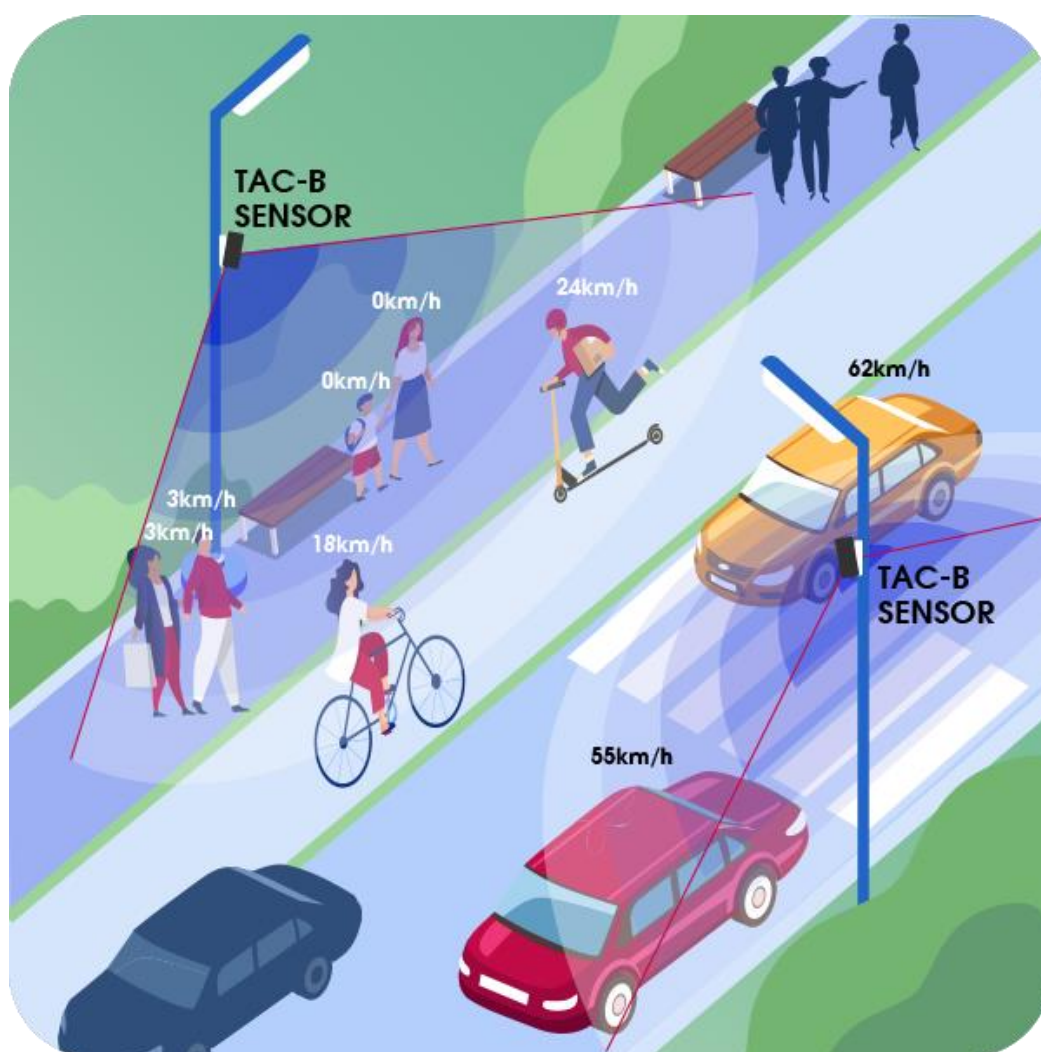


TAC-B 3D-W SENSOR

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

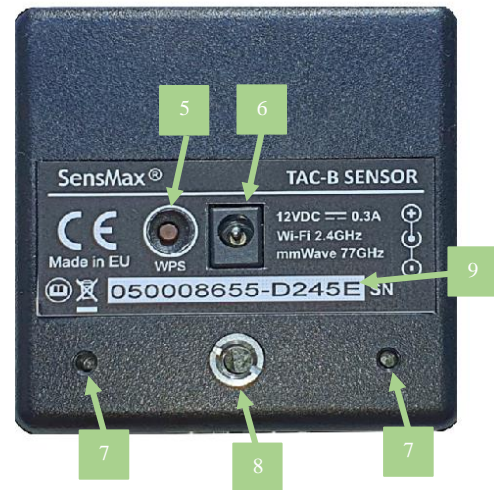
Enclosure	ABS plastic IP54
Counting accuracy	For range 10m >99% (for density 1 persons per m ²)
Field of view	120° horizontal, 60° vertical
Range	10m
Range resolution	5cm (for 10m range)
Max speed of object detection	35 km/h
GDPR privacy law	100% compliant (provides complete anonymity)
Notifications & 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 16GB (enough for storage of 900 year of counting data with 5 minutes step)
Power	12VDC 0.5A
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 diameter 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

For best results, the sensor should be positioned high enough to be above the top of tracked objects (optionally with a slight down tilt). The aim is to position the sensor so that the antenna beam can encompass the area of interest. If the down tilt is too severe, noise from ground clutter increases and the effective sensing area decreases.

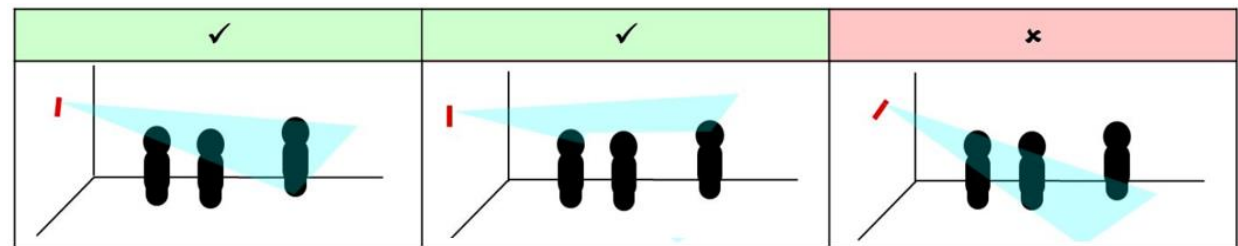
The vertical viewing angle of TAC-B 3D-W sensor is around 60°. This allows to install sensor without any down tilt. For scenes where objects may move in close proximity to the sensor, down tilt 10-15° may be necessary.

The table below reflects the minimal distance from sensor till detecting objects, depending from the installation height (if the sensor is installed without a down tilt):

Installation height, m	Minimal detecting distance, m
2.0	0.5
2.2	0.8
2.4	1.2
2.6	1.5
3.0	2.0

Optimal installation height: 2.0-3.0m

Down tilt (optionally): 5-10 degrees



Picture bellow shows possible installation using of standard SensMax bracket:



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

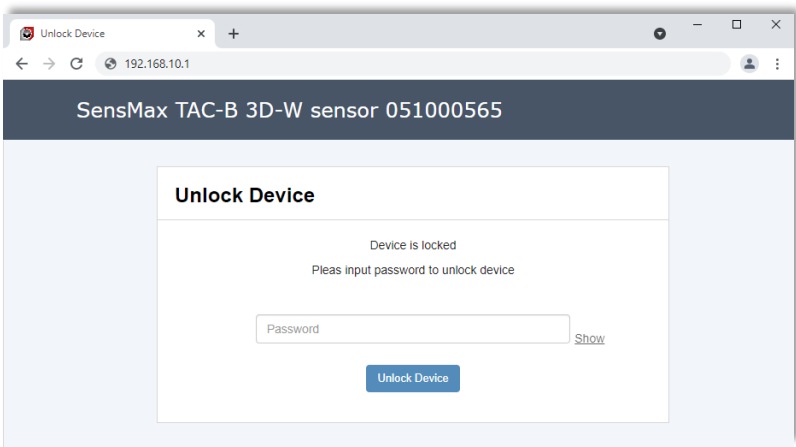
All configurations are available on the device web page.

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.

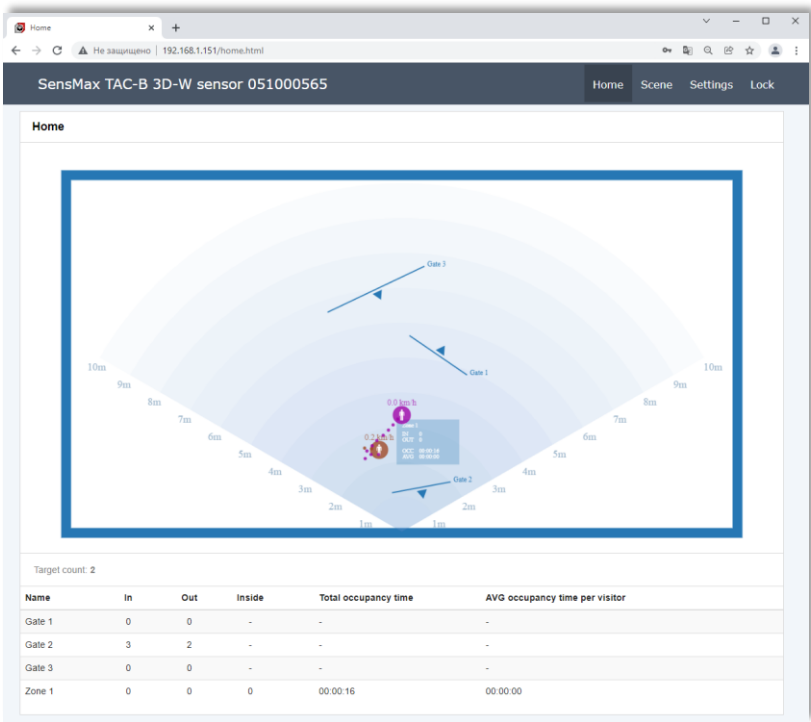
The login page will be opened.

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.

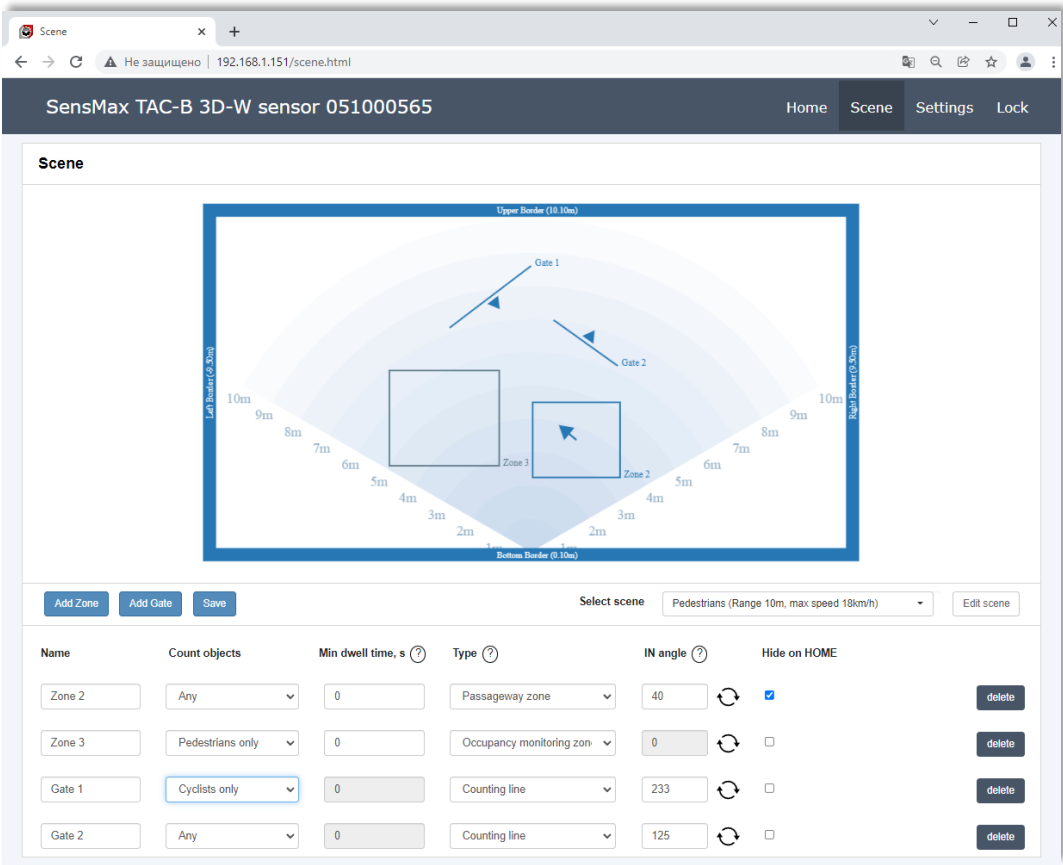


Scene web page

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

The **Scene** page allows to setup scene parameters, user defined gates, 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.

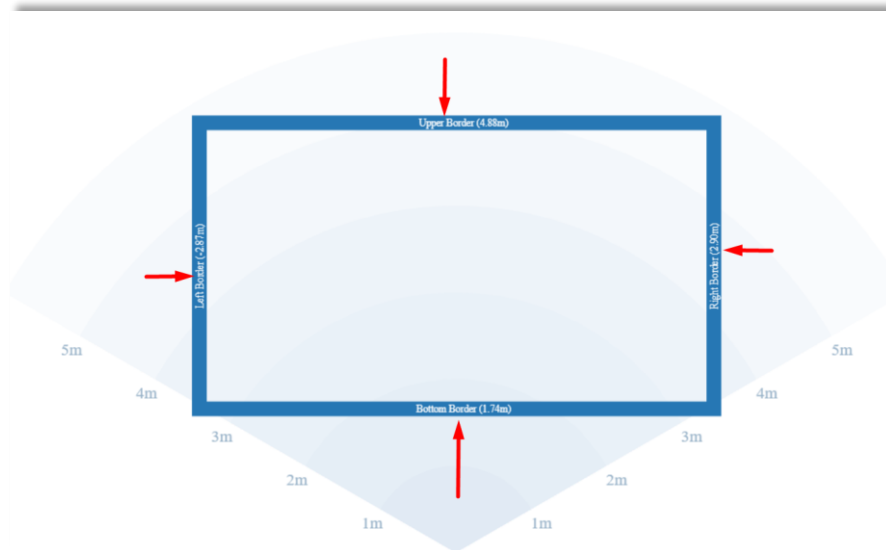
Name	Count objects	Min dwell time, s	Type	IN angle	Hide on HOME
Zone 2	Any	0	Passageway zone	40	<input checked="" type="checkbox"/>
Zone 3	Any	0	Occupancy monitoring zon	0	<input type="checkbox"/>
Gate 1	Any	0	Counting line	233	<input type="checkbox"/>
Gate 2	Any	0	Counting line	125	<input type="checkbox"/>

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 Cyclists .
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 12 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

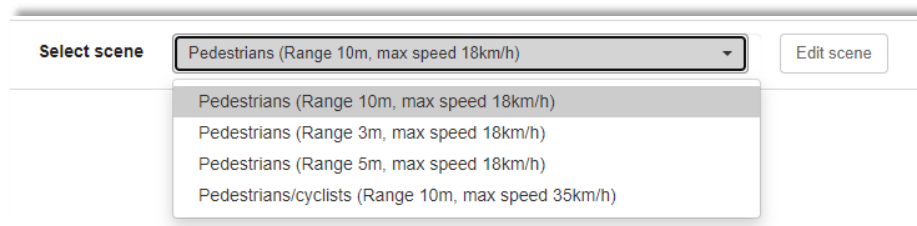
User can configure the active area by moving the borders.

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



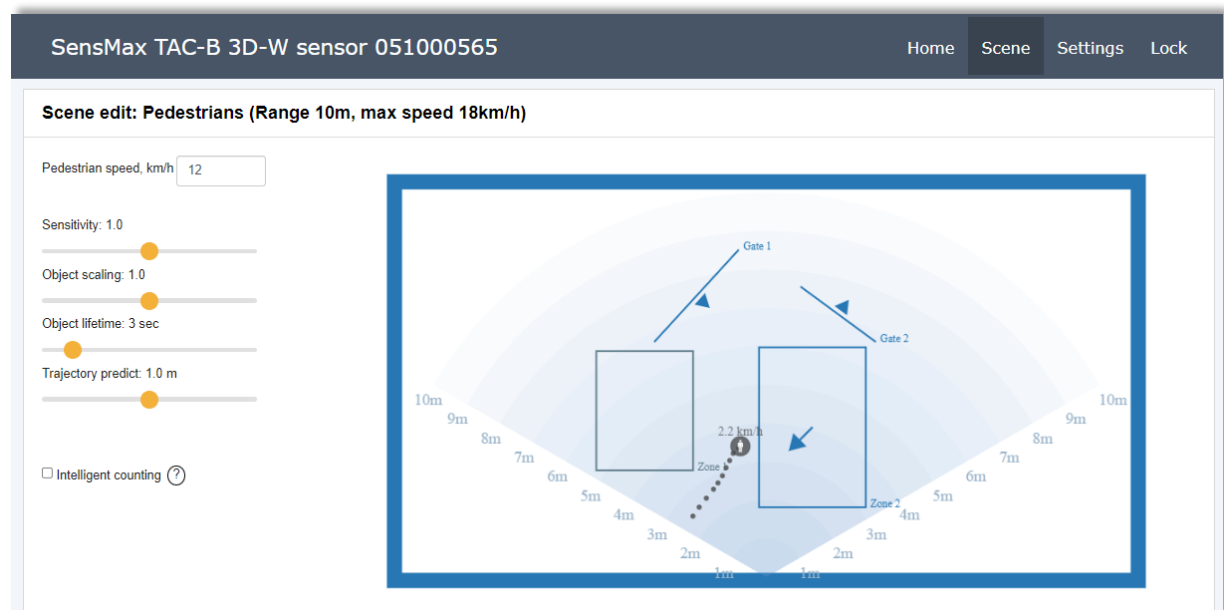
Select scene

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



Edit scene

User can adjust main parameters for any scene by  pressing of button.



<i>Pedestrian speed</i>	This setting define 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 "cyclist".
<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 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 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.

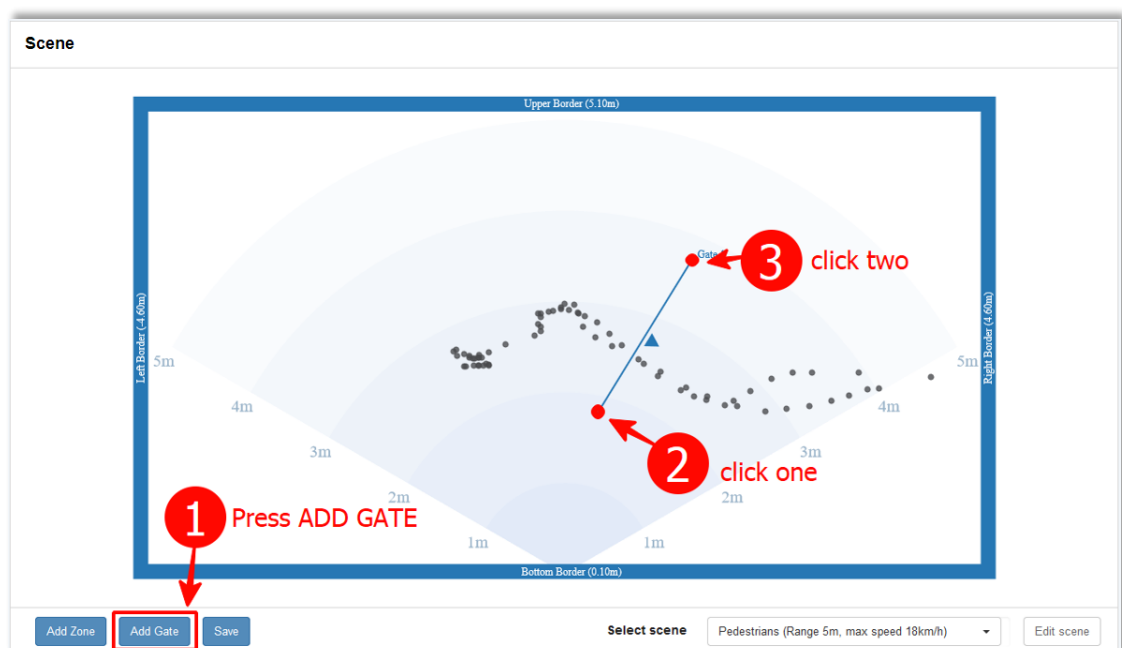
Each Zone has the INSIDE parameter, which displays the number of people inside the Zone at the moment. Also for Zones it is possible to measure dwell time and social distance violation.

To add a counting 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 **Settings** tab. All settings are divided into tabs.

Network

This tab contains network settings.

The screenshot shows a web browser window with the address bar displaying "192.168.1.151/settings.html". The page title is "SensMax TAC-B 3D-W sensor 051000565". The navigation bar includes "Home", "Scene", "Settings" (selected), and "Lock". The "Settings" section has tabs for "Network", "MQTT", "Telegram", "Notifications", "System", and "Status". The "Network" tab is active, showing "Wi-Fi Settings" and "Network settings".

Wi-Fi Settings:

- ☒ WPA2-PSK
- ☐ WPA2-Enterprise
- ☐ Input SSID manually
- SSID: connected (-47 dBm)
- Password: [Show](#)
- [Refresh networks list](#)

Network settings:

- ☐ Use DHCP
- LOCAL IP:
- GATEWAY:
- MASK:

[Save 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.

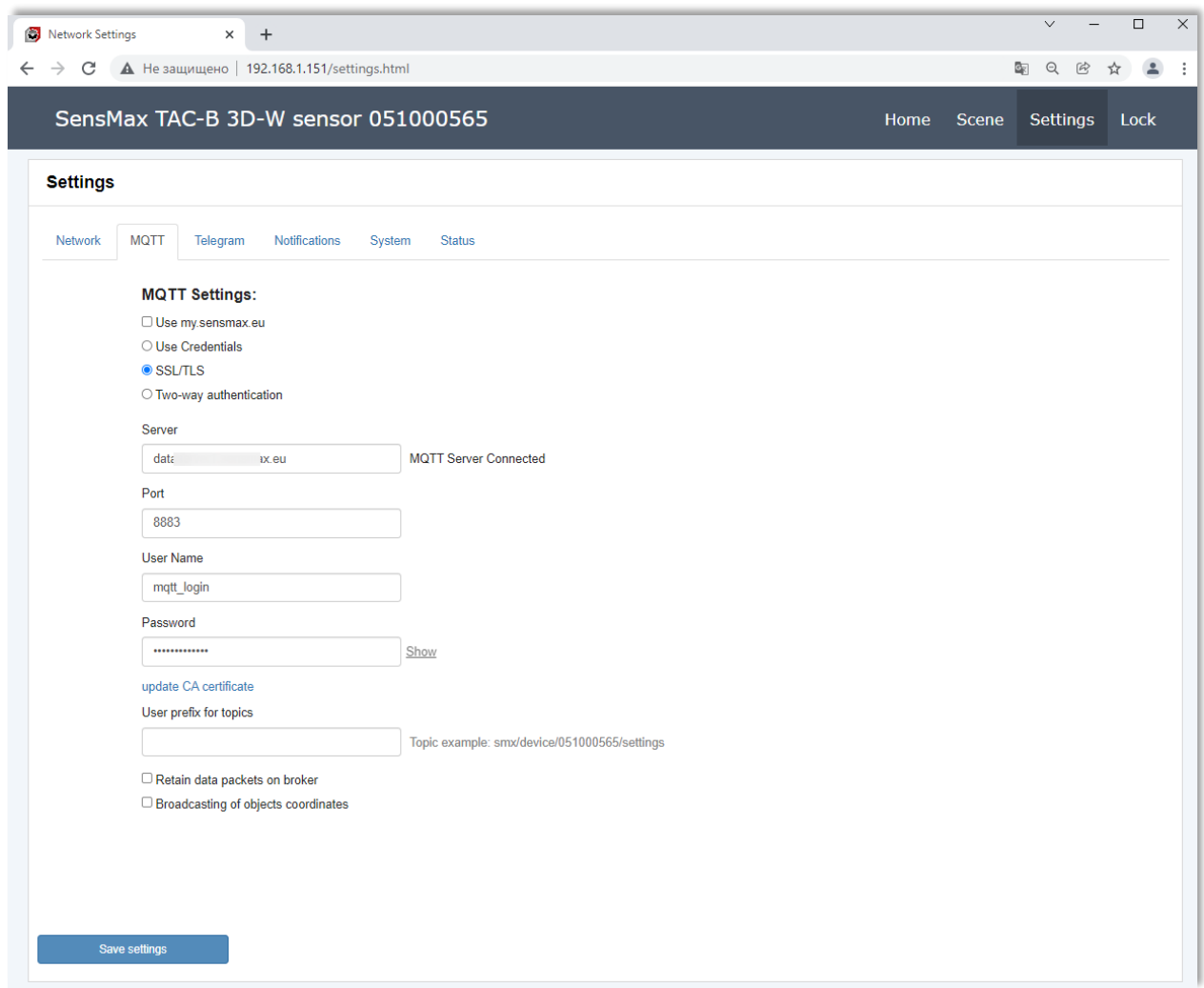
Network settings

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.



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 authentication.

User prefix for topics	User can add any prefix to topic name. Max name 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.

[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.

The screenshot shows a web browser window with the address bar displaying "192.168.1.151/settings.html". The page title is "SensMax TAC-B 3D-W sensor 051000565". The navigation bar includes "Home", "Scene", "Settings", and "Lock". The "Settings" tab is active, and the "Telegram" sub-tab is selected. The "Telegram Notifications" section contains the following options:

- ☒ Enable Notifications
- ☐ Send startup message
- ☒ Send system alerts
- ☒ Every day report at 10:00

Below these options, there are input fields for:

- Device name: TAC-B sensor 051000565
- Telegram Token: [Redacted] [Show](#)
- Telegram Chat ID: [Redacted] [Show](#)

A "Send test message" button is located below the input fields. At the bottom of the settings page, there is a "Save settings" button.

Telegram notifications

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

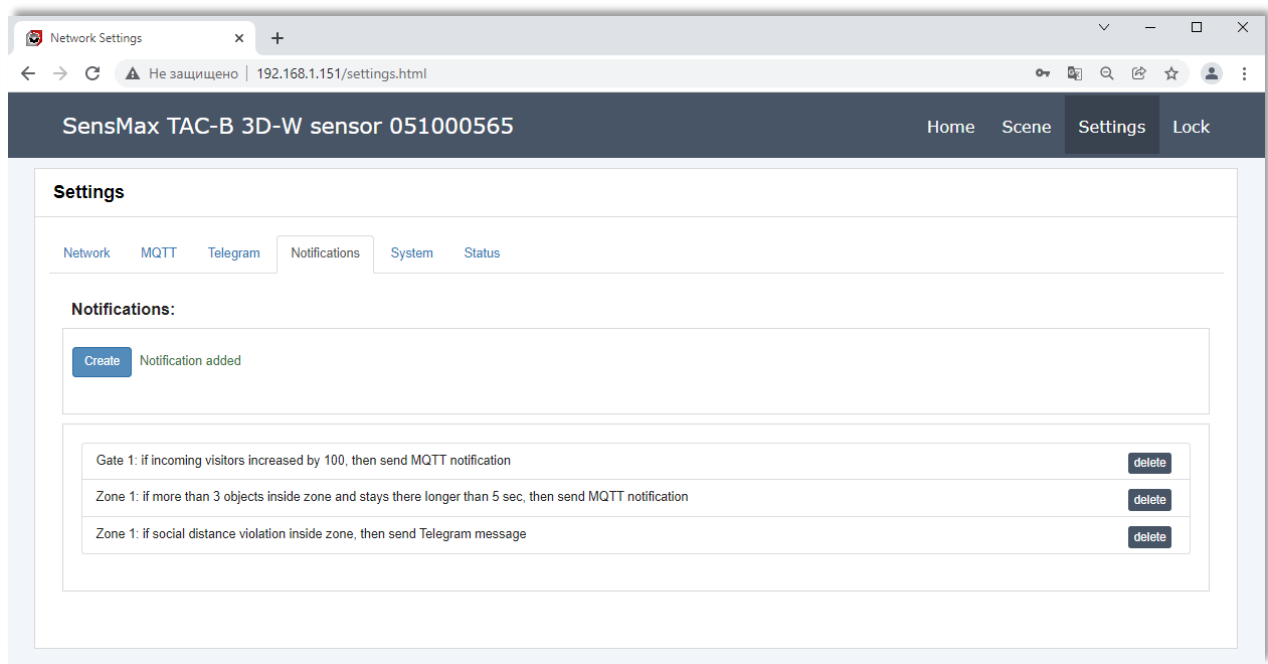
User can select the type of notifications which can be send.


To obtain **Telegram token** and **Telegram Chat ID**, please refer to **AN020 (SensMax telegram connection)** document.

[Download AN020 document](#)

Notifications

On this tab user can configure various notifications.



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

The form for creating a new notification is displayed. It includes a 'Cancel' button at the top left. The fields are: 'OBJECT' (dropdown menu with 'Zone 1' selected), 'TRIGGER' (dropdown menu with 'INSIDE' selected), 'CONDITION' (dropdown menu with 'MORE THAN' selected), 'VALUE' (text input with '10'), 'DELAY (sec)' (text input with '5'), and 'ACTION' (dropdown menu with 'MQTT notification' selected). A 'Create notification' button is at the bottom left.

Table below describes the notification parameters:

<i>OBJECT</i>	In this list all user defined object (gates and zones) are presented. Need to select one.
<i>TRIGGER</i>	<p>Depending from object type (zone or gate) there will be allowed different triggers for selection.</p> <p>Supported triggers for the GATE:</p> <ul style="list-style-type: none">INPUT (the count of incoming visitors)OUTPUT (the count of outgoing visitors) <p>Supported triggers for the ZONE:</p> <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 VIOLATIONTOTAL OCCUPANCY TIME
<i>CONDITION</i>	<p>In this list presented the type of conditions: MORE THAN and EVERY NEXT</p> <p>If MORE THAN selected, sensor will generate single notification when defined value will be reached.</p> <p>If EVERY NEXT selected, sensor will generate notification every time when counting result increases by defined value.</p>
<i>VALUE</i>	The value which should be reached for trigger activation.
<i>DELAY</i>	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.
<i>ACTION</i>	Defines the notification type: Telegram notification or MQTT notification

System

On this tab user can configure various settings.

The screenshot shows a web browser window with the address bar displaying "192.168.1.151/settings.html". The page title is "SensMax TAC-B 3D-W sensor 051000565". The navigation bar includes "Home", "Scene", "Settings", and "Lock". The "Settings" tab is active, and the "System" sub-tab is selected. The "Settings" section is divided into two columns. The left column contains "Time and Date Settings" with options for "Automatic NTP time" (selected) and "Set time and date manually". Below these are fields for "NTP server" (pool.ntp.org), "Time Zone" (UTC+2), and a checked option for "Use daylight saving time". The "Social distance settings" section includes fields for "Allowed objects count" (2), "Minimal allowed distance between objects" (100 cm), and "Delay" (10 sec). The right column contains "More settings" with a "New unlock password" field and a "Show" link. Below this are checkboxes for "Hide device SSID", "Disable LED indication", "Disable startup sound" (checked), "Show borders in HOME page" (checked), "Show grid on HOME page" (checked), "Enable custom scene" (checked), and "Enable automatic firmware update". A "Firmware check update & install" button is at the bottom right. A "Save settings" button is at the bottom left of the settings area.

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 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.

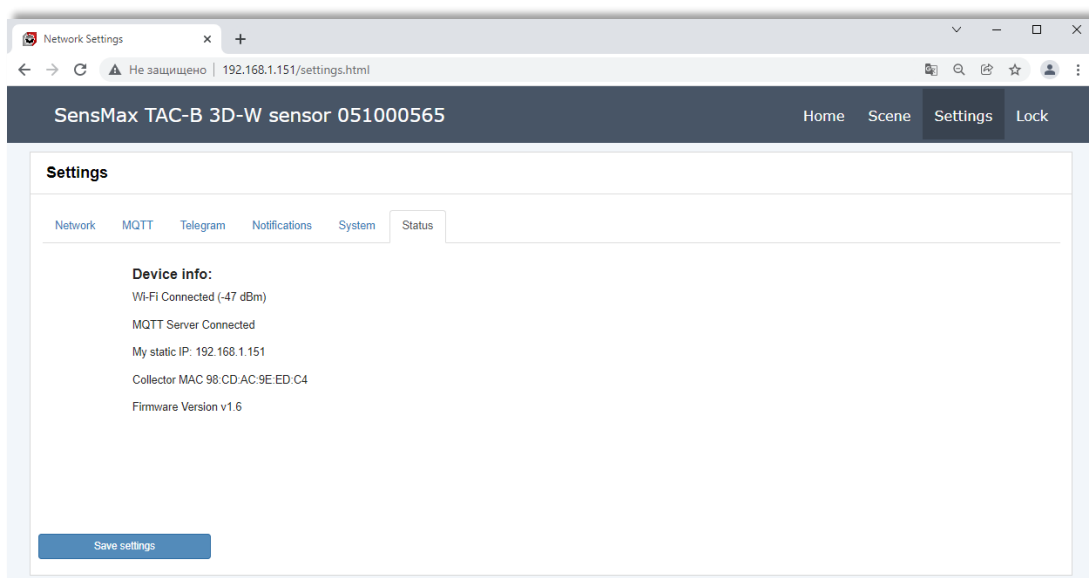
Please refer to **Notification** section of this manual for getting more information about notifications.

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.



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