OUTDOOR DUAL TECHNOLOGY MOTION DETECTOR

OPAL / OPAL Plus

Firmware version 2.01

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 / OPAL Plus detector allows detection of motion in the protected area. It is designed for outdoor use. This manual applies to the detector with electronics version E (or newer).

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.
- Microwave based anti-mask feature.
- Dusk sensor [OPAL Plus].
- Capability of separate sensor configuring/testing.
- Sensitivity configuring by means of OPT-1 keyfob [OPAL Plus].
- Three LED indicators.
- Remote LED enable/disable.
- Remote configuring mode enable/disable.
- Supervision of detector signal path 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.

Anti-mask feature

Detection by the microwave sensor of an object moving at a distance of 10-20 centimeters from the detector is interpreted as an attempt to mask the detector and results in activation of anti-masking relay for two seconds. Objects permeable to microwaves, but isolating the infrared radiation are not detected by the anti-mask feature.

Supervision features

In the event of the voltage drop below 9 V (± 5%) for more than 2 seconds or the signal path 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

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

5 red LED indicating alarm – ON for 2 seconds.

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

> ℹ️ *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 [OPAL Plus only].

8 infrared receiver allowing to configure the detector by means of OPT-1 keyfob [OPAL Plus only]. The keyfob is offered by SATEL.
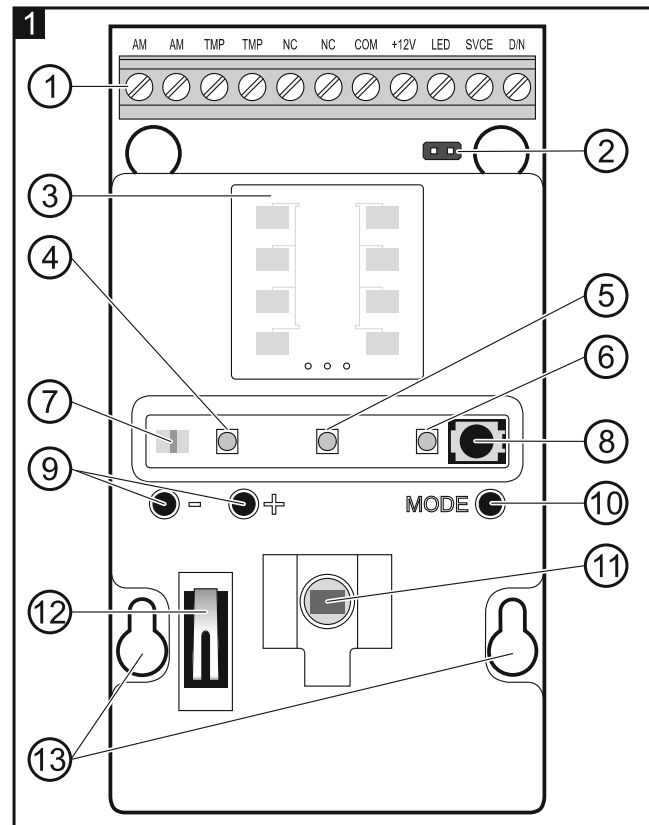
9 ▬ and ✚ buttons used during sensors sensitivity setting.

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

11 dual element pyrosensor. **Do not touch the pyroelectric sensor, so as not to soil it.**

12 tamper contact activated by cover removal.

13 fixing screw holes.

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

i   *When mounting the detector on the angle or ball bracket, it is necessary to install additional tamper contact (it is included in the detector delivery set).*
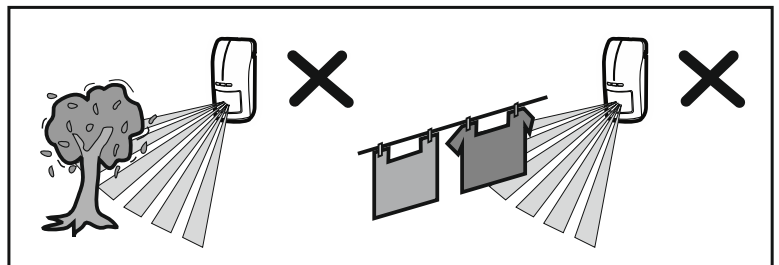
4.   Installation

⚠   **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.


2.4 m
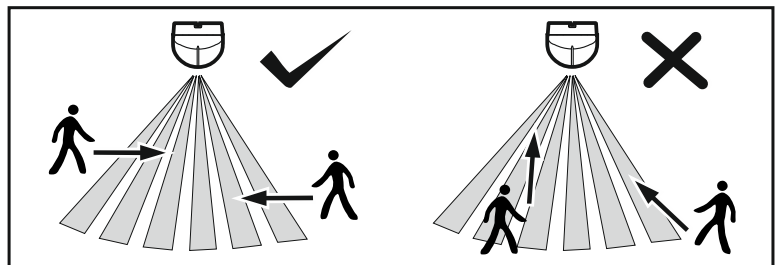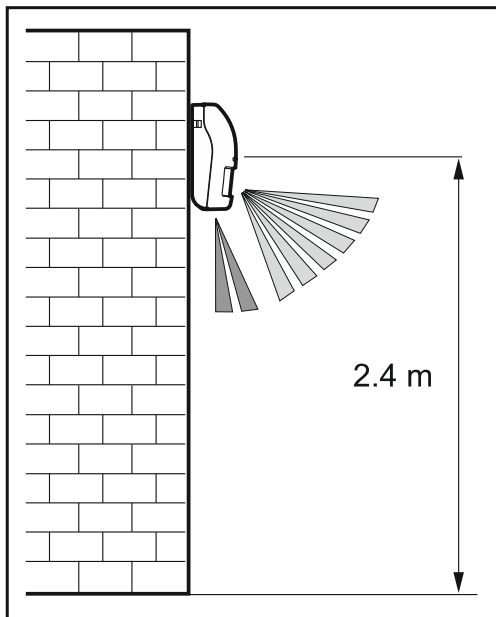
Install the detector so that the expected movement of an intruder will be across the coverage pattern.

Don't install the detector closer than 3 meters from the moving objects (eg. tree branches, bushes, laundry etc.).
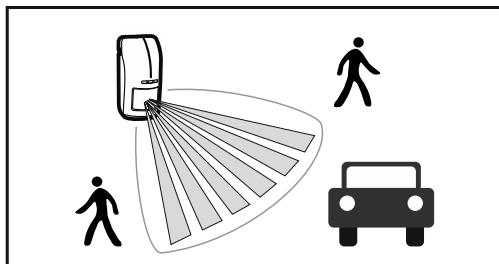
If traffic nearby or objects moving out of the protected area cause an alarm, move the detector slightly downwards or reduce the detector sensitivity.
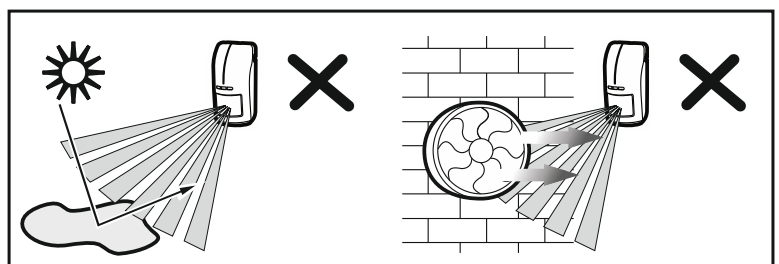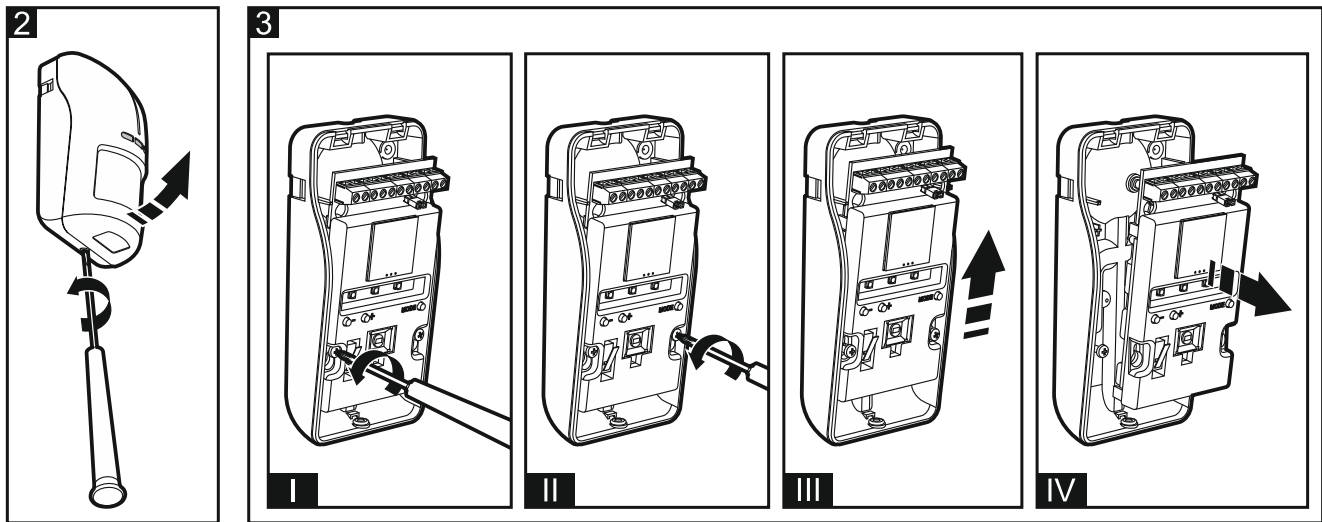
Don't direct the detector on reflective surfaces or on fans or a heat sources.

i   *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. 2).
2.   Remove the electronics board (Fig. 3).

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 4 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.
7. Configure the detector (see: "Detector configuring").
8. Replace the cover.
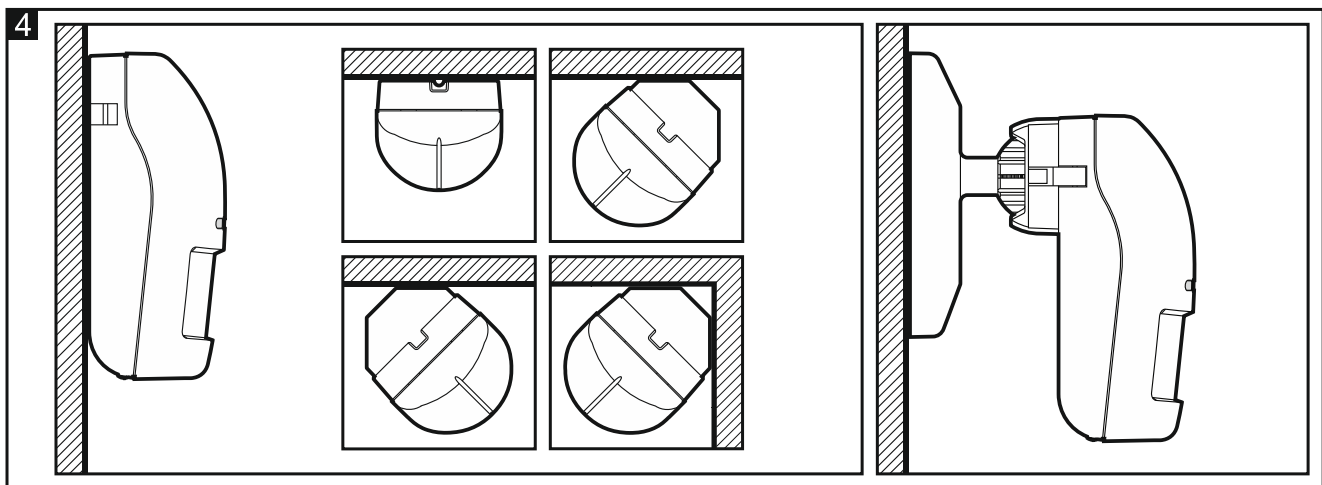
Wall mounting

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. 5-I),
   – screw the tamper unit to the enclosure base (Fig. 5-III).

i *Figure 5 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.
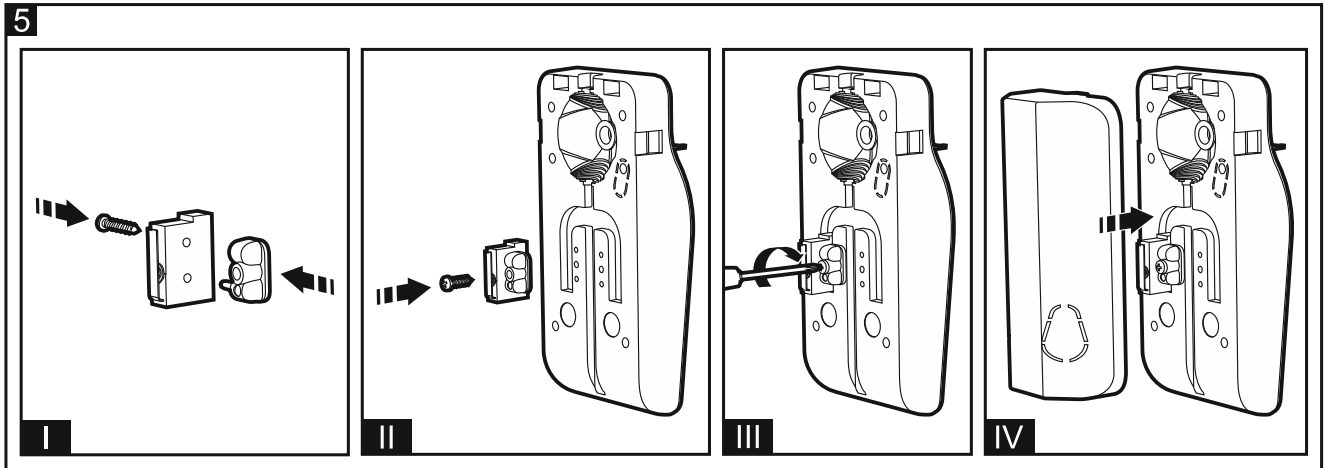6. Using screws, fasten the enclosure base to the bracket (Fig. 7).

Ball bracket mounting

1. Attach extra tamper contact:
   – screw the holder to the tamper contact (Fig. 6-I),
   – put the unit making the surface bigger on the tamper contact (Fig. 6-I),
   – screw the tamper unit to the ball bracket (Fig. 6-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. 6-IV).
4. Run the cable through the opening in the enclosure base.
5. Using screws, fasten the enclosure base to the ball bracket (Fig. 8).
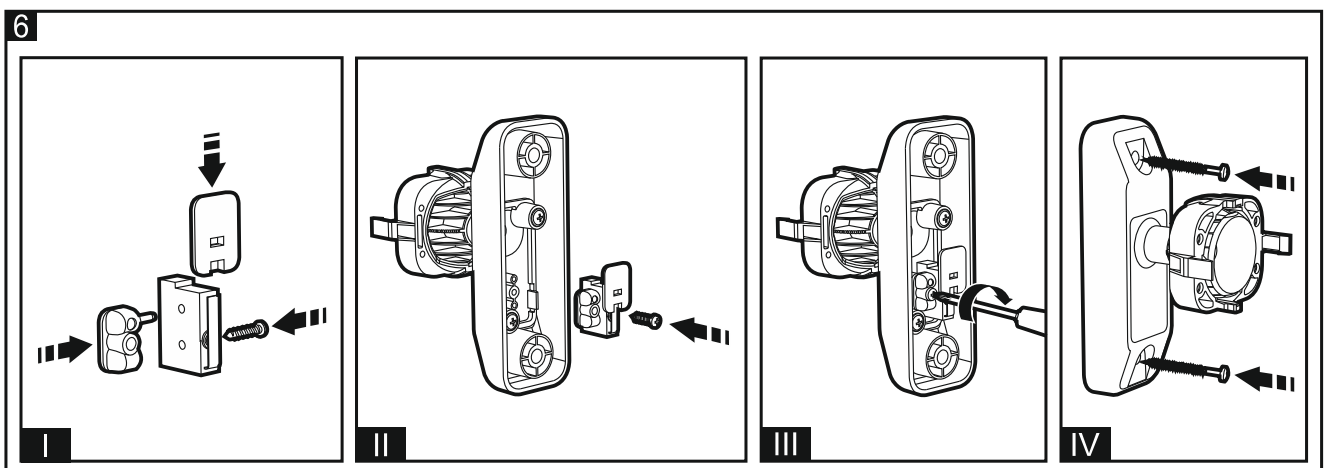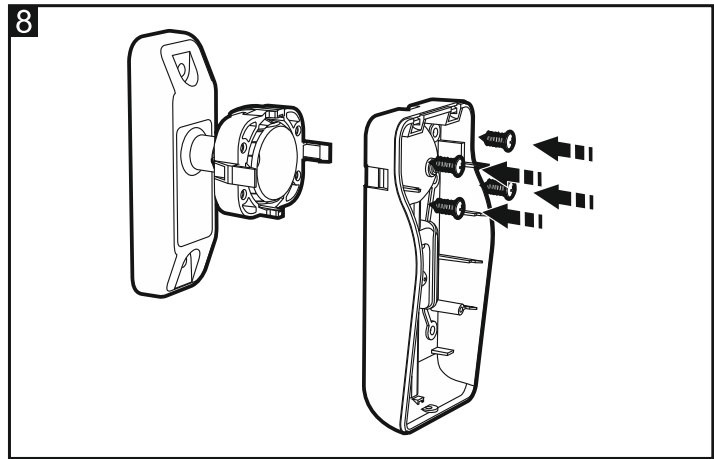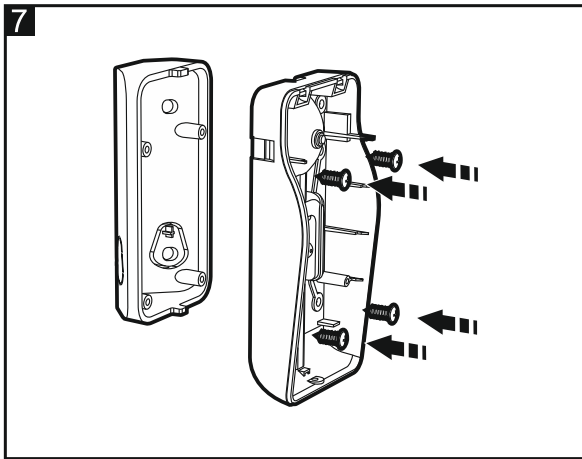
Connecting the additional tamper contact

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 [OPAL Plus].

Each sensor has 16 sensitivity thresholds.

Figure 9 shows the coverage areas of the motion detector (▨ - minimum, ☐ - default, ◩ - maximum, ▦ - creep zone).
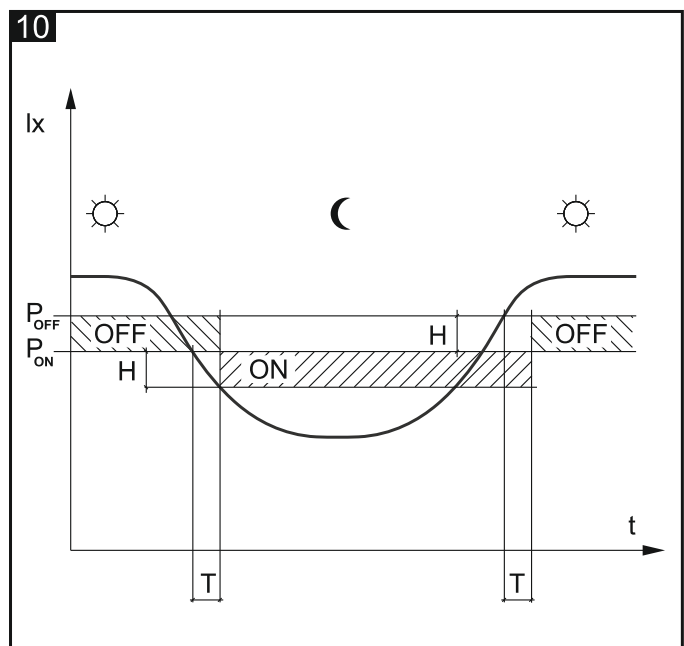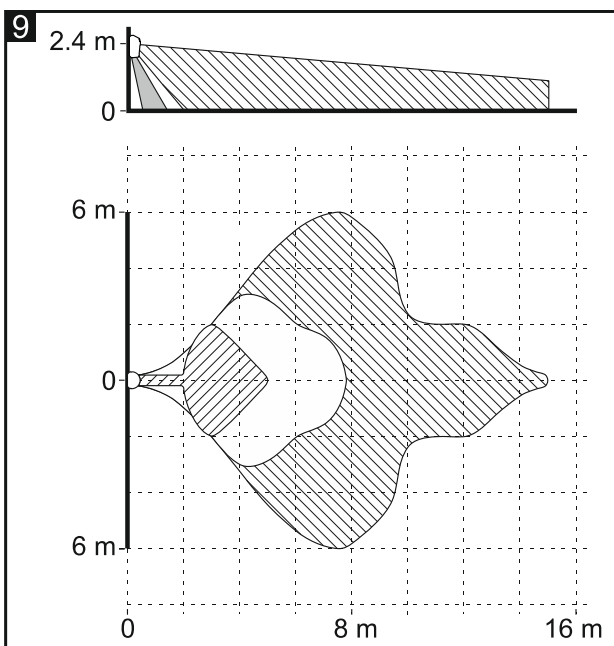
Figure 10 shows the way the dusk sensor operates. On the timeline the T time delay is presented (in operating mode T=15 min, in configuring mode T=3 s). Illustrated with the letter H in Figure 10 light intensity hysteresis and time delay make the sensor immune to short and accidental changes of light 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.

i   *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.

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 informs of microwave sensor configuring, blinking frequency informs of sensitivity (higher blinking frequency = higher sensor sensitivity),

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

The PIR sensor

yellow LED – blinking informs of PIR sensor configuring, blinking frequency informs of sensitivity (higher blinking frequency = higher sensor sensitivity),

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

The dusk sensor

red LED – blinking informs of dusk sensor configuring, blinking frequency informs on the set detection threshold (higher blinking frequency = higher detection threshold),

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

i   *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.

> ℹ️ *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 [OPAL Plus]

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

> ℹ️ *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.

Note: 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. Start-up and walk test

1. Power-up the detector. All LEDs will begin alternately blinking for 40 seconds, which indicates the detector warm-up.
2. When the LEDs stop blinking, 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".

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

7. 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 11. 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.**
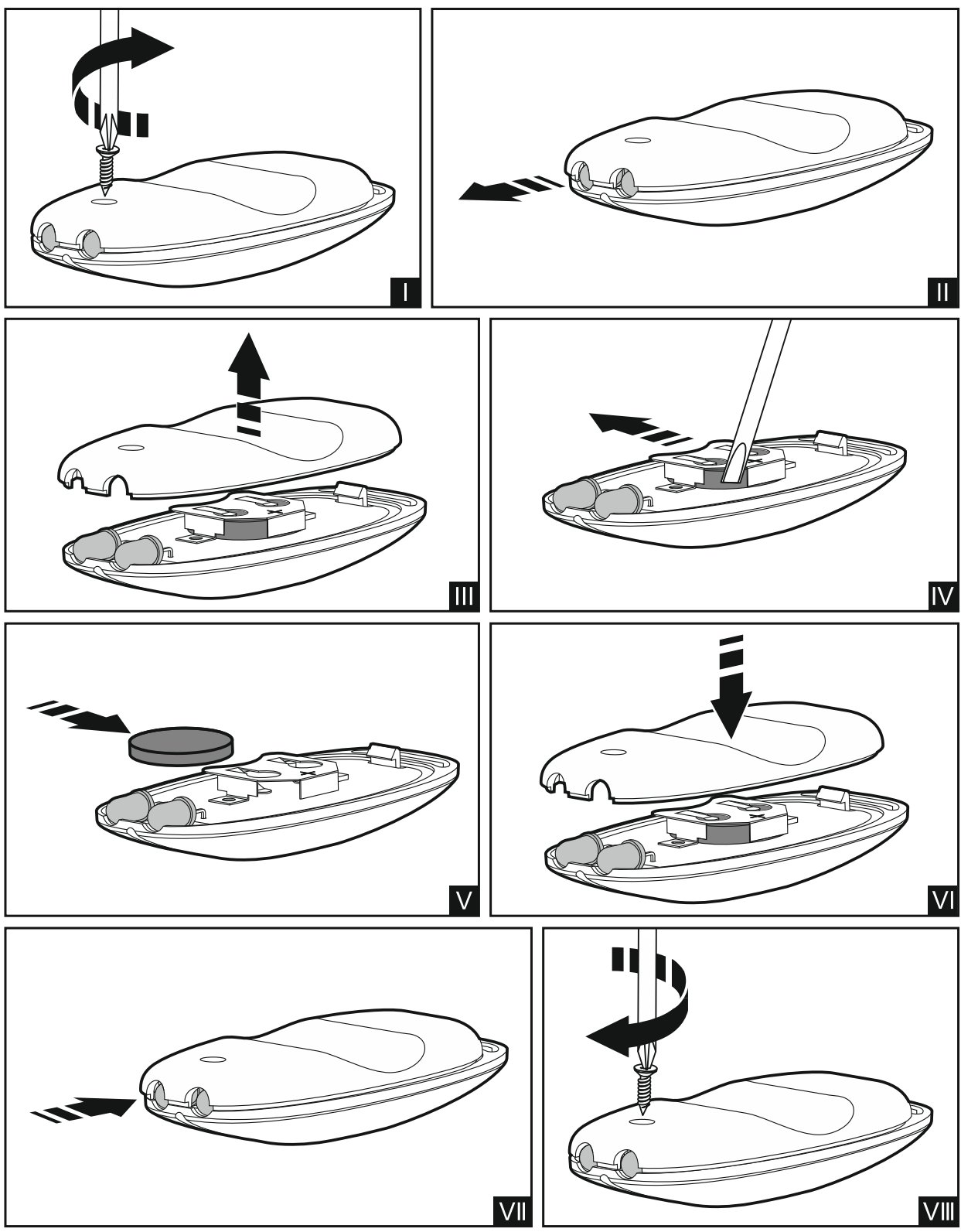
8. Specifications

OPAL / OPAL Plus detector

Supply voltage .... 12 V DC ±15%

Standby current consumption	OPAL ....12 mA
	OPAL Plus ....15 mA
Maximum current consumption	OPAL ....20 mA
	OPAL Plus ....20 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 .... 0.3...3 m/s
Alarm signaling period.. 2 s
Warm-up period .... 40 s
Recommended installation height ....2.4 m
Security grade according to EN50131-2-2 .... Grade 2
Standards complied with EN50131-1, EN50131-2-2, EN50130-4, EN50130-5
IP code IP54
Environmental class according to EN50130-5 ....IIIa
Operating temperature range...-40...+55 °C
Maximum humidity ....93±3%
Dimensions .... 65 x 138 x 58 mm

Detector weight (without a bracket)	OPAL ....174 g
	OPAL Plus ....176 g

OPT-1 keyfob

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