SensMax®
Sense your business

RADAR SENSOR

TAC-B FAMILY

Data Sheet

Document version v 4.0

Table of content (part 1 of 2)

DESCRIPTION 1
APPLICATION 2
MODEL COMPARISON 2
TECHNICAL SPECIFICATION 3
TAC-B 3D-W SENSOR ELEMENTS 4
TAC-B 3D-WP SENSOR ELEMENTS 5
TAC-B 4G SENSOR ELEMENTS 6
TAC-B 4G SENSOR SIM CARD INSTALLATION 7
TAC-B SENSOR INSTALLATION 8
CONFIGURATION OF SENSOR USING WEB PAGE 9
HOME WEB PAGE 10
SCENE WEB PAGE 11
- COUNTING OPTIONS 12
- WALLS 13
- SELECT SCENE 13
- EDIT SCENE 14
- ROUTE LINE 16
- GATES 16
- ZONES 17
- CREATING OF USER GATES OR ZONES 18

Table of content (part 2 of 2)

SETTINGS WEB PAGE 19

NETWORK 19

Wi-Fi Settings 19

Network settings 19

MQTT 20

MQTT Settings 21

MESSAGING 21

Email 22

Telegram 22

SYSTEM 23

Time and Date Settings 23

Social distance settings 24

More settings 24

POWER 25

Low power scanning 25

Low power network mode 25

Suspend mode 26

STATUS 26

REPORTS WEB PAGE 27

TODAY REPORT 27

CSV REPORT 28

NOTIFICATIONS 29

SUPPORT OF WEBHOOKS 31

Description

The SensMax TAC-B sensors use the mmWave contactless technology which operates in the spectrum 60 GHz. The sensor emits a scanning “chirp” and receives reflections from objects.

SensMax TAC-B sensors can be used for robust indoor/outdoor sensing in all lighting, smoke, fog, rain, detect very fine motions, penetration through materials like plastic, fabric, and drywall. Using of original SensMax software is optional, but sensor can be used without it.

The SensMax TAC-B sensors supports popular IoT MQTT protocol, Email and Telegram API. These features gives reach opportunities for integration of TAC-B sensor to any projects.

Key features include:

- **4D Real-time Tracking:** Tracks moving objects in four dimensions: X, Y, Z coordinates, and speed.
- **Object Counting:** Counts moving objects within user-defined counting lines and zones
- **Privacy Compliant:** Collects anonymous data, ensuring 100% GDPR and privacy law compatibility.
- **Object Differentiation:** Distinguishes between different types of moving objects, such as pedestrians and cyclists, based on their speed.
- **Simple Installation:** Easy to install on a wall at a height of 2-3 meters.
- **Offline Operation:** Can work offline by storing data on a built-in Micro SD card and uploading it to the server once a network connection is restored.
- **Intelligent Counting:** Prevents double-counting of objects.
- **Flexible Notification & Reporting:** Integrated with Email, Telegram & MQTT.

Application

The TAC-B sensors can be used for:

- people counting in different gates and zones
- outdoor people counting
- occupancy monitoring
- dwell time measurement
- social distance violation detection
- building automation
- smart city projects
- security projects

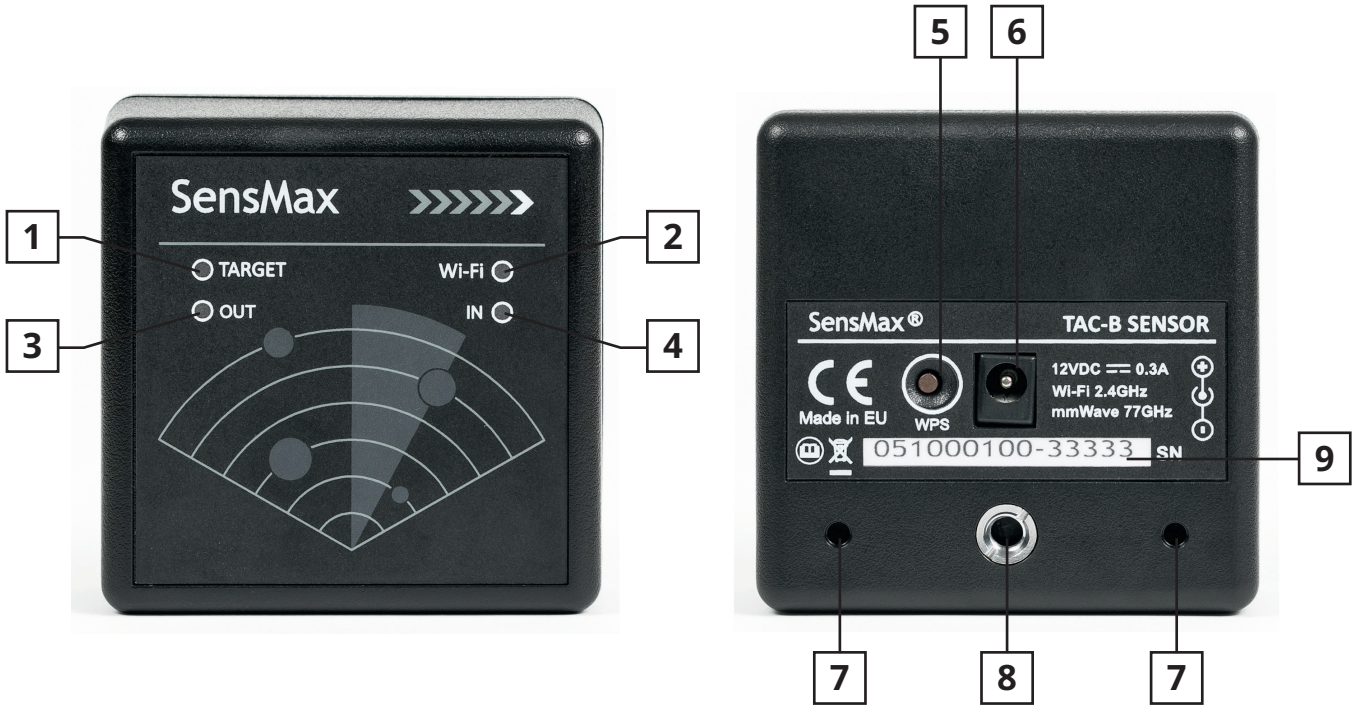
Model comparison

Model	IP rating	Application	Dimensions, mm	Wi-Fi connection	Low-power features	4G LTE modem	Color
SensMax TAC-B 3D-W	IP54	Indoor	80×80×35	+	—	—	Black
SensMax TAC-B 3D-WP	IP65	Indoor / Outdoor	80×80×45	+	+	—	Black
SensMax TAC-B 4G	IP65	Indoor / Outdoor	120×120×45	+	+	+	White

Technical specification

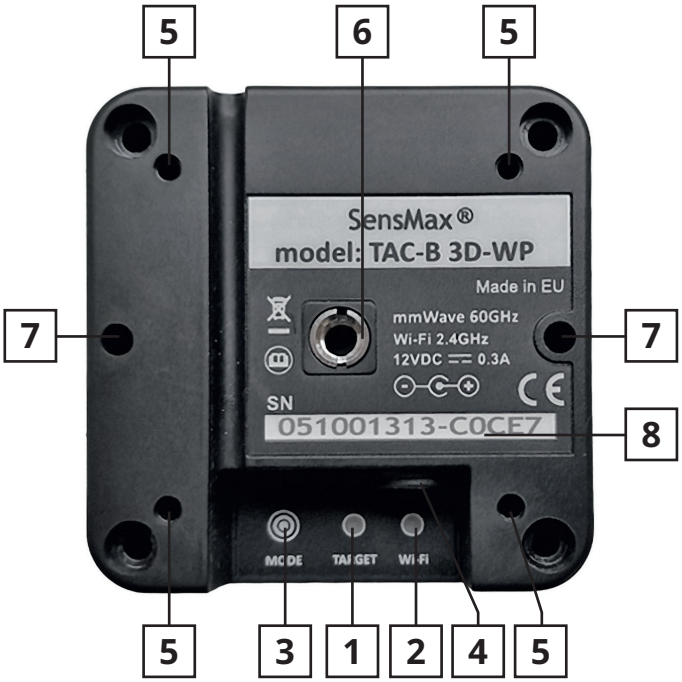
Enclosure	**Polycarbonate plastic IP65**
Counting accuracy	For range 10m >99% (for density 1 persons per m^2)
Field of view	120° horizontal, 60° vertical
Max range	Pedestrian / cyclists detection: 10 m Car detection: 20m (available for outdoor models only)
Range resolution	5cm for 5 m scene / 10 cm for 10 m scene / 20 cm for 20 m scene
Max speed of object	50 km/h
GDPR privacy law	100% compliant (provides complete anonymity)
Notifications & Reporting	Onboard **Email** and **Telegram** notifications and reports. **MQTT** support.
Internet connection	Wi-Fi 2.4 GHz / WPA2-PSK / WPA2-ENTERPRISE (PEAP-MSCHAP v2) 4G LTE (for TAC-B 4G only)
Data storage	SD card 8 GB (enough for storage of >100 year of counting data with 5 minutes step)
Power	12VDC 0.5A (AVG power consumption is 4 WH in active mode)
Low-power mode consumption	Available for outdoor models only. Low power scanning mode enabled: 2 WH Low power network mode enabled: 3.2 WH Low power scanning mode & Low power network mode enabled: 1.2 WH Suspend mode: 0.2 WH
Working temperature	–25...+65°C

TAC-B 3D-W sensor elements



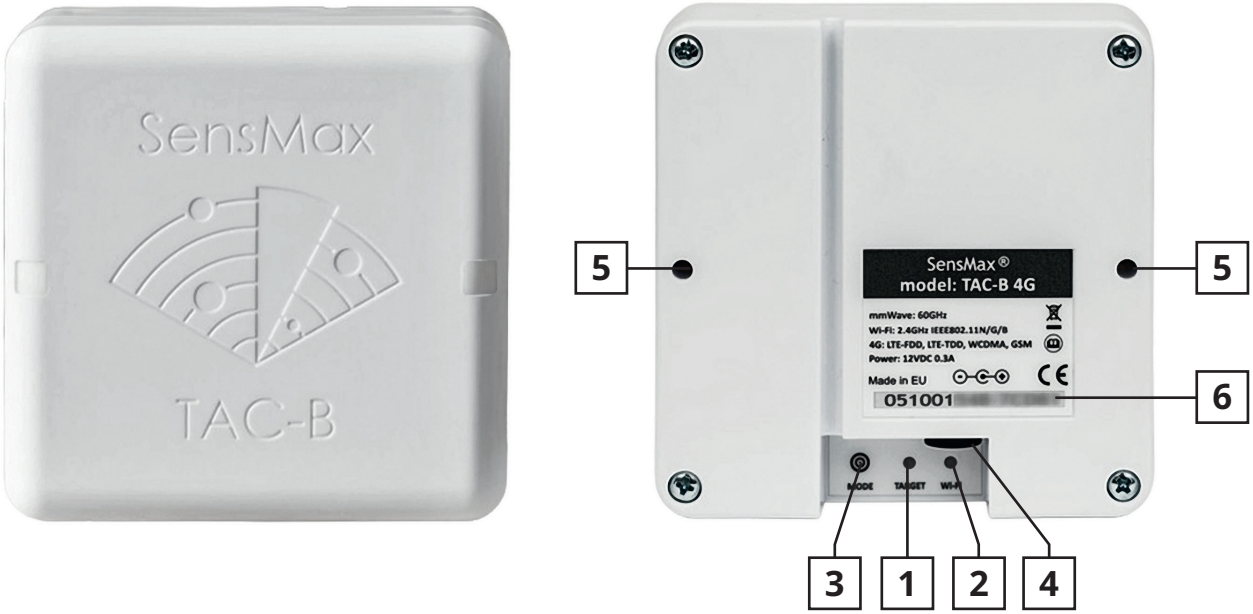
Icon	Status	Description
[1] TARGET LED (YELLOW)	Blinking	Sensor captured at least one target. The blinking frequency is dependent from distance from object till sensor (fast blinking for near target and slow for the far target).
[2] Wi-Fi LED (GREEN)	Lights	Wi-Fi Network & server both connected.
	Flashes 1 time per sec	Wi-Fi connected but server not connected.
[3] OUT LED (RED)	Flashes	Blinks when sensor detects new OUTGOING visitor for any Gate or Zone.
[4] IN LED (RED)	Flashes	Blinks when sensor detects new INCOMING visitor for any Gate or Zone.
[5] Button	Short Press	No action.
	Press and hold 30 sec	Apply Factory Reset.
[6] Power supply	n/a	Standard 5 mm diametre power supply connector.
[7] Mounting hole type A	n/a	Hole for fixing of standard SensMax bracket.
[8] Mounting hole type B	n/a	Standard tripod 1/4-20 UNC thread.
[9] Serial number	n/a	Device serial number.

TAC-B 3D-WP sensor elements



Icon	Status	Description
[1] TARGET LED (YELLOW)	Blinking	Sensor captured at least one target. The blinking frequency is dependent from distance from object till sensor (fast blinking for near target and slow for the far target).
[2] Wi-Fi LED (GREEN)	Lights	Wi-Fi Network & server both connected.
	Flashes 1 time per sec	Wi-Fi connected but server not connected.
[3] Button	Short Press	Wake up from suspend power mode (if enabled).
	Press and hold 30 sec	Apply Factory Reset.
[4] Power supply	n/a	Standard 5 mm diametre power supply connector.
[5] Mounting hole type A	n/a	Hole for fixing of standard SensMax bracket.
[6] Mounting hole type B	n/a	Standard tripod 1/4-20 UNC thread.
[7] Mounting hole type C	n/a	Through hole for mounting the sensor on the wall.
[8] Serial number	n/a	Device serial number.

TAC-B 4G sensor elements



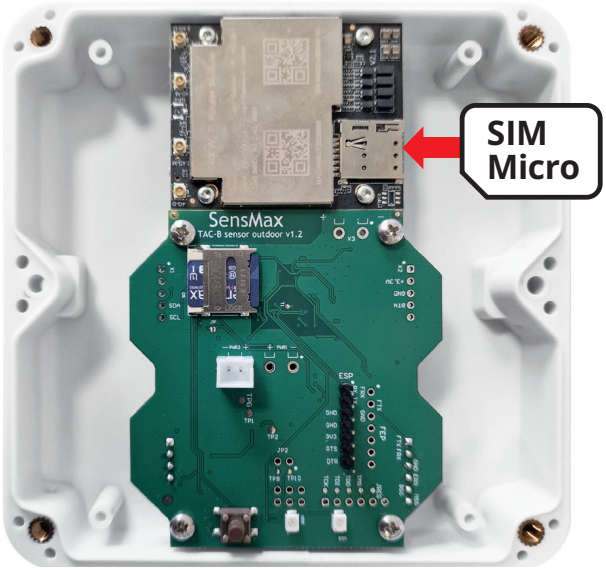
Icon	Status	Description
[1] TARGET LED (YELLOW)	Blinking	Sensor captured at least one target. The blinking frequency is dependent from distance from object till sensor (fast blinking for near target and slow for the far target).
[2] Wi-Fi LED (GREEN)	Lights	Wi-Fi Network & server both connected.
	Flashes 1 time per sec	Wi-Fi connected but server not connected.
[3] Button	Short Press	Wake up from suspend power mode (if enabled).
	Press and hold 30 sec	Apply Factory Reset.
[4] Power supply	n/a	Standard 5 mm diametre power supply connector.
[5] Mounting hole type C	n/a	Through hole for mounting the sensor on the wall.
[6] Serial number	n/a	Device serial number.

TAC-B 4G sensor SIM card installation

The SensMax TAC-B 4G sensor is equipped with a built-in 4G router for mobile internet connectivity. To use it, please install a SIM card following the instructions below.

SIM Card Preparation:

- Ensure you have a Micro-SIM card with an active data plan.
- **Important:** The PIN code check must be disabled on the SIM card before installation.



SIM card installation process:

1. **Open the Enclosure:** Carefully unscrew the four screws on the sensor's case.
2. **Be Careful:** While removing the cover, hold it steady to avoid damaging the internal power cable.
3. **Install the SIM Card:** Insert your Micro-SIM card into the dedicated slot until it clicks into place.
4. **Reassemble the Sensor:** Close the enclosure and securely fasten the screws.

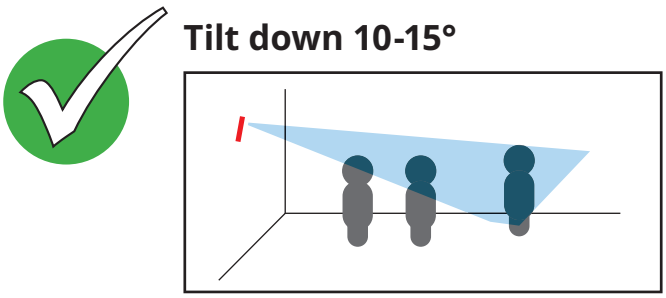
4G Router Configuration & Access

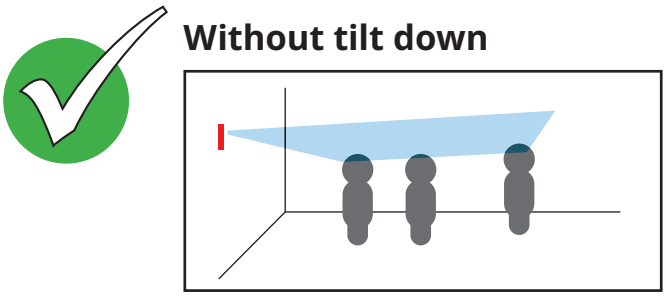
- **Connecting to the Router:** The 4G router creates its own Wi-Fi access point with a name (SSID) like **Wireless_BXXXXX**. The default Wi-Fi password is the same as the sensor's serial number (for example: 051001313).
- **Advanced Settings:** If you need to configure the APN or other specific 4G router settings, connect to its access point using a mobile phone or laptop. Then, open a web browser and navigate to **192.168.100.1** to access the configuration page.

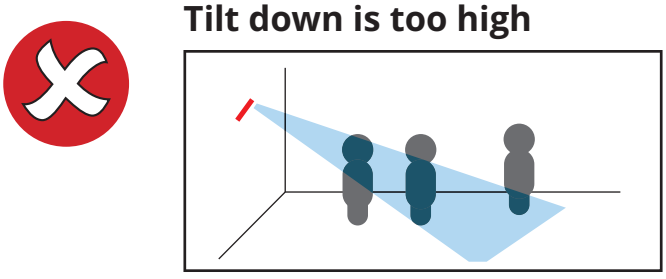
TAC-B sensor Installation

- Recommended installation height is higher than 2 meters above the floor.
- The sensor beam should be directed above the heads.
- If the installation height is more than 2.5 meters, a slight tilt down of 10-15 degrees is recommended. This improves the detection of far objects.
- Don’t increase the tilt too much, this will cause the near object will obscure the far object.

Optimal installation height: 2.5-3.5 m
Down tilt (optionally): 5-10 degrees







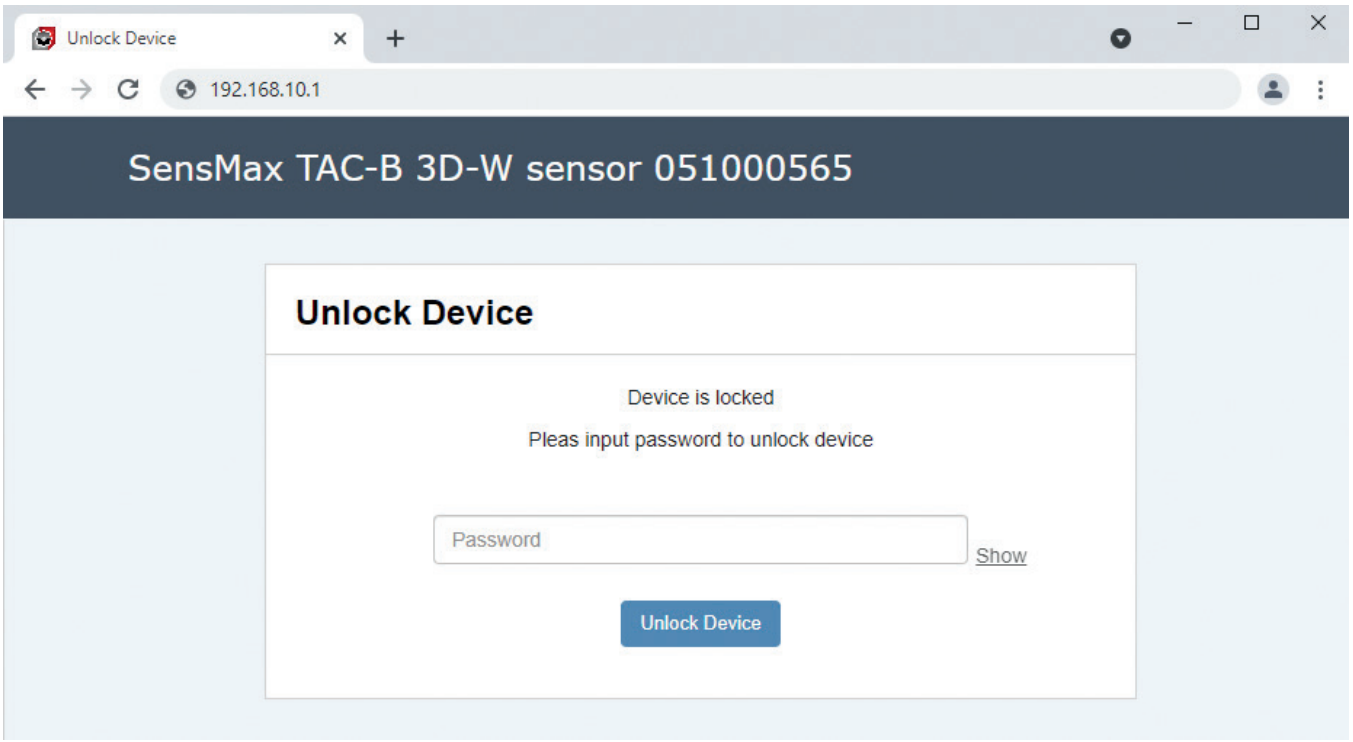
Configuration of sensor using web page

All configurations are available on the device web page.

To access settings web page, please do following steps:

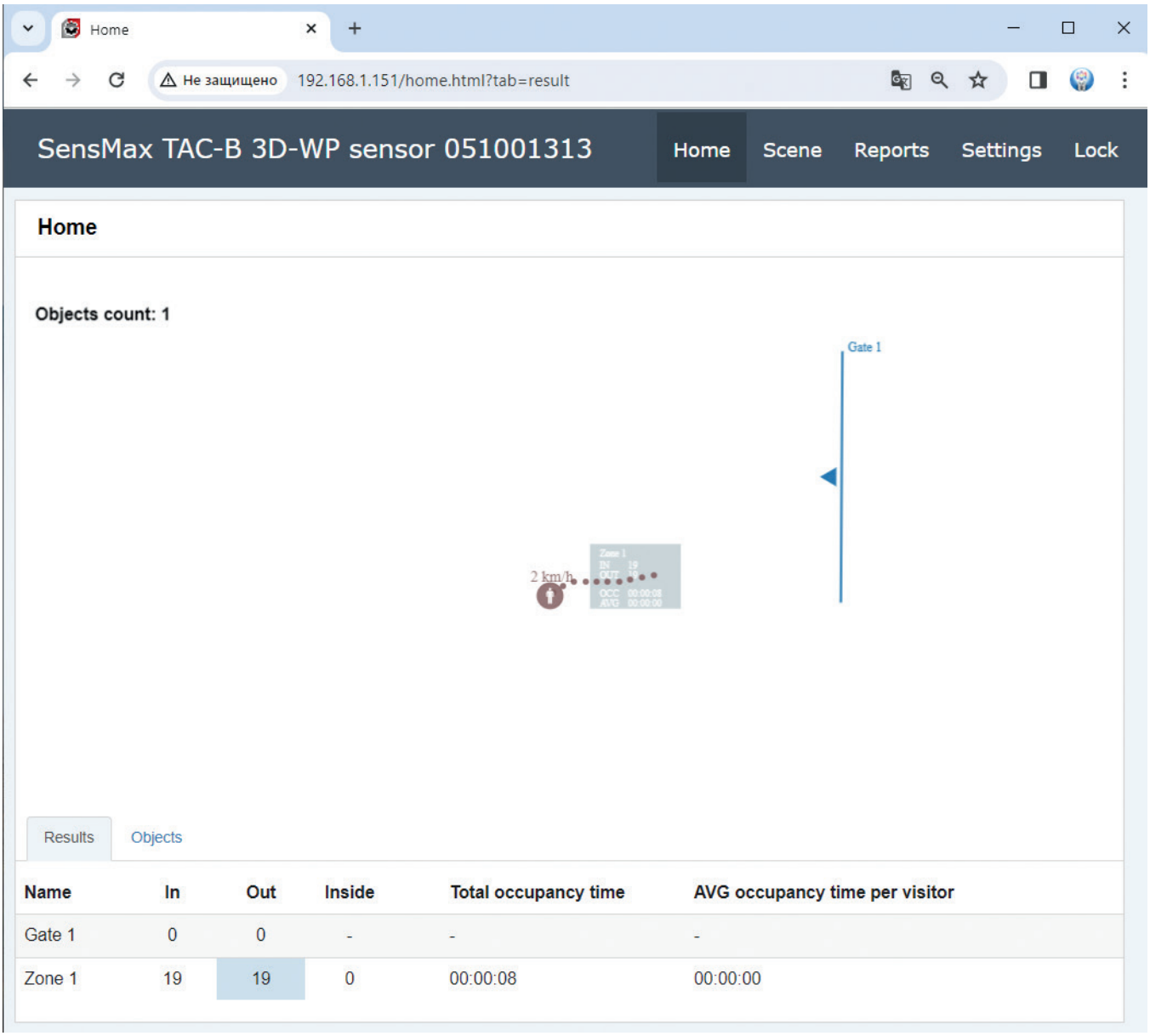
- Connect device to power supply.
- Scan for available Wi-Fi networks on your Laptop or Mobil Phone.
- Connect to TAC-B Access Point (AP name is “SensMax TAC-B XXXXXXXXX”).
  The default password is same as device Serial Number.
  For example, in this document the device AP will be SensMax TAC-B 051000565,
  and password will be 051000565.
- Open your web browser.
- Input IP address 192.168.10.1 to address bar and press Enter.

The login page will be opened.
To unlock settings, please input your password again (for this example, password is 051000565).



Home web page

The **Home** page shows user defined gates and zone, how also currently tracked objects. The table below shows detailed counting result for every gate and every zone.



The **Results** tab displays today's counts for all lines and zones.

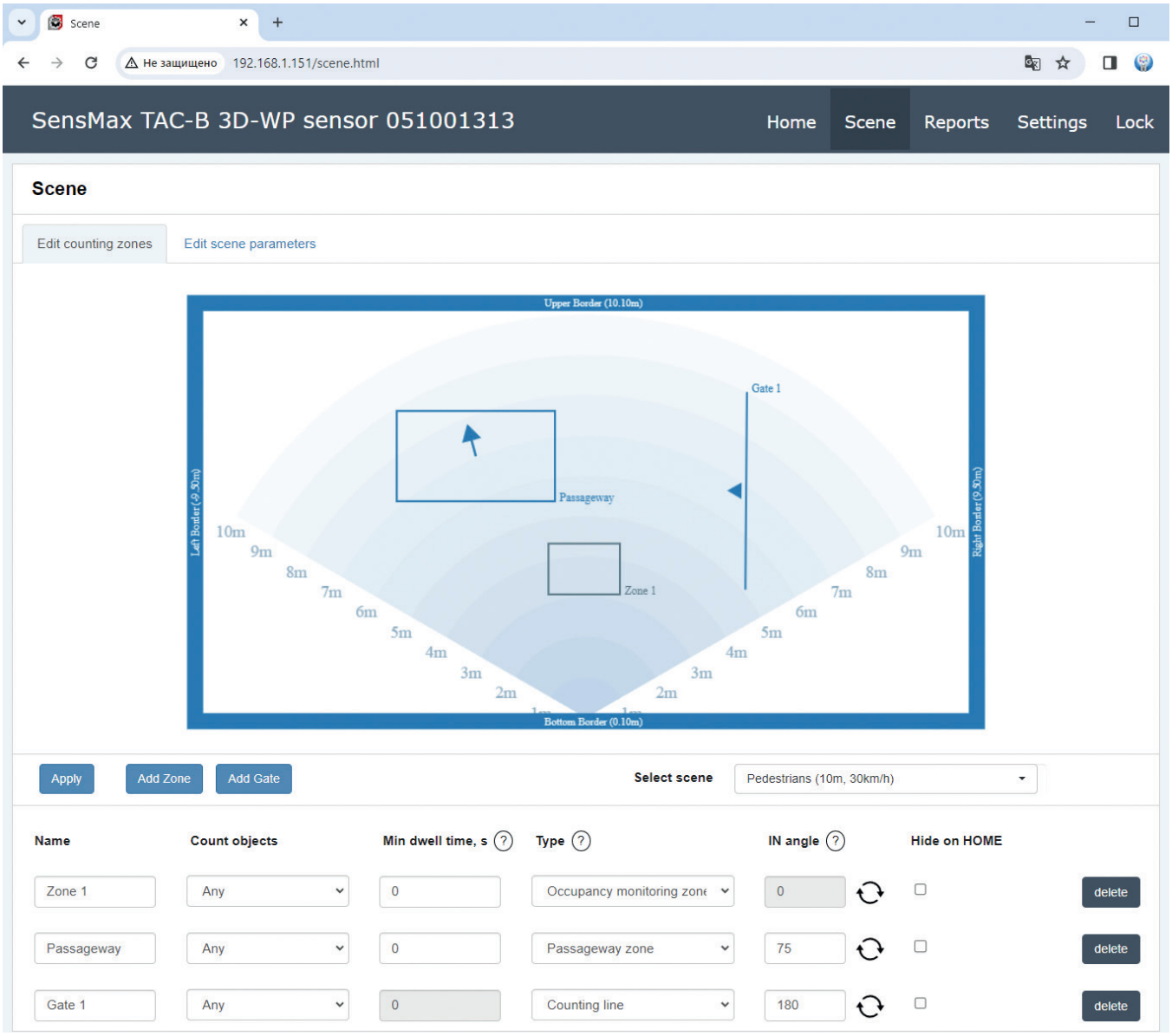
The **Objects** tab displays information about the last 20 detected objects.

Scene web page

To enter page please press **Scene** tab.

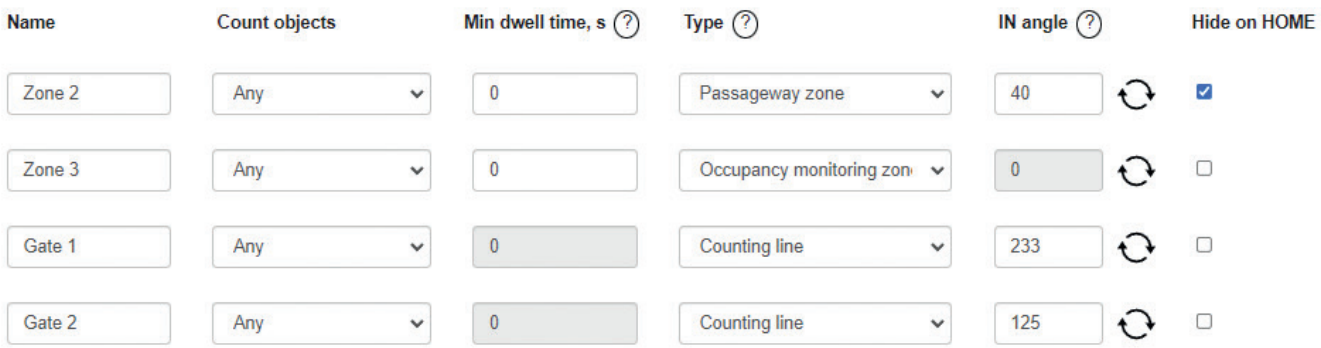
The **Scene** page allows to setup scene parameters, user defined counting lines, zones and other parameters.

User can add up to 5 Gates and up to 5 Zones.



Counting options

For each Gate or Zone it is possible to set different options to adjust counting preferences.

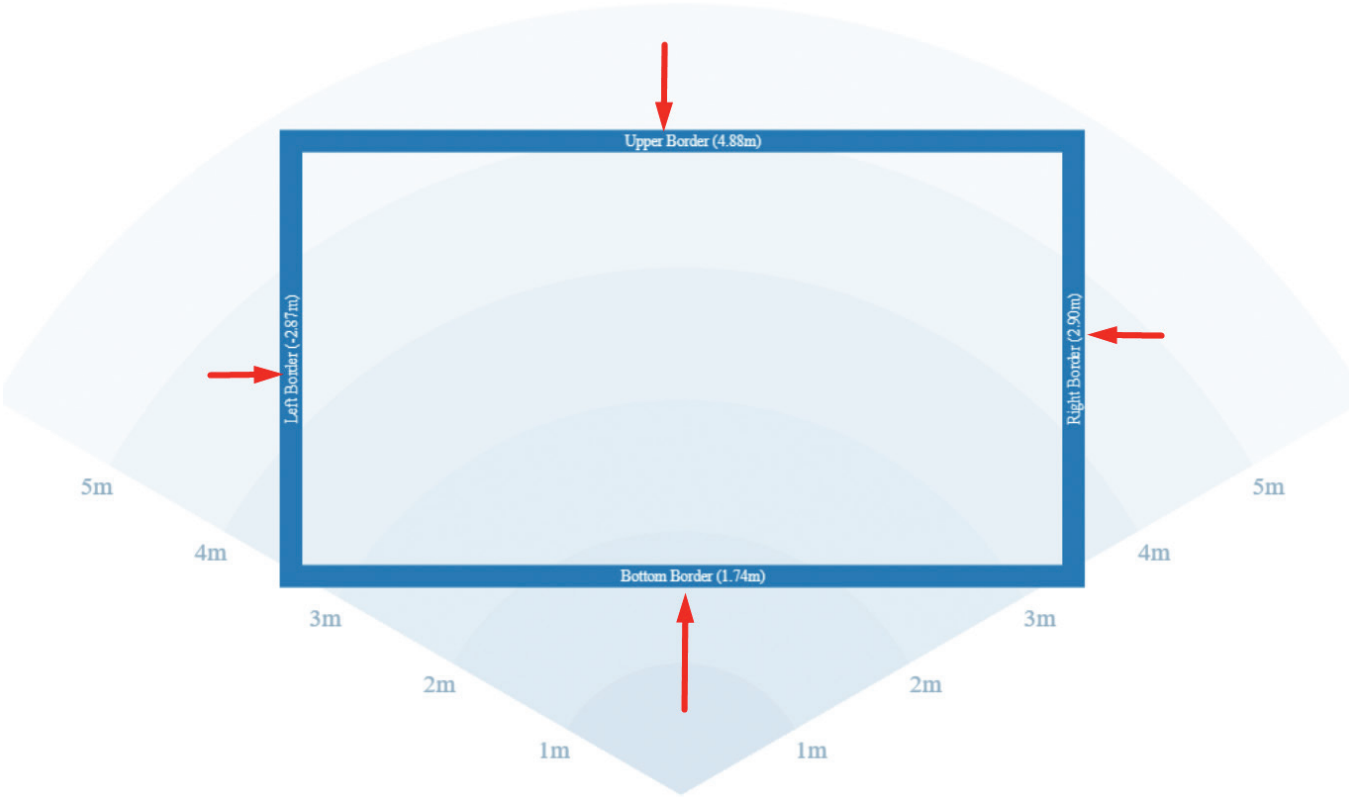


Name	The name of Gate or Zone. Max lenght is 16 symbols.
Count objects	Allows to select the type of objects to be counted for current Gate or Zone: **Any, Pedestrians** or **Vehicles**.
Min dwell time	The Min dwell time is a time which object must spend inside the Zone in order to be counted. If Min dwell time set to 0, each object will be counted immediately when it visits Zone.
Type	This setting allows to set the type of current Gate or Zone. For Gates is only available the **Counting line** type. For Zones user can select **Occupancy monitoring zone** or **Passageway zone** type. Please refer to **Page 15** of current document for more information about types.
IN angle	This setting allows to adjust the direction of INCOMING flow.
Hide on HOME	This setting allows to hide corresponding Gate or Zone on Home page.

Walls

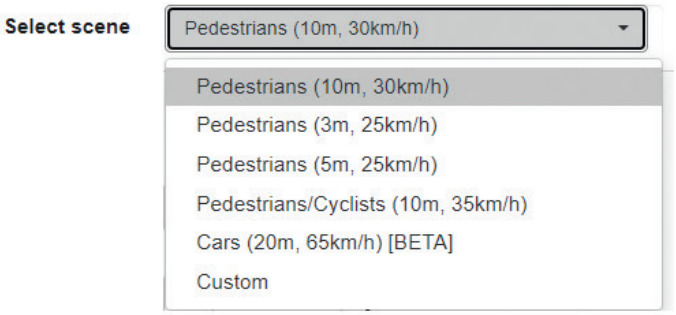
User can configure the active area by moving the borders.

Targets inside active area will be detected and tracked, targets outside of this area are ignored.



Select scene

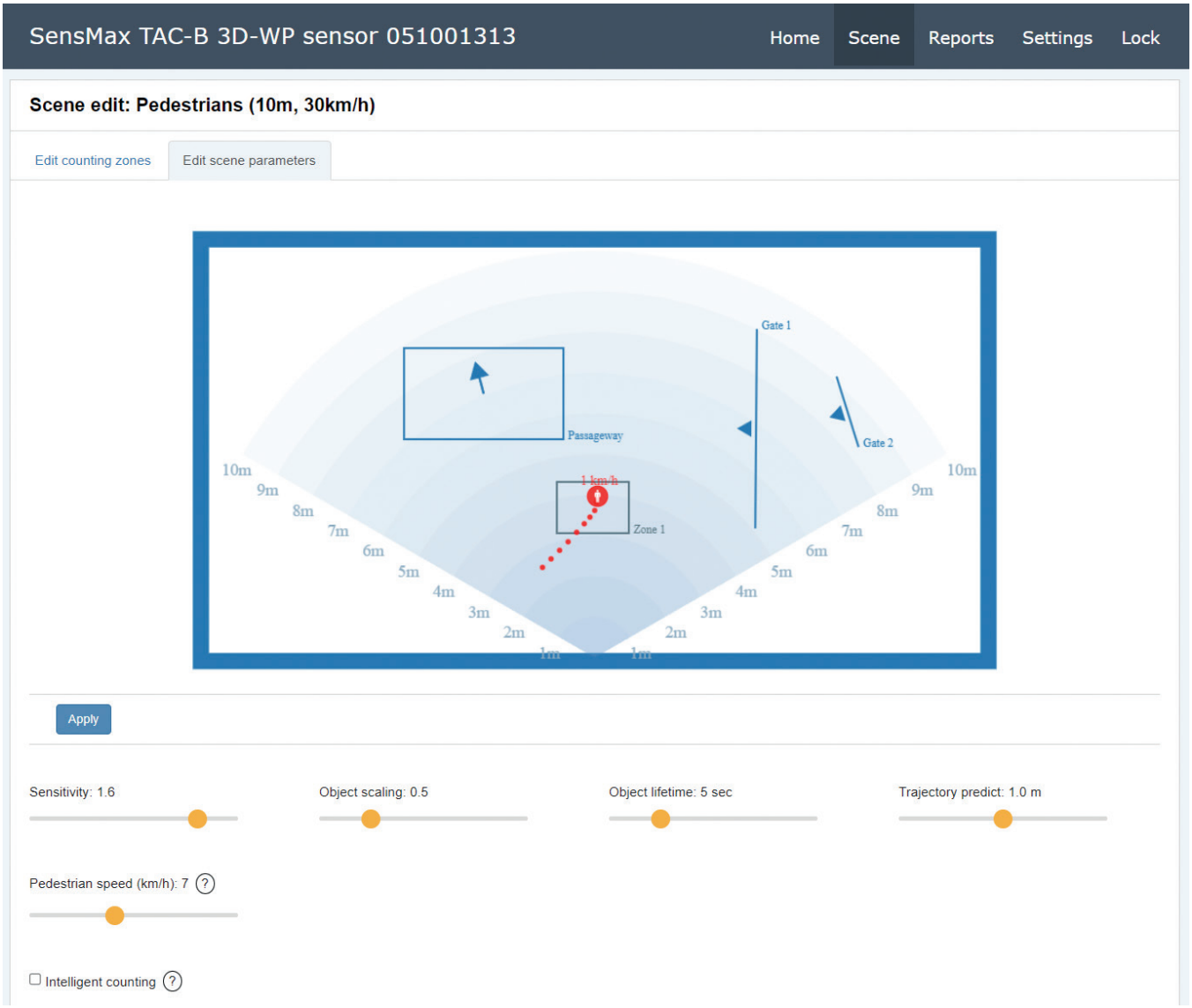
To provide best counting and tracking results it is important to select scene correctly. User can select one from pre-defined scenes.



Please note: *The range resolution is different for different scenes. The better resolution provides more accurate separation of objects. The 5 m scene has 5 cm resolution. The 10 m scene has 10 cm resolution.*

Edit scene

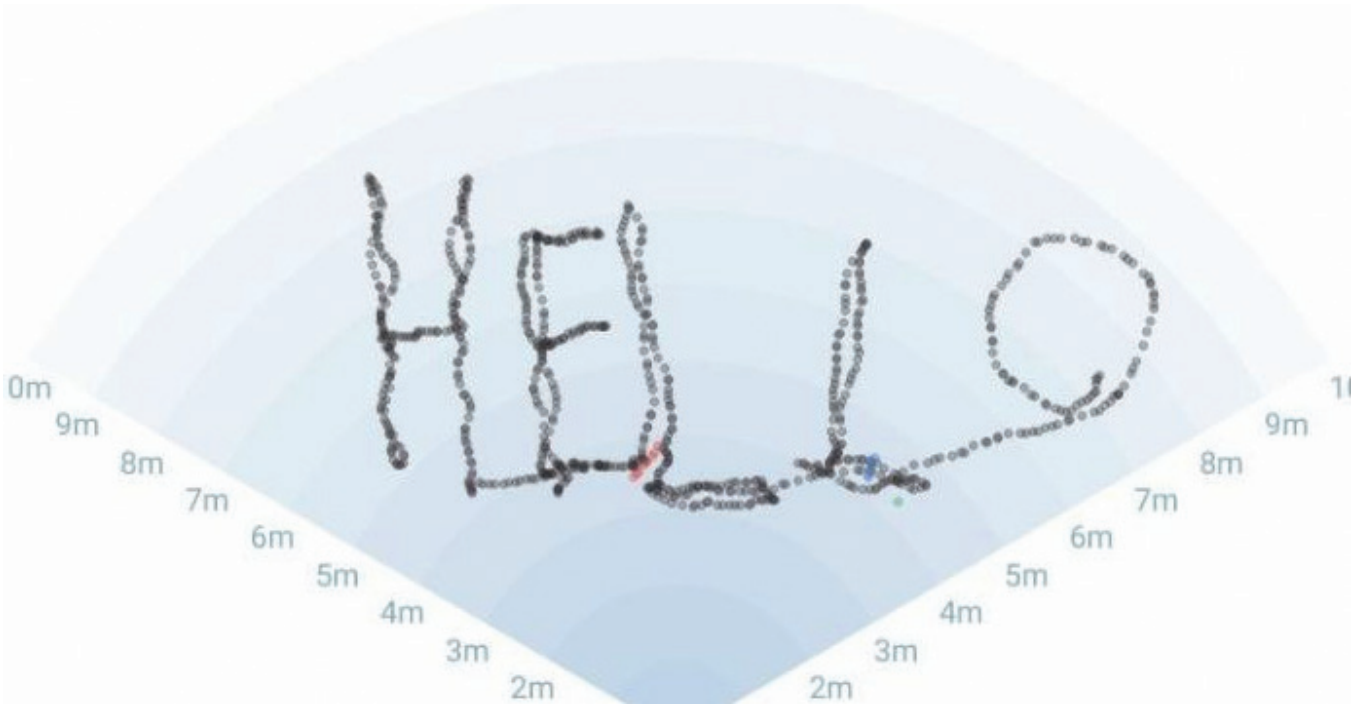
User can adjust main parameters for any scene by entering to **Edit scene** parameters tab.



Pedestrian speed	This setting defines the max speed of pedestrians. If speed of object is below this value, the object will be marked as “pedestrian”. If object faster than it will be marked as “vehicle”.
Sensitivity	This setting allows to adjust sensitivity of sensor. Higher value allows to recognize any fine movement for outdoor use. For indoor use, sometimes the tracker is detecting too many people in the scene (ghosts). One likely cause is multipath reflections (radar Energy reflected from a person being reflected again from a wall, ceiling, floor or some object). In this case it may be necessary to reduce sensor sensitivity to remove ghosts.
Object scaling	This setting allows to adjust the reference object volume. When people are near each other and walking at the same pace in the same direction, there is needed some reference object size for the tracker for recognize all objects correctly. If sensor recognize few people as single track, please decrease this value. And if sensor recognize single people as multiple tracks, please increase this value.
Object lifetime	This setting defines the lifetime of static objects. The object becomes static when there is no any motion detected. It is recommended to use low values (1...10 sec) if your main target to count passing people. For projects where main purpose is occupancy monitoring of defined zones, it may be necessary to use higher values.
Trajectory predict	Sometimes situations arise where the sensor may lose a tracked object. For example, an object has left the room and thus disappeared from the radar’s field of view. The algorithm analyses the speed and direction of the object and predicts its movement by some distance. This significantly improves the counting accuracy for such complex scenarios.
Intelligent counting	If smart counting is enabled, the sensor counts an object once and skips the count if the object crosses the gate or zone repeatedly.

Route line

For convenient adjustment of the sensor, the movement of the objects are displayed on the field of view. Routes are not erased, so you can accurately position the counting zones based on the image of the routes.



Gates

The Gate (or counting line) indicates doors or entrances.

Each Gate has an IN and OUT direction.

The arrow located on the line of passage indicates the IN direction.

To add a Gate, click the **Add Gate** button and do two mouse clicks, at the start point and at the end point of Gate.

The Gate can only have a **Counting line** type - count moving objects which are crossing specified line in defined direction.

Zones

Counting zones are indicated as rectangles.

Each Zone has the INSIDE parameter, which displays the number of people inside the Zone at the moment. Also for Zones it is possible to measure dwell time and social distance violation.

Each zone can have a **Occupancy monitoring zone** type or **Passageway zone** type.

The **Occupancy monitoring zone** works following:

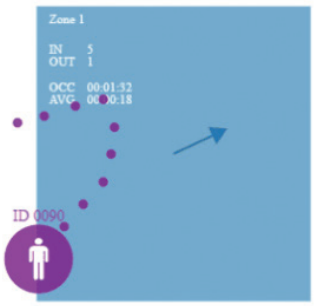
When object come in into Zone, it counted as IN and when object leave Zone it counted as OUT. All visitors entering to Zone will be counted with the direction IN, and all those who leave Zone will be counted with the direction OUT.

The **Passageway zone** works following:

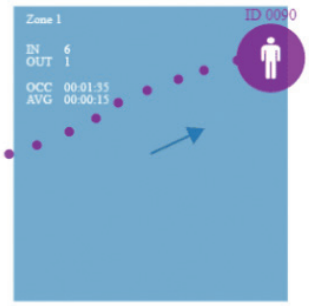
When the sensor detects an object crossing the Zone, the algorithm analyses the direction in which the object is moving and, depending on the direction of movement, counts IN or OUT. Independent from which point in Zone an object starts its movement, the algorithm will analyse object's trajectory and decide in which direction the object is moving.

In case if an object has entered to Zone, turned around, and left Zone in the same direction, such object will be ignored by the counting algorithm.

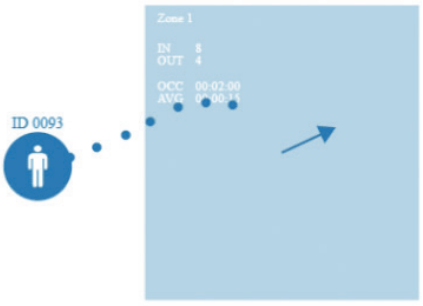
Object filtered out



Object counted



Object counted



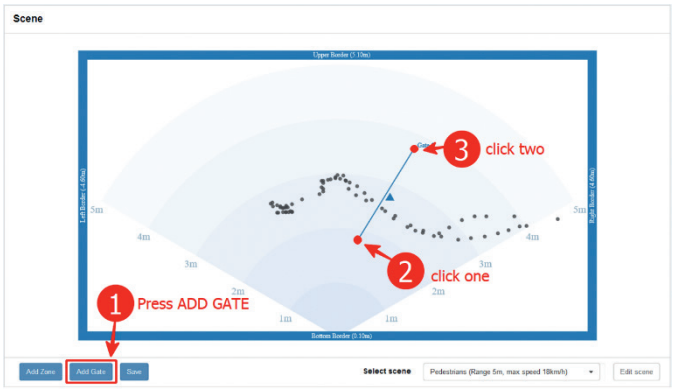
Creating of user gates or zones

To add a counting gate or zone, click the **Add Zone** button, and with two clicks, mark the beginning and end of the zone.

Example of adding of new Gate:

- Go several times along the route where the gate should be marked.
  Your route will be draw on field of view (grey dotted line on picture below).
- Press Add Gate button.
- Click in desired place to indicate the beginning of gate.
- Click again to indicate the end of gate.
- Press Save button.

Do the same steps for adding of Zone.

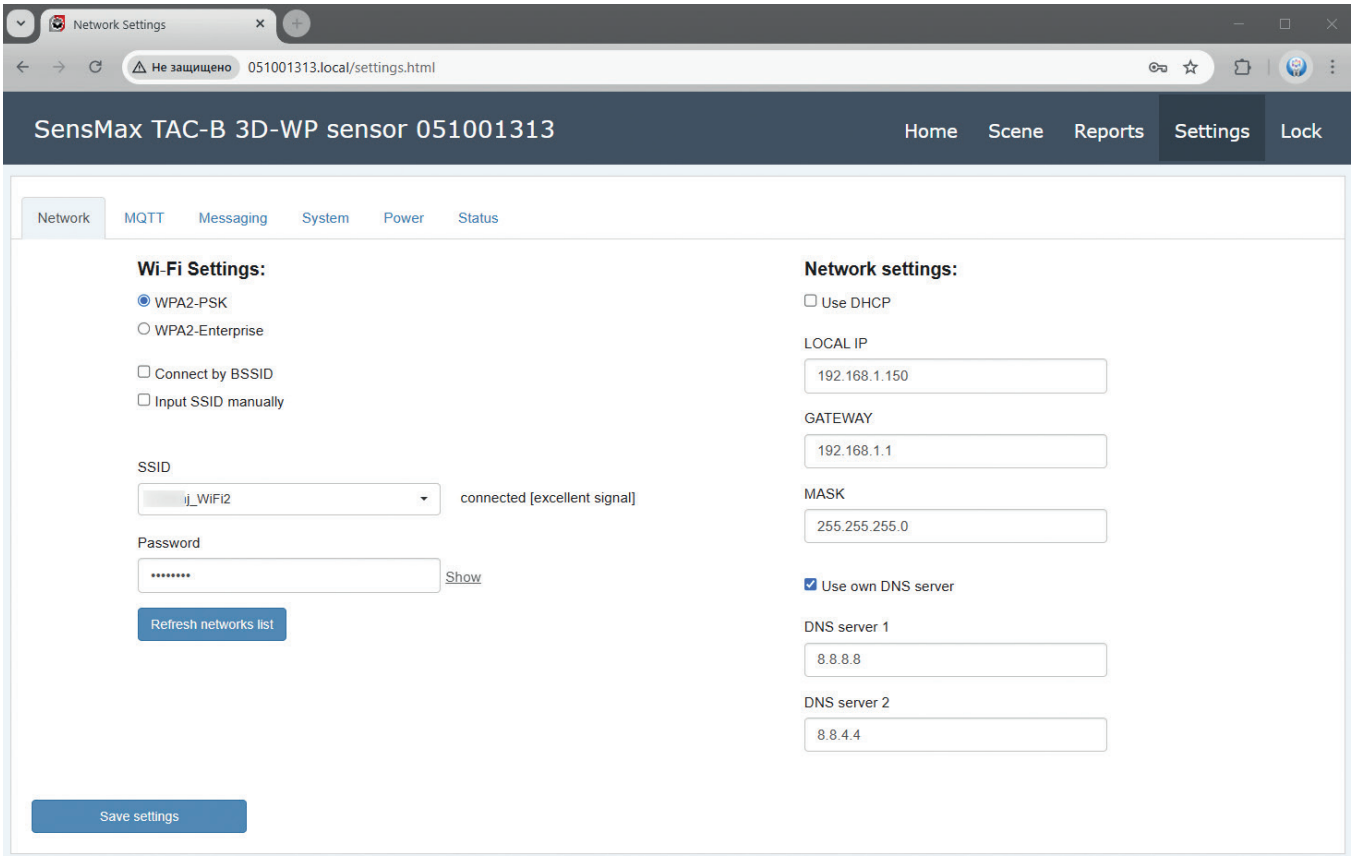


Settings web page

To enter page please press the Settings tab in upper menu. All settings are divided into tabs.

Network

This tab contains network settings.



❖ Wi-Fi Settings

To connect to new Wi-Fi network, please press the **Refresh networks list** button.

After few seconds, all founded networks will be displayed in SSID list. Please choose the correct Wi-Fi network and input password.

To connect to hidden Wi-Fi network, please set **Input SSID manually** flag and input desired SSID and password manually.

❖ Network settings

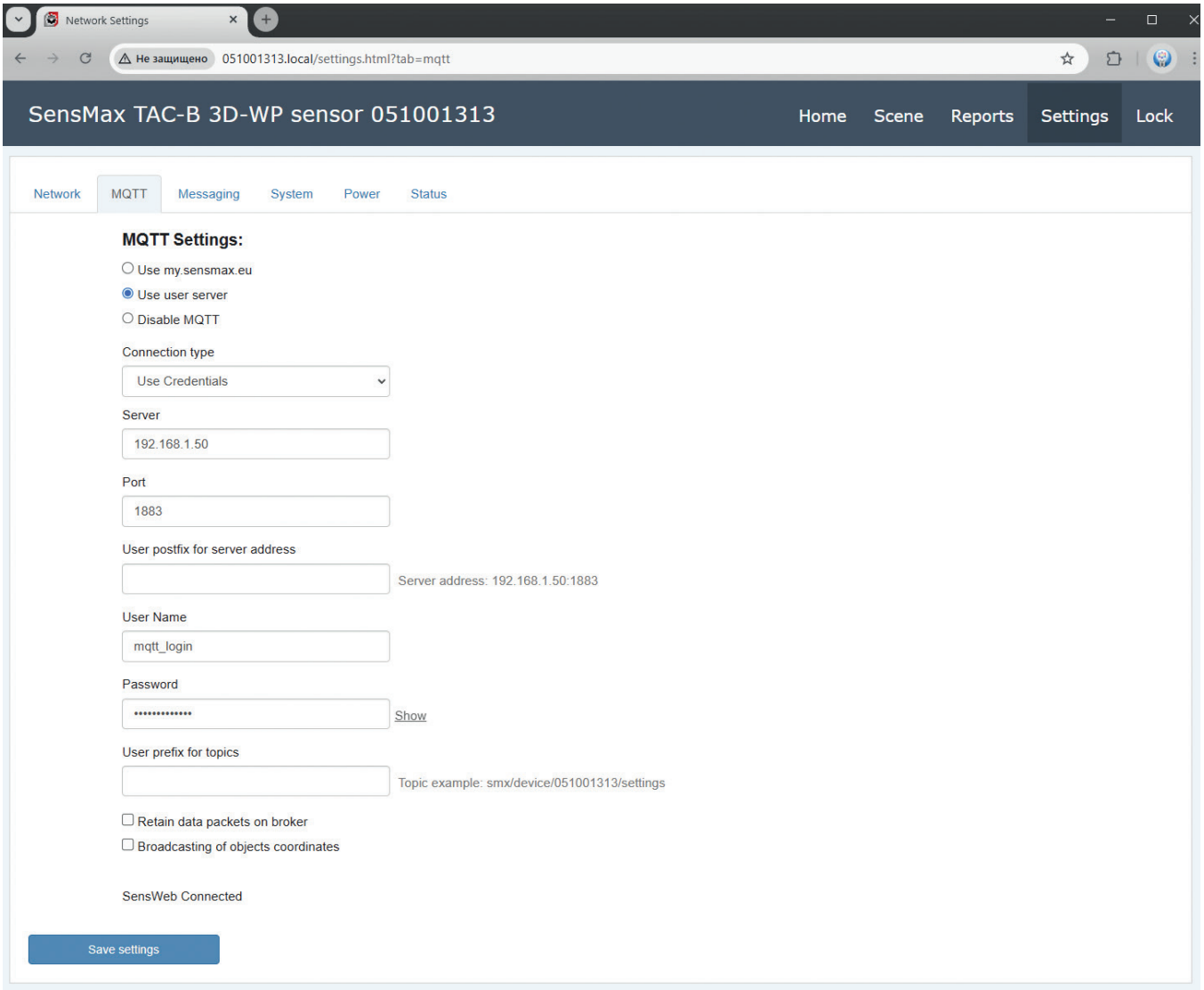
If **Use DHCP** is selected, all network settings will be obtained from internet router automatically (the DHCP should be enabled in your internet router).
Or you can input all network settings manually.

If **Use own DNS server** is selected, you can set your own DNS servers. By default, Google's DNS servers 8.8.8.8 and 8.8.4.4 are used.

MQTT

This tab allows to configure the MQTT connection.

The user can select one of the MQTT brokers:
the SensMax cloud (my.sensmax.eu) or the user broker.



❖ MQTT Settings

To setup device for working with my.sensmax.eu system, the **Use my.sensmax.eu** setting should be used.

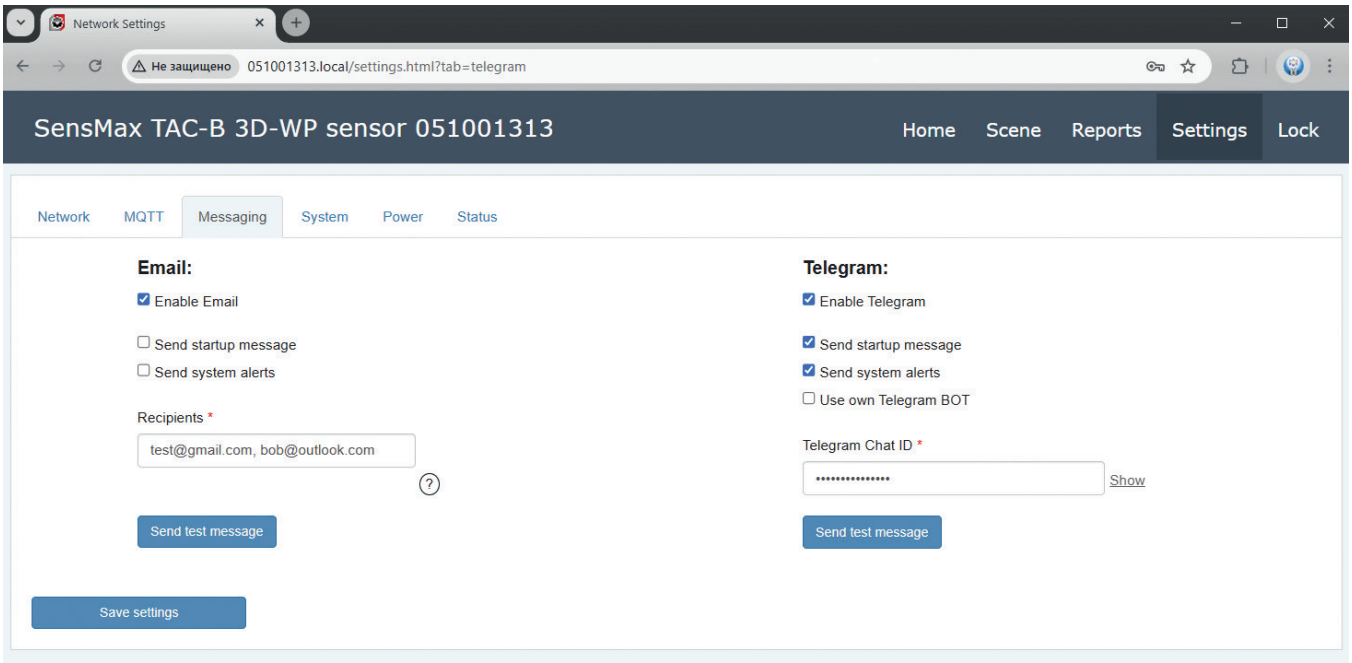
To setup own MQTT broker, please use one from possible settings:
Credentials, SSL/TLS, Two-way auth, Mutual auth, WebSocket, WebSocket Secure.

User prefix for topics	Optionally, user can add any prefix to topic name. Max lenght is 128 symbols.
Retain data packets on broker	If enabled, the data packets will be stored on MQTT broker. Please refer to MQTT documentation for more info.
Broadcasting of coordinates	If enabled, sensor will send the special packet which contains coordinates of all currently detected object. The Short packet represent current positions of objects only. The Long packet represent current positions of objects, how also history of 10 previous positions.
User postfix for server address	Optionally, user can add any postfix to server address. Max lenght is 128 symbols.

Download SensMax MQTT documentation

Messaging

The TAC-B sensor can send notifications and reports to Email and Telegram.



❖ Email

To enable Email, please select the **Enable Email** option and specify up to three recipients, separating them with commas.

In addition to custom notifications and reports, the user can enable a startup message and system notifications, such as the start of a firmware update.

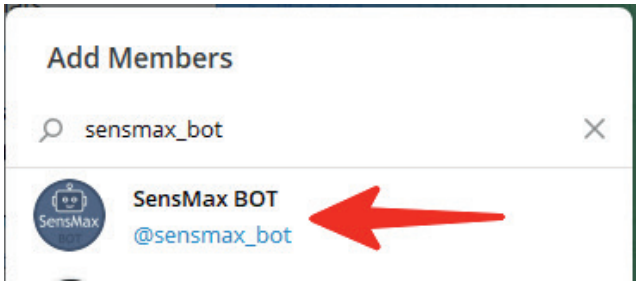
❖ Telegram

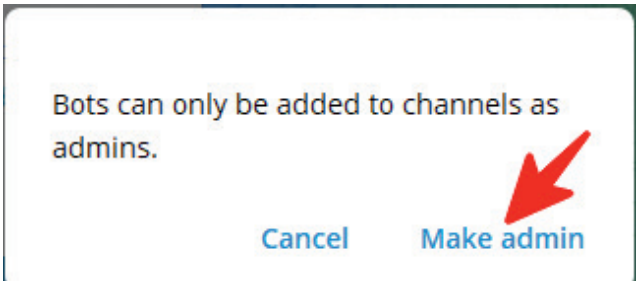
To enable Telegram, please select the **Enable Telegram** option.

Telegram messenger sends messages using bots. You can use the SensMax bot, or you can create your own bot.

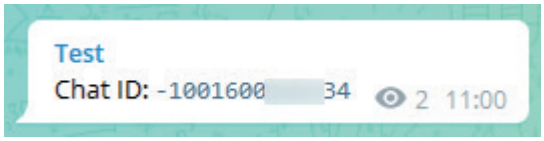
Connection of SensMax BOT:

- Open your Telegram app
- Press the menu button ☰ , and select the New Channel.
- Enter channel name and press the Create button.
- Select type of new channel (Private or Public).
- In next step Telegram will ask you to add members into your channel.
  Please typo sensmax_bot in search field and select the SensMax BOT:





- When everything done, you will see the Chat ID in Telegram chat window.
  Please input your Chat ID to the TAC-B sensor.



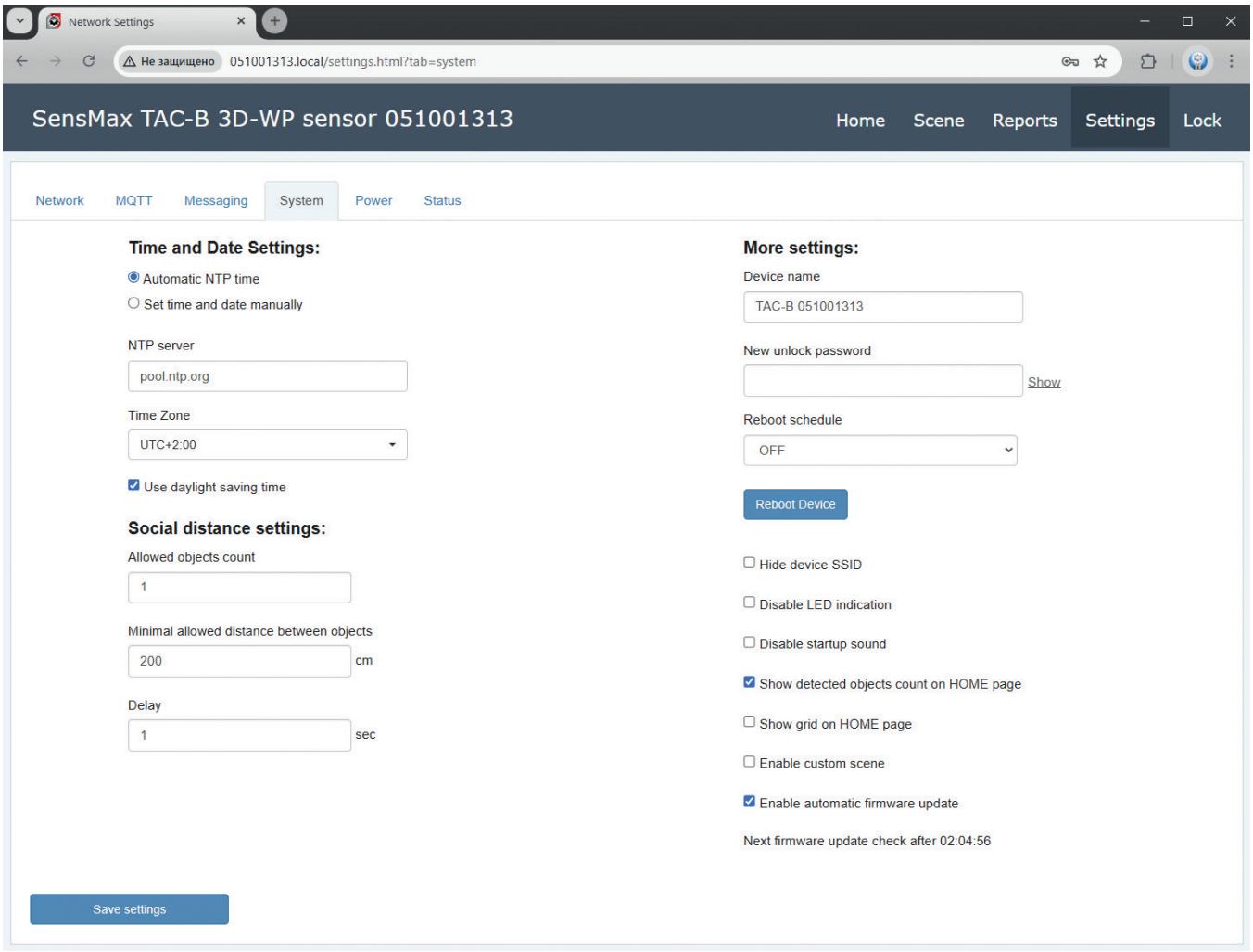
Connection of user BOT:

Please refer to AN020 document for more information.

Download the AN020 (SensMax telegram connection) document

System

On this tab user can configure various settings.



❖ Time and Date Settings

The TAC-B sensor supports the NTP time protocol. If Automatic NTP Time option selected, device will get internet time automatically.

Also it is possible to set time and date manually.

The sensor has a built-in non-volatile clock that continue working during few hours even if the sensor power is turned off.

❖ Social distance settings

Here you can adjust parameters for social distance violation.

The sensor measures the distance between nearby objects, and if this distance is less than the determined value and persists for longer than the specified time, the sensor generates a notification.

Social distance monitoring is performed for all user zones.

Please refer to Notification section of this manual for getting more information about notifications.

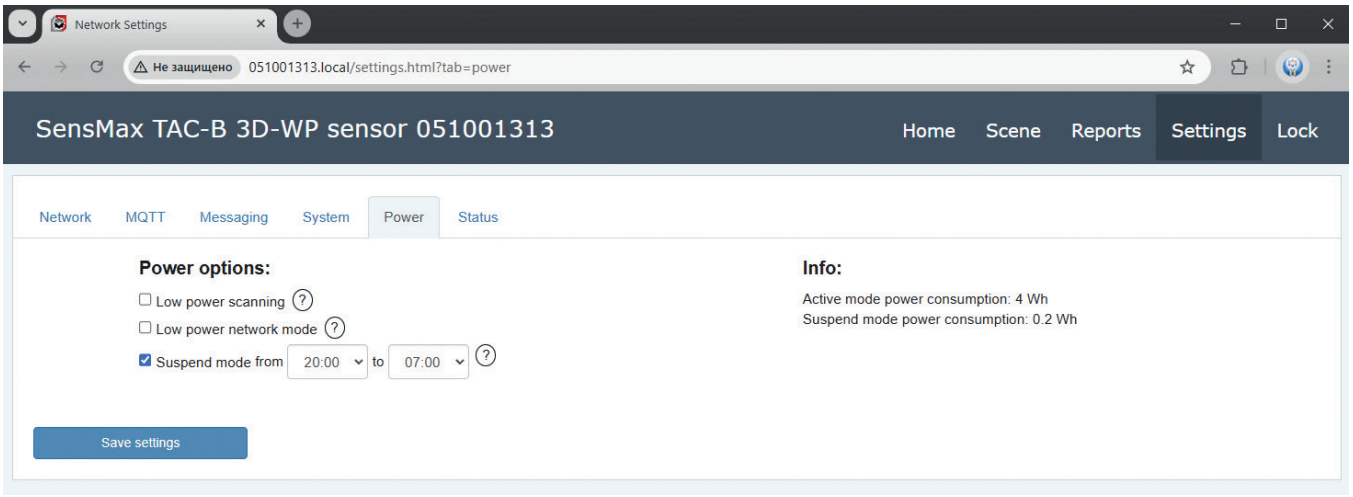
❖ More settings

PASSWORD	Here you can change password which used for collector AP and settings page both. We recommend to change password if you still use default password.
Hide device SSID	If this setting selected, you cannot connect to device directly using of connection to collector AP. But if collector already connected to your local network, you able login to settings web page from any PC inside this network. To do this, you will need to input the collector IP address in internet browser.
Disable LED Indication	If selected, all LED indication will be disabled.
Disable startup sound	If selected, the greeting melody will not be played when device startup.
Show borders in HOME page	If selected, the borders of active area will be shown on home page.
Show grid on HOME page	If selected, the field of sensor view will be shown on home page.
Enable automatic firmware update	If enabled, device will check firmware updates in random period of time 2...8 hours. If new firmware found, it will be installed automatically. Device will reboot after update. If disabled, user can check firmware update manually.

Power

This tab is only available for outdoor devices (TAC-B 3D-WP and TAC-B 4G).

This tab allows the user to configure various power-saving settings to optimize energy consumption.



❖ Low power scanning

If this mode is enabled, the radar will send several scanning pulses per second to detect any movement in the scene. If motion is detected, normal scanning mode is activated. When the scene remains empty for more than 10 seconds, the low power scanning mode will turn on automatically.

This mode allows for an average energy saving of up to 2 Wh.

However, in a scenario where fast-moving objects such as cyclists or cars are possible, this mode is not recommended, as fast objects may not be detected when it is in use.

❖ Low power network mode

If this mode is enabled, Wi-Fi (and the 4G LTE MODEM for the TAC-B 4G model) will turn on every hour to send accumulated data and reports. In this mode, the sensor will not send instant notifications or MQTT packets of the single_ts type. This mode saves an average of 0.8 Wh of energy.

To access the sensor's access point, Wi-Fi must be forcibly enabled. The user can do this by pressing the sensor's button or by power cycling the sensor. After activation, the Wi-Fi (and the 4G LTE MODEM on the TAC-B 4G model) will remain active for five minutes.

❖ Suspend mode

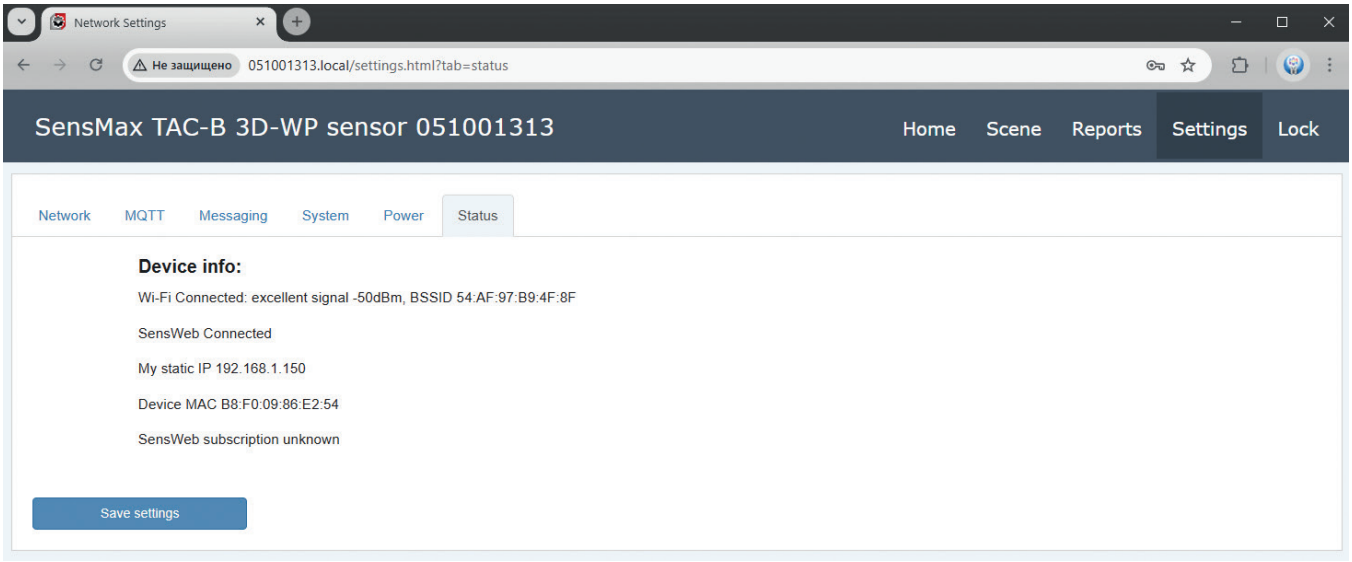
The user can configure a time-based schedule to enable Suspend mode.

When this mode is active, the sensor is in its lowest power consumption mode. Scene scanning, object tracking and object counting are disabled. Wi-Fi and the 4G LTE MODEM are disabled. In this mode, the sensor consumes 0.2 WH of energy.

To forcibly wake the sensor from Suspend mode, you must press the sensor's button or simply power cycle the sensor. After a reboot, the sensor remains on for five minutes.

Status

On this tab actual system status shown.



Reports web page

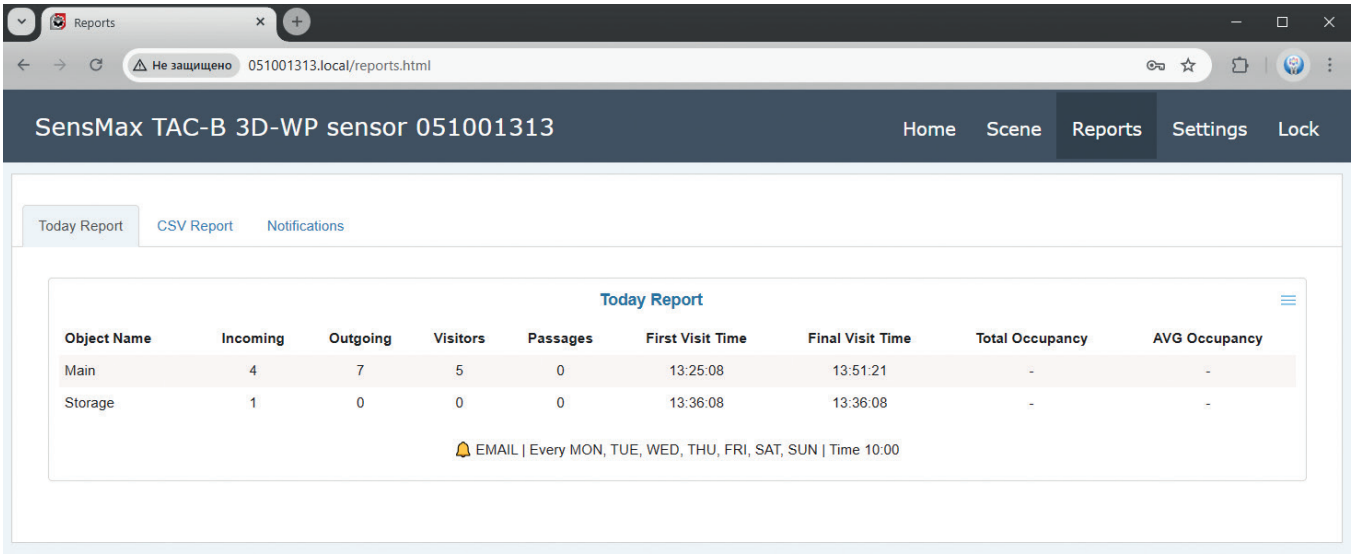
To enter page please press the **Reports** tab in upper menu.
This page contains allows to manage Reports and Notifications.

Today Report

This type of report allows user to view information for today in the form of a table or a list.

The user can configure automatic sending of the report to Email or Telegram.

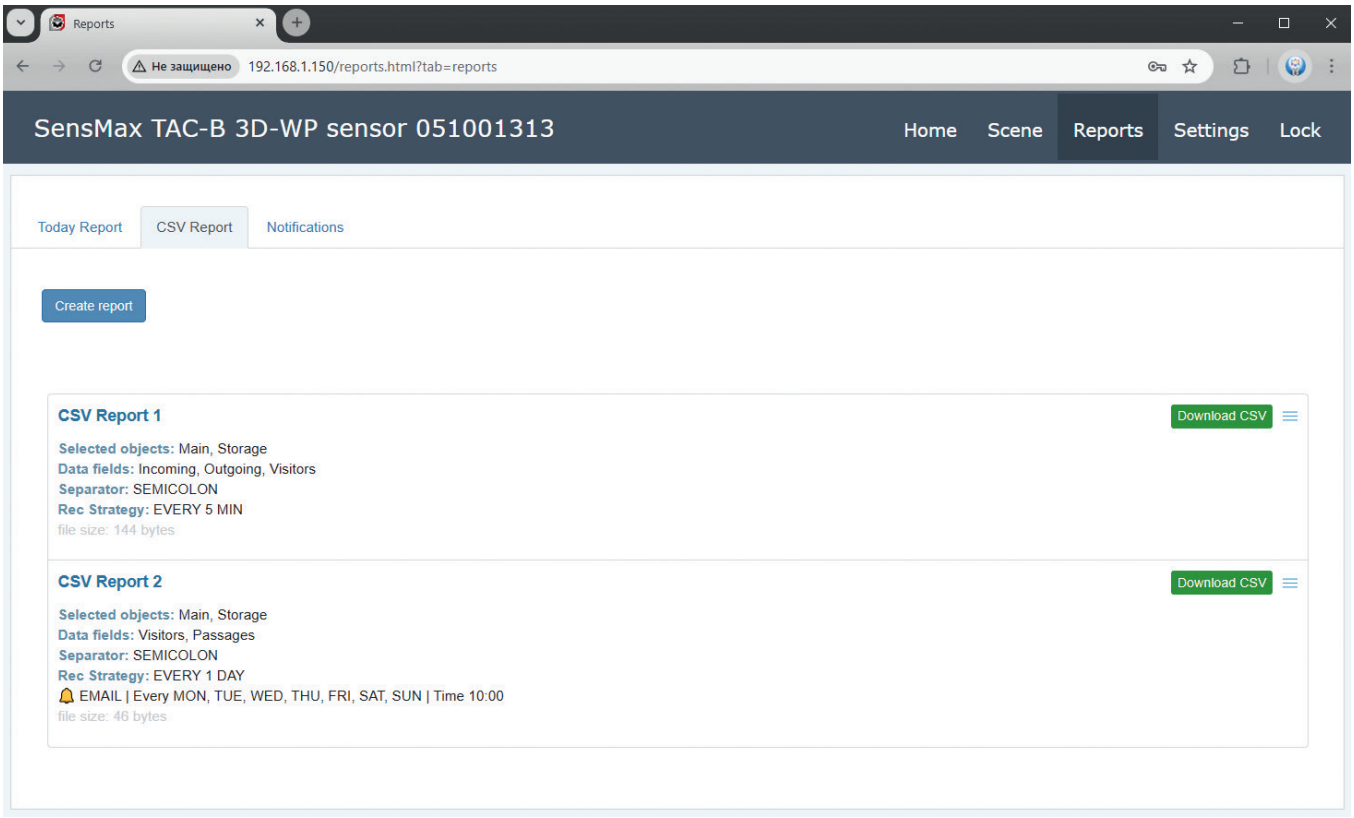
For creating of new report, please press the **Create** button and setup desired parameters.



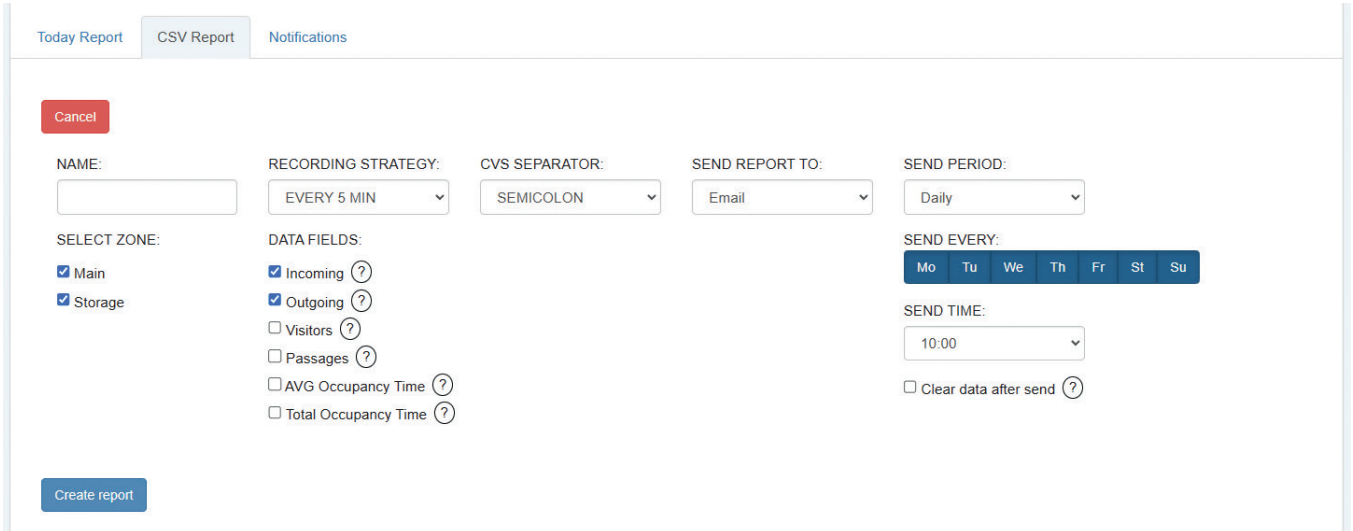
CSV Report

On this tab user can configure CSV reports.

The user can configure automatic sending of the report to Email or Telegram.



For creating of new report, please press the Create button and setup desired parameters:



Once the report has been created, the sensor begins writing the data to a CSV file on the built-in Micro SD card. To download the report, press the Download CSV button of the desired report.

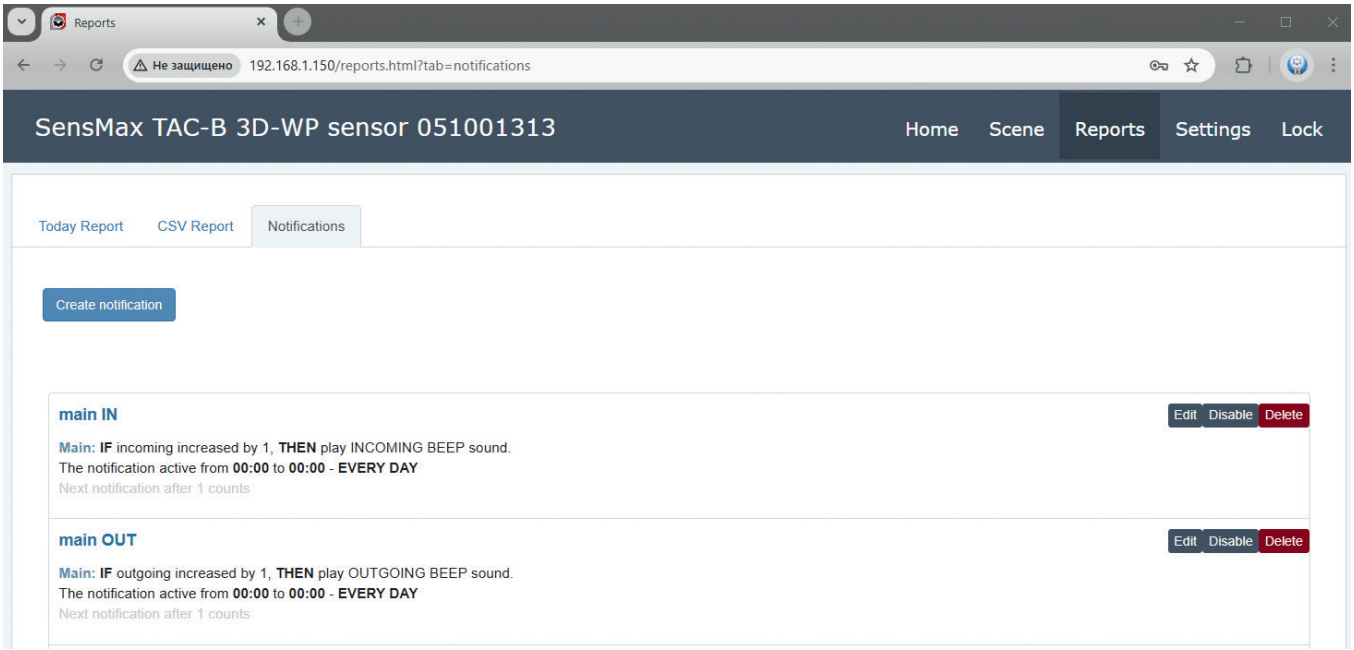
Please note:

1. *The VISITORS field calculated by formula:*
   For Gates and Passageway Zones: **VISITORS = (INPUT + OUTPUT)/2**
   For Zones: **VISITORS = INPUT**

2. *The PASSAGES field calculated by formula:*
   For Gates and Passageway Zones: **VISITORS = INPUT + OUTPUT**
   For Zones: **VISITORS = INPUT**

Notifications

On this tab user can configure notifications.



For creating of new notification, please press the **Create** button and setup desired parameters:

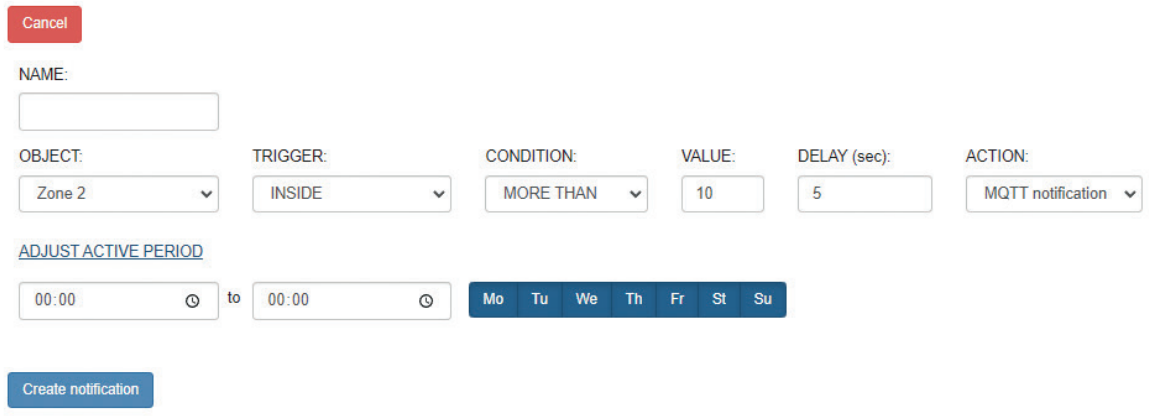


Table below describes the notification parameters:

OBJECT	In this list all user defined object (gates and zones) are presented. Need to select one.
TRIGGER	Depending from object type (zone or gate) there will be allowed different triggers for selection. Supported triggers for the GATE: ▪ INCOMING (the count of incoming visitors) ▪ OUTGOING (the count of outgoing visitors) ▪ VISITORS ▪ PASSAGES ▪ ANY MOTION ▪ FIRST VISITOR (the first visitor for today) ▪ EVERY 5 MIN ▪ EVERY HOUR Supported triggers for the ZONE: ▪ INCOMING (the count of incoming visitors) ▪ OUTGOING (the count of outgoing visitors) ▪ VISITORS ▪ PASSAGES ▪ ANY MOTION ▪ FIRST VISITOR (the first visitor for today) ▪ EVERY 5 MIN ▪ EVERY HOUR ▪ INSIDE ZONE (number of objects currently inside the zone) ▪ ZONE IS EMPTY ▪ SOCIAL DISTANCE VIOLATION ▪ TOTAL OCCUPANCY TIME
CONDITION	In this list presented the type of conditions: MORE THAN and EVERY NEXT If MORE THAN selected, sensor will generate single notification when defined value will be reached. If EVERY NEXT selected, sensor will generate notification every time when counting result increases by defined value.
VALUE	The value which should be reached for trigger activation.
DELAY	This setting presented for the INSIDE trigger only. When the object count inside selected zone is more than defined value, this condition should stay during DELAY period before notification will be generated.
ACTION	Defines the notification type: Telegram notification, MQTT notification, Webhook launch or Sound Alert.

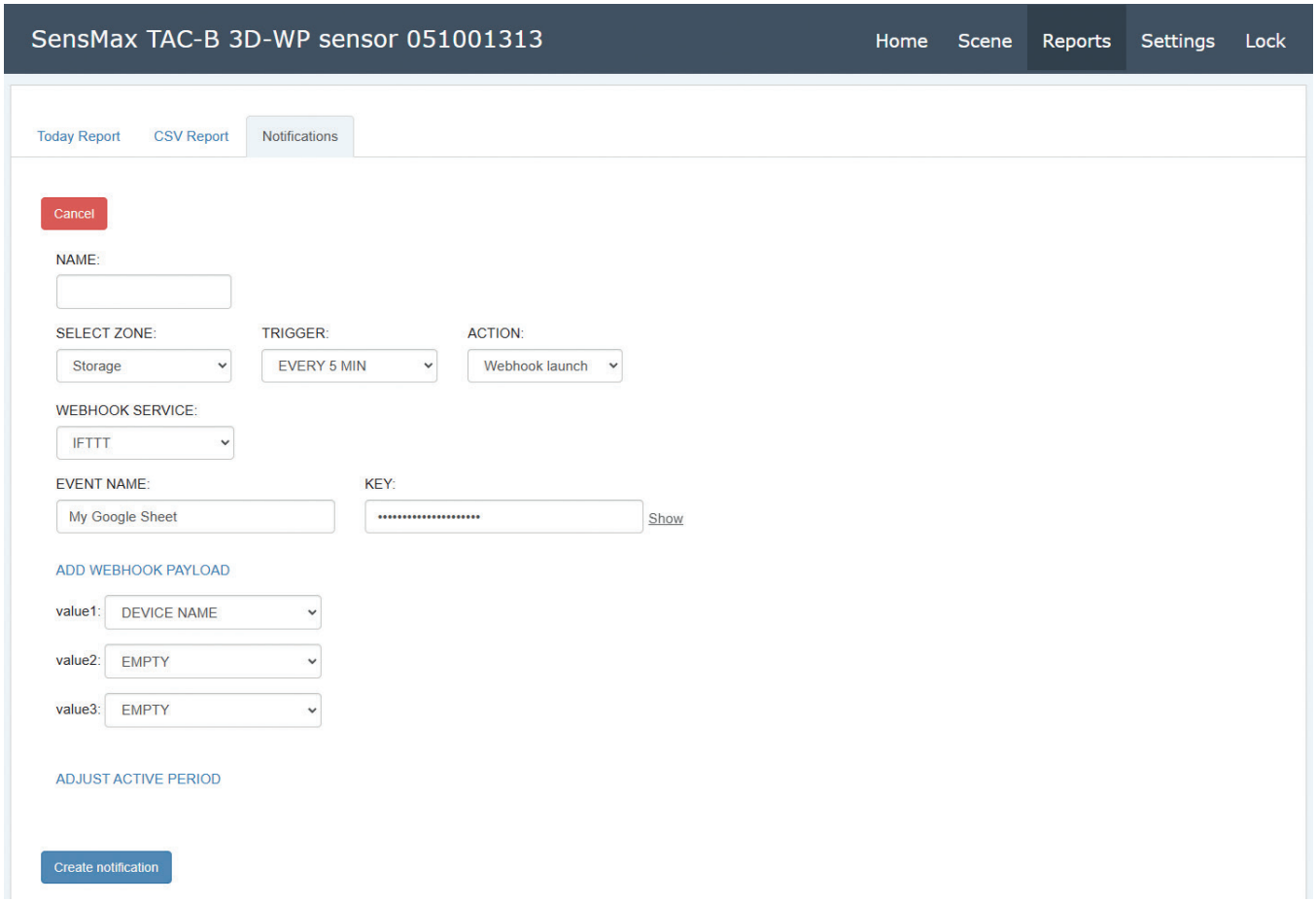
Support of Webhooks

The sensor supports webhooks provided by IFTTT and Shelly services. Webhooks allow the sensor to send commands to different devices or send data to different services.

To use webhooks, need to select the **Webhook launch** in the **ACTION** field.

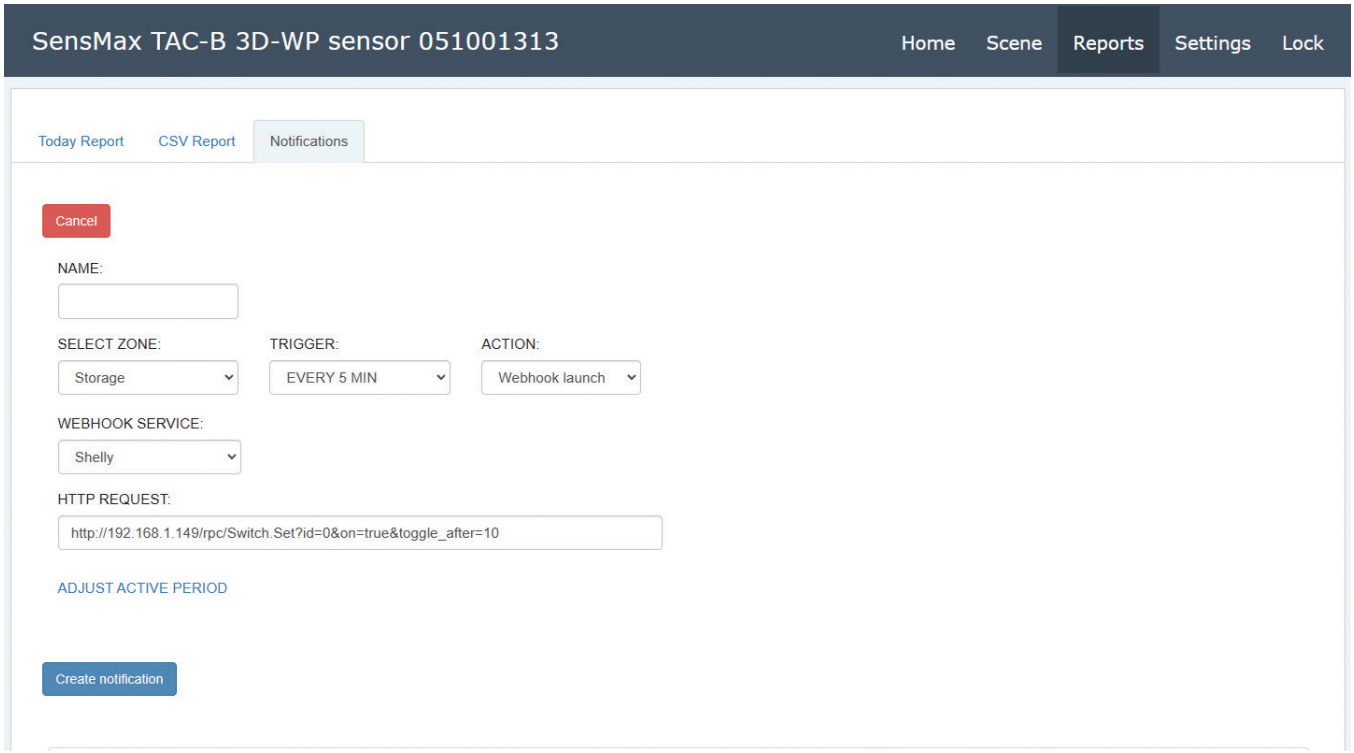
Example of notification creating for IFTTT:

Please refer to the IFTTT documentation for more information.



Example of notification creating for Shelly:

Please refer to the Shelly documentation for more information.



Document revision history

Document version	Release date	Notes
v. 3.8	10 March 2025	Messaging page description added
v. 3.9	21 April 2025	Low-power modes description added
v. 4.0	18 June 2025	Document redesign

SensMax®

Sense your business

+371 67553110

office@sensmax.lv

www.sensmax.eu

t.me/sensmax

www.facebook.com/sensmaxmanufacturer

www.linkedin.com/company/sensmax