

OUTDOOR DUAL TECHNOLOGY MOTION DETECTOR
OPAL Pro



Firmware version 1.01

WARNING

The device should be installed by qualified personnel.

Read carefully this manual before proceeding to installation.

Changes, modifications or repairs not authorized by the manufacturer shall void your rights under the warranty.

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The following symbols may be used in this manual:



- note;



- caution.

The OPAL Pro detector allows detection of motion in the protected area. It is designed for outdoor use. This manual applies to the detector with electronics version B (or newer) and firmware version 1.00 (or newer). The detector meets requirements of the EN 50131-2-4 standard for Grade 3.



The Grade 3 certificate applies to the indoor use. The outdoor use of the detector (despite full Grade 3 functionality) is not covered by the certificate (there is no standard for the outdoor detectors).

1. Features

- Passive infrared (PIR) sensor and microwave sensor.
- Digital motion detection algorithm.
- Digital temperature compensation.
- Pet immunity up to 20 kg.
- Immunity to false alarms caused by moving but not changing their position objects (eg. branches of trees).
- Creep zone.
- Active IR anti-mask, compliant with EN 50131-2-4 requirements for Grade 3.
- Dusk sensor.
- Capability of separate sensor configuring/testing.
- Sensitivity configuring by means of OPT-1 keyfob.
- Three LED indicators.
- Remote LED enable/disable.
- Remote configuring mode enable/disable.
- Supervision of motion detection system and supply voltage.
- Tamper protection against cover removal and tearing enclosure from the wall.
- Weatherproof enclosure featuring a very high mechanical strength.

2. Description

The alarm will be triggered when infrared sensor (PIR) and microwave sensor detect motion within a time period shorter than 4 seconds.

Active IR anti-mask

The active anti-mask feature detects attempts to cover the detector or paint over the lens. The detector emits infrared radiation and measures the amount of radiation reflected. If the lens is covered or painted over, the amount of reflected radiation will change. Registering a rapid change in the level of infrared radiation will result in activating the anti-mask relay. The relay will remain active as long as masking is sensed by the detector.



The active anti-mask feature meets the EN 50131-2-4 requirements.

Supervision features

In the event of the voltage drop below 9 V ($\pm 5\%$) for more than 2 seconds or the motion detection system failure, the detector will signal a trouble. The trouble is indicated by the activation of alarm relay and the steady light of all LED indicators. The trouble signaling will continue as long as the trouble persists.

Remote LED enable/disable

The LED can be enabled/disabled remotely when the LED is not enabled by means of the jumper. The LED terminal is provided to allow remote LED enable/disable. The LED is enabled, when the terminal is connected to the common ground, and disabled, when the terminal is disconnected from the common ground. You can connect to the LED terminal an OC type control panel output programmed e.g. as the "Service mode status", "BI switch" or "Zone test status".

Remote configuring mode enable/disable

The SVCE terminal is provided to allow remote configuring mode enable/disable. The configuring mode is enabled, when the terminal is connected to the common ground. You can connect to the SVCE terminal an OC type control panel output programmed e.g. as the "Service mode status", "BI switch" or "Zone test status".

3. Electronics board



Do not remove the plastic cover from the circuit board to prevent damage to the components located on the board.

Do not touch the pyroelectric sensor, so as not to soil it.

① terminals:

- AM** - anti-masking output (NC relay).
- TMP** - tamper output (NC).
- NC** - alarm output (NC relay).
- COM** - common ground.
- +12V** - power input.
- LED** - remote LED control.
- SVCE** - remote control of configuring mode.
- D/N** - dusk sensor output (OC type output).

② pins to enable/disable the LED indicators. If the LED indicators are to be enabled, place the jumper on pins (the remote LEDs enable/disable is not available then).

③ microwave sensor.

④ yellow LED indicating motion detection by PIR sensor – ON for 4 seconds.

⑤ red LED indicating alarm – ON for 2 seconds.

⑥ green LED indicating motion detection by microwave sensor – ON for 4 seconds.



During the detector warm-up all LEDs blink alternately for about 40 seconds. All LEDs are ON during detector trouble. LEDs are also used for signaling in configuring mode (see: "Detector configuring").

⑦ dusk sensor.

⑧ infrared receiver allowing to configure the detector by means of OPT-1 keyfob. The keyfob is offered by SATEL.

⑨ anti-mask circuit LEDs.

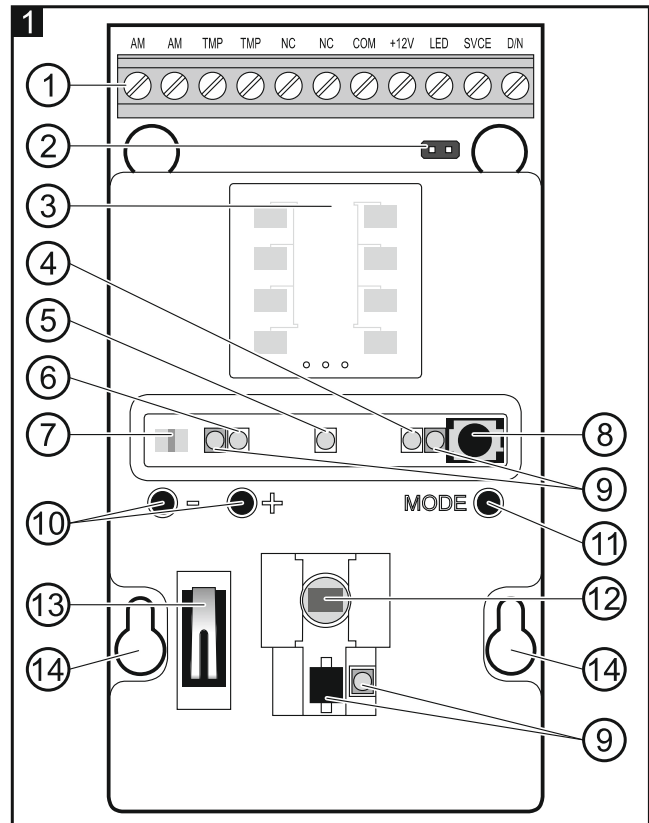
⑩ buttons used during sensors sensitivity setting.

⑪ MODE button used for the detector configuring (see: "Detector configuring").

⑫ dual element pyrosensor.

⑬ tamper contact activated by cover removal.

⑭ fixing screw holes.



On the other side of the electronic board is a tamper contact activated by removing the detector from the wall.



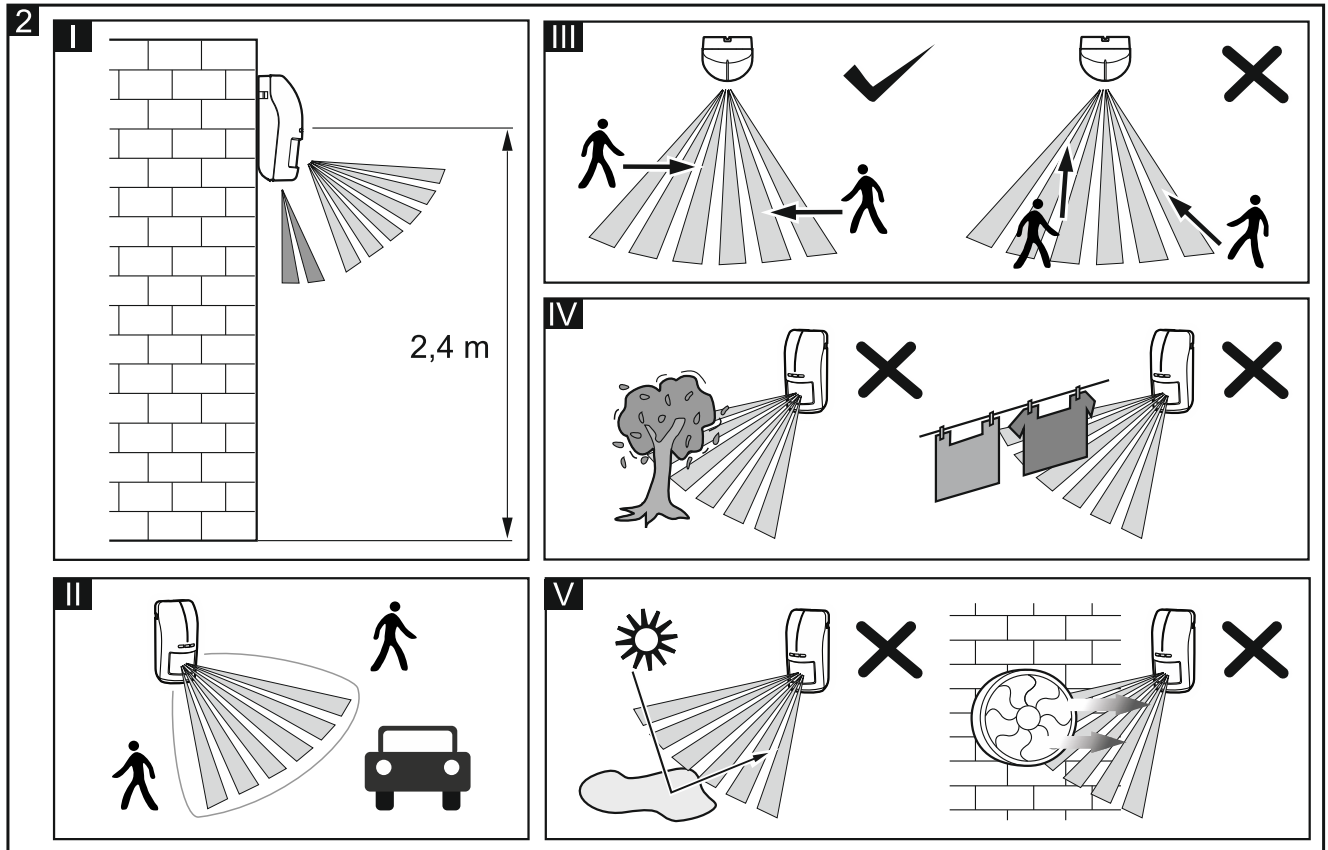
When mounting the detector on the angle or ball bracket, it is necessary to install additional tamper contact.

4. Installation



Disconnect power before making any electrical connections.

If the detector is to be pet immune, it should be mounted at 2.4 m height with no vertical tilt. It is especially important when mounting on a ball bracket.

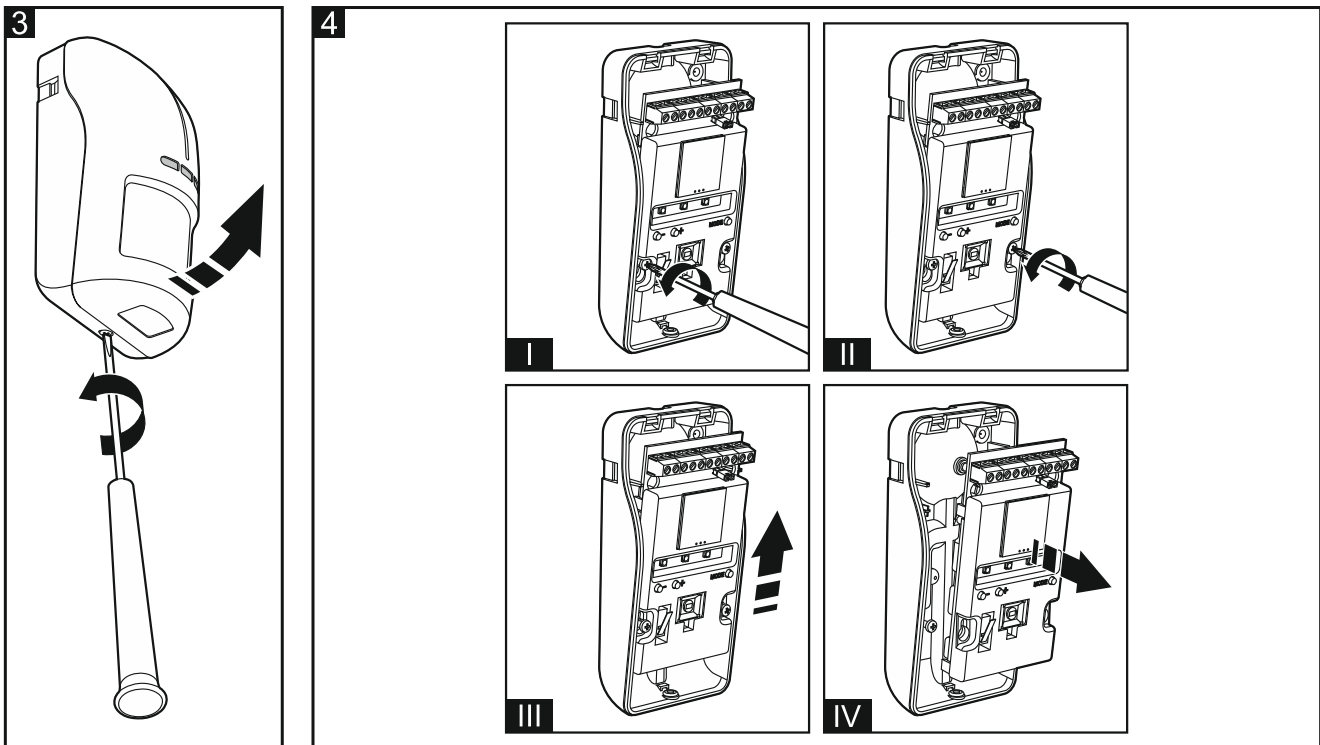


- The detector can be installed outdoors as well as indoors, in spaces with harsh environmental conditions (high dustiness, high humidity, low or high temperatures, etc.). Thus, you can use it in warehouses, production halls, or other industrial facilities.
- Install the detector at the recommended height (Fig. 2-I).
- If traffic nearby or objects moving out of the protected area cause an alarm, move the detector slightly downwards or reduce the detector sensitivity (Fig. 2-II).
- Install the detector so that the expected movement of an intruder will be across the coverage pattern (Fig. 2-III).
- Don't install the detector closer than 3 meters from the moving objects (eg. tree branches, bushes, laundry etc.) (Fig. 2-IV).
- Don't direct the detector on reflective surfaces or on fans or a heat sources (Fig. 2-V).
- Do not install the detector in locations exposed to direct action of sun rays.



When putting two or more cables into the enclosure, it is advisable to place them in heat shrink tube. It reduces the risk of getting water into the enclosure.

1. Remove the front cover (Fig. 3).
2. Remove the electronics board (Fig. 4).

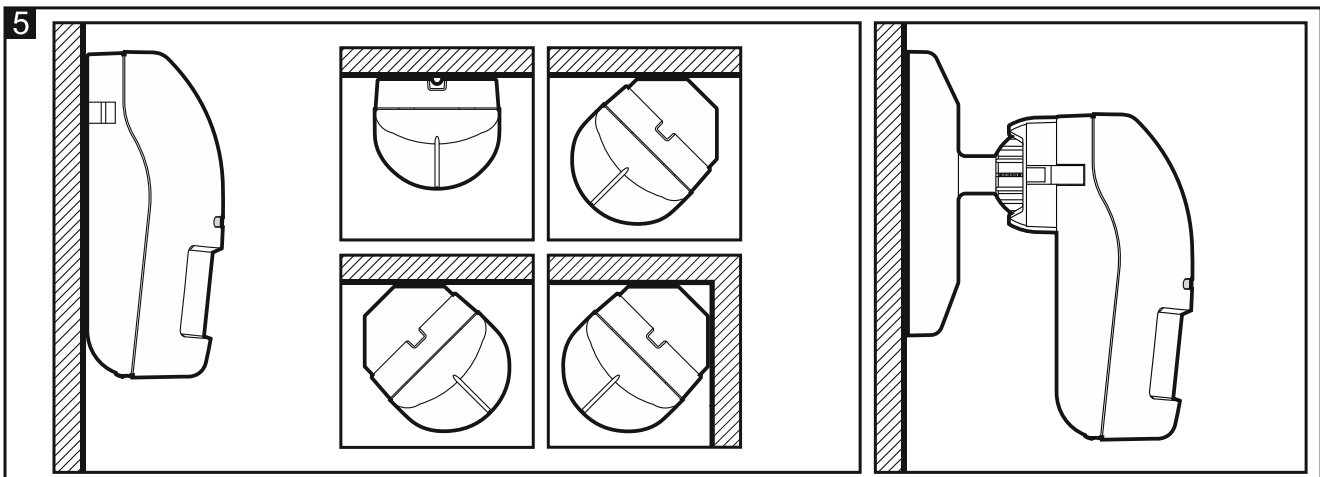


3. Make the opening for cable in the enclosure base.
4. Mount the enclosure base to the wall (see: "Wall mounting"), to the angle bracket (see: "Angle bracket mounting") or to the ball bracket (see: "Ball bracket mounting"). In Figure 5 possible ways of mounting the detector are shown.
5. After mounting the detector, fix the electronics board.
6. Connect the wires to the corresponding terminals.



If the detector is to be installed outdoors, do not connect the anti-masking outputs to the control panel zones. Severe weather conditions, including rain, fog or frost, can be interpreted by the anti-mask circuit as an attempt to mask the detector.

7. Power-up the detector. All the LEDs will be blinking alternately for 40 seconds, signaling the detector warm-up.
8. After the LEDs stop blinking, configure the detector (see: "Detector configuring").
9. Replace the cover.
10. Power-off the detector and then power-up it again for the anti-mask circuit to configure properly. After power-up, the detector will be analyzing (for 40 seconds) the environment in which it has been installed, and will adapt the operating parameters of anti-mask accordingly. When the environment analysis is in progress, the enclosure must be closed and the detector must not be covered by any undesirable objects.



Wall mounting

1. Run the cable through the opening in the enclosure base.
2. Using wall plugs (screw anchors) and screws, fasten the enclosure base to the wall

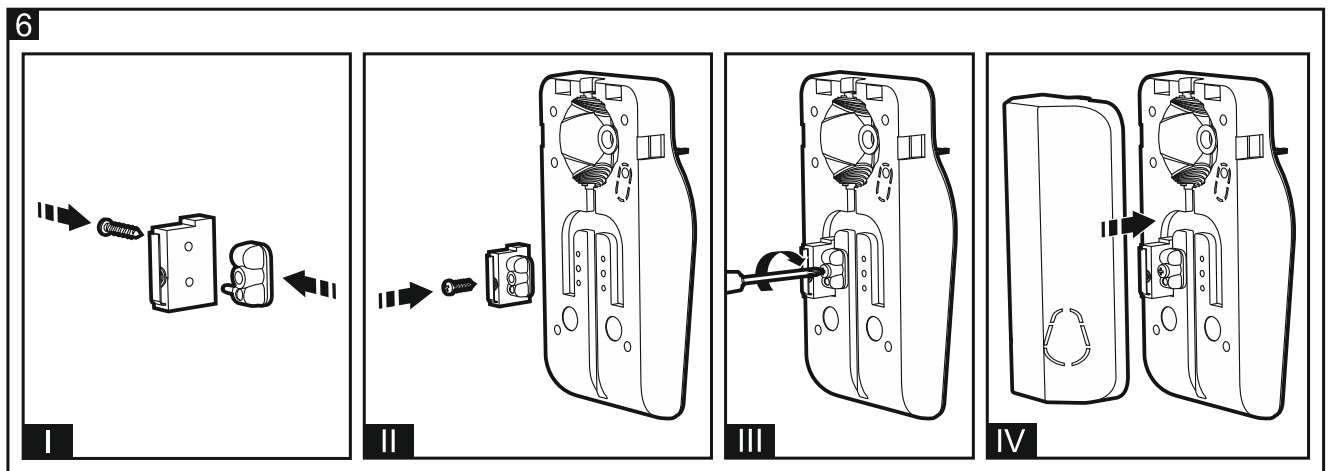
Angle bracket mounting

1. Attach extra tamper contact:
 - screw the holder to the tamper contact (Fig. 6-I),
 - screw the tamper unit to the enclosure base (Fig. 6-III).



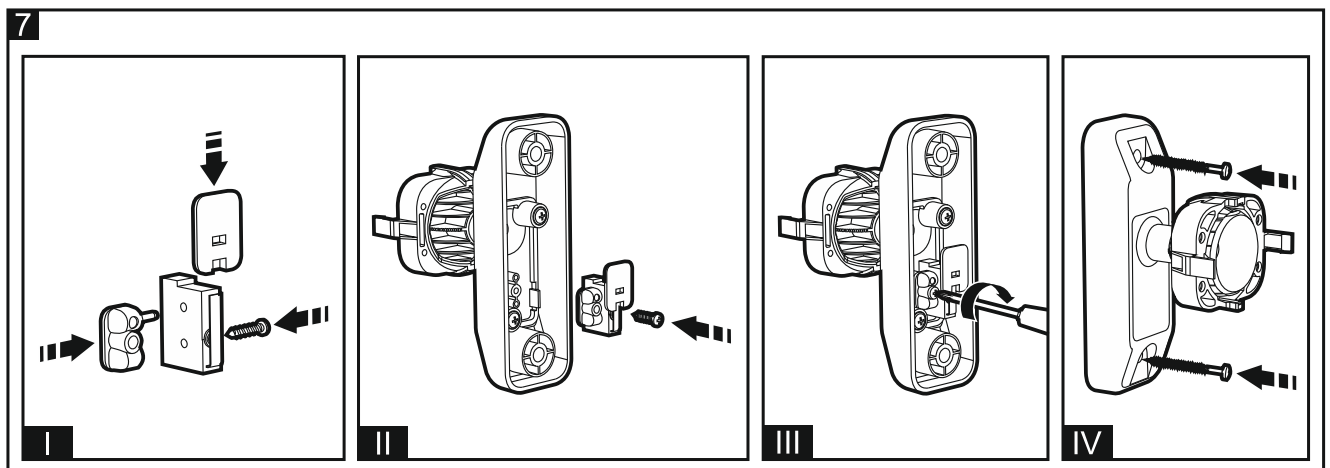
Figure 6 shows mounting the tamper contact in one of two available positions. The place of tamper contact installing depends on the way of angle bracket mounting. If the tamper contact is to be installed in the other position, place tamper contact holder on the other side.

2. Prepare openings in the bracket for screws and a cable.
3. Pass the cable through the prepared opening.
4. Using wall plugs (screw anchors) and screws, fasten the bracket to the wall.
5. Run the cable through the opening in the enclosure base.
6. Using screws, fasten the enclosure base to the bracket (Fig. 8).



Ball bracket mounting

1. Attach extra tamper contact:
 - screw the holder to the tamper contact (Fig. 7-I),
 - put the unit making the surface bigger on the tamper contact (Fig. 7-I),
 - screw the tamper unit to the ball bracket (Fig. 7-III).
2. Run the cable through the opening in the handle of the bracket.



3. Using wall plugs (screw anchors) and screws, fasten the ball bracket to the wall (Fig. 7-IV).

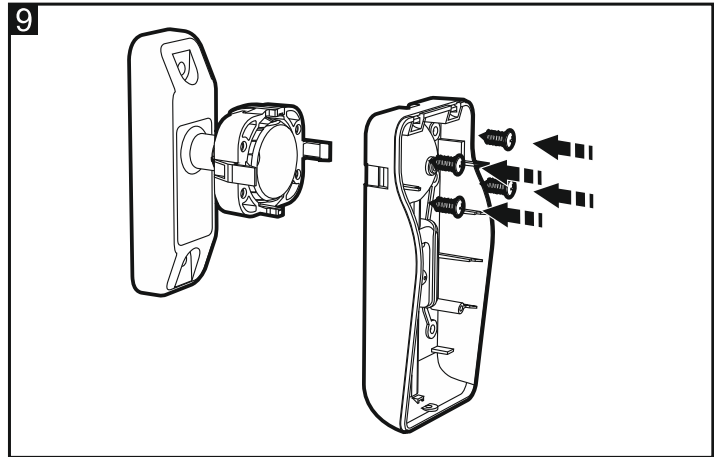
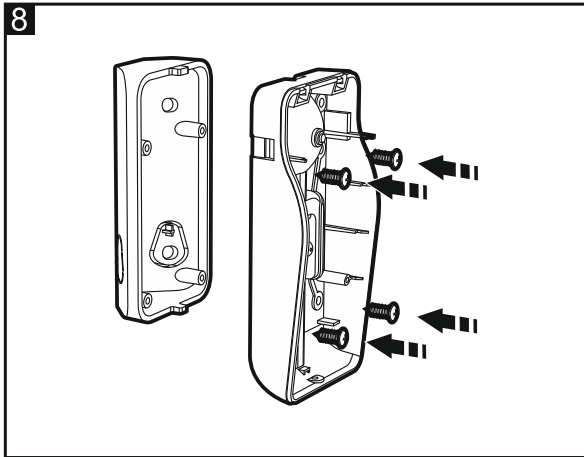
4. Run the cable through the opening in the enclosure base.
5. Using screws, fasten the enclosure base to the ball bracket (Fig. 9).

Connecting the additional tamper contact

The additional tamper contact is provided with three wires:

- black – common wire,
- blue – wire for NC circuit,
- grey – wire for NO circuit.

The tamper contact can be connected in series to tamper output (TMP) on detector electronics board or to additional tamper circuit.



5. Detector configuring

The detector allows you to configure working parameters of each sensor separately:

- detection sensitivity of the microwave sensor,
- detection sensitivity of the PIR sensor,
- detection threshold of the dusk sensor.

Each sensor has 16 sensitivity thresholds.

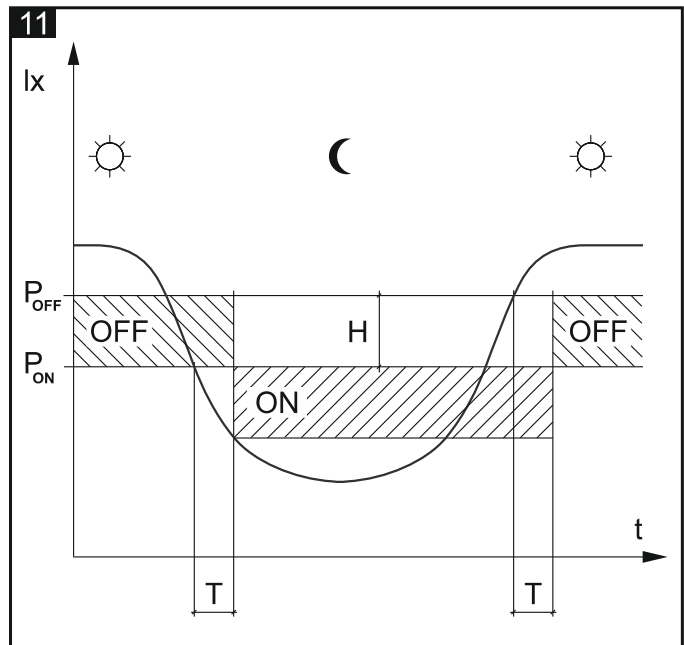
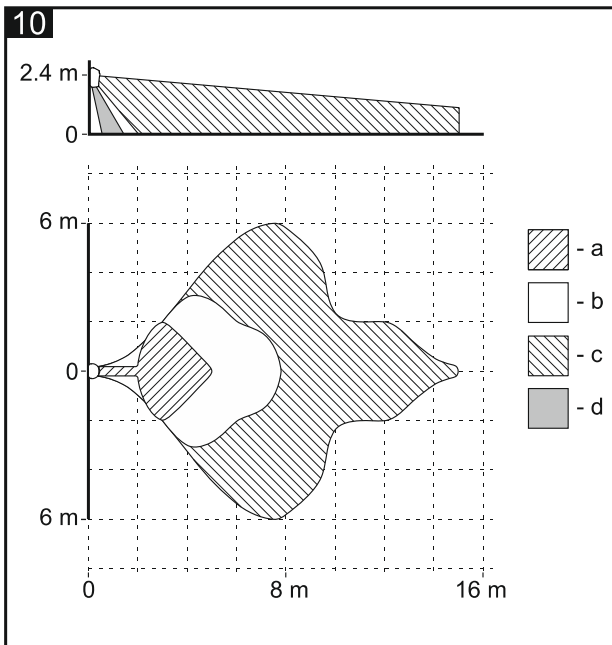


Figure 10 shows the coverage areas of the motion detector (a - minimum, b - default, c - maximum, d - creep zone).

Figure 11 shows the way the dusk sensor operates. On the timeline the T time delay is presented (in operating mode T=15 min, in configuring mode T=3 s). Illustrated with the letter H light intensity hysteresis and time delay make the sensor immune to short and accidental changes of light intensity. Table 1 presents light intensity values for three detection thresholds.

Detection threshold	Light intensity [lx]	
	Turning on [P _{ON}]	Turning off [P _{OFF}]
minimum	10	170
default	25	100
maximum	30	80

Table 1.



All parameters set in the configuring mode are written in the detector non-volatile memory and are retained even after power loss.

If the detector is to be pet immune, for the infrared and microwave sensors do not set the detection sensitivity higher than default.

Starting configuring mode

Press MODE button on the detector electronics board for 2 seconds or apply the common ground to the SVCE terminal. After starting the configuring mode, the green LED starts to blink, it means that you can configure the sensitivity of the microwave sensor.



Entering the configuring mode disables the anti-mask feature. The anti-mask feature will be automatically enabled after you exit the configuring mode.

Signaling in the configuring mode

The way in which LEDs operate during configuring of the sensors is as follows.

The microwave sensor

green LED – blinking indicates microwave sensor configuring, blinking frequency gives information about sensitivity (higher blinking frequency = higher sensor sensitivity),

yellow LED – signals motion detection – ON for 2 seconds.

The PIR sensor

yellow LED – blinking indicates PIR sensor configuring, blinking frequency gives information about sensitivity (higher blinking frequency = higher sensor sensitivity),

green LED – signals motion detection – ON for 2 seconds.

The dusk sensor

red LED – blinking indicates dusk sensor configuring, blinking frequency gives information about the set detection threshold (higher blinking frequency = higher detection threshold),

yellow LED – ON when the light intensity is below the set threshold.



Reaching the bottom or top limit of adjustment setting is indicated by the LED which is ON for 3 seconds.

Configuring by means of the detector buttons

By pressing buttons **-** (value decreasing) and **+** (value increasing) set the sensitivity / detection threshold of the sensor.



Pressing buttons **-** and **+** simultaneously restores default settings for the configured sensor. Keeping the buttons pressed for 3 seconds restores default settings for all sensors.

Pressing MODE button briefly allows starting configuring of another sensor. Blinking of the proper LED will indicate which sensor is being configured (see: "Signaling in the configuring mode").

Configuring by means of OPT-1 keyfob

Point the keyfob towards the detector and by pressing buttons ● (value decreasing) and ○ (value increasing) set the sensitivity / detection threshold of the sensor.



Pressing the button ▲ restores default settings for the configured sensor.

By pressing ■ (the next sensor) or □ (the previous sensor) go to another sensor configuring. Blinking of the proper LED will indicate which sensor is being configured (see: “Signaling in the configuring mode”).

End of configuring mode

Press MODE button on the electronics board for 2 seconds or remove the common ground from the SVCE terminal.



If the configuring mode was activated by means of the MODE button, it is automatically exited after 20 minutes since the last operation performed by the user.

6. Anti-mask delay

Anti-mask delay is the time during which the detector must be covered for the anti-mask relay to be activated (cf. “Active IR anti-mask”). By default, the delay is 1 second. You can increase the delay up to 60 seconds.



If the anti-mask delay is 60 seconds, the anti-mask feature does not meet the requirements of EN 50131-2-4 for Grade 3.

To program the 60-second delay:

1. Power off the detector.
2. Place a jumper across the LED enable/disable pins.
3. Press and hold down the ■ button on the electronics board.
4. Power on the detector.
5. 3 seconds after power-on release the ■ button. The new settings will be saved.

To program the 1-second delay:

1. Power off the detector.
2. Remove the jumper from the LED enable/disable pins.
3. Press and hold down the ■ button on the electronics board.
4. Power on the detector.
5. 3 seconds after power-on release the ■ button. The new settings will be saved.

7. Walk test

Check that moving within the coverage area will activate the alarm relay and make the LED light up red.

Separate testing of sensors

Testing of the sensors is done in the detector configuring mode. Starting the mode, choosing the sensor and the way of changing sensitivity are described in detail in the chapter “Detector configuring”.

6. Start the configuring mode.
7. Choose the sensor to be tested.
8. Check that moving in the coverage area will activate the alarm relay and make the violation signaling LED light up.
9. If it is needed, readjust sensitivity and check the sensor operating.

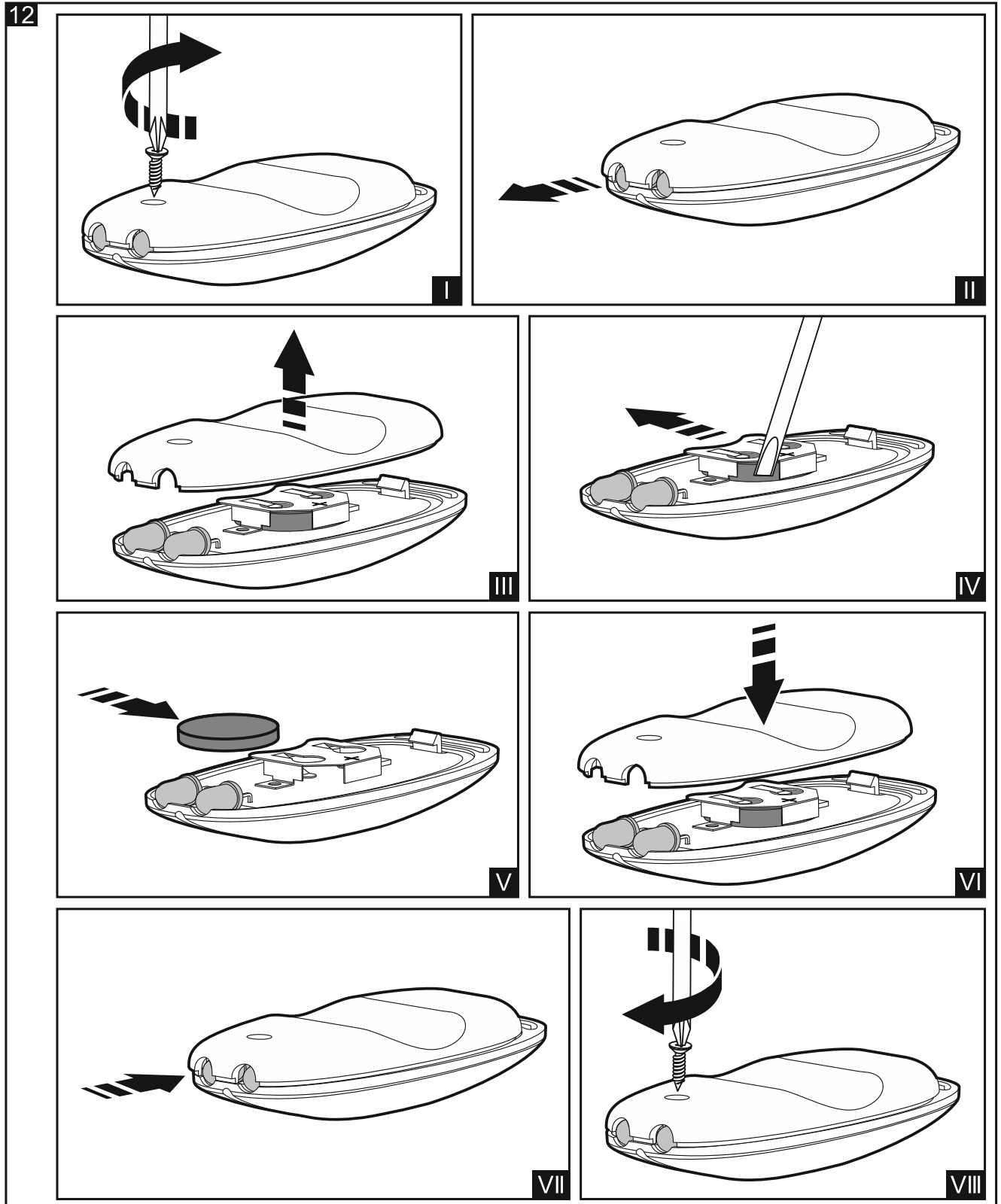
8. OPT-1 keyfob

The keyfob is CR2032 3V lithium battery powered. Battery life depends entirely on the way the keyfob is used. The battery lasts for at least 8 thousand button pressings.

The keyfob LED is ON if any button is pressed. If the battery is low, the LED blinks instead of being ON. You should replace the battery then. The way of battery replacing is shown in Figure 12. If the battery is low, the keyfob range decreases.



The used batteries must not be discarded, but should be disposed of in accordance with the existing rules for environment protection.



9. Specifications

OPAL Pro

Supply voltage	12 V DC \pm 15%
Standby current consumption	17 mA
Maximum current consumption.....	30 mA
Relay contacts rating (resistive load).....	40 mA / 16 V DC
D/N output rating (OC type output).....	50 mA / 12 VDC
Microwave frequency.....	24 GHz
Detectable speed	0.2...3 m/s
Alarm signaling period	2 s
Warm-up period	40 s
Recommended installation height.....	2.4 m
Security grade.....	Grade 3
Standards complied with.....	EN50131-1, EN 50131-2-4, EN50130-4, EN50130-5
IP code	IP54
Environmental class according to EN50130-5.....	IIIa
Operating temperature range	-40...+55 °C
Maximum humidity	93 \pm 3%
Dimensions	65 x 138 x 58 mm
Detector weight (without a bracket)	178 g

OPT-1 keyfob

Battery.....	CR2032 3V
Range	15 m
Enclosure dimensions.....	78 x 38 x 16 mm
Weight.....	24 g