device type = Master Alarm function = enabled	1 bit	CR-T-	[1.005] Alarm

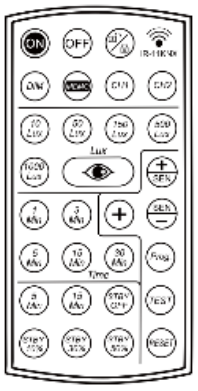
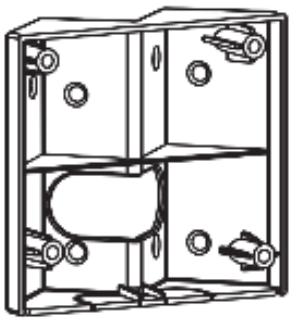
14 Troubleshooting

Lighting / HVAC output does not turn on	Sensor is not powered.	Verify the KNX bus connection
	Incorrect wiring	Refer to wiring diagram for correct connection
	Incorrect Lux setting.	Check if Lux is set to the correct value
	Unable to detect movement	Check detection range setting
Lighting / HVAC output does not turn off	Auto off time is set too long	Set auto off time to a shorter time and check if the load is or not switched off according to the pre-set delay off time
	Sensor is triggered	Keep away from the detection range to avoid activating the sensor while doing the test
Red LED does not turn on	Sensor is not set to Test mode	Activate test mode
	Detection range exceeded	Walk in the effective detection range
	LED indicating function is set to “Disable”.	Set the LED indicating function to “Enable” via ETS software
	The sensor has an incorrectly positioned shield	Check the positioning of the optical shield on the lens
Erratic trigger events	Sources of heat may affect the sensor	Verify that the sensor is not aimed towards any heat source such as air conditionings, electric fans, heaters etc.
	Reflective surfaces are reflecting radiation from heat sources toward the sensor	Verify that the sensor is not aimed towards any highly reflective surfaces
	There are moving objects in the detection area	Make sure there are no swaying or moving objects within the detection coverage

15 Package contents

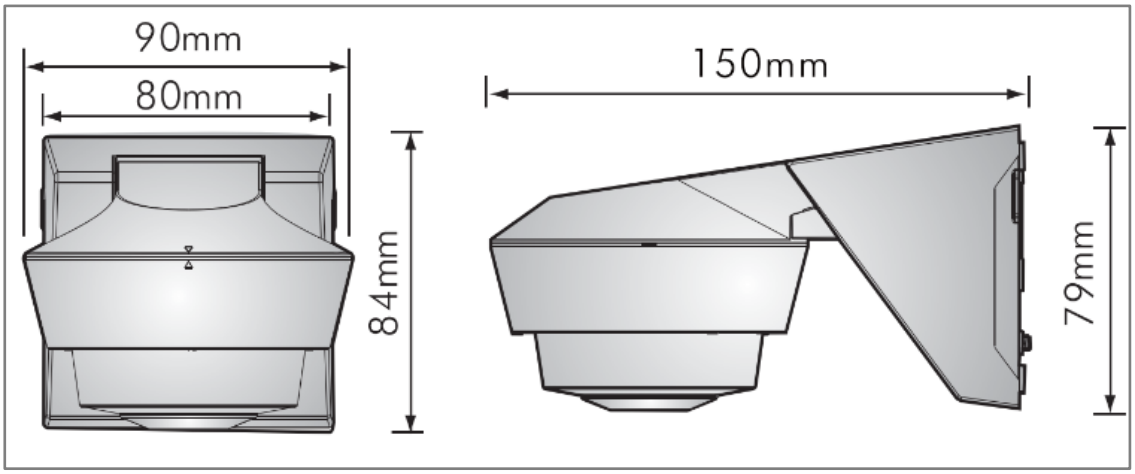
		
EK-DH4-TP Sensor	Lens shield	Instruction sheet

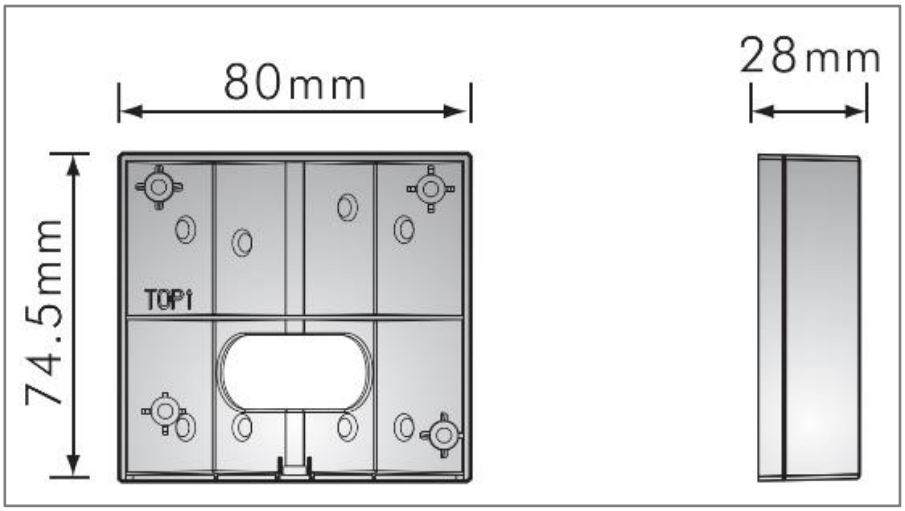
16 Optional accessories

	
EK-QR6-IR IR remote controller	EK-QS3 Support for external mounting

17 Dimensions

Dimensions in the pictures are in mm.





18 Markings

- KNX
- CE: the device complies with the Low Voltage Directive (2006/95/EC) and the Electromagnetic Compatibility Directive (2004/108/EC).
  Tests carried out according to following regulations:
  - EN 61000-3-2
  - EN 61000-3-3
  - IEC/EN 61000-6-1
  - IEC/EN 61000-6-3
  - EN 55014
  - EN 50491

19 Maintenance

The device is maintenance-free. To clean it, use only a dry cloth; avoid the use of detergents, solvents or other aggressive substances, particularly on the lens.

20 Disposal

At the end of its useful life the product described in this datasheet is classified as waste from electronic equipment in accordance with the European Directive 2002/96/EC (WEEE), and cannot be disposed together with the municipal undifferentiated solid waste.

Warning: *Incorrect disposal of this product may cause serious damage to the environment and human health.*

Please be informed about the correct disposal procedures for waste collecting and processing provided by local authorities.

21 General warnings

- Installation, electrical connection, configuration and commissioning of the device can only be carried out by qualified personnel in compliance with the applicable technical standards and laws of the respective countries.
- In case of tampering, the compliance with the essential requirements of the applicable directives, for which the device has been certified, is no longer guaranteed.
- ekinex® KNX defective devices must be returned to the manufacturer at the following address: EKINEX S.p.A. Via Novara 37, I-28010 Vaprio d'Agogna (NO) Italy

22 Other information

This datasheet is aimed at installers, system integrators and planners

For further information on the product, please contact the ekinex® technical support at the e-mail address: support@ekinex.com or visit the website www.ekinex.com.

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