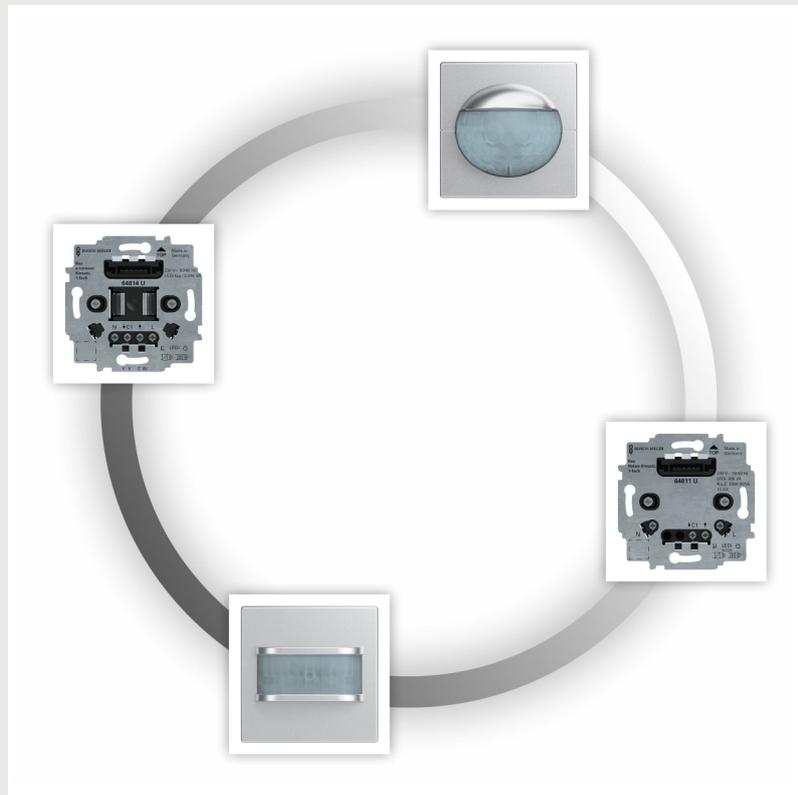


Product manual | 27.08.2021

# Busch-Watchdog

## ABB flexTronics



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# 1 Notes on the instruction manual

Please read through this manual carefully and observe the information it contains. This will assist you in preventing injuries and damage to property, and ensure both reliable operation and a long service life for the device.

Please keep this manual in a safe place.

If you pass the device on, also pass on this manual along with it.

ABB accepts no liability for any failure to observe the instructions in this manual.

If you require additional information or have questions about the device, please contact ABB or visit our Internet site at:

[www.BUSCH-JAEGER.com](http://www.BUSCH-JAEGER.com)

## 2 Safety

The device has been constructed according to the latest valid regulations governing technology and is operationally reliable. It has been tested and left the factory in a technically safe and reliable state.

However, residual hazards remain. Read and adhere to the safety instructions to prevent hazards of this kind.

ABB accepts no liability for any failure to observe the safety instructions.

### 2.1 Information and symbols used

The following Instructions point to particular hazards involved in the use of the device or provide practical instructions:



#### **Danger**

Risk of death / serious damage to health

- The respective warning symbol in connection with the signal word "Danger" indicates an imminently threatening danger which leads to death or serious (irreversible) injuries.



#### **Warning**

Serious damage to health

- The respective warning symbol in connection with the signal word "Warning" indicates a threatening danger which can lead to death or serious (irreversible) injuries.



#### **Caution**

Damage to health

- The respective warning symbol in connection with the signal word "Caution" indicates a danger which can lead to minor (reversible) injuries.



#### **Attention**

Damage to property

- This symbol in connection with the signal word "Attention" indicates a situation which could cause damage to the product itself or to objects in its surroundings.



#### **NOTE**

This symbol in connection with the word "Note" indicates useful tips and recommendations for the efficient handling of the product.

The following safety symbols are used in the operating manual:



This symbol alerts to electric voltage.

## 2.2 Intended use

The flex device combinations for movement detectors are used for switching lighting systems in dependence of brightness and/or movement. It is designed only for interior areas of buildings and for wall mounting.

The flex device combinations for movement detectors are not suitable for use as an intrusion or attack alarm since they lack the required security against sabotage in accordance with the German VdS (Authority on Safety and Security) regulations.

## 2.3 Improper use

Each use not listed in Chapter 2.2 "Intended use" on page 6 is deemed improper use and can lead to personal injury and damage to property.

ABB is not liable for damages caused by use deemed contrary to the intended use of the device. The associated risk is borne exclusively by the user/operator.

The device is not intended for the following:

- Unauthorized structural changes
- Repairs

## 2.4 Target group / Qualifications of personnel

### 2.4.1 Operation

No special qualifications are needed to operate the device.

### 2.4.2 Installation, commissioning and maintenance

Installation, commissioning and maintenance of the device must only be carried out by trained and properly qualified electrical installers.

The electrical installer must have read and understood the manual and follow the instructions provided.

The electrical installer must adhere to the valid national regulations in his/her country governing the installation, functional test, repair and maintenance of electrical products.

The electrical installer must be familiar with and correctly apply the "five safety rules" (DIN VDE 0105, EN 50110):

1. Disconnect
2. Secure against being re-connected
3. Ensure there is no voltage
4. Connect to earth and short-circuit
5. Cover or barricade adjacent live parts

## 2.5 Safety instructions



### **Danger - Electric voltage!**

Electric voltage! Risk of death and fire due to electric voltage of 100 ... 240 V. Dangerous currents flow through the body when coming into direct or indirect contact with live components. This can result in electric shock, burns or even death.

- Work on the 100 ... 240 V supply system may only be performed by authorised and qualified electricians.
- Disconnect the mains power supply before installation / disassembly.
- Never use the device with damaged connecting cables.
- Do not open covers firmly bolted to the housing of the device.
- Use the device only in a technically faultless state.
- Do not make changes to or perform repairs on the device, on its components or its accessories.
- Keep the device away from water and wet surroundings.



### **Caution! - Risk of damaging the device due to external factors!**

Moisture and contamination can damage the device.

- Protect the device against humidity, dirt and damage during transport, storage and operation.

## 3 Information on protection of the environment

### 3.1 Environment



#### **Consider the protection of the environment!**

Used electric and electronic devices must not be disposed of with domestic waste.

- The device contains valuable raw materials which can be recycled. Therefore, dispose of the device at the appropriate collecting depot.

All packaging materials and devices bear the markings and test seals for proper disposal. Always dispose of the packaging material and electric devices and their components via the authorized collecting depots and disposal companies.

The products meet the legal requirements, in particular the laws governing electronic and electrical devices and the REACH ordinance.

(EU Directive 2012/19/EU WEEE and 2011/65/EU RoHS)

(EU REACH ordinance and law for the implementation of the ordinance (EC) No.1907/2006).

## 4 Overview

### 4.1 Design lines

This system manual serves for the technical planning of the simple to complex installations of movement detectors.

The different design lines of the device groups and devices are not listed in this system manual. The sections for the design line are marked with a "xxx" at the article numbers of the respective devices.

Please obtain the desired current design versions and the corresponding complete article numbers as well as the order numbers from the respective product catalogues or the online catalogue at <https://busch-jaeger-catalogue.com>.

### 4.2 Basic principles

Information about basic functions and principles of operation of the devices are available at Chapter 12 "Information about planning and application" on page 49.

## 5 Overview of product range

### 5.1 Applications

Lighting systems can be controlled intelligently, according to need, with movement detectors.

The choice of the right device depends on the type of rooms, the size of the area to be monitored, the installation situation and the type of movement to be detected. In rooms that are entered by people, other detection situations than, for example, in stairwells are used.

In addition to the detection situations, the devices are different with regard to the operating technology.

### 5.2 Compatibility

The movement detectors from product group ABB flexTronics are **not** compatible with movement detectors of the following series:

- Busch-Watchdog 180 flush-mounted standard sensor
- Busch-Watchdog 180 flush-mounted sensor, Comfort II
- Flush-mounted inserts with the 6-pin round interface, such as:
  - Busch-Universal relay switch insert 6401 U-102-500
  - Busch-Universal 2-gang 1-way insert 6402 U-500
  - Busch-Watchdog MOS FET insert 6804 U-101-500
  - Busch-Watchdog Relay insert 6812 U-101-500
  - Busch-Watchdog Extension unit insert 6805 U-50x

The movement detectors from product group ABB flexTronics can therefore **not** be integrated into installations with movement detectors of the following series:

- Busch-Watchdog 180 flush-mounted standard sensor
- Busch-Watchdog 180 flush-mounted sensor, Comfort II

### 5.3 ABB flexTronics Movement detectors

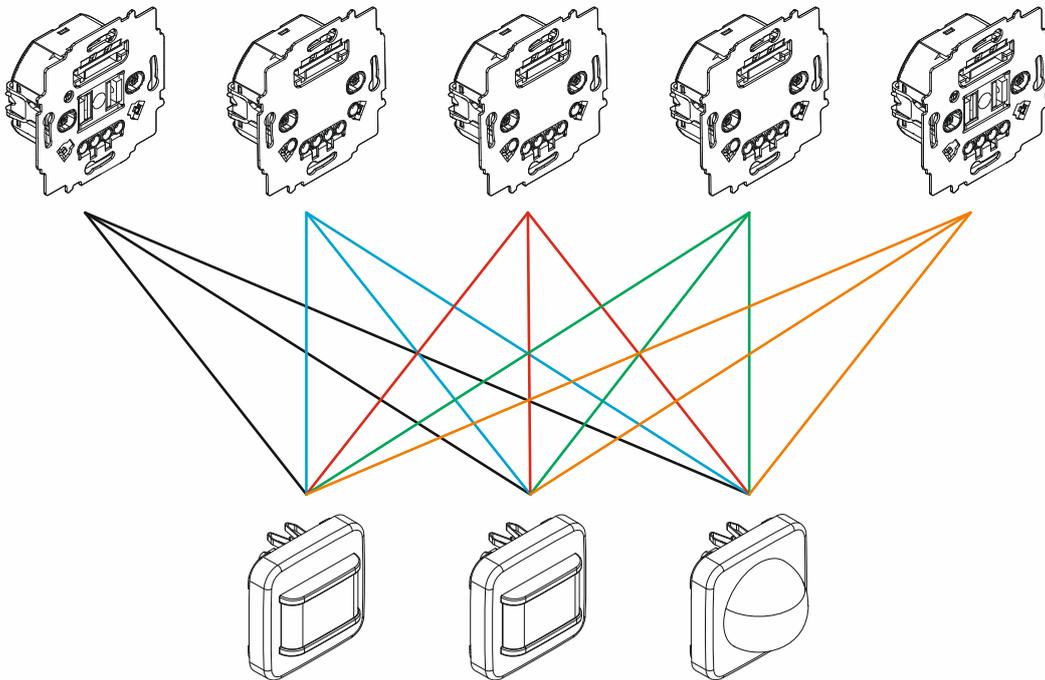


Fig. 1: ABB flexTronics Movement detector

ABB flexTronics devices have a modular design. The sensor and the actuator are isolated from each other.

- The desired function of the mounted movement detector is determined from the combination of the actuator and sensor used.
- The mounted movement detector is operated by means of the sensor.

The interfaces between the sensors and the actuators are standardised.

- One sensor can be combined with all actuators.
- One actuator can be combined with all sensors.

In this way, all available actuators, sensors, switches, etc. of the ABB flexTronics devices can be combined with each other in a purely physical manner. This does not always makes sense, however.

This product manual provides information about the useful combinations for the implementation of movement detectors for light control.

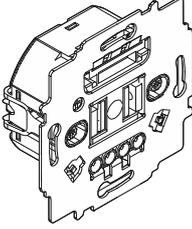
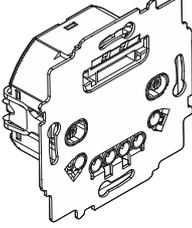
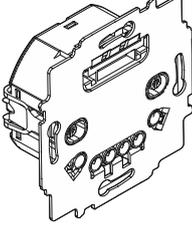
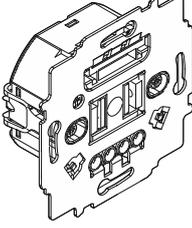
## 5.4 Device overview

In the following you will find an overview of actuators, sensors and control elements for the implementation of lighting control with movement detectors.

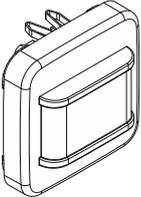
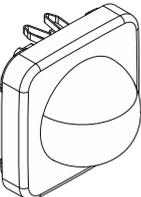
The brief descriptions of the characteristics provide an initial orientation. For a detailed overview of the characteristics and use cases of the devices:

- Characteristics (device functions): see chapter 6 “Device Functions“ on page 16
- Use cases: see chapter 12.2 “Case studies“ on page 55

The following actuator variants are available for combining movement detectors:

	<p>E-contact</p> <p>64814 U-500 e-contact insert flex, 1-gang</p>	<p>Residential applications and legacy installations in locations where an N-busbar is not available.</p> <ul style="list-style-type: none"> <li>– Noiseless switching of lighting systems.</li> <li>– 2-wire connection (neutral busbar is not required, but can be connected as an option)</li> </ul>
	<p>64811 U-500 Relay insert flex, 1 gang</p> <p>64821 U-500 Relay insert flex, 2 gang</p>	<p>For all popular applications</p> <ul style="list-style-type: none"> <li>– Switching of lighting systems.</li> </ul>
	<p>64891 U-500 Extension unit insert flex</p>	<p>For all popular applications</p> <ul style="list-style-type: none"> <li>– Expansion of the coverage and the detection range.</li> <li>– Setup of extension operation.</li> </ul>
	<p>Dimmer</p> <p>64851 U-500 LED dimmer insert flex, 1gang</p>	<p>For all popular applications</p> <ul style="list-style-type: none"> <li>– The device is used for switching and/or dimming lighting systems.</li> </ul>

The following sensor variants are available for combining movement detectors:

	<p>Basic</p> <p>64761-xxx-500 Busch-Watchdog 180 flex, Basic sensor with select lens</p>	<p>Applications in rooms</p> <ul style="list-style-type: none"> <li>- Switching of lighting systems in dependence of brightness and/or movement.</li> </ul>
	<p>Comfort</p> <p>64762-xxx-500 Busch-Watchdog 180 flex, Comfort sensor with select lens</p>	<p>Applications in rooms</p> <ul style="list-style-type: none"> <li>- Switching of lighting systems in dependence of brightness and/or movement.</li> <li>- Additional local operation via switching rocker with selectable switch-off prewarning for use in public stairwells.</li> </ul>
	<p>Comfort multilens</p> <p>64764-xxx-500 Busch-Watchdog 180 flex, Comfort sensor with multi-lens</p>	<p>Applications in stairwells</p> <ul style="list-style-type: none"> <li>- Switching of lighting systems in dependence of brightness and/or movement.</li> <li>- Additional local operation via switching rocker with selectable switch-off prewarning for use in public stairwells.</li> <li>- Also suitable for mounting heights of 2.2 m.</li> </ul>

#### 5.4.1 Mounting possibilities

The wall mounting / ceiling mounting of the flush-mounted inserts takes place in a standard flush-mounted box or device box. The following mounting situations are possible, for example:

##### Wall mounting

- Stone walls
- Plaster walls
- Hollow walls
- Insulated walls

The devices are not suitable for:

- Purely surface mounting

If a flush-mounted installation is not desired or not possible, the flush-mounted inserts can also be mounted in surface-mounted housings for flush-mounted inserts.

## 5.5 Setting options / control

Depending on the device, the following methods for setting or configuration are available. When used as an extension unit, only the brightness switching threshold is set. The main units are used to control the switch-off delay.

### Trimmers on the sensors

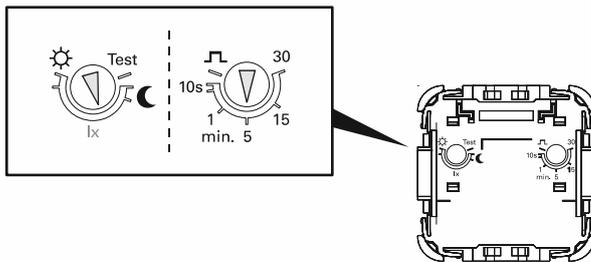


Fig. 2: Setting via trimmers: sensors

The trimmers for setting devices are located on the rear side of the sensors.

- To set devices using the trimmers: see chapter 10.2 “Device settings of settings“ on page 41

### Setup via the rocker buttons on the sensors

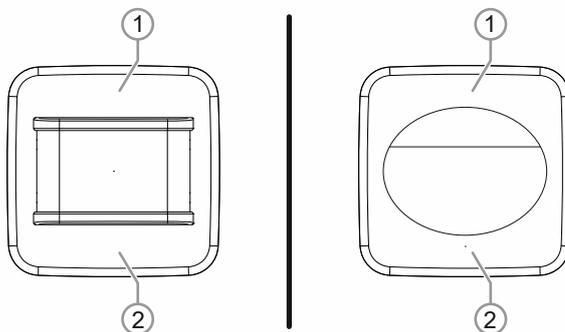


Fig. 3: Setting via rocker buttons: sensors

Available on the devices:

- Busch-Watchdog 180 flex, Comfort sensor with select lens
- Busch-Watchdog 180 flex, Comfort sensor with multi-lens

The rocker buttons [1] / [2] are used to set the switch-off prewarning and the memory function.

- For setting the special functions via the rocker buttons: see chapter 10.4 “Special functions of the comfort sensors“ on page 44.

**Trimmers on the flush-mounted inserts (only in the case of dimmers)**

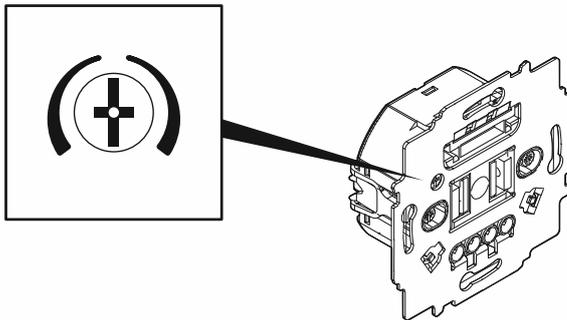


Fig. 4: Setting via trimmers: flush-mounted insert of dimmer

On the front of the flush-mounted insert, there is a trimmer for setting the operating mode and the minimum brightness.

- see chapter 10.5 “Device settings of the dimmer“ on page 46.

## 6 Device Functions

### 6.1 Overview of functions

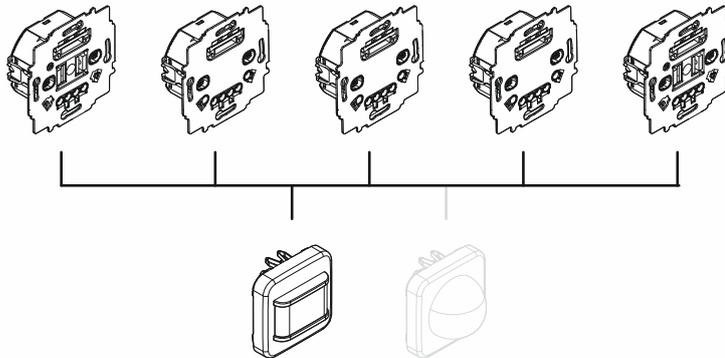


Fig. 5: 180 flex, Basic sensor with select lens: Functions in combination with flush-mounted inserts

**64761-xxx-500 180 flex, Basic sensor with select lens**  
**Functions in combination with:**

	<b>64814 U-500 e-contact insert flex, 1-gang</b>	<b>64811 U-500 Relay insert flex, 1 gang</b>	<b>64821 U-500 Relay insert flex, 2 gang</b>	<b>64891 U-500 Extension unit insert flex</b>	<b>64851 U-500 LED dimmer insert flex, 1gang</b>
--	--	--	--	---	--

<b>Purpose</b>					
Movement detectors	X	X	—	X	X
Movement detector Control of channel 2 via extension input	—	—	X	—	—
Soft ON/OFF	X	—	—	—	X
Noiseless switching	X	—	—	—	X
Old installations without N-busbar in the connection unit	X	—	—	—	X
Stairwell	—	—	—	—	—
Coverage increase as extension unit	—	—	—	X	—

<b>Features</b>					
Local operation via integrated rocker switch	—	—	—	—	—
Extension operation via additional push-button possible	X	X	X	—	X
Brightness-value threshold	X	X	X	X	X
Minimum brightness	—	—	—	—	X
Permanent light	—	—	—	—	—
Memory function	—	—	—	—	—
Short-time pulse for e.g. automatic staircase lighting	—	X	X	—	—
Switch off delay	X	X	X	—	X
Switch-off warning	—	—	—	—	—
Test mode	X	X	X	X	X

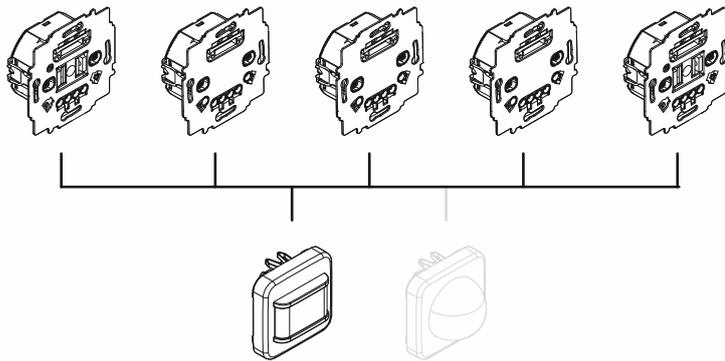


Fig. 6: 180 flex, Comfort sensor with select lens: Functions in combination with flush-mounted inserts

**64762-xxx-500 180 flex, Comfort sensor with select lens**  
**Functions in combination with:**

	<b>64814 U-500</b> e-contact insert flex, 1-gang	<b>64811 U-500</b> Relay insert flex, 1 gang	<b>64821 U-500</b> Relay insert flex, 2 gang	<b>64891 U-500</b> Extension unit insert flex	<b>64851 U-500</b> LED dimmer insert flex, 1gang
--	---	---	---	--	---

**Purpose**

Movement detectors	X	X	—	X	X
Movement detector Control of channel 2 via extension input	—	—	X	—	—
Soft ON/OFF	X	—	—	—	X
Noiseless switching	X	—	—	—	X
Old installations without N-busbar in the connection unit	X	—	—	—	X
Stairwell	X <sup>1)</sup>	X <sup>1)</sup>	—	X <sup>1)</sup>	X <sup>1)</sup>
Coverage increase as extension unit	—	—	—	X	—

**Features**

Local operation via integrated rocker switch	X	X	X	X	X
Extension operation via additional push-button possible	X	X	X	—	X

Brightness-value threshold	X	X	X	X	X
Minimum brightness	—	—	—	—	X
Permanent light	X	X	X	—	—
Memory function	—	—	—	—	X
Short-time pulse for e.g. automatic staircase lighting	—	X	X	—	—
Switch off delay	X	X	X	—	X
Switch-off warning	X	X	X	—	X
Test mode	X	X	X	X	X

1) Only one detection level

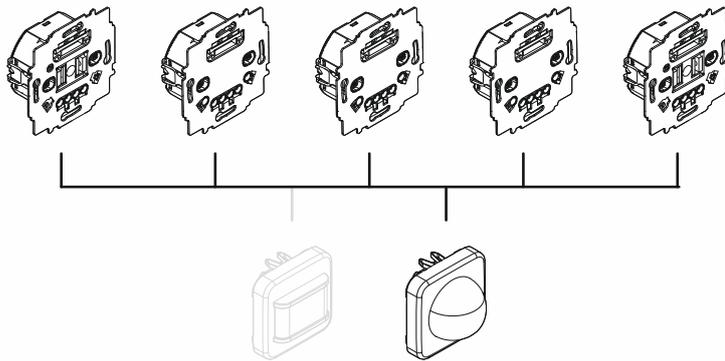


Fig. 7: 180 flex, Comfort sensor with multi-lens: Functions in combination with flush-mounted inserts

**64764-xxx-500 180 flex, Comfort sensor with multi-lens**  
**Functions in combination with:**

	<b>64814 U-500 e-contact insert flex, 1-gang</b>	<b>64811 U-500 Relay insert flex, 1 gang</b>	<b>64821 U-500 Relay insert flex, 2 gang</b>	<b>64891 U-500 Extension unit insert flex</b>	<b>64851 U-500 LED dimmer insert flex, 1gang</b>
--	--	--	--	---	--

**Purpose**

Movement detectors	X	X	—	X	X
Movement detector Control of channel 2 via extension input	—	—	X	—	—
Soft ON/OFF	X	—	—	—	X
Noiseless switching	X	—	—	—	X
Old installations without N-busbar in the connection unit	X	—	—	—	X
Stairwell	X	X	—	X	X
Coverage increase as extension unit	—	—	—	X	—

**Features**

Local operation via integrated rocker switch	X	X	X	X	X
Extension operation via additional push-button possible	X	X	X	—	X

## Device Functions

Brightness-value threshold	X	X	X	X	X
Minimum brightness	—	—	—	—	X
Permanent light	X	X	X	—	—
Memory function	—	—	—	—	X
Short-time pulse for e.g. automatic staircase lighting	—	X	X	—	—
Switch off delay	X	X	X	—	X
Switch-off warning	X	X	X	—	X
Test mode	X	X	X	X	X

## 6.2 Functions

### Short-time pulse

- The output of the device can be configured as electronic current surge sensor to activate a staircase light automaton, for example. Here, during the "On" phase, the output is switched on only periodically for 1 second with 100% brightness and then switched off for 9 seconds. A switch-off delay cannot be set. The short-time pulse is sent as long as movement is detected (always 1 second, then a pause for 9 seconds, etc.).

### Test mode

- Execution of an activation test. The device switches on at a detected movement for about 2 seconds, independently of brightness. The red LED flashes during this time. After that, the device is read for the next movement detection.

### Extension operation via push-button

- An additional operation for switching on using a push-button on the extension input of the flush-mounted insert.
  - A manual switch-on of the connected load can be implemented. The return to automatic mode takes place after no more movement has been detected plus the set switch-off delay.

### Switch-off warning according to DIN 18015

- The light flashes 30 seconds before deactivation.
  - For times under 60 seconds: 15 seconds before switch-off
  - For times under 30 seconds: 5 seconds before switch-off
- This function is required for stairwells in multifamily houses. The end of the illumination time is indicated in a timely manner to extend the illumination duration through movement detection or extension operation.
- Activation via the setup procedure: see chapter 10.4 "Special functions of the comfort sensors" on page 44.

### Switch off delay

- The lighting is not switched off directly when it is deactivated. If, for example, someone leaves the room and the movement detector has no more detection, the lighting remains on for a while. The time until the lighting is actually switched off is adjustable.

### Memory function (only in case of the dimming function)

- The lighting is switched on with the last brightness level to which the lighting was dimmed. If the memory function is deactivated, the lighting is switched on with the maximum brightness value.
- Activation via the setup procedure: see chapter 10.4 "Special functions of the comfort sensors" on page 44.

### Local operation via rocker (only with comfort sensors)

- The attached sensor is designed as a rocker. Via this rocker function, the lighting can be switched on and off independently of the movement detector function. This also applies to main unit combinations / extension unit combinations.
- Operation: see chapter 10.1 "Operation of sensors" on page 39.

### Minimum brightness (only in case of the dimming function)

- The brightness of the lighting cannot be dimmed lower than this value.
- The minimum brightness is set on the flex LED dimmer insert, see chapter 10.5 "Device settings of the dimmer" on page 46.

### Coverage increase

- To increase the detection ranges, additional sensors can be connected in series in conjunction with an extension insert. In this case, the switch-off delay is set and controlled via the sensor of the main unit.
  - A maximum of 9 extension units may be connected to a main unit via the extension line (PlusWire). The extension line is limited to a total of 10 devices.
- The brightness-value threshold can be set individually on each sensor.

### 6.3 Detection range

#### 64761-xxx-500 180 flex, Basic sensor with select lens

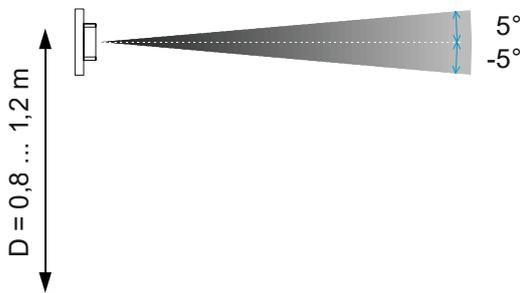


Fig. 8: Opening angle of the select lens

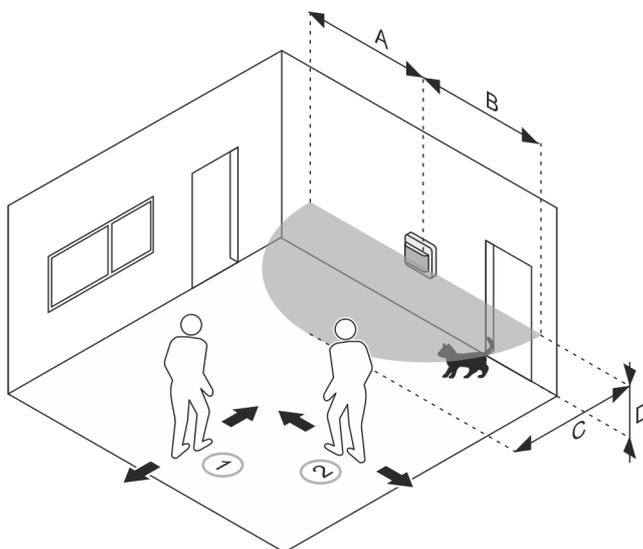


Fig. 9: Detection ranges: select lens principle

<b>Mounting height [D]: 0.8 ... 1.2 metres</b>			
<b>[1] Lengthways toward the detector</b>		<b>[2] Crosswise toward the detector</b>	
A / B	5 metres	A / B	12 metres
C	5 metres	C	12 metres

Tab. 1: Detection ranges of the select lens

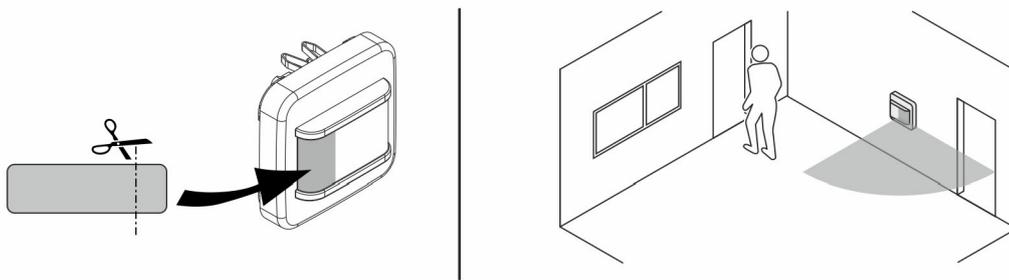


Fig. 10: Detection range restriction: select lens

In the case of the select lens, it is possible to restrict the detection range by masking off the lens.

**64762-xxx-500 180 flex, Comfort sensor with select lens**

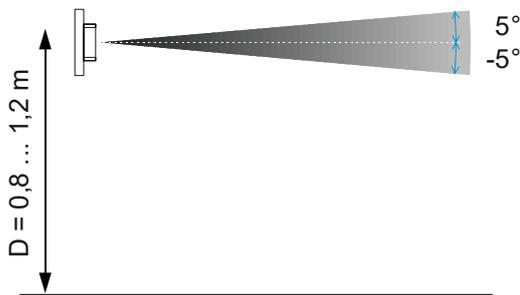


Fig. 11: Opening angle of the select lens

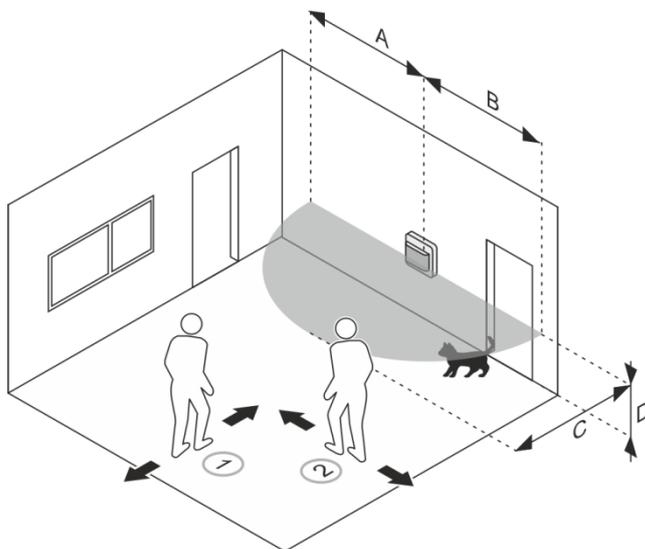


Fig. 12: Detection ranges: select lens principle

<b>Mounting height [D]: 0.8 ... 1.2 metres</b>			
<b>[1] Lengthways toward the detector</b>		<b>[2] Crosswise toward the detector</b>	
A / B	5 metres	A / B	12 metres
C	5 metres	C	12 metres

Tab. 2: Detection ranges of the select lens

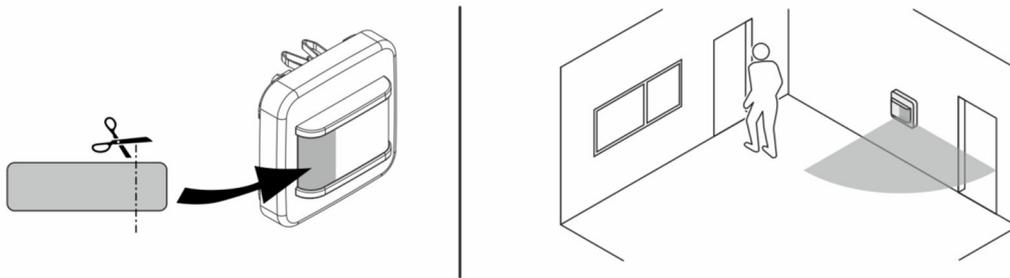


Fig. 13: Detection range restriction: select lens

In the case of the select lens, it is possible to restrict the detection range by masking off the lens.

64764-xxx-500 180 flex, Comfort sensor with multi-lens

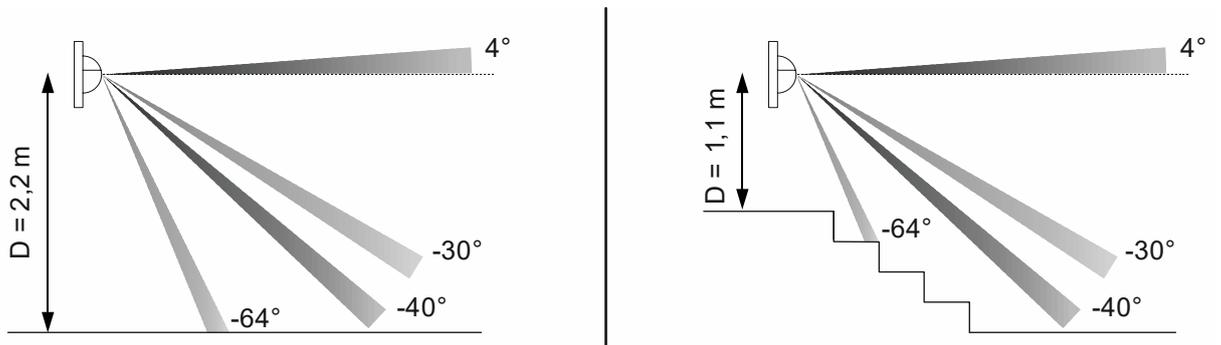


Fig. 14: Opening angle of the multi-lens

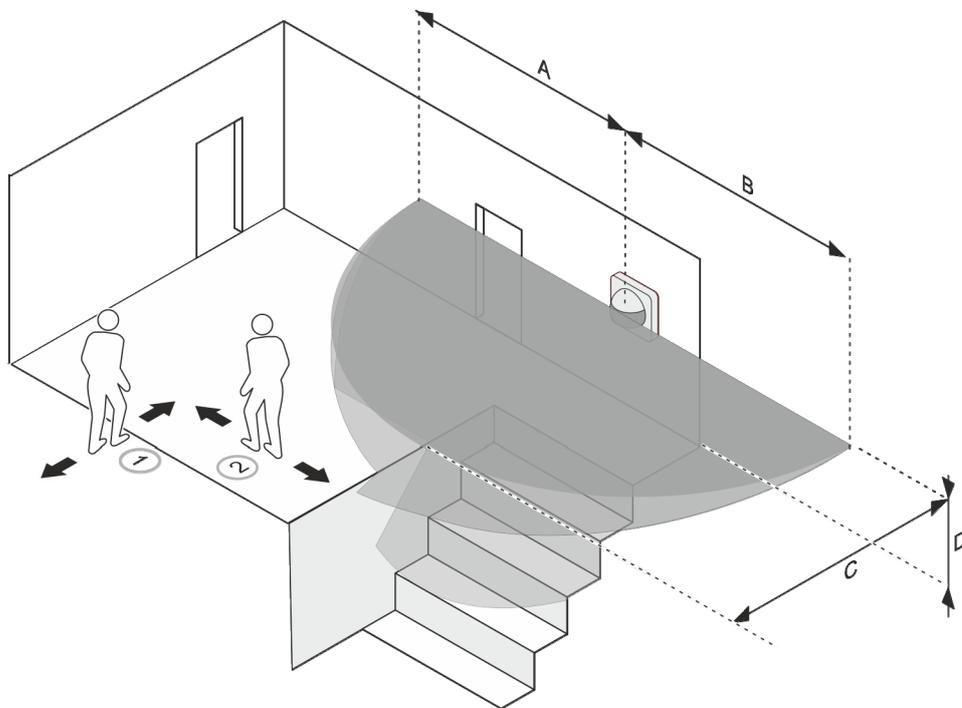


Fig. 15: Detection ranges: multi-lens principle

<b>Mounting height [D]: 2.2 metres</b>			
<b>[1] Lengthways toward the detector</b>		<b>[2] Crosswise toward the detector</b>	
A / B	4 metres	A / B	8 metres
C	4 metres	C	8 metres

<b>Mounting height [D]: 1.1 metres</b>			
<b>[1] Lengthways toward the detector</b>		<b>[2] Crosswise toward the detector</b>	
A / B	5 metres	A / B	7 metres
C	5 metres	C	8 metres

Tab. 3: Detection ranges: multi-lens principle



**Notice**

In the case of the multi-lens, it is possible to restrict the detection range by masking off the lens only to a limited extent.

- If this is nevertheless necessary, a masking strip can be requested from the ABB central sales service.

## 6.4 Switching capacity

Load at 230 V						
	Operation on miniature circuit breakers	LEDi	Low-voltage LED with external converter	Incandescent lamps	230 V halogen lamps	Low-voltage halogen lights on conventional transformers (magnetic transformers)
64814 U-500 e-contact insert flex, 1-gang	16 A	3 ... 240 W/VA	10 ... 240 W/VA	10 ... 240 W	10 ... 240 W	10 ... 240 VA
64811 U-500 Relay insert flex, 1 gang	16 A	300 W/VA	300 W/VA	2300 W	2300 W	2300 VA
64821 U-500 Relay insert flex, 2 gang	16 A	2x 300 W/VA	2x 300 W/VA	2x 1840 W	2x 1150 W	2x 1150 W
64891 U-500 Extension unit insert flex	16 A					
64851 U-500 LED dimmer insert flex, 1gang – With leading edge control	16 A	3 ... 100 W/VA	3 ... 100 W/VA	—	—	20 ... 240 W/VA
64851 U-500 LED dimmer insert flex, 1gang – With trailing edge control	16 A	3 ... 240 W/VA	3 ... 240 W/VA	10 ... 240 W	10 ... 240 W	—

	Low-volt halogen lamps on electronic transformers	Energy-saving bulbs / compact fluorescent lamps (CFLi)	Flourescent lamps
64814 U-500 e-contact insert flex, 1-gang	10 ... 240 VA	—	—
64811 U-500 Relay insert flex, 1 gang	2300 VA	No entry	2300 VA, 10 AX at cos φ 0.9
64821 U-500 Relay insert flex, 2 gang	2x 1150 VA	No entry	2 x 1150 VA, 2x 5 AX at cos φ 0.9
64891 U-500 Extension unit insert flex			
64851 U-500 LED dimmer insert flex, 1gang – With leading edge control	—	—	—
64851 U-500 LED dimmer insert flex, 1gang – With trailing edge control	3...240 W/VA *	—	—

\* In the case of LC transformers, the maximum load is reduced to 100 W/VA

## 7 Technical data

<b>Movement detectors sensors</b>	
<b>Designation</b>	<b>Value</b>
Opening angle:	180°
Brightness limit value:	1 - 500 lux, daytime operation
Switch-off delay:	<ul style="list-style-type: none"> <li>▪ 10 seconds - 30 minutes</li> <li>▪ Short-time pulse 1 second</li> </ul>
Mounting height:	
<ul style="list-style-type: none"> <li>▪ 64761-xxx-500 180 flex, Basic sensor with select lens</li> </ul>	0.8 m - 1.2 m
<ul style="list-style-type: none"> <li>▪ 64762-xxx-500 180 flex, Comfort sensor with select lens</li> </ul>	0.8 m - 1.2 m
<ul style="list-style-type: none"> <li>▪ 64764-xxx-500 180 flex, Comfort sensor with multi-lens</li> </ul>	0.8 m - 2.2 m
Protection type:	IP20
Temperature range:	-5°C - +45°C
Storage temperature:	-25°C - +70°C

Table 4: Technical data: sensors

<b>Flush-mounted inserts</b>	
<b>Designation</b>	<b>Value</b>
Nominal voltage:	
<ul style="list-style-type: none"> <li>▪ 64814 U-500 e-contact insert flex, 1-gang</li> <li>▪ 64811 U-500 Relay insert flex, 1 gang</li> <li>▪ 64821 U-500 Relay insert flex, 2 gang</li> <li>▪ 64891 U-500 Extension unit insert flex</li> <li>▪ 64851 U-500 LED dimmer insert flex, 1gang</li> </ul>	230 V AC, 50 Hz
Power loss:	
<ul style="list-style-type: none"> <li>▪ 64811 U-500 Relay insert flex, 1 gang</li> <li>▪ 64821 U-500 Relay insert flex, 2 gang</li> <li>▪ 64891 U-500 Extension unit insert flex</li> </ul>	< 0.3 W
<ul style="list-style-type: none"> <li>▪ 64814 U-500 e-contact insert flex, 1-gang</li> <li>▪ 64851 U-500 LED dimmer insert flex, 1gang</li> </ul>	< 0.5 W
Switching capacity:	see chapter 6.4 "Switching capacity" on page 30
Connection:	
<ul style="list-style-type: none"> <li>▪ 64814 U-500 e-contact insert flex, 1-gang</li> <li>▪ 64811 U-500 Relay insert flex, 1 gang</li> <li>▪ 64821 U-500 Relay insert flex, 2 gang</li> <li>▪ 64851 U-500 LED dimmer insert flex, 1gang</li> </ul>	L, N, inputs and outputs non-floating
<ul style="list-style-type: none"> <li>▪ 64891 U-500 Extension unit insert flex</li> </ul>	L, N and extension unit output non-floating

Screw-type terminal:	
<ul style="list-style-type: none"> <li>▪ Wire cross-section rigid:                             <ul style="list-style-type: none"> <li>▪ 64814 U-500 e-contact insert flex, 1-gang</li> <li>▪ 64811 U-500 Relay insert flex, 1 gang</li> <li>▪ 64891 U-500 Extension unit insert flex</li> <li>▪ 64851 U-500 LED dimmer insert flex, 1gang</li> </ul> </li> <li>▪ 64821 U-500 Relay insert flex, 2 gang</li> <li>▪ Wire cross-section flexible:                             <ul style="list-style-type: none"> <li>▪ 64814 U-500 e-contact insert flex, 1-gang</li> <li>▪ 64811 U-500 Relay insert flex, 1 gang</li> <li>▪ 64891 U-500 Extension unit insert flex</li> <li>▪ 64851 U-500 LED dimmer insert flex, 1gang</li> <li>▪ 64821 U-500 Relay insert flex, 2 gang</li> </ul> </li> </ul>	2 × 2.5 mm <sup>2</sup> (maximum) 1 × 1.0 mm <sup>2</sup> (minimum)  2 × 2.5 mm <sup>2</sup> (maximum) 1 × 1.5 mm <sup>2</sup> (minimum)  2 × 2.5 mm <sup>2</sup> (maximum) 1 × 1.0 mm <sup>2</sup> (minimum)  2 × 2.5 mm <sup>2</sup> (maximum) 1 × 1.5 mm <sup>2</sup> (minimum)
Claw:	Removable, protected and with reset
Admissible cable length for extension operation:	Maximum of 100 m
Protection type:	IP20
Operating temperature:	
<ul style="list-style-type: none"> <li>▪ 64814 U-500 e-contact insert flex, 1-gang</li> <li>▪ 64891 U-500 Extension unit insert flex</li> <li>▪ 64851 U-500 LED dimmer insert flex, 1gang</li> </ul>	-5°C - +45°C
<ul style="list-style-type: none"> <li>▪ 64811 U-500 Relay insert flex, 1 gang</li> <li>▪ 64821 U-500 Relay insert flex, 2 gang</li> </ul>	-25 °C to +55 °C
Storage temperature:	-25°C - +70°C

Table 5: Technical data: flush-mounted inserts

## 8 Connection, installation / mounting

### 8.1 Requirements for the electrician



#### **Danger - Electric voltage!**

Install the device only if you have the necessary electrical engineering knowledge and experience.

- Incorrect installation endangers your life and that of the user of the electrical system.
- Incorrect installation can cause serious damage to property, e.g. due to fire.

The minimum necessary expert knowledge and requirements for the installation are as follows:

- Apply the "five safety rules" (DIN VDE 0105, EN 50110):
  1. Disconnect
  2. Secure against being re-connected
  3. Ensure there is no voltage
  4. Connect to earth and short-circuit
  5. Cover or barricade adjacent live parts.
- Use suitable personal protective clothing.
- Use only suitable tools and measuring devices.
- Check the type of supply network (TN system, IT system, TT system) to secure the following power supply conditions (classic connection to ground, protective earthing, necessary additional measures, etc.).

## 8.2 Mounting / dismantling



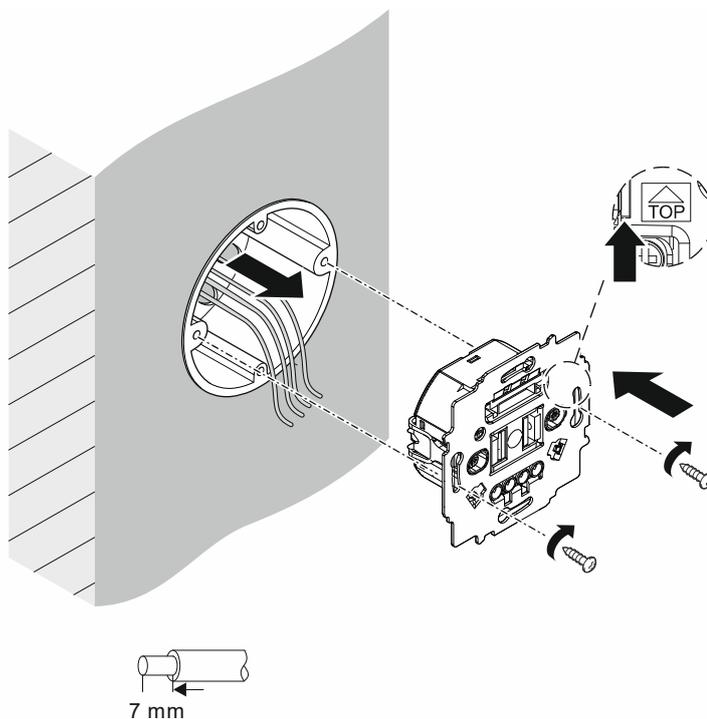
**Caution! The device can sustain damage when coming into contact with hard objects!**

The plastic parts of the device are sensitive.

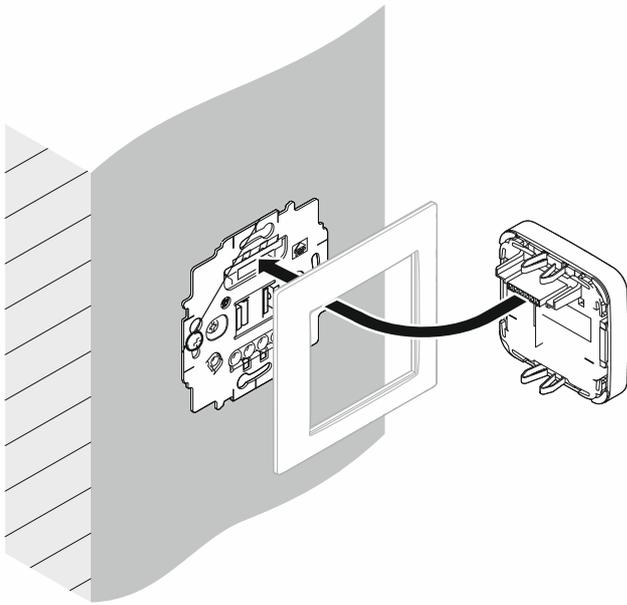
- Pull the attachment off only with your hands.
- Do not lever parts off with screwdrivers or similar hard objects.

All ABB flexTronics inserts are mounted / disassembled the same way.

To install the device, perform the following steps:



1. Mount and connect flush-mounted device inserts.
  - Circuit diagram, see chapter 8.3 “Electrical connection” on page 37.



2. Plug the sensor / control element together with the cover frame onto the flush-mounted device insert.
  - Cover frames are not included in the scope of delivery and must be purchased separately.

The flex device combination is mounted.

### 8.3 Electrical connection

#### Example for connection

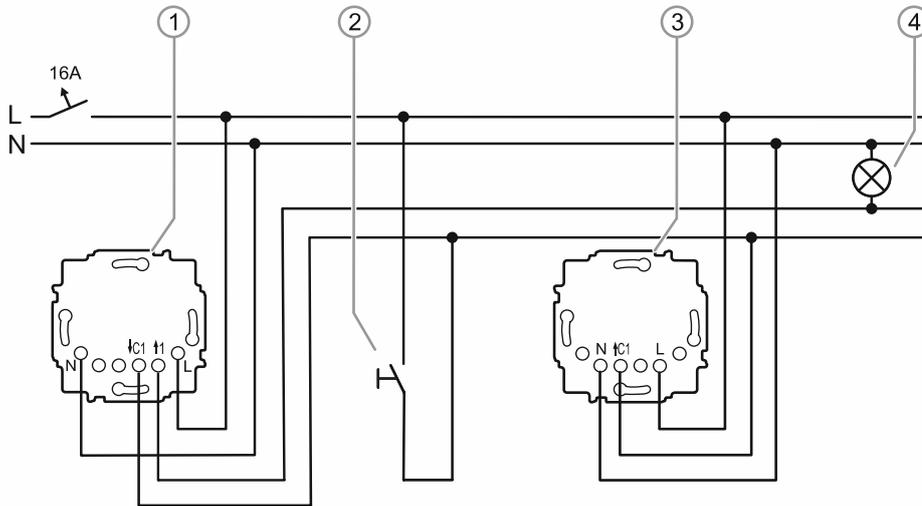


Fig. 16: Connection example: main unit with extension unit and extension unit push-button

#### [1] Master thermostat

- "Relay insert flex, 1 gang" with "Busch-Watchdog 180 flex, Comfort sensor with select lens"

#### [2] Option: Extension unit push-button

- E.g.: 2020 US/500

#### [3] Extension unit

- "Extension unit insert flex" with "Busch-Watchdog 180 flex, Basic sensor with select lens"
- The detection range can be extended with additional extension units [3] (maximum 9 extension units).

#### [4] Lighting

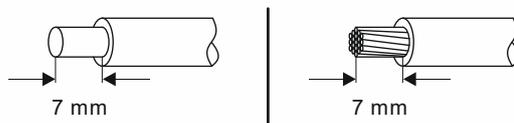


Fig. 17: Skinning length

#### Stripping length:

- Single-wire: 7 mm
- Fine-wire: 7 mm

## 9 Commissioning

Commissioning does not take place. The sensors are ready for operation directly after they are attached to the flex insert.

- For subsequent further parameter setting: see chapter 10.4 “Special functions of the comfort sensors“ on page 44.

## 10 Operation

### 10.1 Operation of sensors

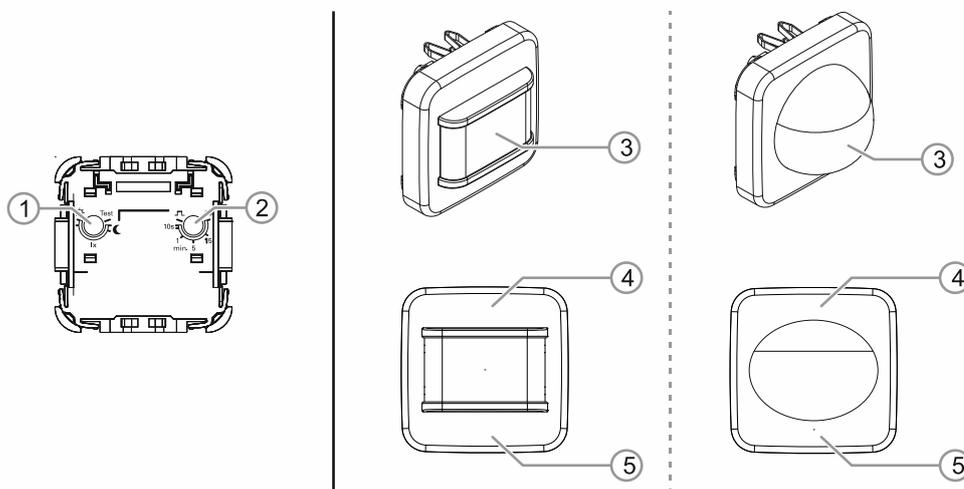


Fig. 18: Control elements

- [1] Trimmers
- [2] Trimmers
- [3] Test LED
- [4] Rocker button top
- [5] Rocker button bottom



#### Notice

The function of the setting elements depends on the flex insert used.

#### Local operation via rocker button [4] / [5]

The attached sensor is designed as a rocker. Via this rocker function, the lighting can be switched on and off independently of the movement detector function.

Rocker button top [4]:

- Brief press of the button:
  - Switch on the light up to the expiration of the switch-off delay.
- Long press of the button:
  - Mounting on relay insert or e-contact insert:
    - Permanent light ON. The LED [3] lights up as status feedback signal.
    - A renewed long press of the button exits the permanent mode.
    - In permanent light ON mode, brief operation is not possible.
  - Mounting on dimmer insert:
    - Increase brightness up to the maximum brightness value.

### Rocker button bottom [5]:

- Brief press of the button:
  - Switch light off immediately.
    - The switch-on can only take place after the movement-dependent blockage time.
- Long press of the button:
  - Mounting on relay insert or e-contact insert:
    - Permanent light OFF, the LED [3] lights up as status feedback signal.
    - A renewed long press of the button exits the permanent mode.
    - In permanent light OFF mode, brief operation is not possible.
  - Mounting on dimmer insert:
    - Reducing the brightness up to the minimum brightness value.

## 10.2 Device settings of settings

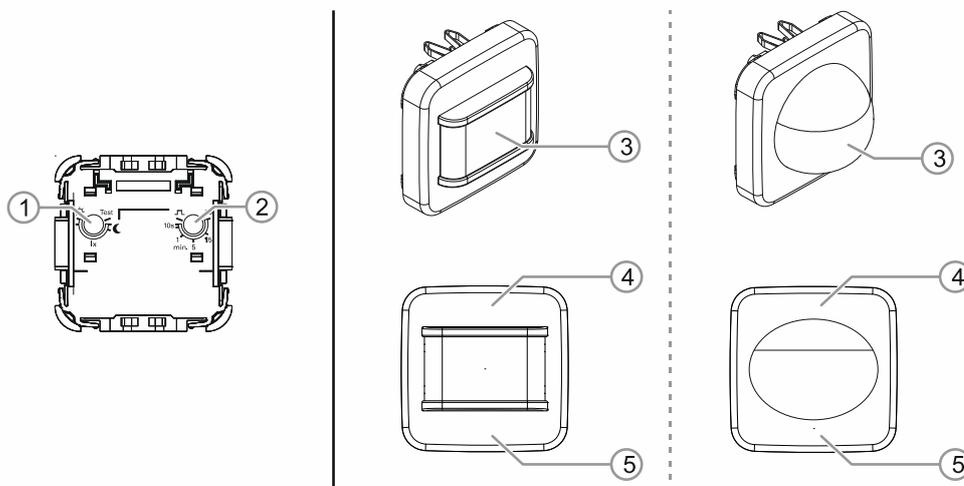


Fig. 19: Control elements

- [1] Trimmers
- [2] Trimmers
- [3] Test LED
- [4] Rocker button top
- [5] Rocker button bottom



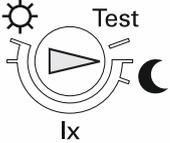
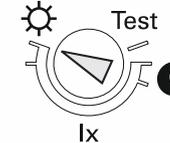
### Notice

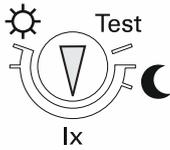
The function of the setting elements depends on the flex insert used.

### Brightness switching threshold

The brightness-value threshold and operation independent of the brightness are set via the trimmer [1] on the rear of the device.

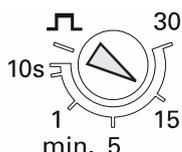
- The brightness-value threshold determines the luminosity from which the light switches on at the detection of movement.
- If the surrounding light is brighter than the set brightness-value threshold, the light does not switch on at the detection of movement.

	<p>"Moon" symbol</p> <ul style="list-style-type: none"> <li>– Activation only at dusk.</li> </ul>
	<p>"Sun" symbol</p> <ul style="list-style-type: none"> <li>– Activation at any brightness.</li> </ul>

	<p>Position between both symbols:</p> <ul style="list-style-type: none"> <li>- Determine a setting by testing until the desired response threshold is reached.</li> <li>- Walk back and forth in front of the sensor until the flush-mounted sensor triggers. Stop and remain still until the consumers are switched off. Confirm the test results by walking again if pertinent.</li> </ul>
---	--

Tab.6: Brightness-value threshold

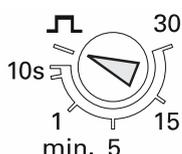
### Switch off delay



The time element installed in the flush-mounted sensor controls the ON period of activated consumers. If the sensor has no more detection, the activated loads coast down for the set time. This function is necessary, for example, if the frequent use of a corridor prevents a constant activation and deactivation or if standstill times in the detection range should be shunted.

- Select time values (given in seconds or minutes) by setting the trimmer [2] on the back of the device to the desired value (e.g., 15 minutes).
- The switch-off delay starts again at each detection of movement.

### Short-time operation

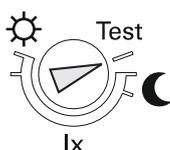


In this operating mode short-time pulses are sent for the duration of detection (1 second ON / 9 seconds OFF).

If a switching signal is emitted, an additional switching signal to activated consumers is suppressed for nine seconds even if the flush-mounted sensor has made a new detection.

- Short-time pulse for activating the staircase light timer switches or door bells.
- It is set via the trimmer [2] on the rear of the device.
- The subsequent behaviour depends on the activated device.

### Activation test



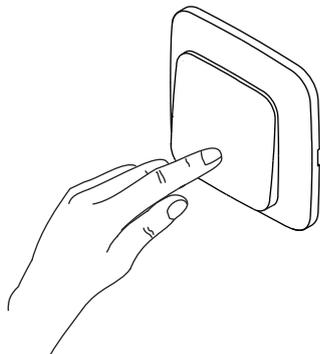
To activate the activation test, set the trimmer [1] on setting "Test".

- Detected movements are signaled in the activation test via the LED [3] (behind the lens). Also the lamp connected on the flex insert is briefly switched on.

- Deactivate the activation test again after the test is completed. This is done by resetting the trimmer [1] to the desired brightness-value threshold.

## 10.3 Extension operation (Option)

### Extension operation via push-button



The light can be switched at any time via an extension unit push-button.

- The switch-off takes place only after the detection range has been exited and the set switch-off delay has expired.

Special function in combination with a flex dimmer insert:

If the extension unit push-button is pressed for a long time (> 3 seconds), the light is dimmed up / down (toggle operation) until the maximum / minimum brightness is reached.

## 10.4 Special functions of the comfort sensors

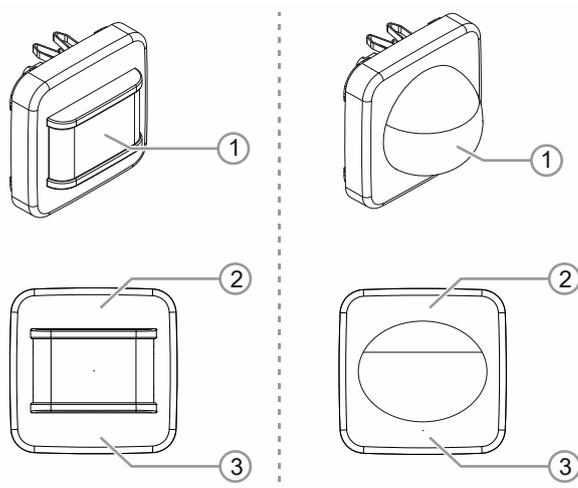


Fig. 20: Control elements for special functions

[1] LED

[2] Rocker button top

[3] Rocker button bottom

### Parameter setting / Setup

The following parameters can be set via the setup procedure specific to the device.

- Switch-off prewarning
- Memory function

Switch-off pre-warning:

1. Calling up setup:
  - Press the top rocker button [2] for >10 seconds.
  - The status LED [1] flashes slowly.
2. Activate / deactivate the switch-off pre-warning:
  - Press the bottom rocker button [3] for approx. 1 second.
  - Within a time window of < 5 seconds.
  - The LED goes out.
  - Then briefly press the top rocker button [2].
  - Within a time window of < 10 seconds.
  - Activates (LED on) or deactivates (LED off) the switch-off pre-warning.
  - Each further press of the top rocker button [2] changes the status of the switch-off prewarning (activated / deactivated).
3. Exit setup:
  - Press the top rocker button [2] for approx. 1 second.
  - Within a time window of < 10 seconds.
  - Saves the preselection. The LED lights up 1x as feedback signal.

Memory function (only in combination with a flex dimmer insert):

1. Calling up setup:
  - Press the top rocker button [2] for >10 seconds.
    - The status LED [1] flashes slowly.
2. Activate / deactivate the memory function (this is only possible in the unit combination with the dimmer insert):
  - Press the top rocker button [2] again for approx. 1 second.
    - The LED goes out.
  - Then briefly press the bottom rocker button [3].
    - Within a time window of < 10 seconds.
    - Activates (LED on) or deactivates (LED off) the memory function of the dimmer.
    - Each further press of the bottom rocker button [3] changes the status of the memory function (activated / deactivated).
3. Exit setup:
  - Press the top rocker button [2] for approx. 1 second.
    - Within a time window of < 10 seconds.
    - Saves the preselection. The LED lights up 1x as feedback signal.

## 10.5 Device settings of the dimmer

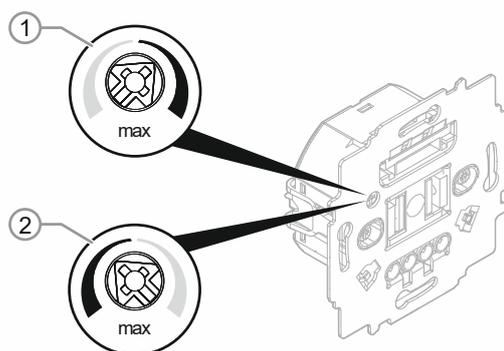
### 10.5.1 Introduction

The minimum brightness determines the luminosity down to which dimming is possible.

The minimum brightness of the flush-mounted insert of the dimmer can be set with the operating part removed by adjusting the trimmer on the front of the device.

Depending on the type of load connected, the appropriate operating mode is also selected during the setting.

### 10.5.2 Operating modes



Right setting range [1]:
Leading edge control

Left setting range [2]:
Trailing edge control

The central setting is locked. This ensures that the trimmer is always in a defined position.

The setting of the operating mode is signalled directly by the connected illumination. Use the following steps to set the operating mode:

- Turn the trimmer to the corresponding setting range (leading edge control [1] or trailing edge control [2]).
  - During the switchover of the operating mode in the middle position the dimmer is briefly deactivated.
  - Inductive loads are automatically recognised by the device. The device then operates in leading edge control.
    - If the trimmer is in trailing edge control setting for inductive loads, the device deactivates. The dimmer then automatically selects the trailing edge control operating mode and can be switched on again manually.

To be on the safe side, set the trimmer to leading edge control.

The new operating mode is set.



#### Notice

The preferred operating mode of the LEDi may possibly be indicated on the LEDi. If this is not the case, determine the suitable operating mode by means of trials.

### 10.5.3 Minimum brightness

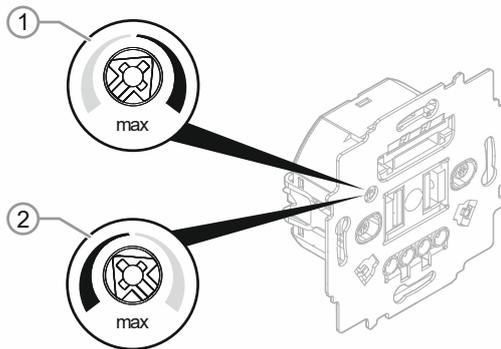


Fig. 21: Setting the minimum brightness

Depending on the set operating mode, the minimum brightness is set in the right [1] or left [2] setting range of the trimmer.

- To set the operating mode: see chapter 10.5.2 “Operating modes” on page 46.

The setting of the minimum brightness is signalled directly by the connected lighting.

Use the following steps to set the minimum brightness:

1. Turn the trimmer slightly.
  - The device switches the lighting to the current minimum brightness.
2. Now set the new suitable minimum brightness for the lighting system on the trimmer.
  - Approximately 3 seconds after the trimmer is no longer moved, and the device switches to the previously set brightness.

The new minimum brightness has been stored.

# 11 Maintenance

## 11.1 Cleaning

**Caution! - Risk of damaging the device!**

- When spraying on cleaning agents, these can enter the device through crevices.
  - Do not spray cleaning agents directly onto the device.
- Aggressive cleaning agents can damage the surface of the device.
  - Never use caustic agents, abrasive agents or solvents.

Clean dirty devices with a soft dry cloth.

- If this is insufficient, the cloth can be moistened slightly with a soap solution.

## 12 Information about planning and application

### 12.1 Principles of function / principles of operation

#### 12.1.1 The difference between movement detectors / presence detectors

Both device types are passive infrared detectors. They serve for switching the lighting when people are present.

##### **Movement detector:**

Movement detectors must detect gross movements, e.g., when someone enters or leaves a room or stairwell. They are usually mounted on a wall.

In terms of technical principle, movement detectors for indoor and outdoor use are the same. However, movement detectors for outdoor use usually have a different housing, as it has to withstand the environmental influences there, for example.

##### **Presence detectors:**

They are rather intended for indoor use. Since they need to detect small movements, such as typing on a keyboard, they are clearly more sensitive than movement detectors. In addition to movement, a presence detector monitors the ambient brightness during the ON phase and can switch off when the brightness-value threshold is exceeded. They are usually mounted below the ceiling.

### 12.1.2 Principles of function

Infrared radiation, also called heat radiation, consists of electromagnetic waves. Every object transmits a characteristic heat radiation, depending on its specific temperature.

The detection of movement depends on the mounting height and the "free view" of the device.

#### Infrared sensor technology (IR sensor technology)

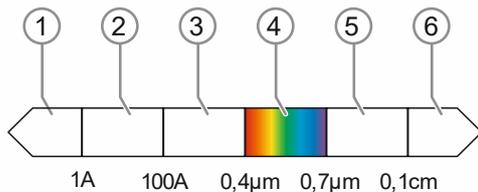


Fig. 22: Function principle of IR sensor technology

IR radiation can be detected with IR sensors and transformed into electric signals. As these sensors only receive and do not transmit IR radiation, they are also known as "passive IR sensors".

- [1] Gamma
- [2] X-ray
- [3] Ultraviolet
- [4] Visible
- [5] Infrared
- [6] Radio waves

#### Passive infrared sensors (passive IR sensors)



Fig. 23: Passive IR sensor

Passive IR sensors are designed so that they react only to a change in heat radiation, e.g., in event of movement.

The transmission range of passive IR sensors is physically dependent on the temperature. The reference amounts to 21°C. The transmission range reduces in a warmer environment.

If heat radiation is constant, no signal is generated. A room being heated alters its heat radiation only very slowly in comparison. It is therefore possible to detect human movements (heat movement).

### Optical system (movement detector)

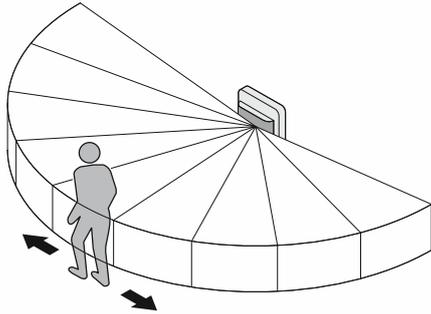


Fig. 24: Optical system (movement detector)

By means of lenses, mirrors and sensors, the area to be monitored is divided into numerous fields or so-called sectors. If a person moves from one sector to the next, this movement is detected.

### Light measurement

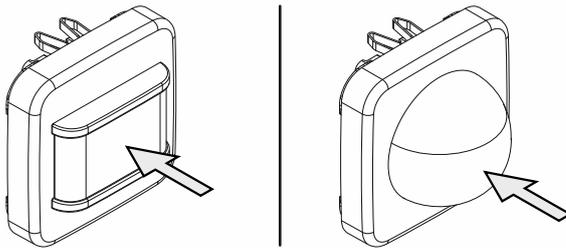


Fig. 25: Brightness sensor

The devices of ABB are fitted with an ambient light measurement. This extends the movement detection process by one brightness-value threshold.

The brightness-value threshold determines the luminosity from which the light switches on. If the surrounding light is brighter than the set brightness-value threshold, the light does not switch on if movement is detected.

### 12.1.3 Lens types

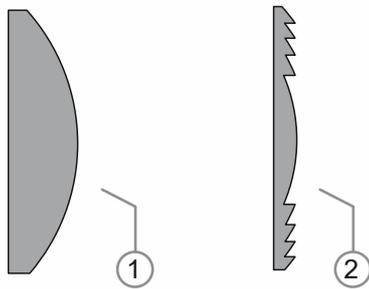


Fig. 26: Lens types

The devices of ABB are fitted with Fresnel lenses. Compared to normal lenses, Fresnel lenses offer the advantage of an increase in the amplification of infrared radiation.

[1] Normal lens (hemispherical)

[2] Fresnel lens

### 12.1.4 Detection ranges / detection levels

#### Moving crosswise toward the device

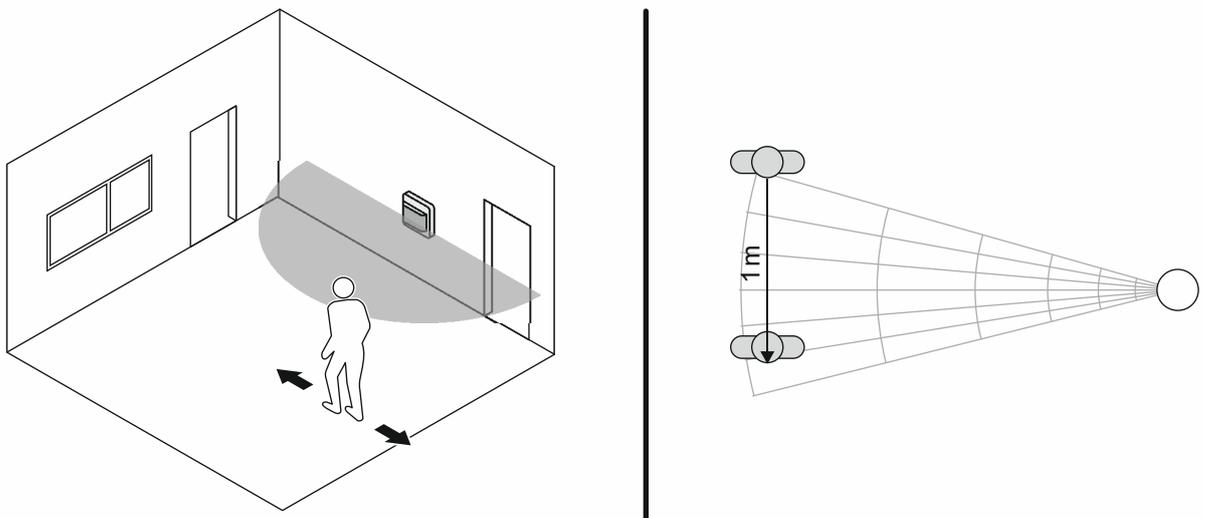


Fig. 27: Detection crosswise to the device

The detection range is at its highest when the person to be detected moves crosswise toward the device. This is called a tangential direction of movement.

The detection of the infrared change functions best when the person to be detected moves crosswise to the viewing field of the device. Here, for example, it crosses several sectors at a 1 m path. If the person moves directly towards the sensor, it takes longer before the person is detected by the device in other sectors.

In the right example graphic, the person touches 6 new sectors at a 1 m path.

### Moving lengthways to/in parallel with the device

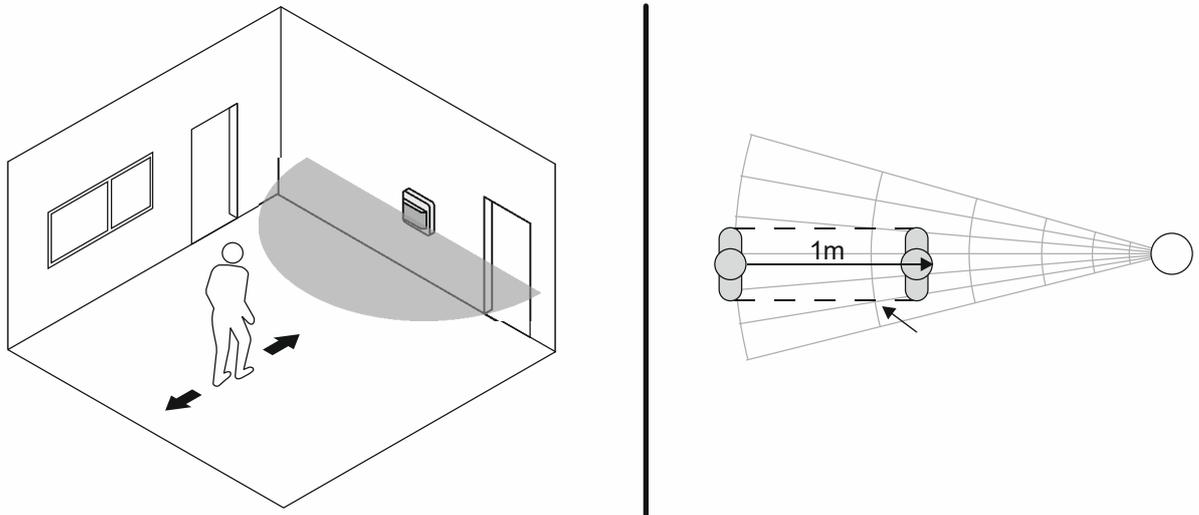


Fig. 28: Moving lengthways to/in parallel with the device

The detection width is physically dependent smaller when the person to be detected moves directly toward the device [A] or in parallel [B] (e.g., in a corridor) with it.

In the bottom example graphic a new sector is touched by the person only at the end of a 1 m path (arrow). It is only here that the person is detected by the device.

The detection of the infrared change functions best when the person to be detected moves crosswise to the viewing field of the device. Here, for example, it crosses several sectors at a 1 m path. If the person moves directly towards the sensor, it takes longer before the person is detected by the device in other sectors. This is called a central approach.

### Mounting heights

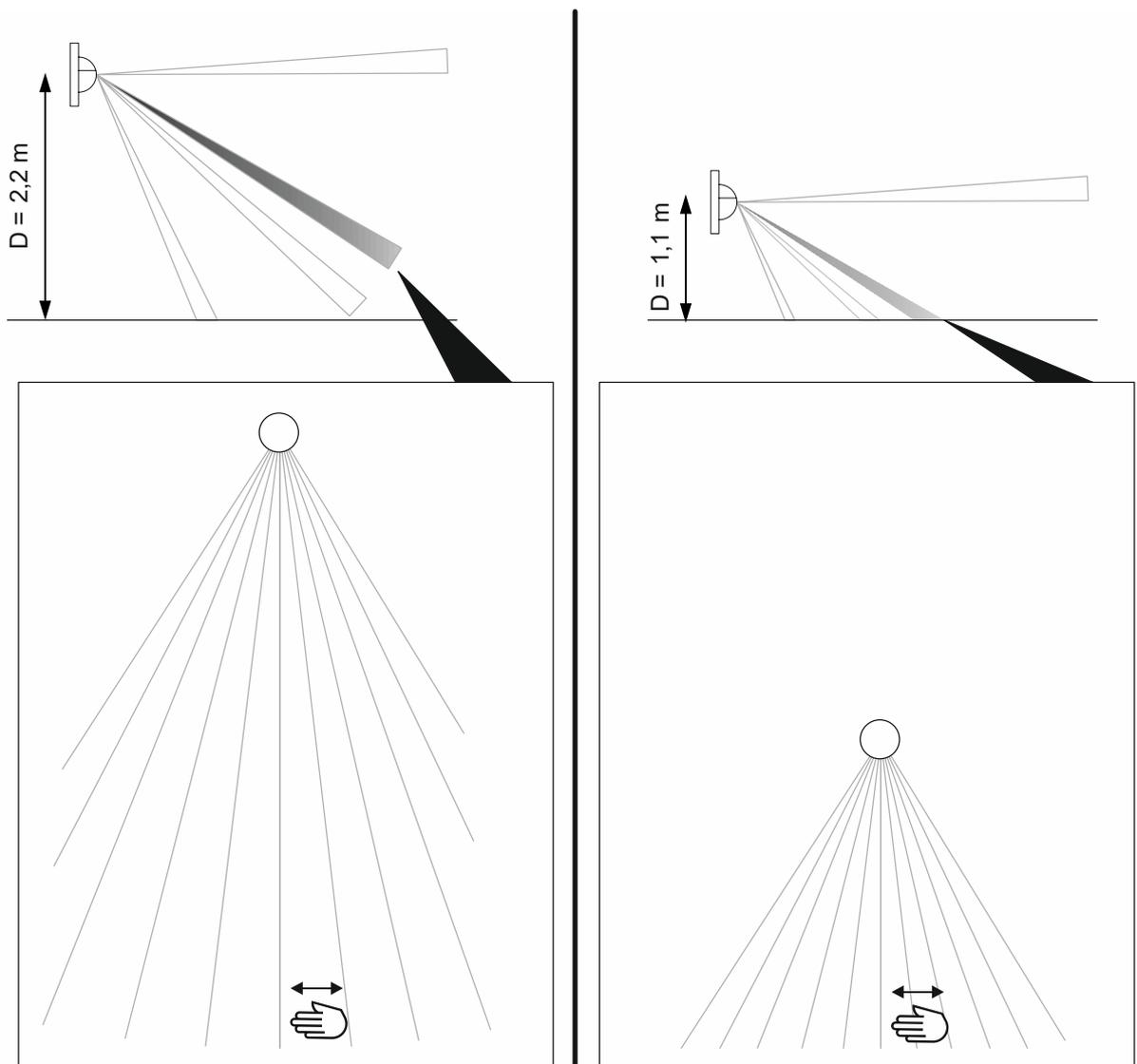


Fig. 29: Mounting heights

Depending on the mounting height, the detection characteristics change.

As the mounting height increases, the sensitivity and detection density decrease. In the left side of the example graphic, the movement is no longer detected because it does not cut across any additional sectors. The Busch-Watchdog is too far removed from it. Optimally, persons are detected at a maximum mounting height of 2.2 m.

In corridors and storage rooms, a mounting height of 2.2 metres is perfectly reasonable due to the desired application.

12.2 Case studies

12.2.1 Corridor

Function

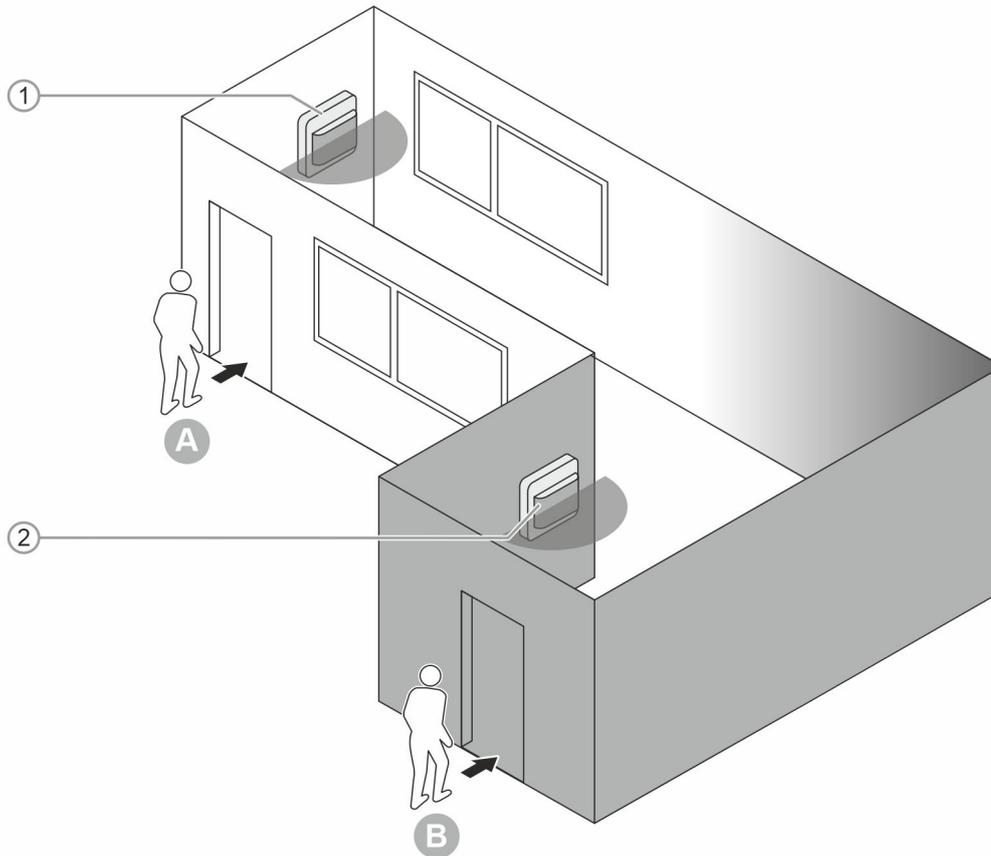


Fig. 30: Application example: corridor with light and dark areas

A corridor lighting system should be controlled intelligently via a Busch-Watchdog. In this corridor there are light and dark areas due to an unfavourable distribution of daylight.

The lighting should be switched depending on movement and the prevailing lighting conditions.

Case 1	Person [A] enters the corridor during the day in the bright area. The lighting remains switched off.
Case 2	Person [B] enters the corridor during the day in the dark area. The lighting is switched on.
Case 3	Person [A] enters the corridor in the light area during the day and then moves to the dark area. The lighting is switched on as soon as the person reaches the detection range of the extension unit sensor [2] in the dark area.

For the implementation of the light control, one sensor is set up as the main unit and one to several sensors as the extension unit.

## Setting the brightness-value thresholds

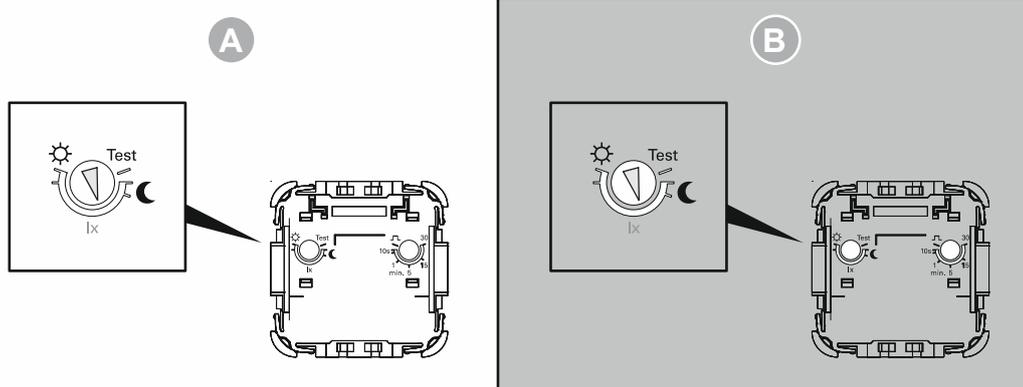


Fig. 31: Application example: corridor with light and dark areas – setting the brightness-value threshold

In this example, the brightness threshold of the sensors of the main unit and the extension unit are set to the same level.

Main unit sensor [A] (in the bright area of the corridor)

- The brightness lies above the brightness-value threshold during the day. The lighting is not switched on if movement is detected.

Extension unit sensor [B] (in the dark area of the corridor)

- In the dark area, the brightness lies below the brightness-value threshold during the day. The switching command is forwarded to the main unit sensor when movement is detected and the lighting is switched by the main unit sensor.
  - This takes place regardless of the fact that the main unit sensor would not switch itself if it had its own movement detection.

## Connection

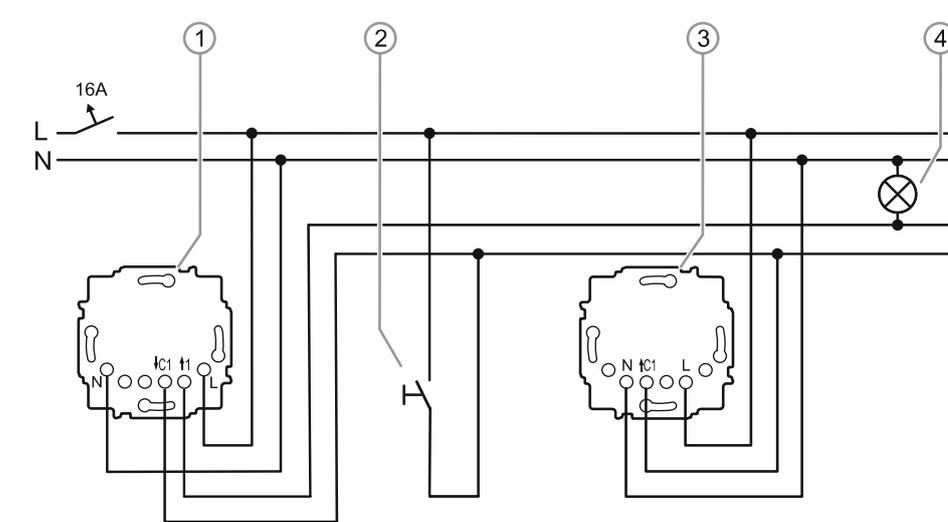


Fig. 32: Application example: corridor with light and dark areas – connection

### [1] Master thermostat

- "Relay insert flex, 1 gang" with "Busch-Watchdog 180 flex, Comfort sensor with select lens"

### [2] Option: Extension unit push-button

- E.g.: 2020 US/500
- The extension unit push-button can be used to switch on the light manually at any time until the switch-off delay has elapsed.

### [3] Extension unit

- "Extension unit insert flex" with "Busch-Watchdog 180 flex, Basic sensor with select lens"
- The detection range can be extended with additional extension units [3].

### [4] Corridor lighting

## 12.2.2 Stairwell

### Function

In a stairwell, the lighting is to be switched via movement detectors.

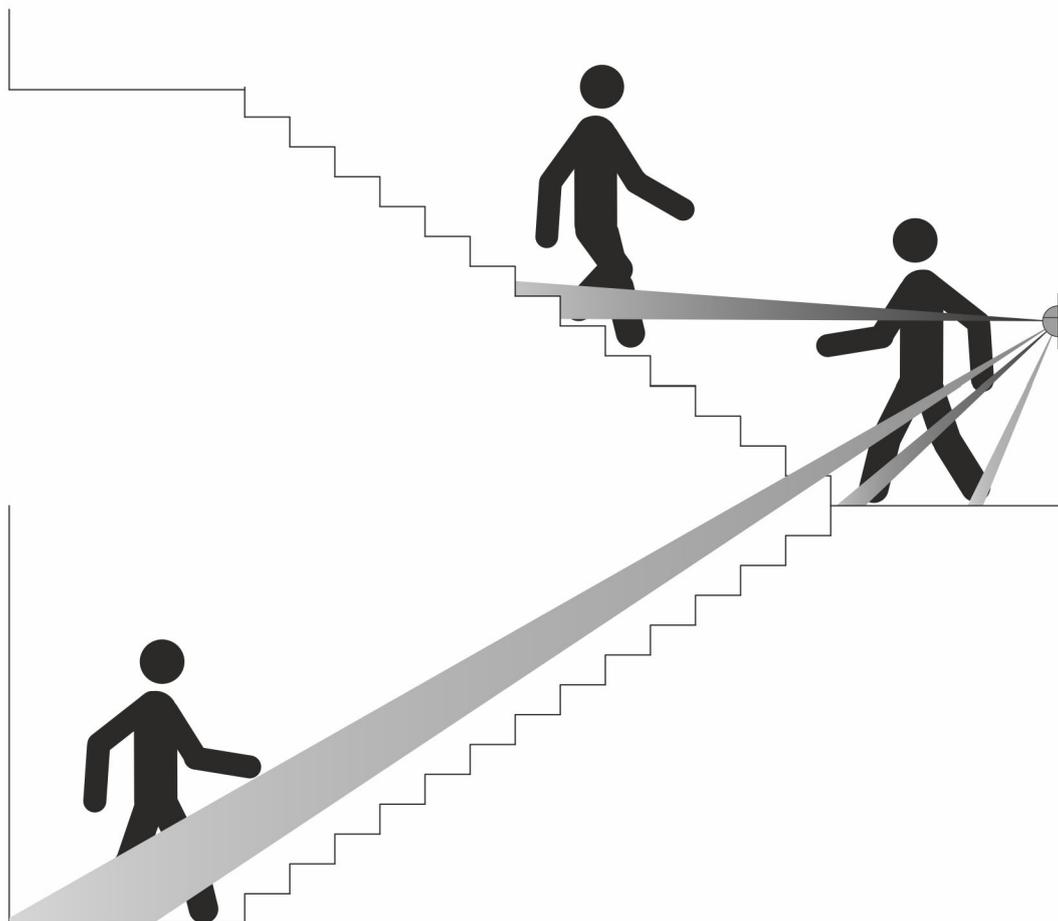


Fig. 33: Application example: stairwell with multi-lens sensor

A multi-lens sensor is particularly suitable for this situation.

If there are several floors, a multi-lens sensor is installed on one floor as the main unit. The other floors are extended accordingly with multi-lens sensors as extension units. In this way, movements in unclear areas, such as stairwells, can be optimally detected.

**Connection**

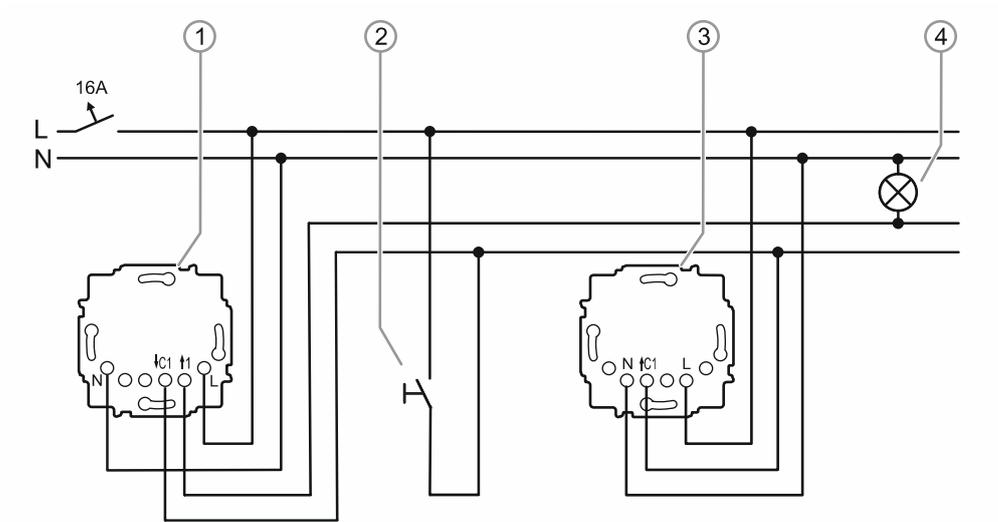


Fig. 34: Application example: stairwell – connection

[1] Master thermostat

- "Relay insert flex, 1 gang" with "Busch-Watchdog 180 flex, Comfort sensor with multi-lens"

[2] Option: Extension unit push-button

- E.g.: 2020 US/500
- The extension unit push-button can be used to switch on the light manually at any time until the switch-off delay has elapsed.

[3] Extension unit

- "Extension unit insert flex" with "Busch-Watchdog 180 flex, Comfort sensor with multi-lens"
- The detection range can be extended with additional extension units [3].

[4] Staircase lighting

## 12.3 Sources of interference

### Moving heating air

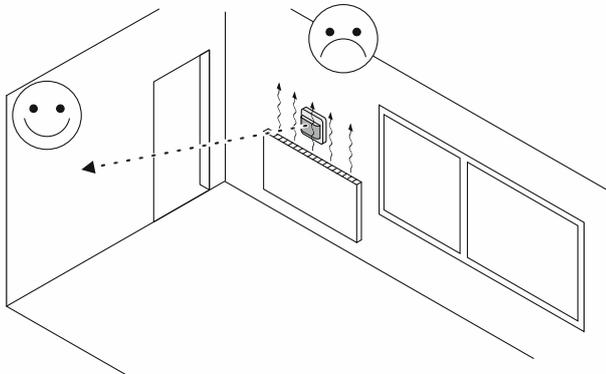


Fig. 35: Movement detector malfunction source: moving heating air

Movement detectors react to infrared radiation (heat radiation). If the movement detector is located in an area where warm air moves strongly, this can lead to undesired switching operations of the movement detector. Such an area is e.g. above a heating system.

Place the movement detector in an area where the movement detector is not affected.

### Open doors

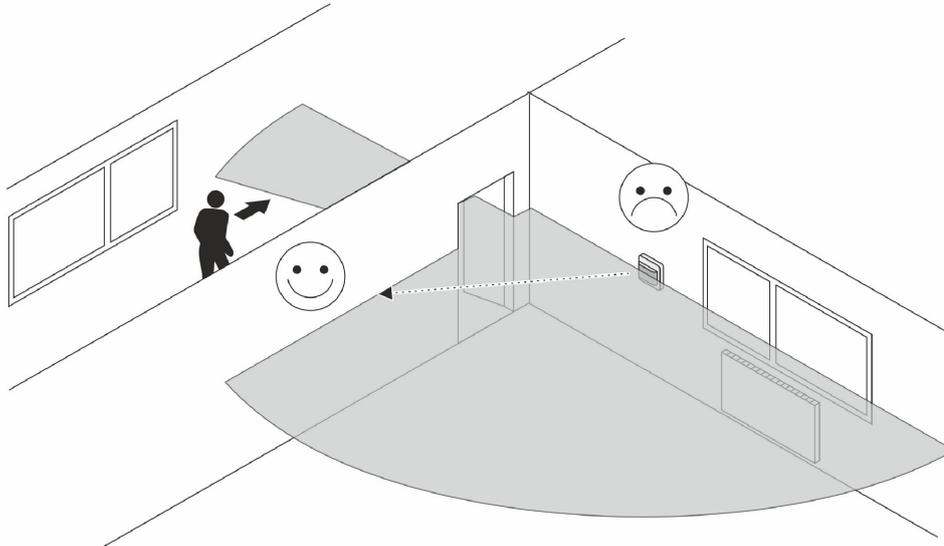


Fig. 36: Movement detector malfunction source: open door

If the movement detector's detection range runs through an open door, this will result in switching operations if a person crosses this range.

In this example, placing the movement detector opposite on the adjacent corridor wall would be more suitable.

## 13 Notes

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