GOOD PRACTICES IN SME

Installing motion and presence sensors

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The following document was developed using European Union financing as part of the “Technical support for the promotion of energy audits and energy efficiency investments in small and medium-sized enterprises in Poland”. The opinions presented in this document should not be treated as the official stance of the European Union.

The project was financed by the European Union as part of Structural Reform Support Programme (SRSP) and realized by the Polish National Energy Conservation Agency (KAPE SA) in cooperation with the European Commission on behalf of the Ministry of Climate and Environment.

How do motion sensors work?

Lighting control systems ensure the right level of lighting depending on the rhythm of changing daylight without the need for constant manual control. They are intelligent systems minimizing energy consumption.

It is effective to use motion sensors in passageways such as staircases and other places where employees do not spend a lot of time. On the other hand, presence sensors should be used in rooms in which employees spend more time (such as offices, bathrooms). This avoids the situation in which the light goes out while the employee is sitting at their desk.

Sensors vary depending on type, model, their sensitivity and area of detection. When selecting a sensor, it is important to read its documentation to choose the right installation location.

The most used sensors are:

- PIR (PIR – Passive Infra-Red) sensors,
- microwave sensors,
- dual sensors.

PIR sensors analyse the infrared spectrum which is emitted by hot object. This type of sensor will react when an object hotter than the ambient temperature enters its range. PIR sensors are less effective on hot days when the difference between air temperature (30-32 °C) and the temperature of the human body (36,6 °C) is insignificant. Another disadvantage of PIR sensors is that heat sources such as radiators can lead to false-positive activations.

Microwave motion sensors use the Doppler effect. They emit electromagnetic radiation at a set frequency and measure the frequency of the reflected wave. If an object within its range moves, the reflected wave will have a different frequency and the sensor will activate the lighting. A disadvantage of microwave sensors is that they can detect motion through doors and thin wall partitions, which the microwave radiation can passes through.

Dual sensors use both methods for detection. Light will only be turned on when both the infrared and microwave sensor detect movement. This reduces the number of false-positive activations.

Pic. 1 eltrox: PIR sensor

Pic. 2 smd-led: microwave sensor

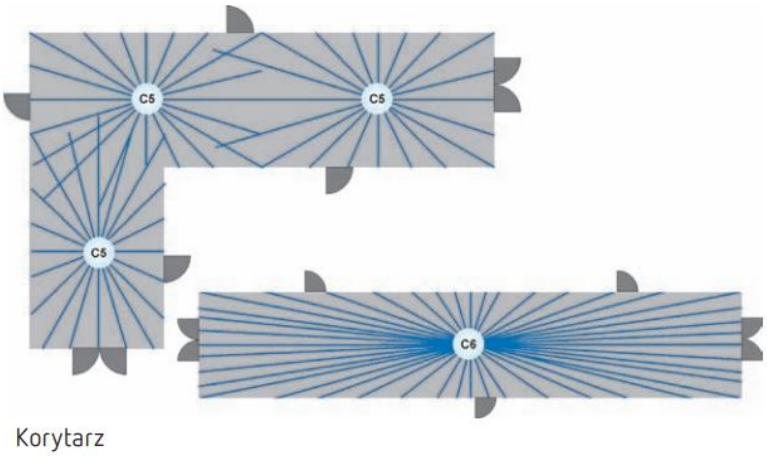
What to consider when installing a motion sensor?

Before installation define:

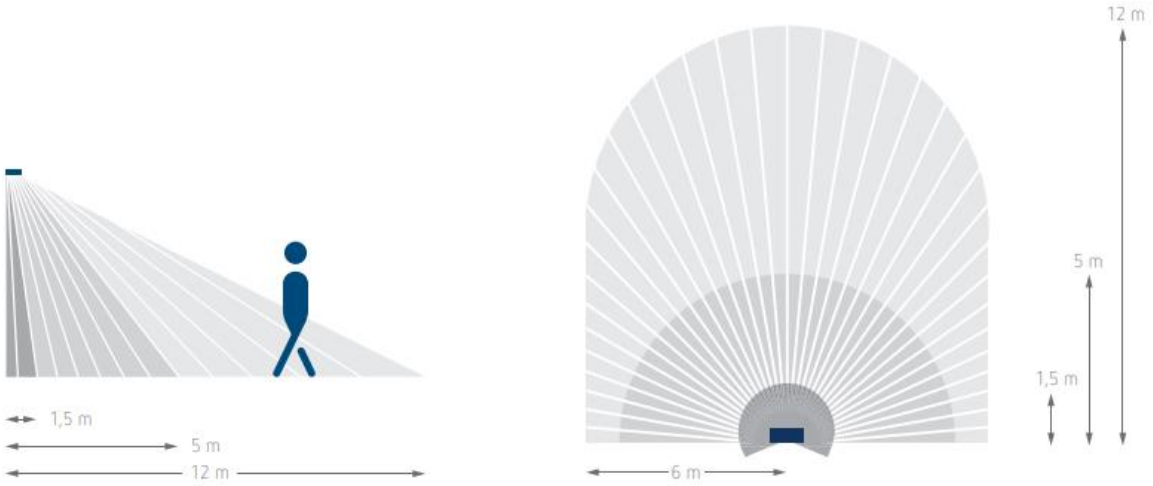
- the area which the sensor should cover,
- which operation interference may occur in the sensor's installation location (e.g. mist, rain, people passing by behind open doors),
- protecting the sensor from liquids,
- operative temperature range of the sensor and the temperature range at the planned installation location,
- risk of UV radiation.

Pay attention that the sensor is placed in the right direction – this enables faster and more effective motion detection. A good solution is installing two sensors so that their fields of detection overlap.

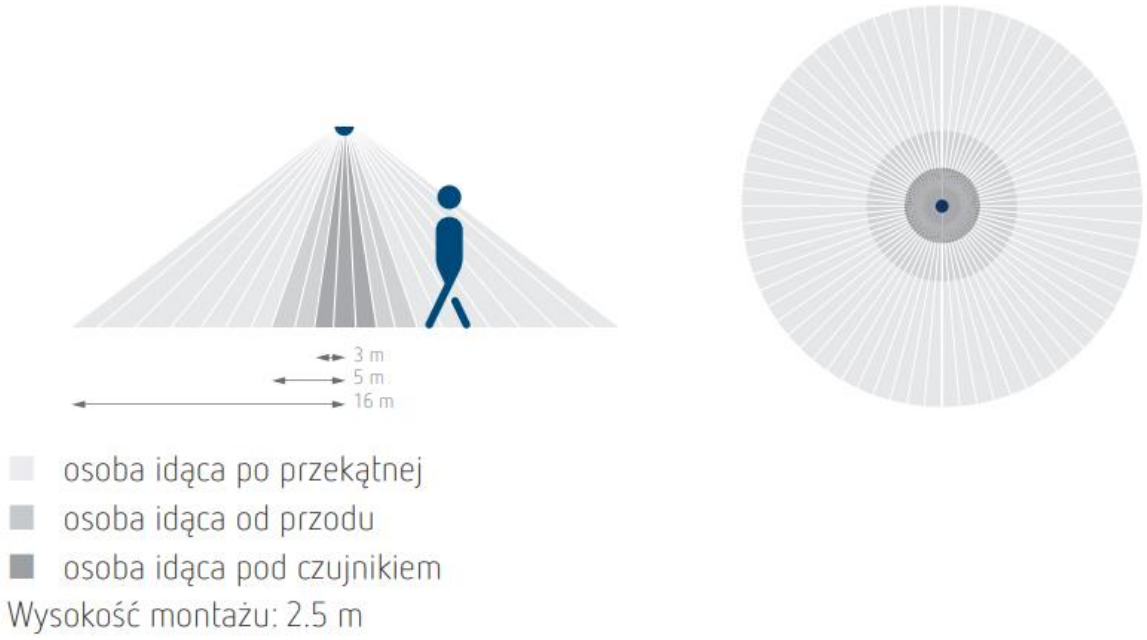
Install sensors so far apart, as to ensure detection field overlap. Pay attention to the sensors hight – it affects the field of detection. Consult the model's technical documentation.



Pic. 3 theben
Top left to bottom right: Corridor



Pic. 4 theben



fot. 5 theben

Top left to bottom right: Person moving diagonally, Person moving forward, Person moving under the sensor, Installation height: 2.5 m

What is the payback time of motion sensors?

We will analyse an office, which has long corridors lighted by a total of 30 LED lighting points, each at 20W. The office is open 250 days a year, 8 hours each day. The average price of electricity is 0,55 PLN/kWh.

To ensure the entire area of the corridor is covered, 9 sensors should be installed (price 50 PLN each). The amount of work done by the lighting installation is decreased by 50%.

Sensor cost:

$$9 \times 60\ PLN = 540\ PLN$$

Energy savings:

$$0{,}5 \times 30 \times 20\ W \times 8\frac{h}{day} \times 250\frac{days}{year} = 600\ kWh/year$$

Electricity cost savings:

$$600\frac{kWh}{year} \times \frac{0{,}55PLN}{year} = 330\ PLN/year$$

Simple payback time:

$$SPBT = \frac{540\ PLN}{330\ PLN/year} = 1{,}6\ years$$

Source: KAPE