

NEW TECH
HOLDING

NT10i Gas Network Survey Vehicle User Manual



ID: NT10i

Manual User P/N: 0101-1124

Revision 2

18 November 2024

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1 Introduction

1.1 Symbols used

The following symbols are used in this manual:



Warning

This symbol indicates a potential hazard associated with improper use of the equipment. It draws attention to a procedure, condition, etc., which, if not properly performed or complied with, could result in injury or death.



Warning

This symbol indicates a potential risk of electric shock. It draws attention to a procedure, condition, etc., which, if not properly performed or complied with, could cause injury or death.



Important

The use of this symbol draws attention to a procedure, condition, etc., which, if not carried out correctly or fulfilled, may cause the device to malfunction, damage the device and void the warranty.

1.2 Safety instructions



Warning

Before using this product, read the following information carefully and make sure it is handled correctly.



Warning

The driver is strictly prohibited from operating the device while driving! Such behaviour can lead to traffic accidents.



Warning

The manufacturer is not responsible for errors, damage, failures caused by incorrect operation.

**Warning**

Attempting to repair/replace components yourself is strictly prohibited. In the event of a malfunction, refer to this operating manual or contact the manufacturer.

**Warning**

Long-term use in direct sunlight and in harsh weather conditions such as rain, snow, hail and strong wind should be avoided. Protective devices such as dust covers are recommended to protect the equipment when it is not in use for long periods of time.

**Warning**

When carrying out the inspection, attention should be paid to the water in the way, so as not to submerge the gas-collecting suction pipes, as this could cause the filtration system to fail. When carrying out inspections, pay attention to foreign bodies and accumulated dust on the road surface, as sucking them in too much can shorten the life of the filter or cause the unit to fail.

**Warning**

Regardless of the condition of the device, always watch out for bumps and speed bumps on the road. Careless driving can cause damage to the device.

2 Product Information

NT10i makes it possible to monitor gas networks along the route of a vehicle equipped with this system. The NT10i works on the basis of one of the best available and proven technologies TDLAS. A selective laser measuring cell detects very small CH₄ concentrations in a fraction of a second. Dedicated software with mapping and geolocation functions provides accurate data GPS data on each detected gas leak point. The easy-to-use equipment meets all gas operators' requirements for performance, reliability and traceability. The system consists of:

1. Suction hose set,
2. Pump system,
3. Measurement module,
4. GPS module with external antenna,
5. Laptop with dedicated software.

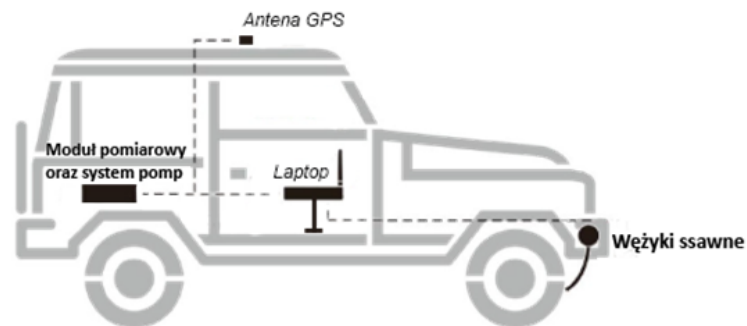


Figure 1: Diagram of the detection system

2.1 Parametres

Rated Supply Parameters		
1	Voltage	12VDC +/-10%
2	Power	<60W
Environmental Conditions		
3	Working temperature	-10 : +50°C
4	Relative humidity	up to 90% RH
Sampling Parameters		
5	Number of measurement points	8
6	Measurement width	2m
7	Protection against liquid and other particles	Yes
GPS Module Parameters		
8	Accuracy	<2m
9	GNSS support	Yes
10	GPS date and car speed reading	Yes
Measurement module parameters		
11	Detection gas	Methane (CH ₄)
12	Measurement range	100%Vol (or 0 -40000ppm)
13	Response time	<2s
14	Atex certification	Yes
Other Parameters		
15	IP protection class	IP66
16	Language	Polish, English

Table 1: Device Specification

2.2 Measurement working principle

„Methane molecules absorb light at specific wavelengths”

- Principle of molecular absorption spectroscopy

„There is a linear correlation between the concentration and absorbance of a solution, making it possible to calculate the concentration of a solution by measuring its absorbance.”

- Lambert Beer law

According to the above laws of physics, a beam of a certain wavelength can be passed through a gas and depending on how attenuated the beam is, the concentration of methane in the passing air mass can be measured.

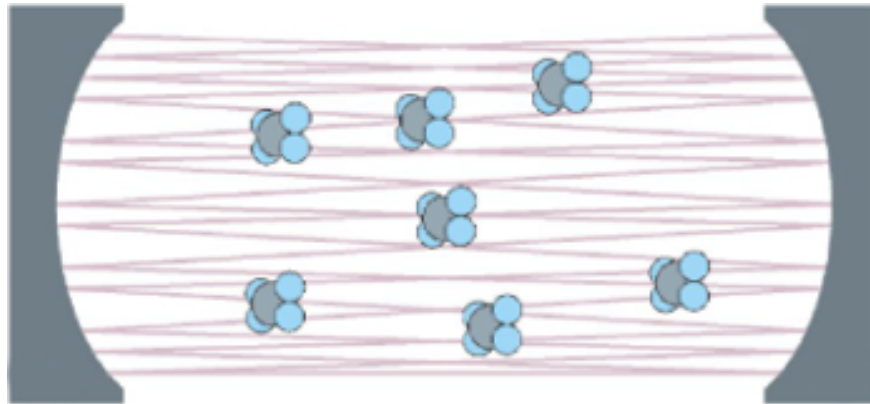


Figure 2: Visualization of absorption

The use of a multi-reflector detection chamber, which allows the laser to pass through the gas being measured multiple times, has significantly increased the accuracy of the measurement.

2.3 Measurement module

The measurement module, based on TDLAS technology, includes the following components:

1. Navigation button,
2. On/Off button,
3. Display,
4. Measure input,
5. USB-C Charge Port.

The measuring module displays the current gas concentration value on its screen. Communication with the software takes place via a wireless bluetooth protocol.

Thanks to TDLAS technology, the module has a sensitivity of 0.1ppm and a low response time. The laser frequency is selected so that it does not interfere with propane, butane, hydrogen, vehicle exhaust or water vapour in the air.



Figure 3: Measurement Module

**Warning**

The measuring module does not start automatically. It must be started before each inspection; see section 3.

**Important**

The measuring module has a built-in battery, so when the car is switched off, the module will not switch off itself.

**Warning**

Correct operation of the measuring module is only possible with the pump system switched on; see section 3.

2.4 Pump system

The pump system incorporates a special arrangement of pumps and sensors, allowing fast delivery of gas to the measuring module. The system is managed from the position of dedicated software via wireless bluetooth communication. It is possible to regulate the pumps, as well as view the error log described in section no. 2.4.1.

Pump System includes the following components:

1. Sample inlet,
2. Sample outlet,
3. Measurement inlet,
4. Measurement outlet,
5. Charging input 12V DC,
6. USB-C output,
7. On/Off button,
8. Indicator light.

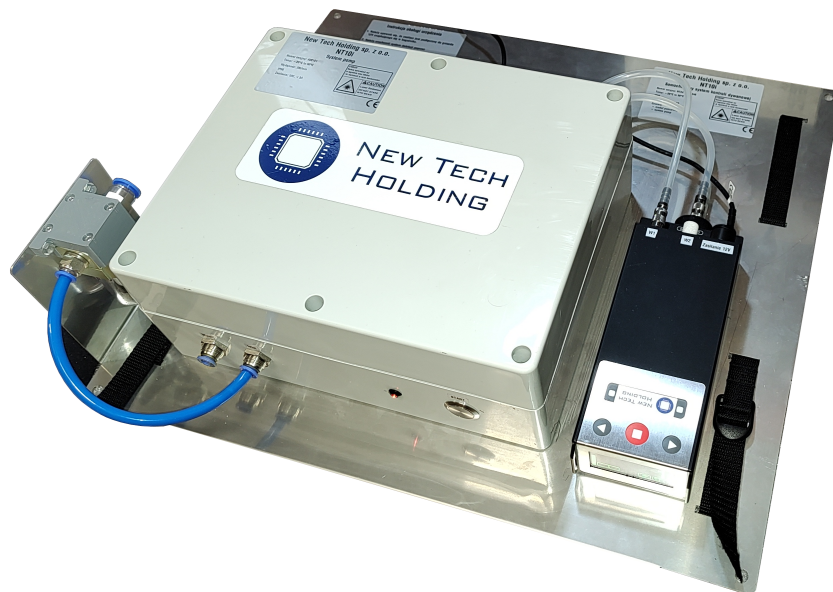


Figure 4: Pump system

2.4.1 Pump system fault log

Error register bit description:

- Bluetooth error - bit 0,
- Critical error - bit 1,

- Flash memory error - bit 2,
- RTOS error - bit 3,
- UART error - bit 4,
- Pump error 1 - bit 8,
- Pump error 2 - bit 9,
- Pump error 3 - bit 10,
- Overpressure error - bit 11,
- Underpressure error - bit 12,
- Axetris communication error - bit 13,

2.5 GPS Module

GNSS-enabled GPS module having an accuracy <2 m. It has an external roof-mounted antenna with a magnetic base. The GPS module connects to the computer via a dedicated USB cable.



Figure 5: GPS Module



Important

After a long period of being unused, the GPS module may need up to several minutes of time to detect the signal again.



Warning

GPS module may not be accurate in closed buildings.

3 Operating Description

3.1 Introduction

Operating of the system is available via a dedicated laptop with Windows 10 or Windows 11

3.2 Turning system on

To start system it is necessary to:

- go to the back of a car, open a trunk where NT10i is mounted,
- ensure that the 12V plug is insert in to the port near to the system,
- make sure that the other end of the power supply is correctly connected via hermetic connector No. 4 to the pump system.(see section 2.4),
- press and hold power button no.6 on the pump system (see chapter 2.4), until the red LED lights up indicating that the unit is operating correctly (about 3-4s),
- press and hold power button no.2 on the measuring module, until it starts working (see section 2.3).
- active the traffic light on the roof of the vehicle

Once the above steps have been completed, go inside the vehicle, start the computer and then connect the USB cable from the GPS module (see section 2.5). Then run the "NTH Inspector" software. For the measuring procedure (see section 3.3.8).

3.3 Software usage



Important

Make sure that the downloaded software is latest version of "NTH Inspection", available on the manufacturer's website.

3.3.1 Layout

Software consist of 2 main blocks shown on figure. 6.

1. Navigation bar,
2. Main software block,

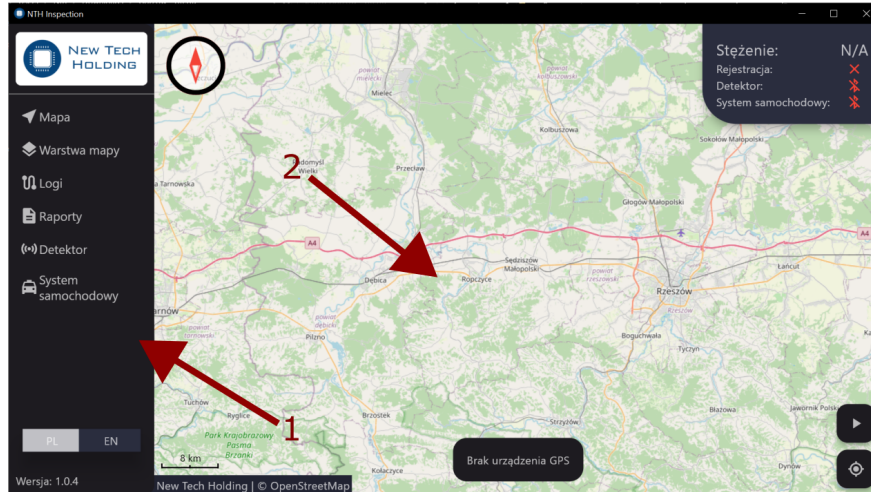


Figure 6: Software view

3.3.1.1 Navigation bar

In the navigation window, you can go to the desired tab by clicking on it. The content of the tabs is described below. This is also where the language can be changed and the current software version is displayed.

3.3.1.2 Main block

This window will display the contents of the selected tab.

3.3.2 'Map' tab

The 'Map' tab is the main tab of the programme. It contains the OpenStreetMap topographic map.

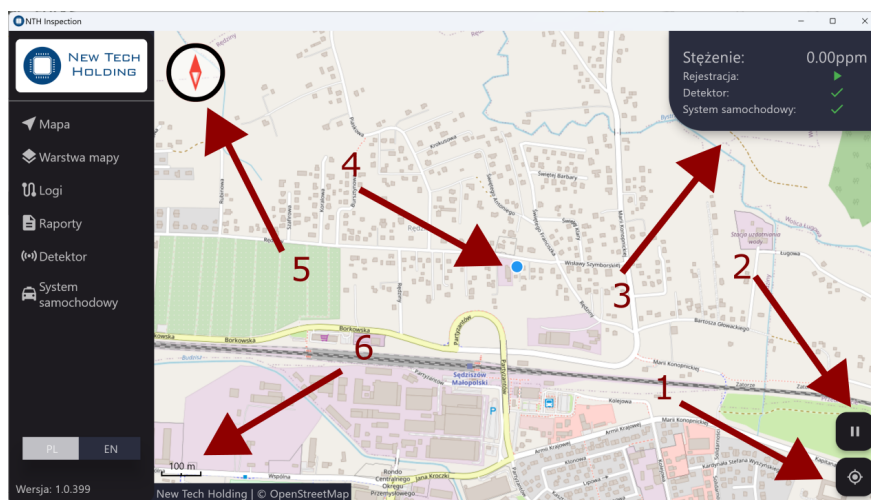


Figure 7: 'Map' tab

Elements on the 'Map' tab (see figure. 7):

- On the map, the blue dot (No. 4) indicates the system current location.
- In the bottom right corner, there is a button (no.1) which is responsible for following the camera on current location. Pressing button activate or deactivate this function.
- Above it, there is a button (No. 2) responsible for starting or ending the measure. For information on the process of measurement, see section 3.3.8.
- In the top right corner there is the information panel (No. 3). It contains important information about the measurement process; see table 2.
- In the top left corner is a compass (No. 5) which indicates our orientation. Pressing on it returns to the default orientation.
- In the bottom left corner there is a scale (no. 6).

3.3.2.1 Map navigation

Moving around the map is possible by dragging the cursor.

Double-pressing zooms in on a selected location. Zooming in/out is also carried out using the scroll wheel on the mouse, as well as the touchpad by moving 2 fingers closer or further apart. Dragging with the 'ctrl' key pressed changes the orientation of the map.



Important

Working on the map with the mouse is much more comfortable than using the touchpad.

Information panel	
Concentration	Current concentration shown in ppm units
Measurement	Indicates measure status: <ul style="list-style-type: none"> ▶ - measure in progress × - measure off
Detector	Indicates device status: <ul style="list-style-type: none"> * - connected ⊙ - error ✖ - disconnected
Vehicle system	

Table 2: Information panel

3.3.3 'Map layers' tab

The 'Map layers' tab allows the line layer to be loaded from the Shapefile. Under the 'Map' tab, you will see a list of the .zip files contained in the folder 'Inspection/Layers/' (folders layout is shown in section 3.3.9). Dragging from top to bottom refreshes the file list.

The 'import' button allows you to 'copy' the file you have selected to the appropriate layer folder.

The 'clear' button allows you to clear the map of applied layers.

After pressing on selected file shown in the list, there will appear 2 buttons. Button "Read" allows to apply selected layer on the map.

Button "Delete" permanently delete selected layer from folder. Applying layer makes it visible in the 'Map' tab, but also in the 'Log' tab.



Warning

Map layers only appear when the map is zoomed in to a fixed level. From a further position, they are no longer visible.

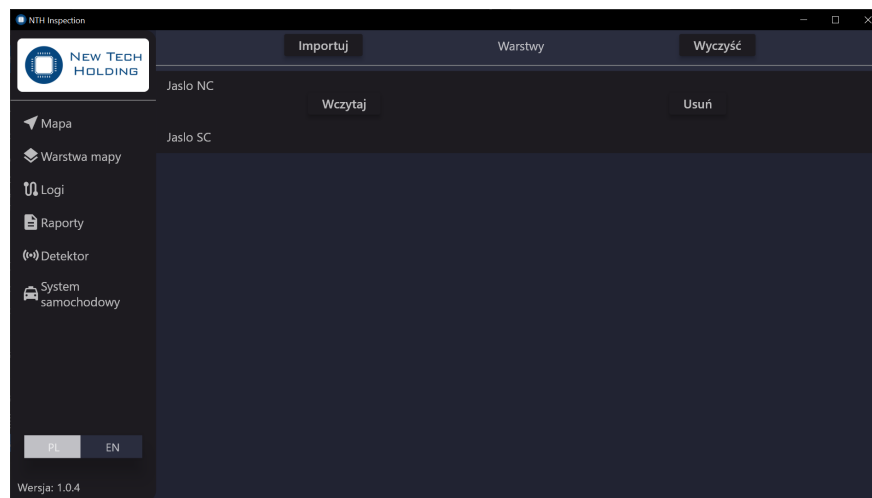


Figure 8: 'Map layer' tab



Warning

The correctly prepared file should be in a .zip file. Inside the zip file there should be 1 .shp file and 1 .shx file named the same. The .zip archive should contain 1 set of Shapefiles (.shp + .shx).



Warning

The Shapefile must comply with the 'ESRI Shapefile Technical Description - July 1998'. Loading the file only loads the Shape 'Polyline'. Other shapes are skipped.

**Warning**

It is only possible to load 1 Shapefile at a time.

3.3.4 'Logs' tab

The 'Logs' tab allows you to review previous inspections, export them to a Shapefile, and create reports.

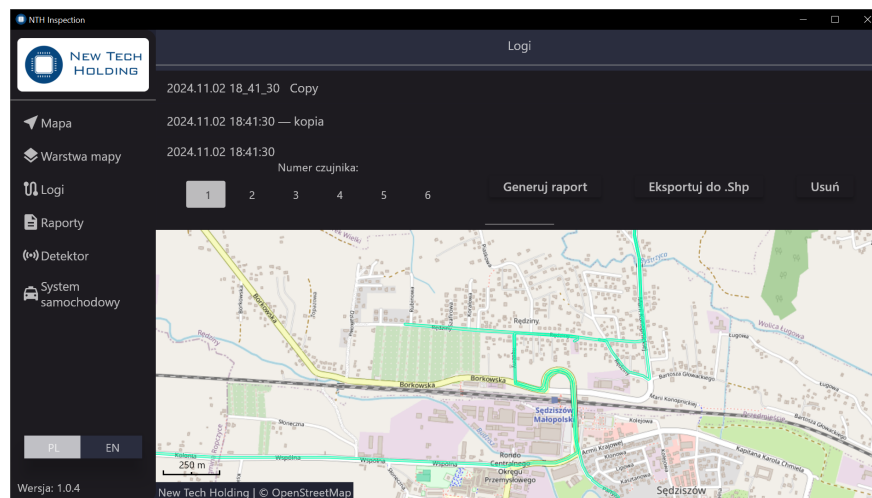


Figure 9: 'Logs' tab

Under the 'Logs' tab, you will find a list of previous measures in the folder 'Inspection/Logs/' (folder layout is shown in section 3.3.9).

Dragging from the top refreshes the list.

After clicking on an individual log, an additional menu with several options appears, as well as the route travelled in the preview at the bottom. The route travelled is displayed as a main line and a wider line corresponding to the width of the vehicle. The colour of the main line corresponds to the gas concentration level at that location, i.e. **green color** - concentration is less than alarm point, **red color** - concentration is exact or higher than alarm point. (see figure. 10).

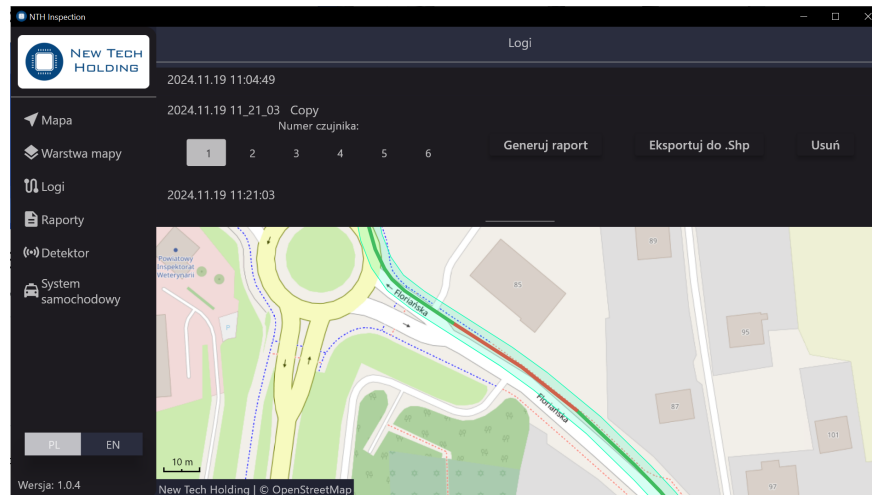


Figure 10: Log tab

Available options for single selected 'log':

- Sensor number - change the sensor from which data is shown (only if the measuring unit supports multiple channels; otherwise the correct sensor number is 1).
- Generate report - once the map preview below has been set to the point of interest, this option allows a report to be made to a pdf file - see section 3.3.5.
- Export to .Shp - this option allows you to export your route to a Shapefile (PolylineM). The file will appear in the folder 'Inspection/Exports/' (folder structure is shown in section 3.3.9).
- Delete - deletes log permanently.

3.3.5 'Reports' tab

In this tab will appear generated reports. After pressing on the interested report there will appear additional option menu:

- Open - allows to open report in the main pdf reader.
- Delete - deletes report permanently.

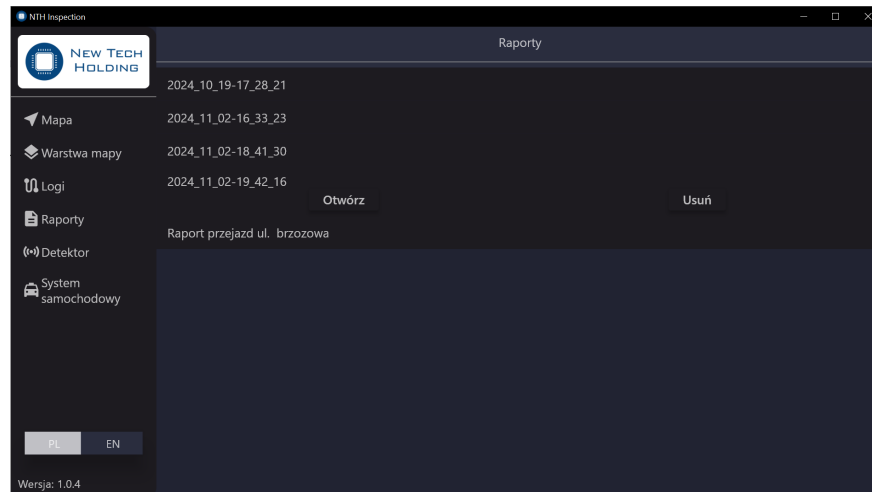


Figure 11: 'Reports' tab

Figures 12 and 13 show sample report generated after measure.

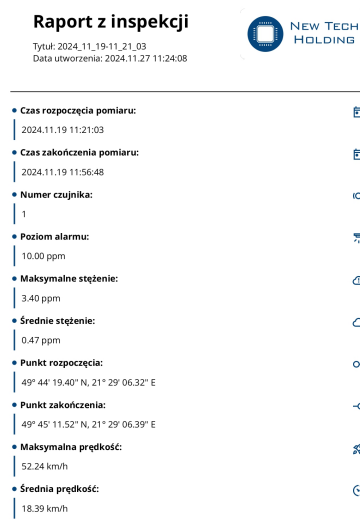


Figure 12: Sample report, page 1

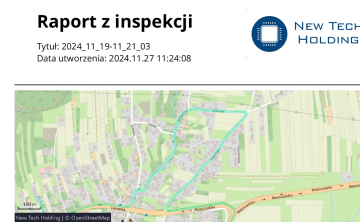


Figure 13: Sample report, page 2

3.3.6 'Detector' tab

'Detector' tab allows to connect with selected measuring device and read main device parameters.

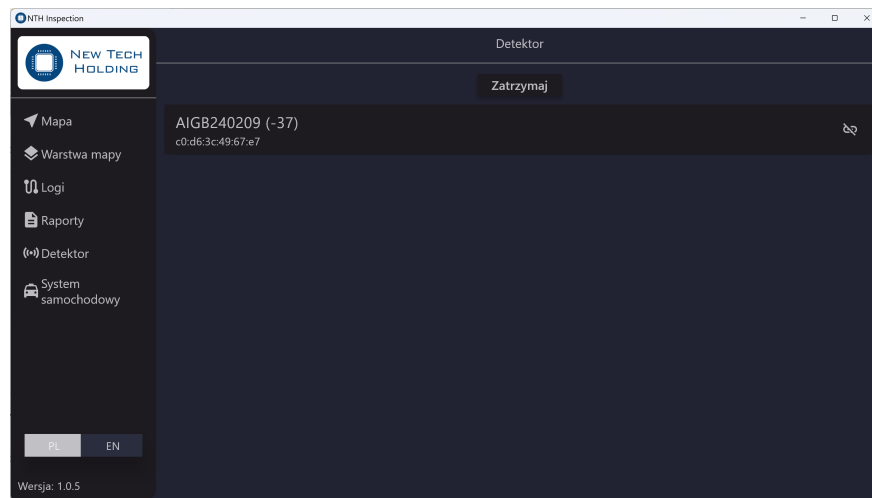


Figure 14: 'Detector' tab

After pressing the button 'Scan' in a seconds there should appear detected measuring devices. Pressing on the device makes connection between laptop and measuring device.

After connection with measuring device there is visible information panel. In it's upper part there is device name and address - pressing this block causes disconnection with measuring device. Below there are available parameters. Parameters marked with an arrow ▶, are editable by clicking and entering a new value.

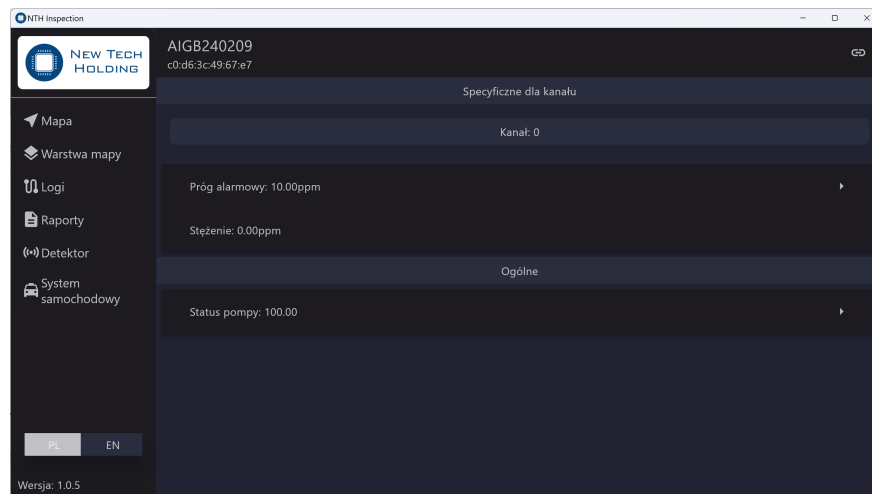


Figure 15: 'Detector' tab after connection

3.3.7 'Vehicle system' tab

'Vehicle system' tab allows to connect with selected car system and read main parameters.

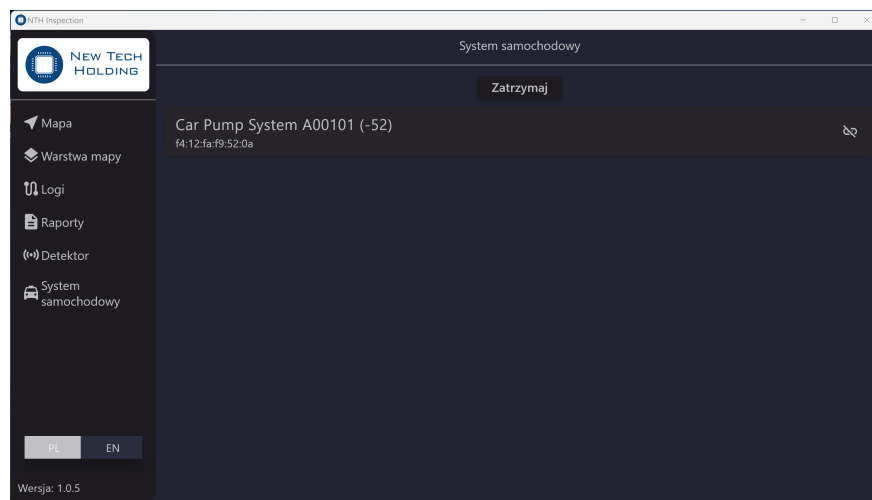


Figure 16: 'Vehicle system' tab

After pressing on button 'Scan' in few seconds there will appear available devices. Pressing on the device block makes connection between car system and computer.

After connection to vehicle system there will appear information panel. In it's top part there is visible device name and address - pressing on this block causes disconnection with measure unit. Below there are visible available parameters. Parameters marked with arrow ▶, is editable after pressing and entering new value.

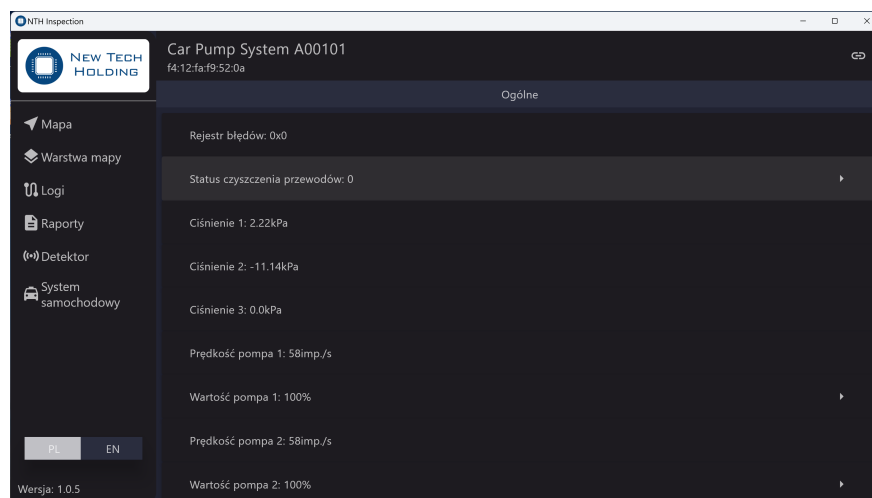


Figure 17: 'Vehicle tab' after connection

3.3.8 Measurement procedure

After turning on, as shown in section 3.2, it is possible to start working with software.

1. Ensure that in the 'Map' tab there is visible current vehicle location. If it's not and on the screen it is visible message 'No GPS device' ensure that GPS plug is connected correctly.
2. If it's necessary open 'Map layer' tab and apply proper line layer.
3. Open 'Detector' tab and connect to measuring device (see section 3.3.6).
4. Set the appropriate alarm threshold on the 'Detector' tab. It is suggested to set the lowest possible threshold, which is 1ppm.
5. Open 'Vehicle system' tab and connect to proper car system (see section 3.3.7).
6. Go back to 'Map' tab and start measure (button on the right bottom corner, see section 3.3.2).
7. Start an gas network inspection.

To end the inspection and save the measurement file, press the 'pause' button at the bottom right of the 'Map' tab. The log will be saved automatically.

3.3.9 Folder structure

Software Folder 'Inspection' is located in the user's folder, which is C:\Users\'userName'\Inspection\.

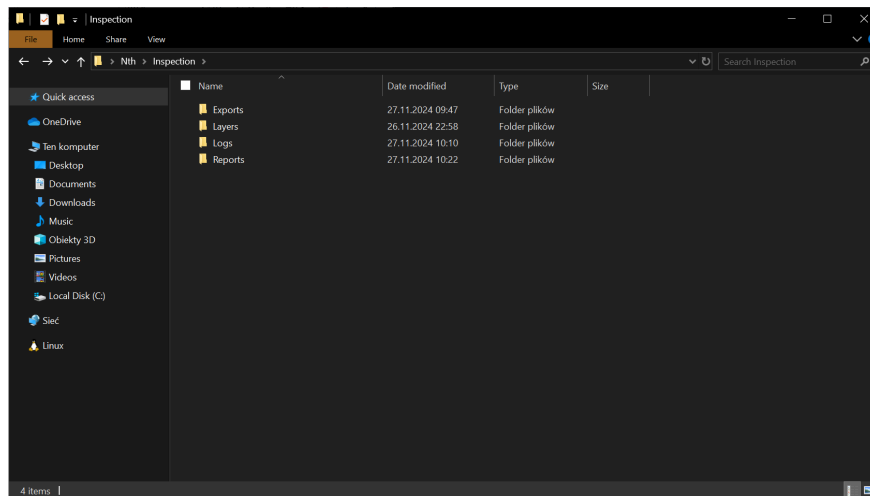


Figure 18: Folder structure

In the main folder includes folders:

- Exports - Exported runs in the form of zip files containing Shapefiles.
- Layers - Imported map layers (see section 3.3.3) in the form of zip files containing Shapefiles.
- Logs - .csv files relating to previous journeys.
- Reports - .pdf files containing reports from measurement.

4 Maintenance

4.1 Routine Maintenance of the unit

To maintain device in a good shape and provide reliable long-term usage it is necessary to observe those following recommendations:

- Park car away from heavy rain and long strong sunlight exposition.
- Use a soft, damp cloth to clean outside the unit.
- It is prohibited to clean car with pressure washer.



Warning

Long-term sunlight exposition especially at summer, can provide generating too high temperature in car and inside measuring system.

4.2 Filters system maintenance



Warning

The laser chamber measuring the gas concentration inside the instrument is a delicate optical element that is susceptible to dust and water contamination in the event of a breakdown, so the sampled gas must be well filtered before entering the detector.

Filtration system includes the following components.

1. Filters at the end of each measuring hoses.
2. Hydrophobic filter in the pump system.
3. Precision filter in measuring module.

Filter lifetime may vary depending on the working environment and frequency of inspection. Cleaning and inspection at least once every 1 week is recommended. Timely replacement of contaminated and damaged parts significantly extends the life of the unit.

4.3 System checking

1. Remove filters from end of every measuring hoses. Check them for discolouration and contamination. Check permeability.
2. Unplug input hose from pump system and check it for permeability.
3. Unplug hydrophobic filter. Unscrew and clean.
4. Unplug input hose from measuring device. Check precision filter for any discolouration and contamination. Check permeability.
5. Unplug rest off pneumatic elements. Check them for contamination. Check permeability.

**Warning**

If a filter is obstructed, discoloured or contaminated, it must be replaced. It is forbidden to use the system with a defective or removed filter.

4.3.1 Blowing out dirtiness

In the event of contamination, connect to the in-car system using the dedicated software and then set 'Duct Cleaning Status' to 1. Setting this option will divert the airflow for 3s to push out the contamination.

In the event of deep contamination of the suction hose system, it is possible to use a compressor to blow the dirtiness back out. For this purpose:

1. Disconnect the sample input (No. 1) from the pump system (see section 2.4). Connect the compressor to the hose.
2. Remove hydrophobic filter and filter at the end of front hoses.
3. Blow out dirtiness.

**Warning**

The filtration system must be checked and cleaned at least once a week and contaminated and damaged parts must be systematically replaced to increase the life of the detector. It is strictly forbidden to use the Gas Network Survey Vehicle with a faulty filtration system.

Numer	Data	Description
Revision 1	15.09.2024	Creation
Revision 2	18.01.2024	Editorial changes, adaptation of the manual to the new software version

Table 3: Revision Table