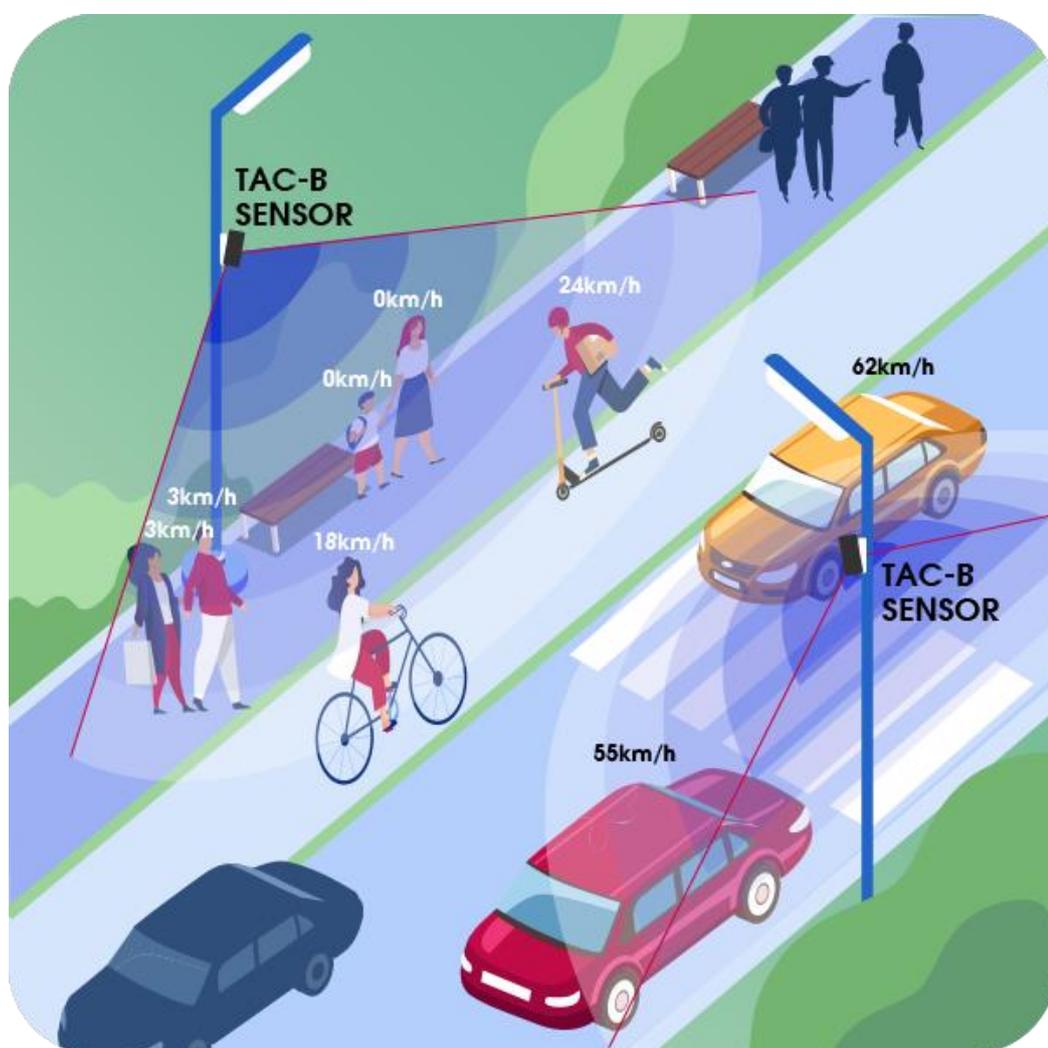


TAC-B 3D-W SENSOR

DATASHEET



Introduction

The TAC-B 3D-W sensor 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 3D-W 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.

The SensMax TAC-B 3D-W sensor was designed as standalone device for using in DIY projects etc.

Using of original SensMax software is optional, but sensor can be used without it.

The SensMax TAC-B 3D-W sensor supports popular IoT MQTT protocol and Telegram API. These features gives reach opportunities for integration of TAC-B sensor to any projects.

Application

The TAC-B 3D-W sensor 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

TAC-B 3D-W Sensor Technical Specification

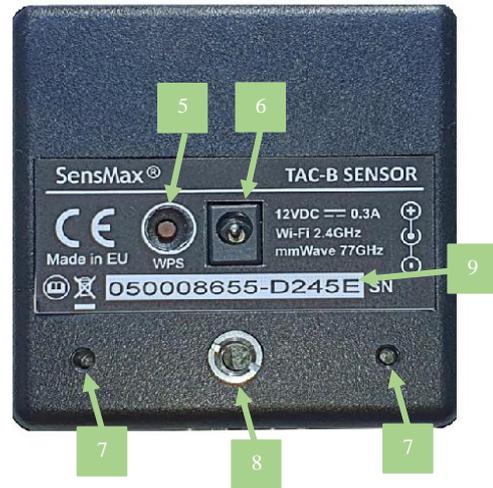
| | |
|---------------------------|---|
| Enclosure | ABS plastic IP54 |
| Counting accuracy | For range 10m >99% (for density 1 persons per m ²) |
| Field of view | 120° horizontal, 60° vertical |
| Max range | 10m (for pedestrian detection) |
| Range resolution | 5cm for 5m scene / 10cm for 10m scene |
| Max speed of object | 35 km/h |
| GDPR privacy law | 100% compliant (provides complete anonymity) |
| Notifications & Reporting | Telegram notifications, MQTT protocol (Email notifications and reporting in case if sensor connected to my.sensmax.eu system) |
| Internet connection | WiFi 2.4 GHz / WPA2-PSK / WPA2-ENTERPRISE (PEAP-MSCHAPv2) |
| Data storage | SD card 8GB (enough for storage of >100 year of counting data with 5 minutes step) |
| Power | 12VDC 0.5A (AVG power consumption is 4WH) |
| Working temperature | -25...+65°C |
| Dimensions | 80x80x35 mm |

TAC-B 3D-W Sensor Elements

FRONT VIEW



REAR VIEW



| Item | 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 Flashes 1 time per sec Flashes 3 times per sec | Wi-Fi Network & server both connected. Wi-Fi connected but server not connected. WPS mode activated. |
| 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. WPS button | Short Press Press and hold 30 sec | Start WPS process. 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-W Sensor Installation

Recommended installation height is higher than 2 meters above the floor.

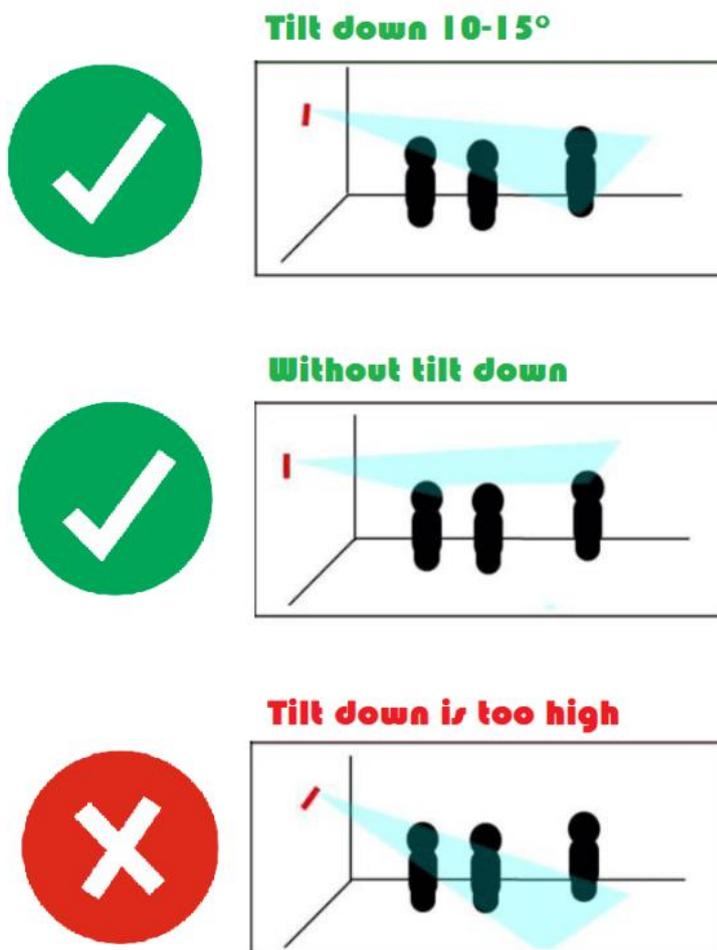
The sensor beam should be directed above the heads.

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: 2.5-3.5m

Down tilt (optionally): 5-10 degrees



Configuration of TAC-B 3D-W sensor using web page

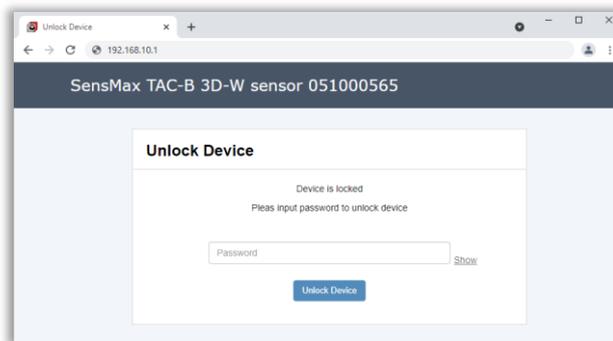
All configurations are available on the device web page.

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 3D-W AP (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.

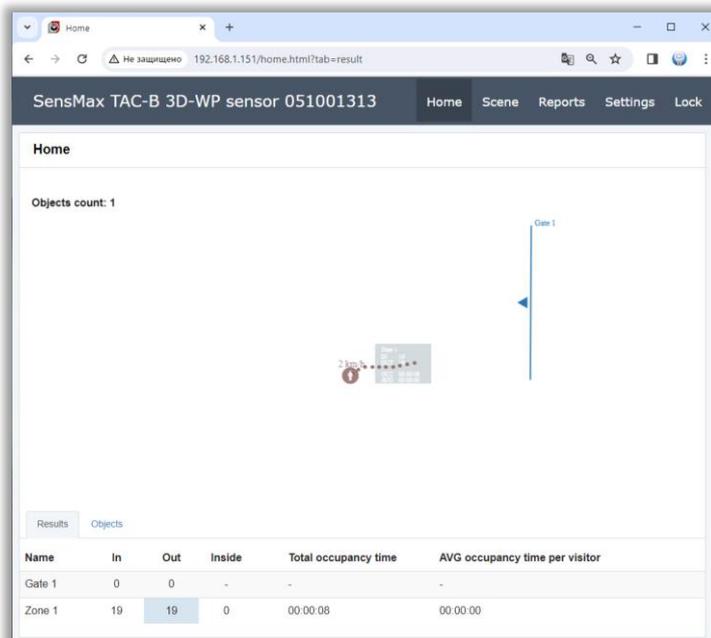
The login page will be opened.

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.

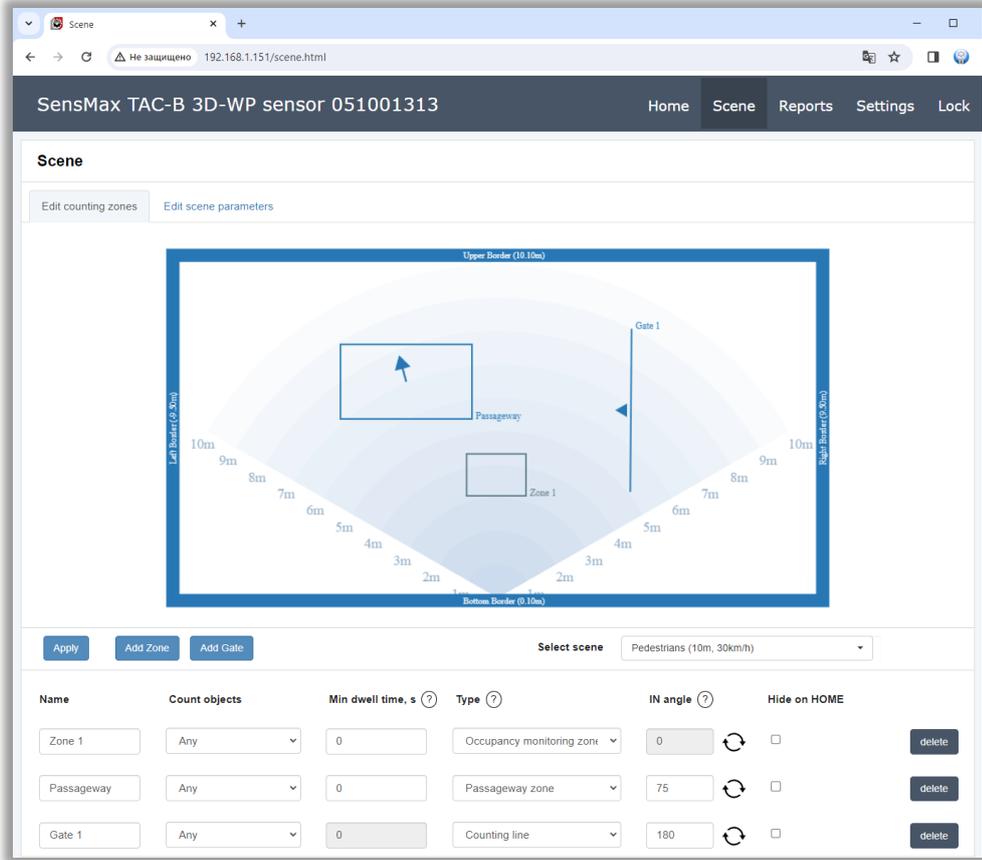
The **Objects** tab displays information about the last 20 detected objects.

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.

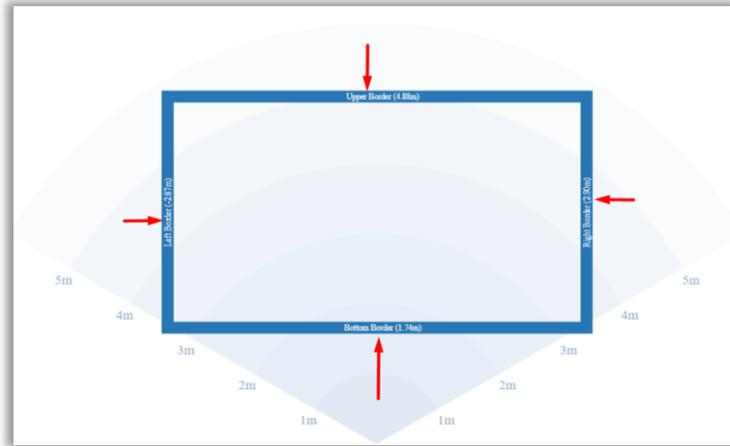
| Name | Count objects | Min dwell time, s ? | Type ? | IN angle ? | Hide on HOME |
|--------|---------------|---------------------|--------------------------|------------|-------------------------------------|
| Zone 2 | Any | 0 | Passageway zone | 40 | <input checked="" type="checkbox"/> |
| Zone 3 | Any | 0 | Occupancy monitoring zon | 0 | <input type="checkbox"/> |
| Gate 1 | Any | 0 | Counting line | 233 | <input type="checkbox"/> |
| Gate 2 | Any | 0 | Counting line | 125 | <input type="checkbox"/> |

| | |
|-----------------------|--|
| <i>Name</i> | The name of Gate or Zone. Max length is 16 symbols. |
| <i>Count objects</i> | Allows to select the type of objects to be counted for current Gate or Zone: Any , Pedestrians or Vehicles . |
| <i>Min dwell time</i> | 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. |
| <i>Type</i> | 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 12 of current document for more information about types. |
| <i>IN angle</i> | This setting allows to adjust the direction of INCOMING flow. |
| <i>Hide on HOME</i> | This setting allows to hide corresponding Gate or Zone on Home page. |

Walls

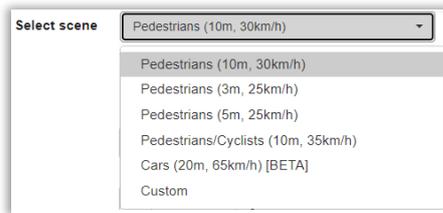
User can configure the active area by moving the borders.

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



Select scene

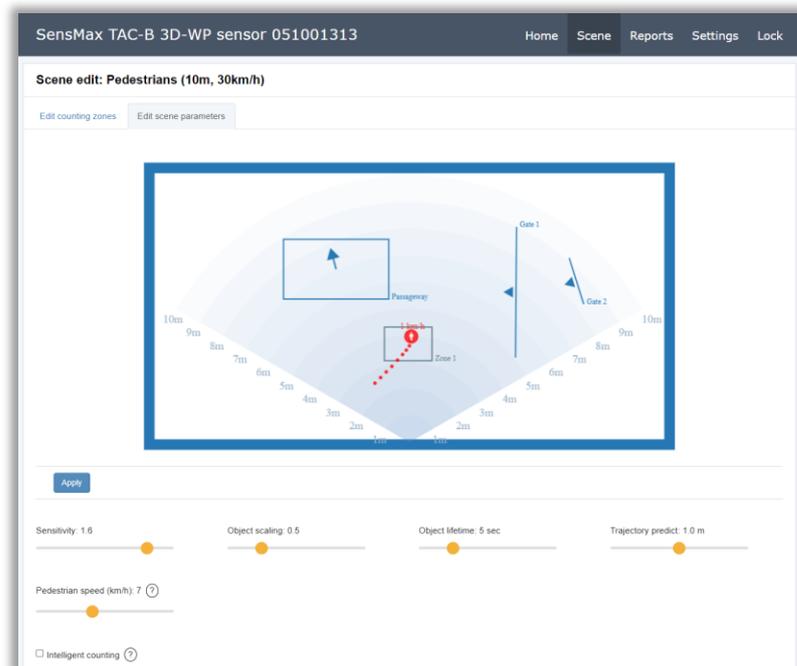
To provide best counting and tracking results it is important to select scene correctly. User can select one from pre-defined scenes.



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

Edit scene

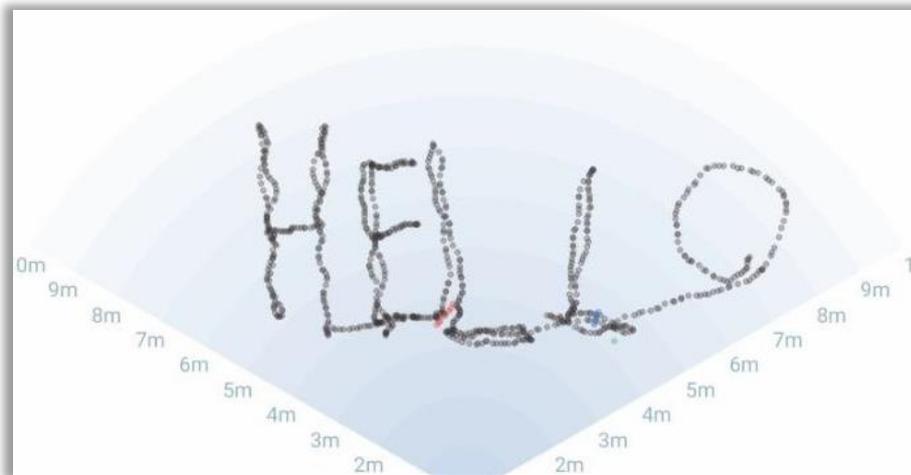
User can adjust main parameters for any scene by entering to **Edit scene parameters** tab.



| | |
|-----------------------------|--|
| <i>Pedestrian speed</i> | 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". |
| <i>Sensitivity</i> | 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. |
| <i>Object scaling</i> | 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. |
| <i>Object lifetime</i> | 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. |
| <i>Trajectory predict</i> | 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. |
| <i>Intelligent counting</i> | When Intelligent counting enabled, the sensor will not count the same object if it crosses the Gate over and over again. This setting affects to counting in Gates, but not affects to counting in Zones. |

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.

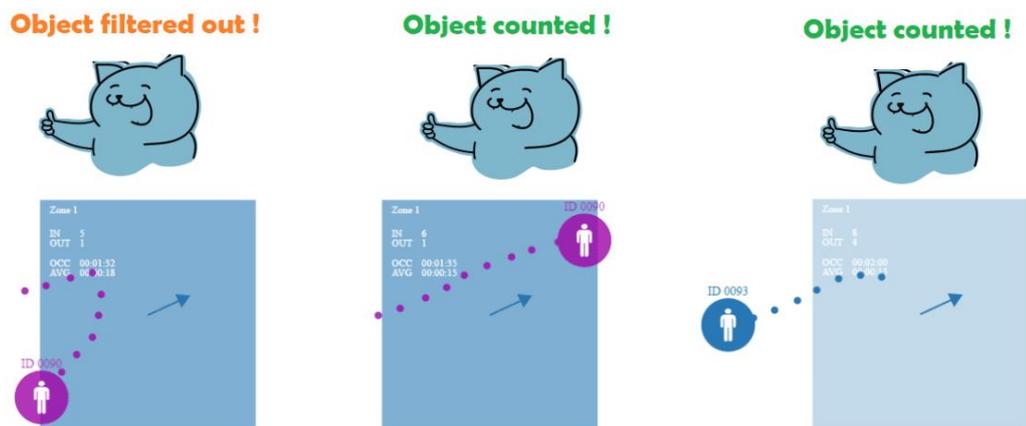
Each zone can have a **Occupancy monitoring zone** type or **Passageway zone** type.

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.



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.

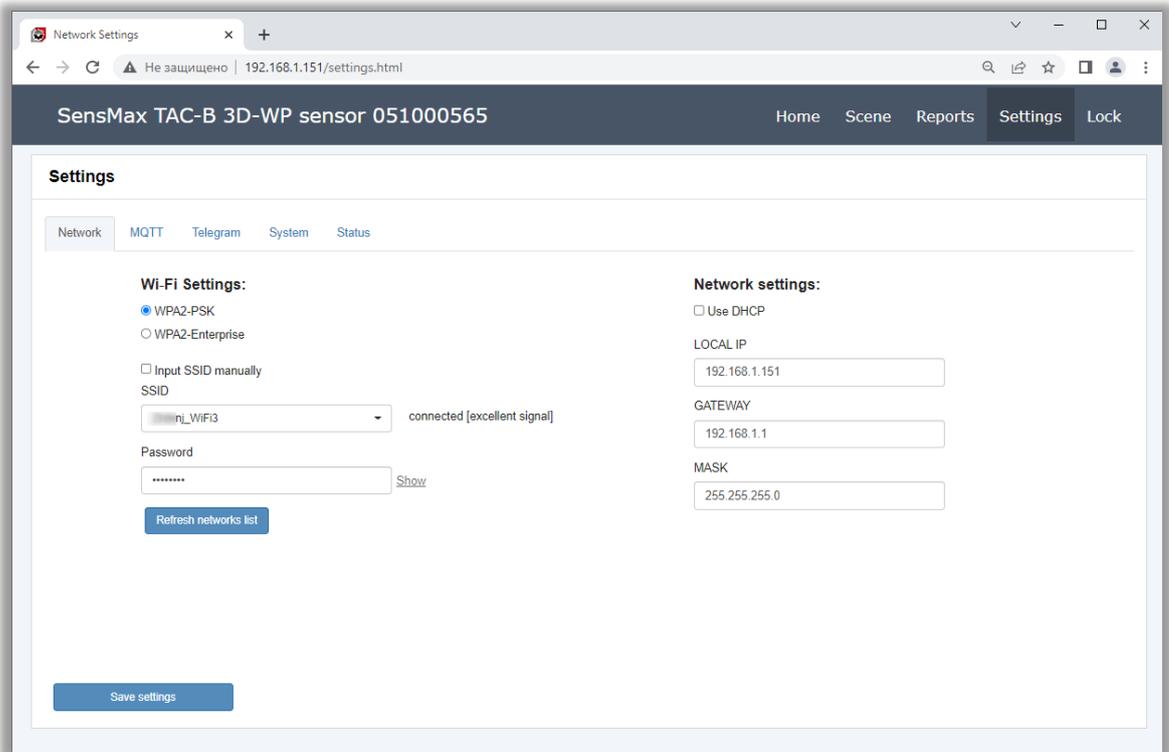


Settings web page

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

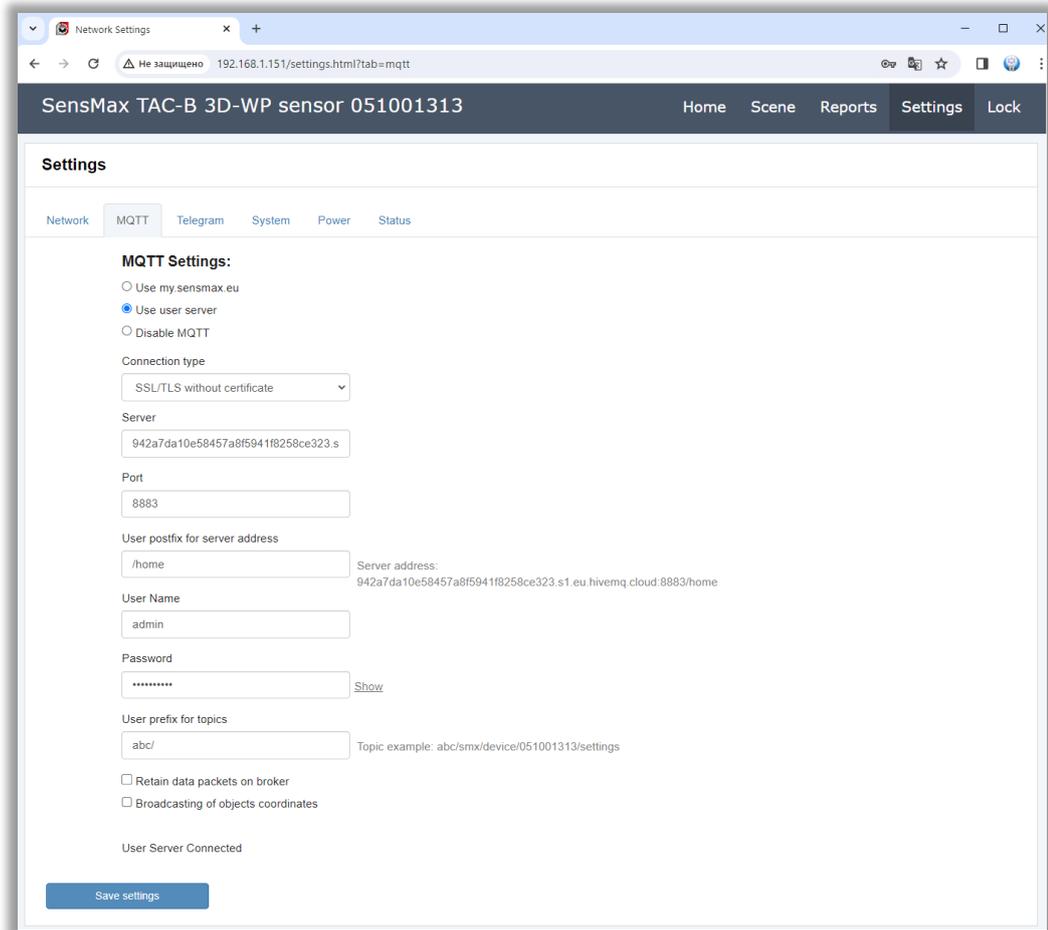
If **Use DHCP** selected, all network settings will be obtained from internet router automatically (the DHCP should be enabled in your internet router).

Or you can input all network settings manually.

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:

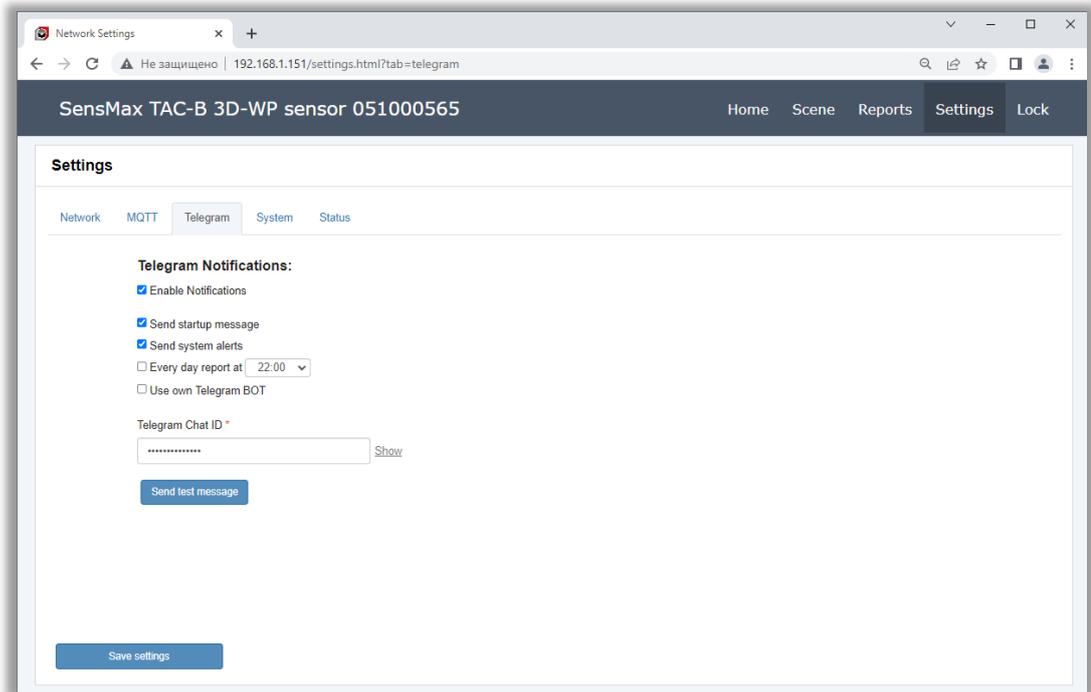
Credentials, SSL/TLS, Two-way auth, Mutual auth, WebSocket, WebSocket Secure

| | |
|---|--|
| User prefix for topics | Optionally, user can add any prefix to topic name. Max length 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 length is 128 symbols. |

[Download SensMax MQTT documentation](#)

Telegram

The TAC-B sensor support the API of Telegram Messenger. This allows to send notifications from device to Telegram chat directly.



Telegram notifications

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

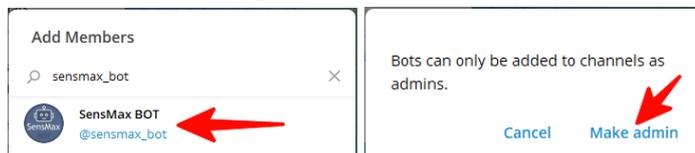
User can select the type of notifications which can be send.

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.



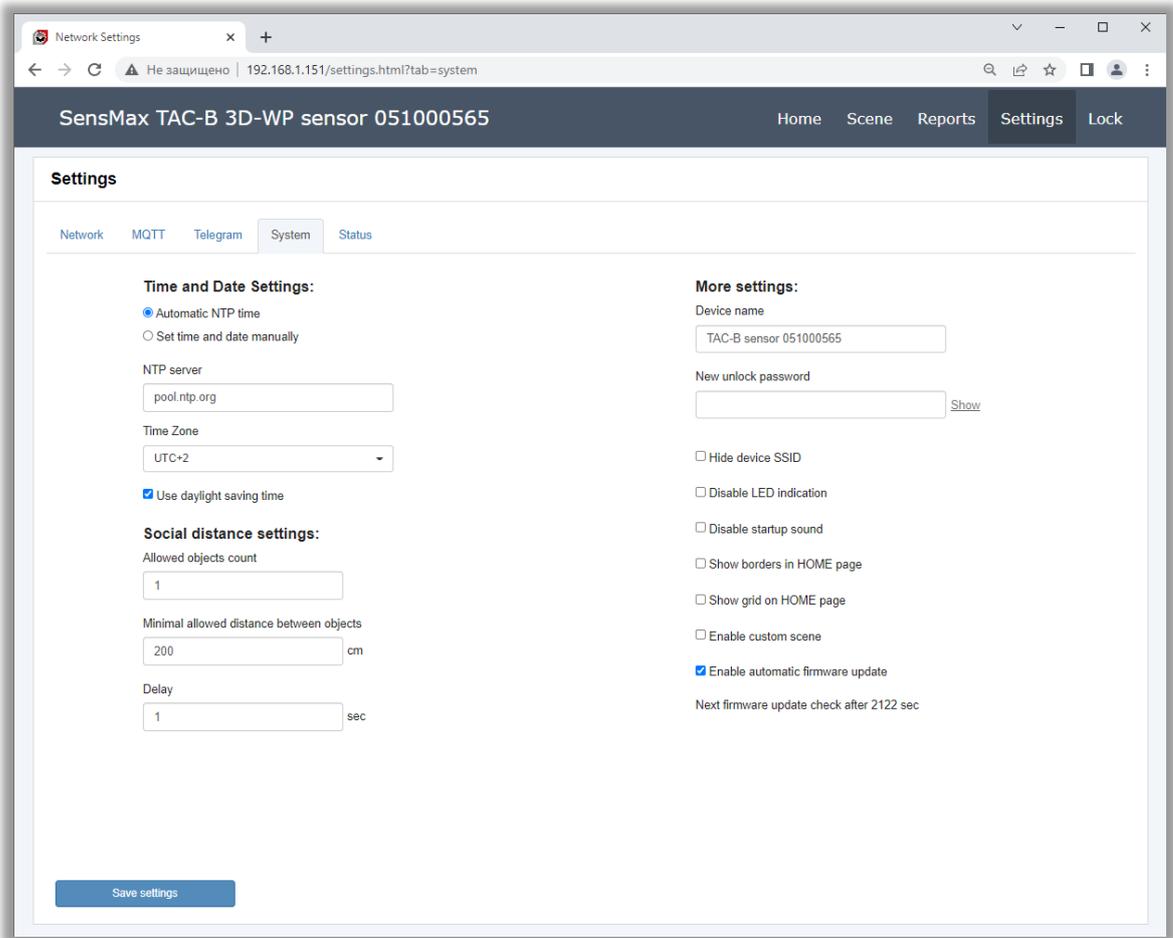
Connection of user BOT:

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.

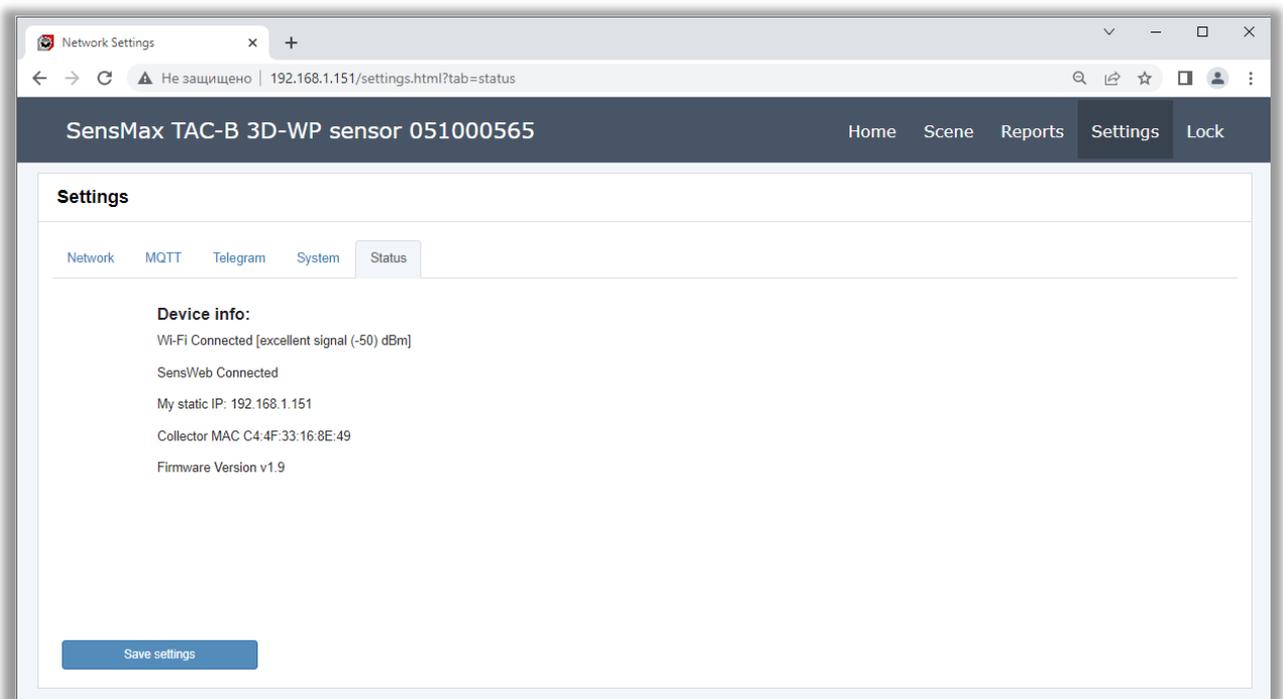
Please refer to **Notification** section of this manual for getting more information about notifications.

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. |

Status

On this tab actual system status shown.

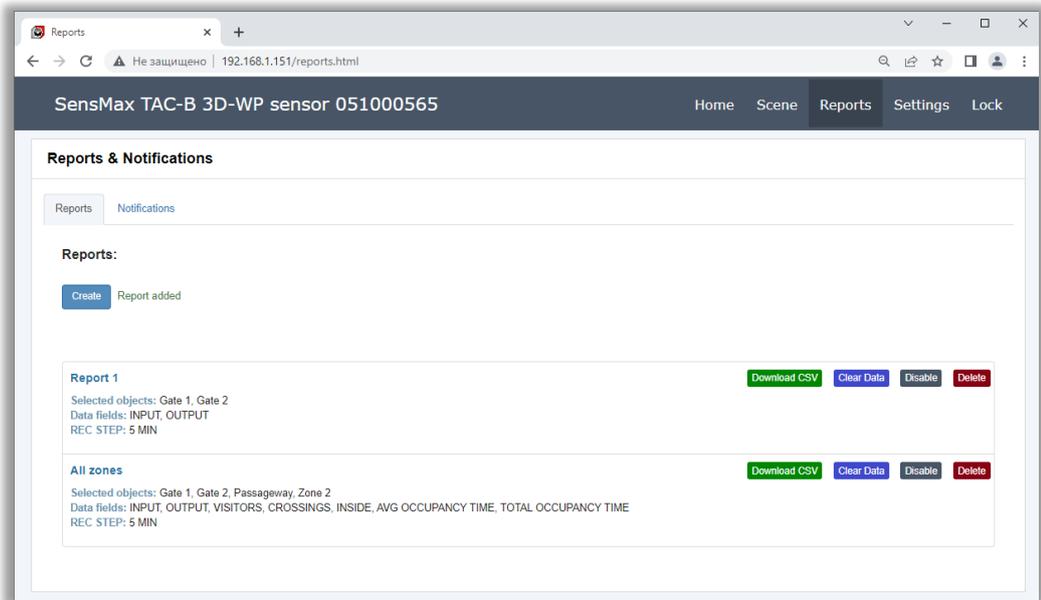


Reports web page

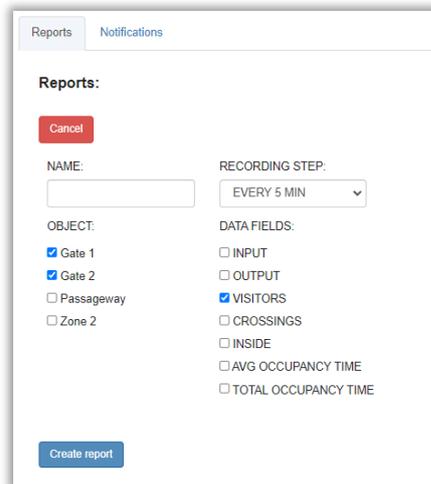
To enter page please press the **Reports** tab in upper menu.
This page contains allows to manage Reports and Notifications.

Reports

On this tab user can configure reports.



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



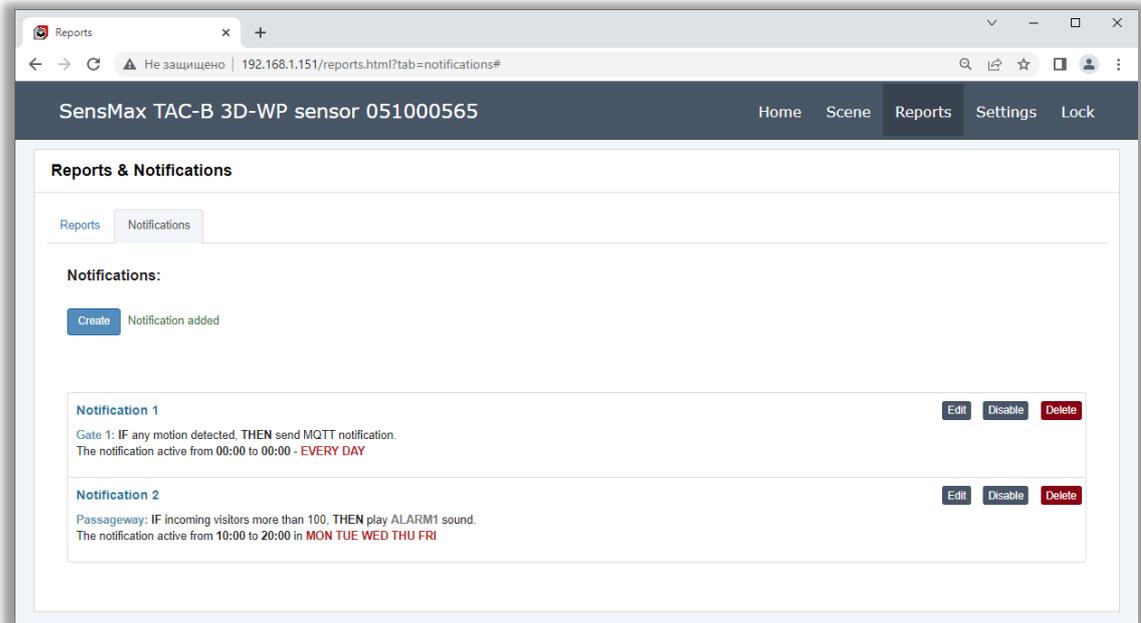
Once the report has been created, the sensor begins writing the data to a CSV file on the built-in Micro SD card. To download the report, press the **Download CSV** button of the desired report.

Please note:

1. The **VISITORS** field calculated by formula:
For Gates and Passageway Zones: $VISITORS = (INPUT + OUTPUT)/2$
For Zones: $VISITORS = INPUT$
2. The **CROSSINGS** 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: <ul style="list-style-type: none"> INPUT (the count of incoming visitors) OUTPUT (the count of outgoing visitors) Supported triggers for the ZONE: <ul style="list-style-type: none"> INPUT (the count of incoming visitors) OUTPUT (the count of outgoing visitors) INSIDE (number of objects currently inside the zone) 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.

The screenshot shows the 'Reports & Notifications' section of the web interface. The 'Notifications' tab is active. A notification is being configured with the following details:

- NAME:** Google Sheets test
- OBJECT:** Gate 1
- TRIGGER:** EVERY 5 MIN
- ACTION:** Webhook launch
- WEBHOOK SERVICE:** IFTTT
- EVENT NAME:** My Google Table
- KEY:** yMJ1THYT6FP7Rjupatdrtb

Below the main configuration, there is an 'ADD WEBHOOK PAYLOAD' section with three value fields:

- value1: DEVICE NAME
- value2: TIME/DATE
- value3: VISITORS

At the bottom, there is an 'ADJUST ACTIVE PERIOD' link and a 'Create notification' button.

Example of notification creating for Shelly:

Please refer to the [Shelly documentation](#) for more information.

The screenshot shows the 'Reports & Notifications' section of the web interface. The 'Notifications' tab is active. A notification is being configured with the following details:

- NAME:** Shelly Example
- OBJECT:** Zone 2
- TRIGGER:** ANY MOTION
- ACTION:** Webhook launch
- WEBHOOK SERVICE:** Shelly
- HTTP REQUEST:** http://192.168.1.178/rpc/Switch.Set?id=0&on=true&toggle_after=10

At the bottom, there is an 'ADJUST ACTIVE PERIOD' link and a 'Create notification' button.



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 www.facebook.com/sensmaxmanufacturer

 www.linkedin.com/company/sensmax

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