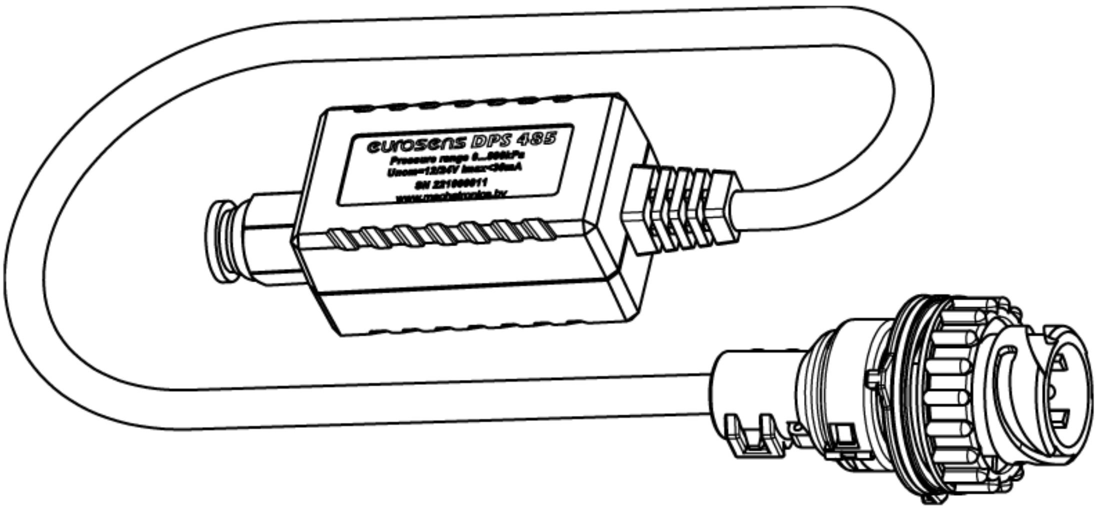
v 2.02

AXLE LOAD SENSOR

eurosens DPS



User manual

MECHATRONICS

CONTENTS

1 General information

1.1 Application

Axle load sensor eurosens DPS (fig. 1.1) is used to determine the axle load of air suspension of a vehicle or measure excessive air pressure up to 0.8 MPa (8 atm).

fig. 1.1. eurosens DPS CAN

1.2 Operation

The air pressure leads to the deformation of the sensor membrane, on which the strain gauges are located. The resistance measurement of the strain gauge bridge is performed by the sensor circuitry and converted into an electronic signal proportional to the air pressure.

Then, the microprocessor converts the signal into air pressure and axle load in kilograms according to the programmed calibration table. The axle load value of eurosens DPS A is of 0-5 Volts, the axle load value of eurosens DPS 485 and eurosens DPS CAN is transmitted in kilograms via transmission protocols (see Appendices I, II).

1.3 Delivery set

eurosens DPS delivery set includes:

- eurosens DPS A/485/CAN axle load sensor;
- specification.

Ordered separately:

- eurosens cable;
- mounting kit (fig. 1.2).

fig. 1.2. eurosens DPS mounting kit

The mounting kit includes the following items:

- a 3A fuse with a holder to connect the sensor to the vehicle's on-board power supply circuits;
- a piece of pneumatic tube with an external diameter of 8 mm;
- a quick-change pneumatic connector;
- 2 plastic ties to secure the sensor.

To configure the sensors, you need service adapter eurosens Destination CAN.

The mounting kit and the connecting input of the sensor are designed for pneumatic tubes with an external diameter of 8 mm. If the vehicle has pneumatic tubes of a different diameter, it is necessary to use adapter fittings. You can order Ø10mm and Ø12mm fittings in Mechatronics (fig. 1.3).

fig. 1.3. Fittings-adapters for 10 and 12mm pneumatic lines.

2 Sensor specification

Table 2.1. Specification of eurosens DPS.

Parameter, measurement unit	Value
Power supply, V	8-32
Pressure, MPa	0-0,8
Weight, g (no cable)	DPS A – 95 DPS 485/CAN - 110
Measurement error, %	≤ 2,5
Connecting external diameter of pneumatic tube, mm	8
Ambient operating temperature, °C	-40 – +85
Output interface	DPS A – voltage of 0-5V DPS 485 – RS-485 DPS CAN - CAN

Table 2.2. Dependence of output voltage of eurosens DPS A on air pressure.

Power supply, U_{TYP}, V	Pressure, MPa	Output voltage, V
24±0,5	0	0,25
	0,1	0,7
	0,2	1,2
	0,3	1,55
	0,4	2
	0,5	2,5
	0,6	2,95
	0,7	3,3
	0,8	3,8

3 SENSOR INSTALLATION

Axle load sensor eurosens DPS is installed into the standard pneumatic line of a vehicle.

3.1 INSTALLATION INTO PNEUMATIC LINE

1) Identify the pneumatic lines leading to pneumatic elements of the left and right sides of a vehicle. They can be either directly connected to each other (in this case, it is enough to install one sensor), or be independent (in fig. 3.1).
2) Release the pressure from pneumatic system.
3) Carefully cut the pneumatic tube leading to the pneumatic element (fig. 3.2).

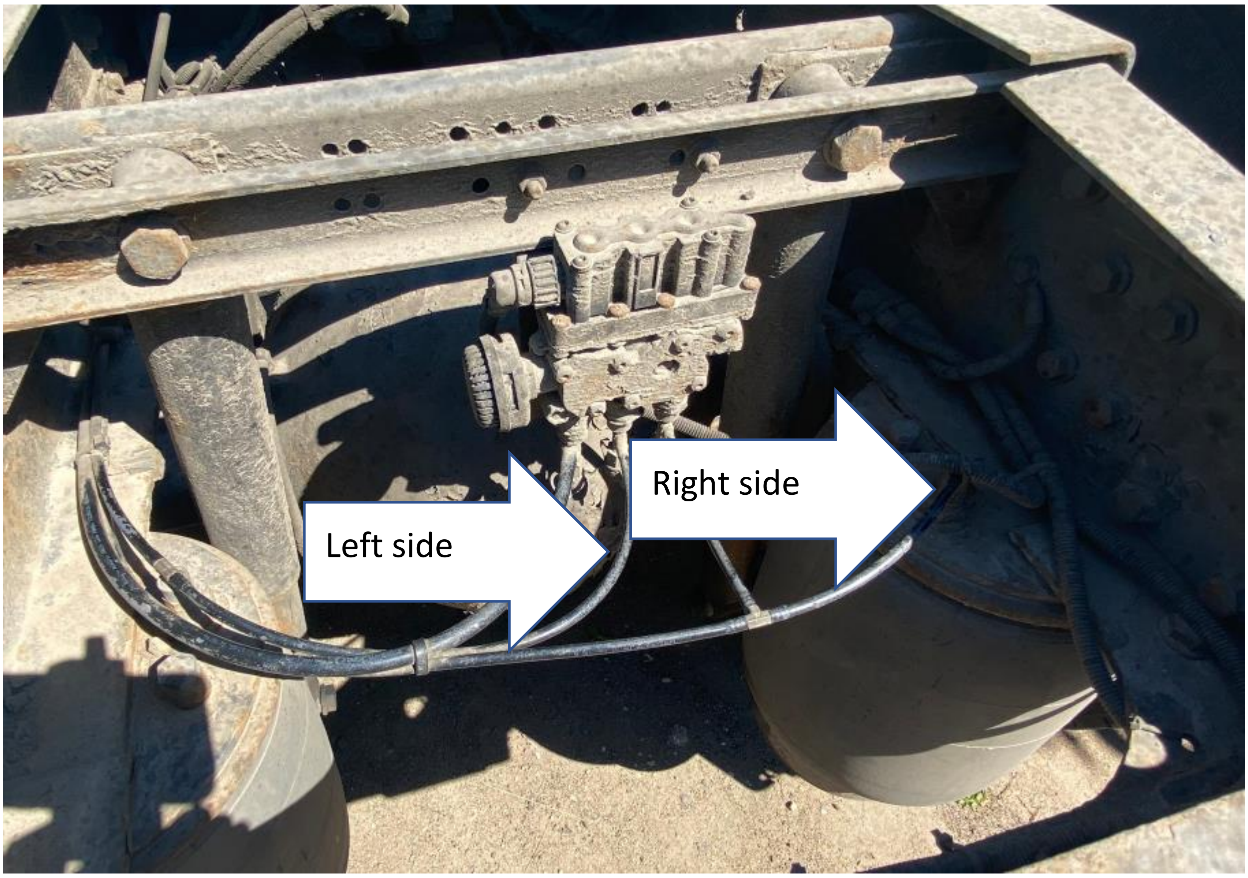


fig. 3.1. Pneumatic lines of left and right sides of truck

fig. 3.2. Cutting pneumatic line

4) Install a piece of the pneumatic tube from the mounting kit into a pneumatic connector (fig. 3.3).

To fix the tube in the pneumatic connector insert it into the connector until it stops and check the fixation by trying to pull it out.

fig. 3.3. Installing pneumatic tube into connector

5) Connect the cut pneumatic line to the pneumatic connector in the same way (fig. 3.4).

fig. 3.4. Connection of pneumatic line finished

6) Connect the sensor to the electrical cable, lay the cable to the connection point with the monitoring terminal and/or on-board display and fix it with plastic ties (fig. 3.5) (not included in the delivery set).

fig. 3.5. Cable fixing

7) Fix the sensor with plastic ties.
8) Connect the sensor wires to the power supply and to the monitoring terminal (display) according to Table 3.1.

Use the fuse from the mounting kit when connecting the power supply.

3.2 INSTALLATION INTO AIR SPRING

If the pneumatic element has a threaded plug, the sensor can be connected directly to it, without tapping into the standard (OEM) pneumatic lines (see Fig. 3.6).

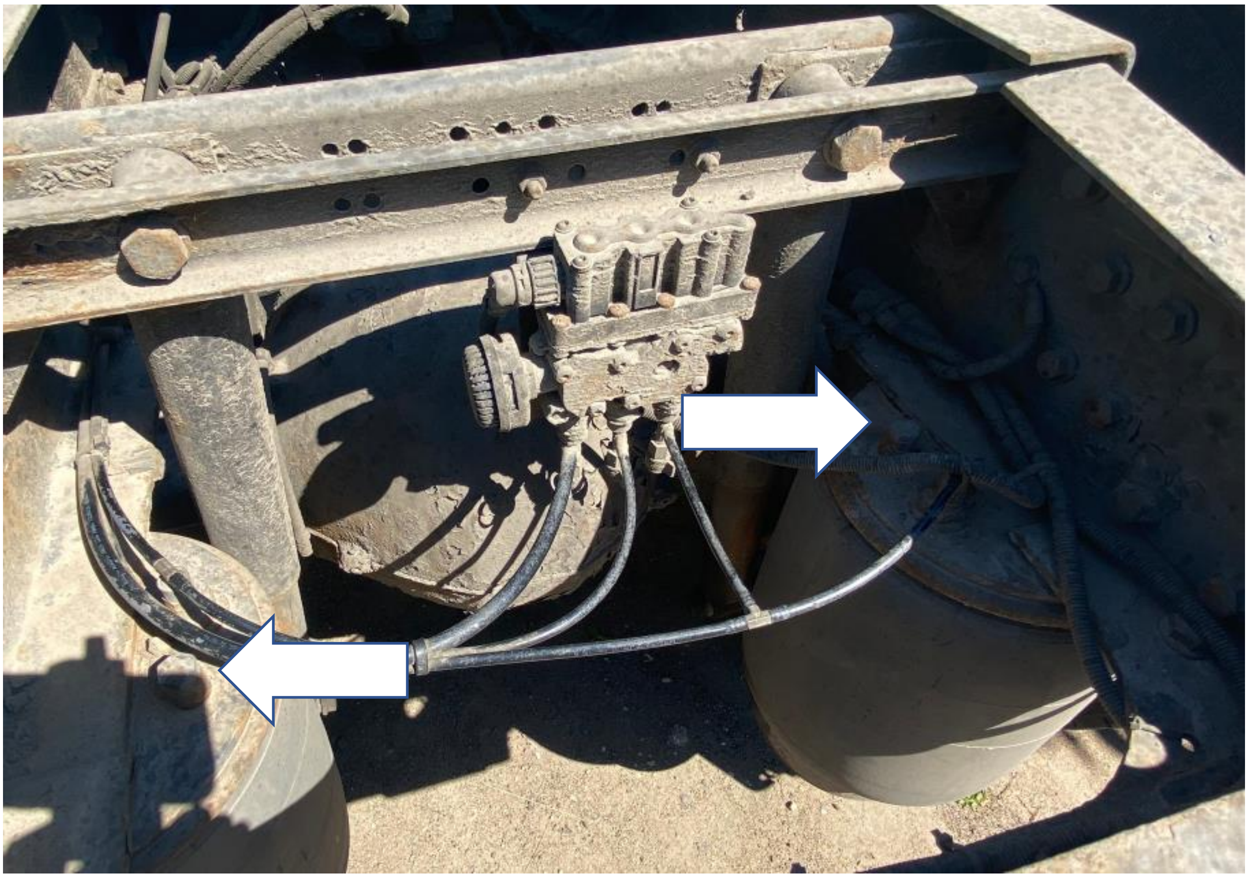


Fig. 3.6. Threaded plugs in air spring elements

To do this, order the alternative mounting kit with index -01 (Difference mounting 01-1 assembly, or Difference mounting 01-1 BT assembly—for the DPS BT wireless sensor) — see Fig. 3.7.

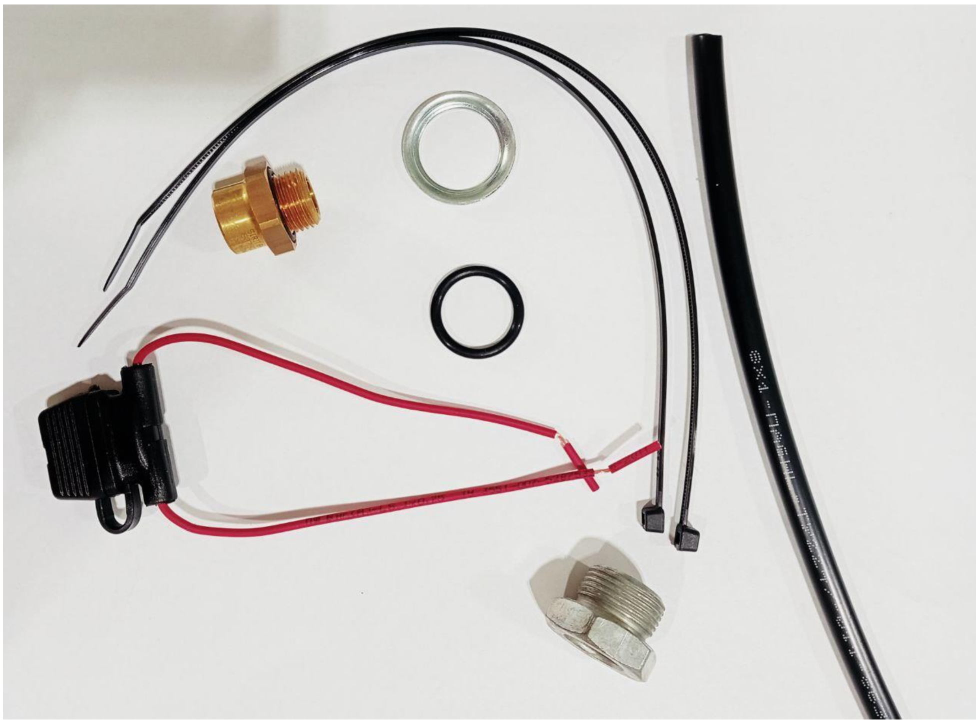


Fig. 3.7. Mounting kit Difference mounting 01-1

Installation is carried out in accordance with Fig. 3.8.

Fig. 3.8. Connecting the sensor to the pneumatic element in place of the plug.

3.3 CONNECTION OF eurosens DPS WITH CABLE

Table 3.1. Electrical connection of eurosens DPS with universal 4-pin cable eurosens.

Pin number	Power circuit	Wire colour	Notes
DPS A			
1	+ 24 V	Red	Power supply
2	GND	Brown	Ground
3	OUT01	Yellow	Analog output
DPS 485			
1	+ 24 V	Red	Power supply
2	GND	Brown	Ground
3	OUT01	Yellow	RS-485A
4	OUT02	Green	RS-485B
DPS CAN			
1	+ 24 V	Red	Power supply
2	GND	Brown	Ground
3	OUT01	Yellow	CAN_H
4	OUT02	Green	CAN_L

4 SENSOR CALIBRATION

Sensor calibration process relates sensor output signal to the value of vehicle real axle load (cargo weight). To calibrate the sensor, you need to create a calibration table with the minimal (empty vehicle) and maximal (fully loaded) axle load values.

4.1 CALIBRATION METHODS

There are two calibration methods:

- **Loading a weighted cargo:** the calibration table has the vehicle cargo weight and the output sensor values correspond to the cargo weight.
- **Axial vehicle weighing**: the calibration table has the axle load and the output sensor values correspond to the axle load.

4.2 DIFFERENCES IN CALIBRATION

There are some differences in calibration of eurosens DPS A and eurosens DPS 485/DPS CAN:

eurosens DPS A	– has no built-in microprocessor; – cannot store the calibration table; – the calibration table must be programmed into the on-board display and (or) the monitoring system server software
eurosens DPS 485 eurosens DPS CAN	– the calibration table is programmed directly into the sensor using the configuration software and the USB service adapter eurosens Destination.

4.3 Configuration software "User Configurator"

The User Configurator will operate correctly if your PC meets the following requirements:

- Screen resolution: 1024 x 768 or higher, 16-bit.
- Operating systems (OS): Windows 7 or higher.
- Additional software: Microsoft.NET Framework 4.5 or higher.
- eurosens Destination 02 driver: STM32 Virtual COM Port Driver.

4.4 Calibration of eurosens DPS CAN

Configuration procedure of eurosens DPS CAN:

1) connect the service adapter eurosens Destination CAN to your PC;
2) run the Configurator **DPS_CAN_Configurator.exe**;
3) select the mode **"CAN"** in the adapter by pressing the button on the side of the adapter;
4) connect the sensor to the service adapter with the cable.

4.4.1 Tab "Information"

After you run **DPS_CAN_Configurator.exe** you will see the Configurator window (fig. 4.1).

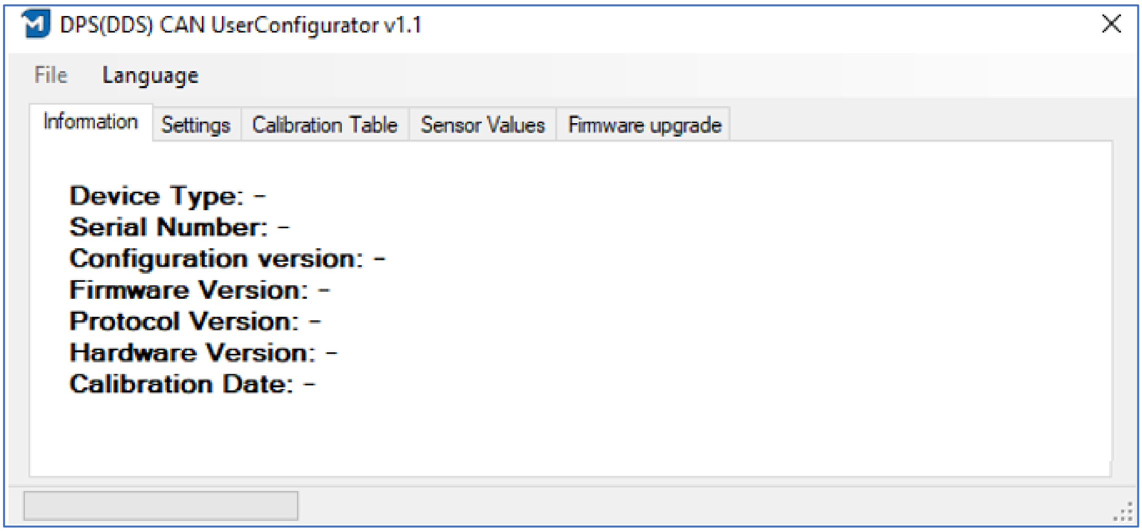


fig. 4.1. Configurator window

The Configurator detects the connected sensor (fig. 4.2).

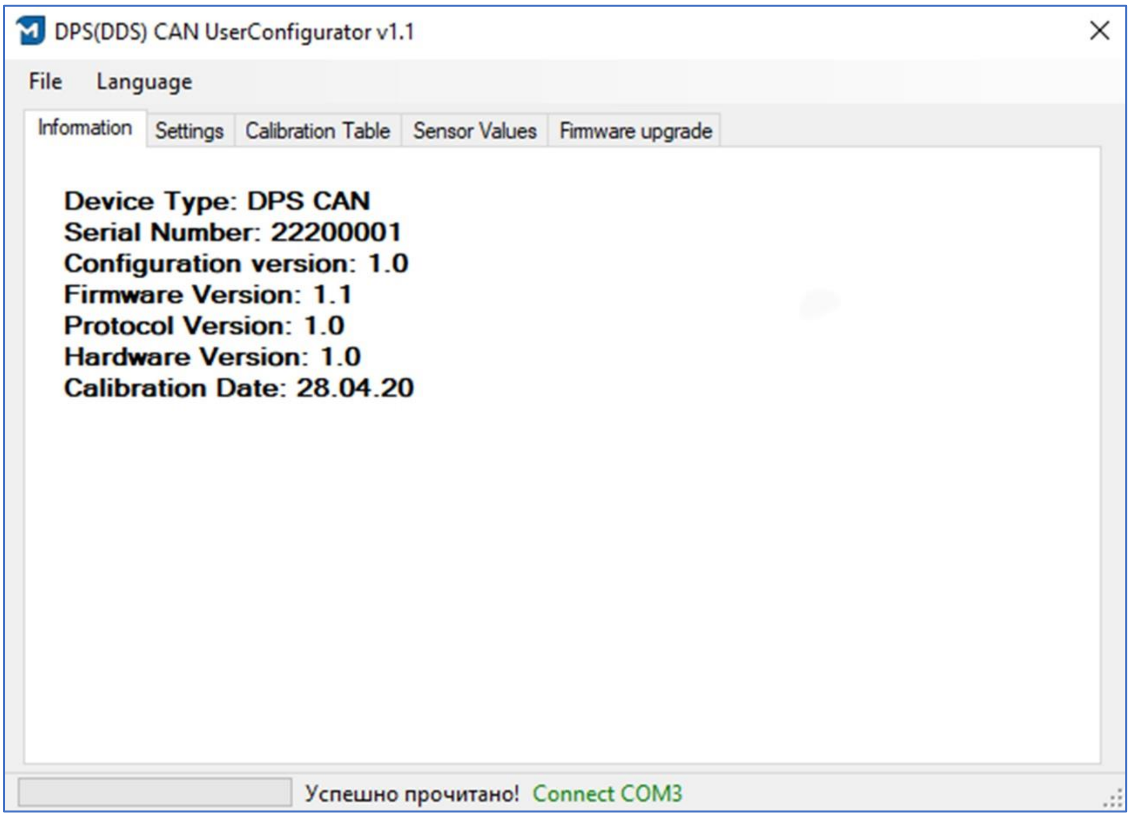


fig. 4.2. Information about connected sensor

4.4.2 Tab "Settings"

If the monitoring system uses several sensors, you need to assign the ID to each sensor (fig. 4.3).

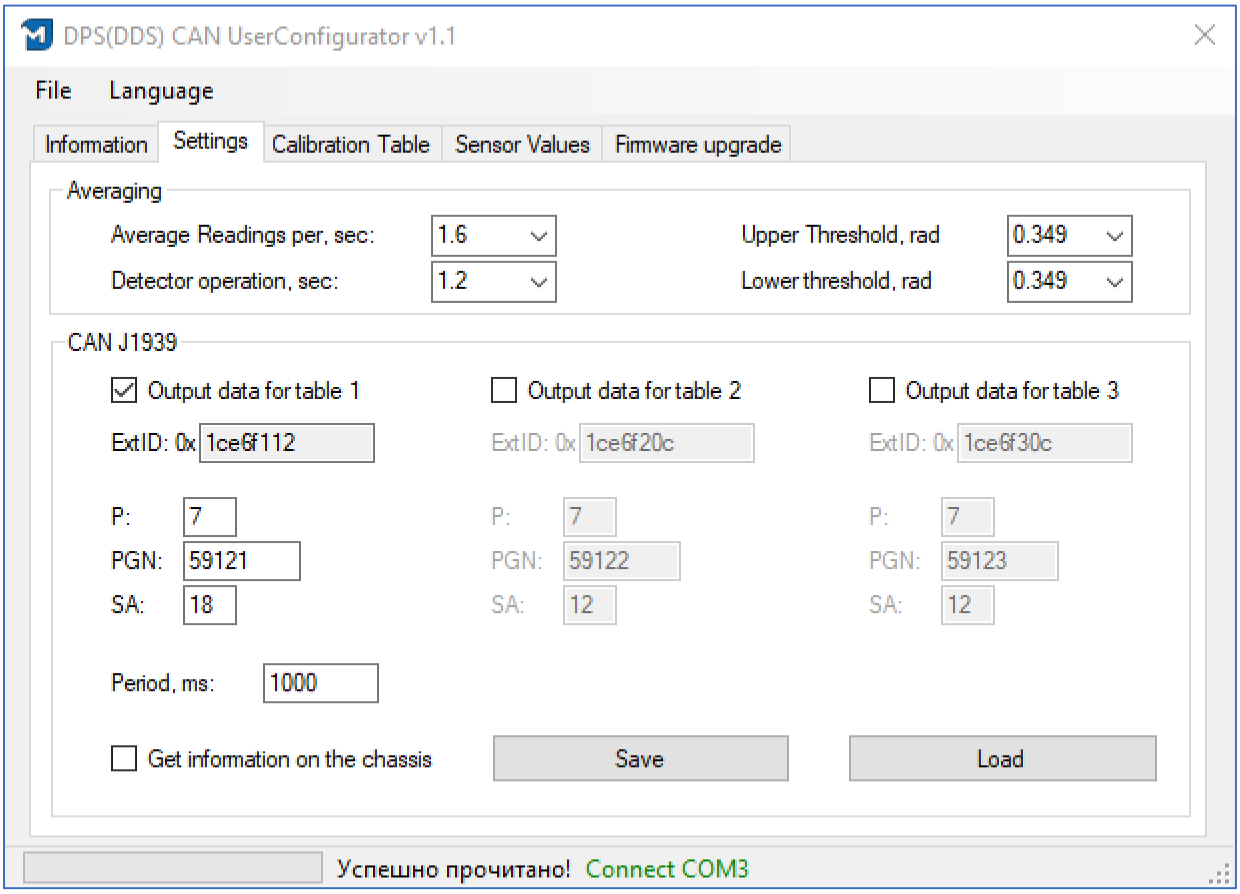


fig. 4.3. Tab "Settings"

Each sensor in the monitoring system must have its unique ID (fig. 4.3).

- **ExtID** field specifies the sensor ID under which it will send messages.
- **SA** field specifies the sensor address. The change of the address results in the change of the sensor ID, which allows you to create a system with a large number of weight or displacement sensors.
- **Averaging** parameter is set to smooth abrupt changes in the sensor readings, e.g., when driving on uneven roads.

The longer the averaging time, the smoother the readings.

As a rule, the monitoring terminals read data from the vehicle's CAN bus, which contains 120-ohm termination resistors. Therefore, in order to connect eurosens DPS CAN to the transport monitoring terminal, it is necessary to enable the option **“Terminator CAN”** in at least one of the sensors.

Click the button **“Save”** after you make the changes.

4.4.3 Tab “Calibration table”

In the tab **“Calibration table”** you need to enter the sensor values of an empty and a fully loaded vehicle/trailer.

The calibration table must have at least two rows. The first row should contain the sensor values of the empty vehicle, and the second row – of the fully-loaded vehicle.

For example, the sensor shows the value “0” for the unloaded axle. Then, the vehicle is loaded and weighed on truck scales. The received sensor values are put into the table.

In the example in fig. 4.4 a fully loaded truck has the axle load of 9500kg, which corresponds to sensor value “3.141” in the second row. If you add a few more records with partial loads, the accuracy of the sensor readings will increase.

Based on the values in the Calibration table, the output value of the sensor will correspond to either the cargo weight or the axle load.

The column **“Load”** contains the increments between calibration points, but not the absolute values of the axle load or cargo weight.

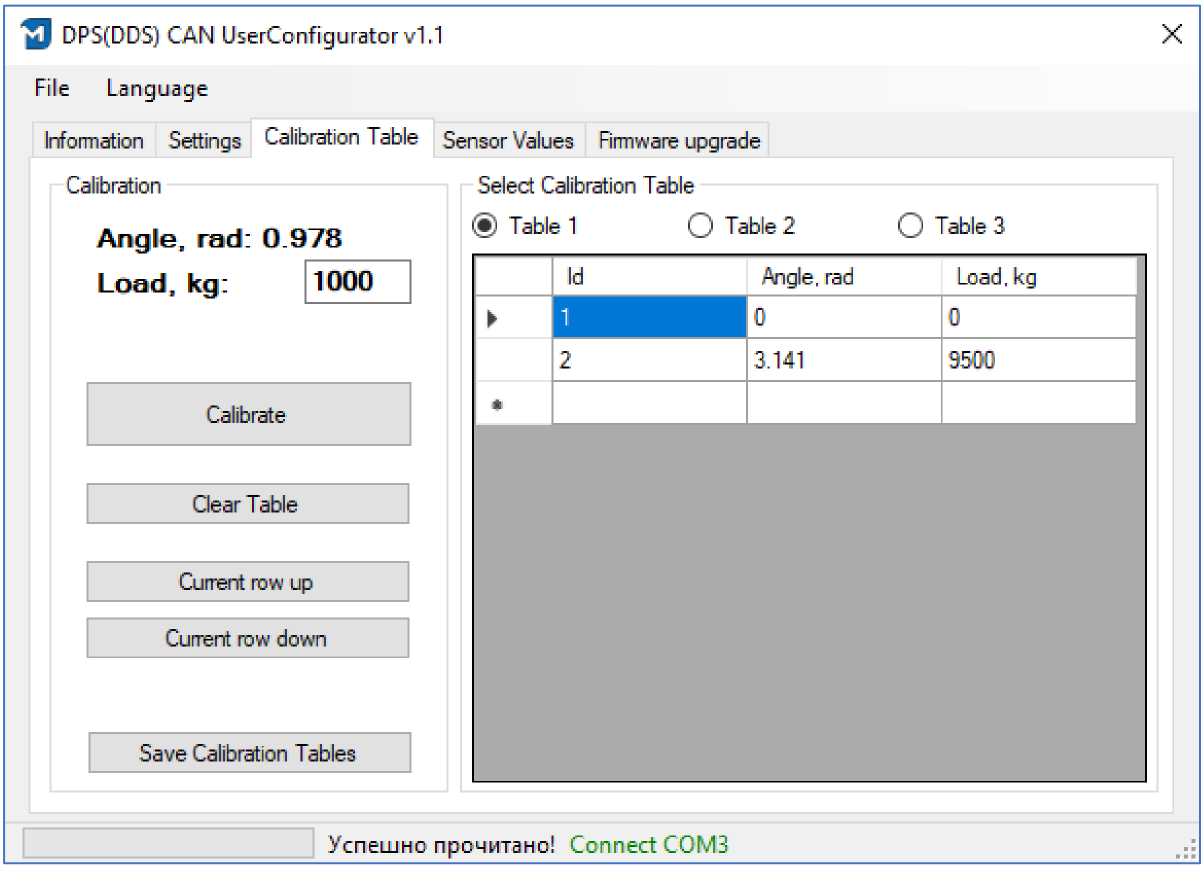


fig. 4.4. Tab “Calibration table”

The **“empty-full”** calibration may cause difficulties, as it is not always possible to load the truck and weigh it immediately. In this case it is recommended to fill in the calibration table on the server side and use the calibration table saved to the sensor by default.

Then, while operating, the vehicle can drive onto the scales to get weight data. The calibration table on the server side will contain the output values of the sensor and the weight data.

Each sensor in the on-board weighing system must be calibrated.

Click the button **“Save Calibration Tables”** after filling in the table.

4.4.4 Tabs "Sensor values" and "Firmware update"

The tab **"Sensor values"** shows the currently transmitted sensor values.

The tab **"Firmware update"** allows you to update the firmware of the sensor or reset it to factory defaults.

4.5 Calibration of eurosens DPS 485

Configuration procedure of eurosens DPS 485:

1) connect the service adapter eurosens Destination 02 to your PC;
2) run the Configurator **MXTUserConfiguratorDPS_485.exe**;
3) select the mode **"RS-485"** in the adapter by pressing the button on the side of the adapter;
4) connect the sensor to the service adapter with the cable.

4.5.1 Tab "Information"

After you run **MXTUserConfiguratorDPS_485.exe** you will see the Configurator window (fig. 4.5):

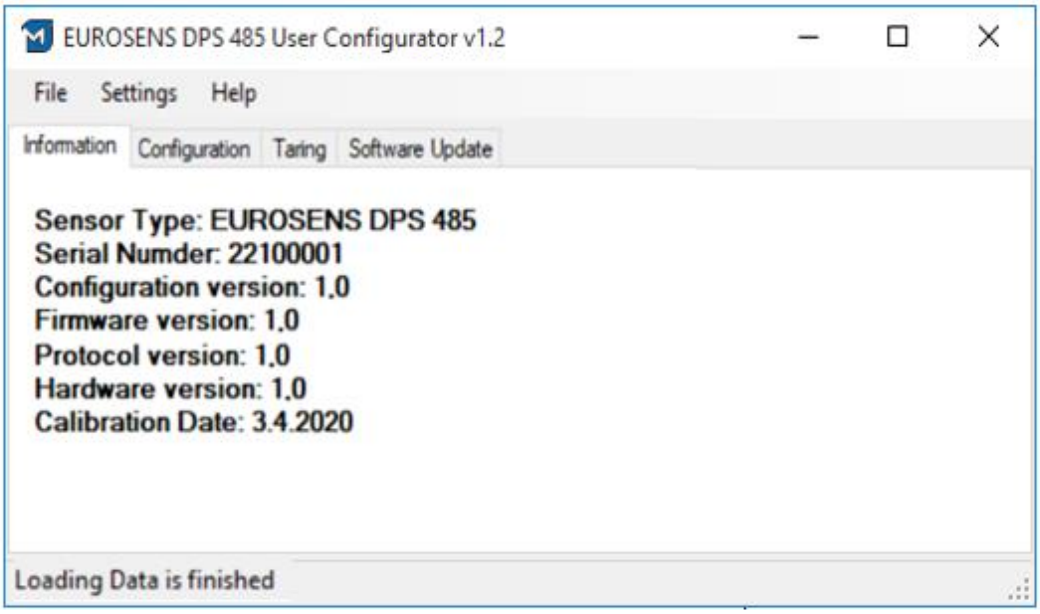


fig. 4.5. Tab "Information"

If the error of COM port opening appears after you start the Configurator:

1) check which COM port is used by the device called **"USB Serial Interface Device"** (Windows device manager – tab **Ports** ("COM and LPT");
2) in the Configurator, select **"Settings" – "Port settings"**;
3) indicate the COM port of the device (fig. 4.6 and fig. 4.7).

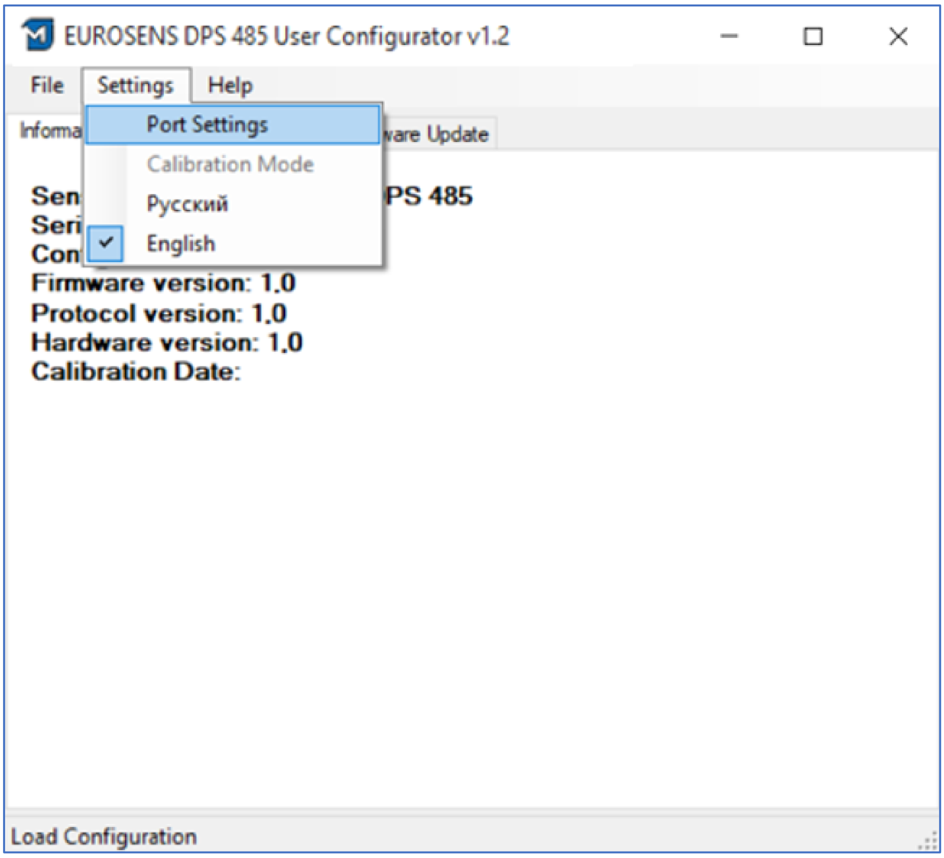


fig. 4.6. Port Settings

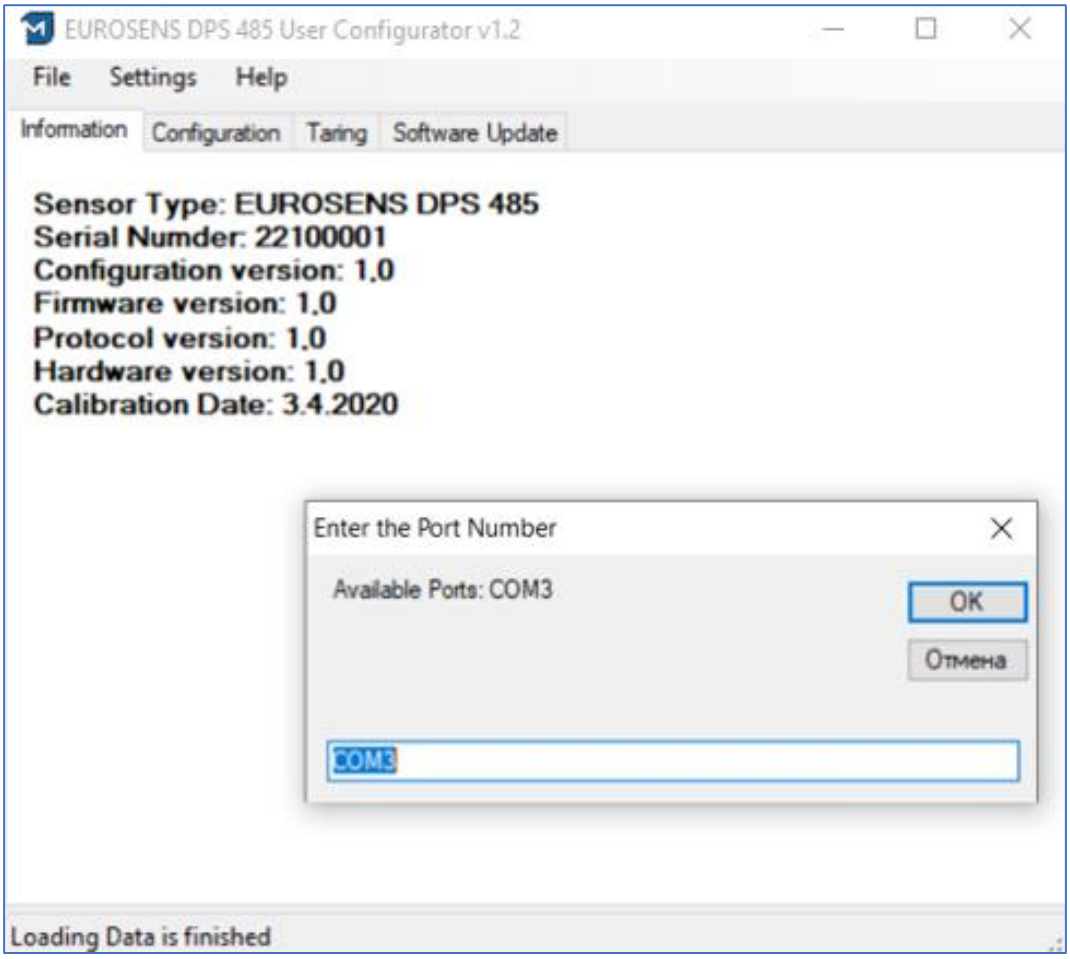


fig. 4.7. Entering Port number

4.5.2 TAB "CONFIGURATION"

If the weighing system uses several sensors, you need to assign the address to each sensor. Thus, the first sensor will get **"Sensor Address"** 1, the second sensor will get **"Sensor Address"** 2, etc. (fig. 4.8).

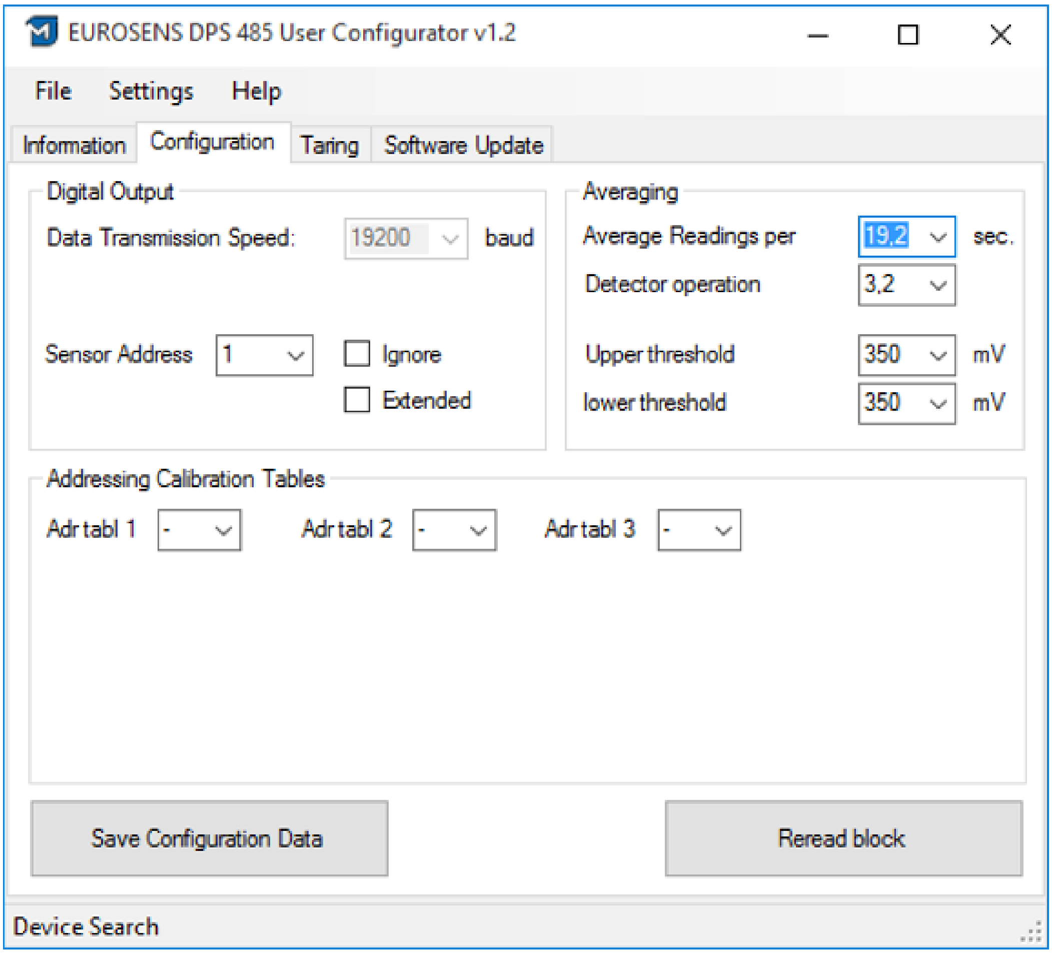


fig. 4.8. Tab "Configuration"

- **Digital Output** allows you to set the data transfer rate and select the operation interface.
- **Averaging** parameter is set to smooth the sensor readings, e.g., when driving on uneven roads.

> The longer the averaging time, the smoother the readings.

Click the button **"Save Configuration Data"** after you make the changes.

4.5.3 TAB "TARING"

The taring procedure of the sensor eurosens DPS 485 is performed as described in chapter 4.4.3.

In the tab **"Taring"** in the calibration table, you need to enter the sensor values (voltage, mV) of an empty and a fully loaded vehicle.

The calibration table must have at least two rows. The first row should contain the sensor values of the empty vehicle, and the second row – of the fully-loaded vehicle.

The column **"Load, kg"** can mean:

- vehicle cargo weight (if the vehicle has only one axle load sensor installed and the cargo weight is measured by this sensor);
- axle load measured with truck scales (platform scales or portable scales).

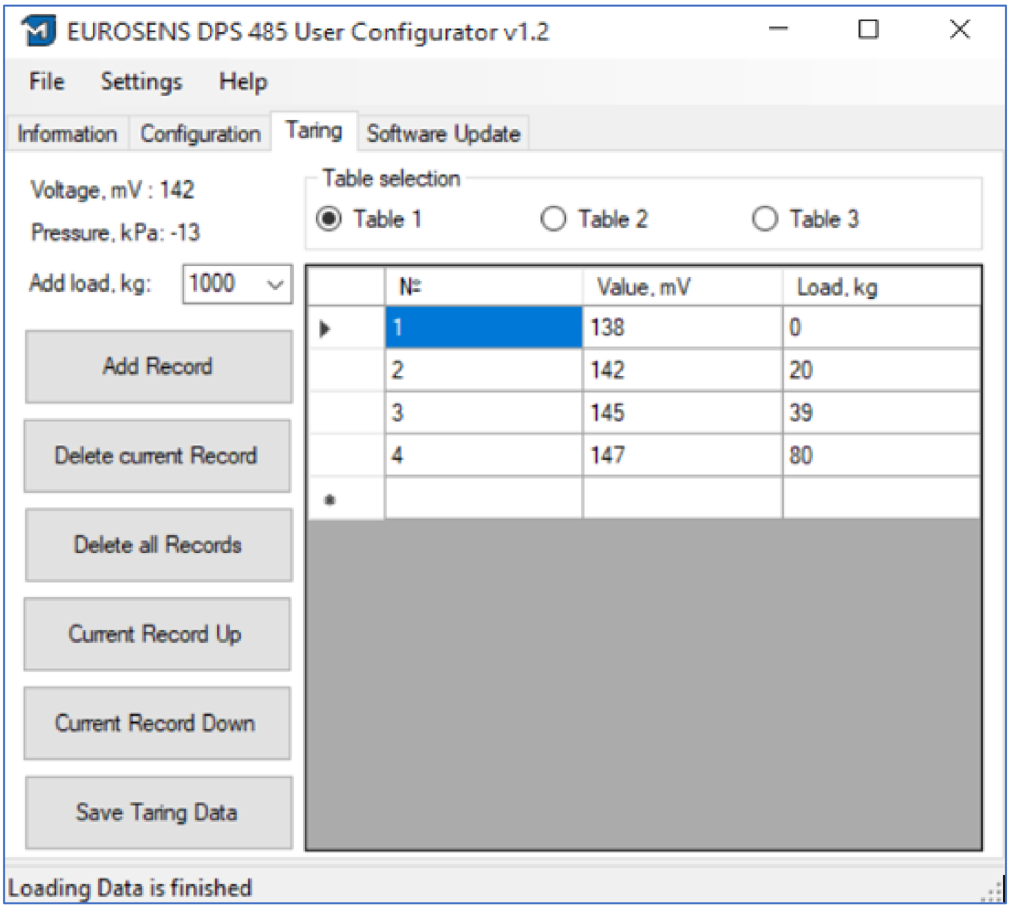


fig. 4.9. Configuration table

Based on the values in the Calibration table (fig. 4.9), the output value of the sensor will correspond to either the cargo weight or the axle load. The column **“Load”** contains the increments between calibration points, but not the absolute values of the axle load or cargo weight.

4.5.4 Tab “Software Update”

The tab “Software Update” allows you to update the firmware of the sensor or reset it to factory defaults.

5 SEALING OF CABLE CONNECTION

Eurosens cable connectors (Fig. 5.1) have special holes for sealing.

fig. 5.1. eurosens cable connectors.

Insert the sealing wire through the holes on the sensor side, then pass it through the holes of the cable connector and pull it out to the side for installing the screw seal (Fig. 5.2).

fig. 5.2. Sealing wire installation

Pass the sealing wire through the holes of the cable socket (Fig. 5.3).

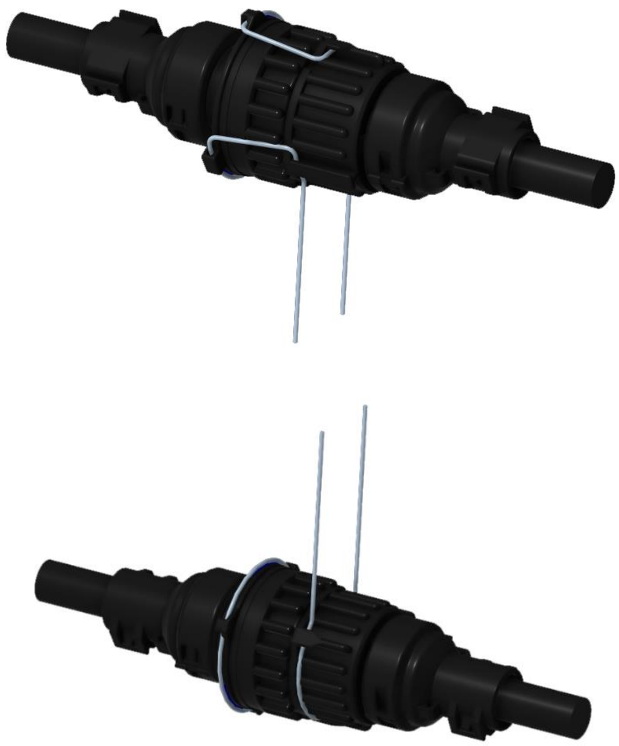


fig. 5.3.

Insert both ends of the wire through the holes of the rotary seal (Fig. 5.4), then tighten the seal against the connector by rotating the rotor (Fig. 5.5). Finally, cut off the excess ends of the sealing wire (Fig. 5.6).

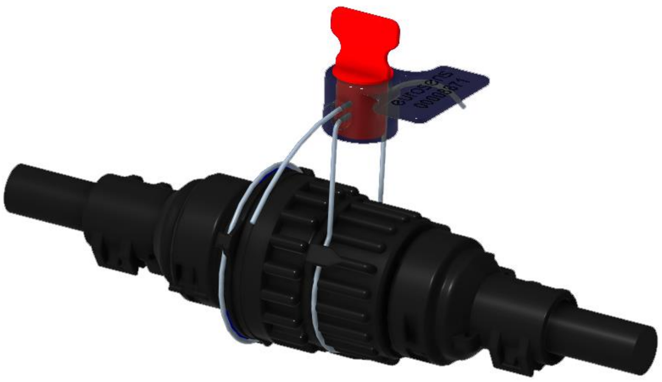


Fig. 5.4. Seal installation

Fig. 5.5.

Fig.5.6. Sealing completed

6 ADDITIONAL INFORMATION

6.1 STORAGE

It is recommended to store axle load sensors eurosens DPS in dry enclosed areas.

eurosens DPS must be stored in its original packaging at temperature range from -50°C to +40°C and relative humidity up to 100% at +25°C.

Do not store eurosens DPS with substances that cause metal corrosion and/or containing aggressive impurities.

The storage period of eurosens DPS should not exceed 24 months.

6.2 TRANSPORTATION

eurosens DPS must be transported in compartments that protect packages from mechanical damage and precipitation.

Air environment in transportation compartments must not contain acidic, alkaline and other corrosive impurities.

Shipping containers with eurosens DPS must be sealed.

6.3 DISPOSAL

eurosens DPS does not contain any substances or components that could be hazardous to health and the environment during and after the service life and disposal.

eurosens DPS does not contain any precious metals in the amount mandatory for accounting.

6.4 Technical support

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6.5 Contacts

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www.eurosenstelematics.com/en

APPENDIX I. DATA TRANSFER PROTOCOL OF eurosens DPS CAN

Table I - 1. **ID 29-bit** (in hex mode) **1CE6F1**** (** - sensor address)

CAN message, bytes							
1	2	3	4	5	6	7	8
Internal sensor voltage, mV 2-byte, unsigned		Pressure, kPa 2-byte, unsigned		Load, kg 4-byte, unsigned			
1	2	1	2	1	2	3	4

APPENDIX II. DATA TRANSFER PROTOCOL OF eurosens DPS 485

The command is designed to read the current data of the axle load sensor. Data is transmitted in the lower byte forward order.

Command format:

Table II - 1. Command structure of data exchange protocol

Displacement, byte	Field size, byte	Value	Description
0	1	31h	Prefix
+1	1	01h...FFh	Network address
+2	1	06h	Operation code
+3	1	00h...FFh	Checksum (CRC)

Response format:

Table II - 2. Response structure of data exchange protocol

Offset, byte	Field size, byte	Value	Description
0	1	3Eh	Prefix
+1	1	01h...FFh	Network address
+2	1	06h	Operation code
+3	1	0	Reserved
+4	2	0000h...FFFFh	Axle load, kg (1 kg resolution)
+6	2	0000h...FFFFh	Internal sensor voltage, mV
+8	1	00h...FFh	Checksum (CRC)

APPENDIX III. AXLE LOAD SENSOR eurosens DPS CAN, GPS TRACKER NAVTELECOM SMART 2435 AND SOFTWARE TRACKING PLATFORM WIALON

You can start setting up the weighing system after you have installed the required number of axle load sensors on the vehicle, powered on the sensors and connected CAN lines of the sensors and the GPS tracker. The maximum number of sensors is limited by the properties of the tracker.

1) Connect the GPS tracker to the PC, or connect to the tracker remotely.
2) Open the Configurator of the tracker, e.g. **NTC Smart Configurator v3,** and select **"Read device configuration"** (fig. III - 1).

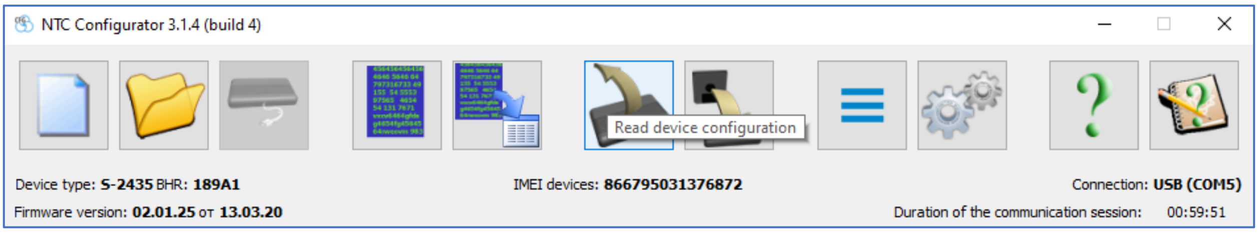

fig. III - 1. Reading device configuration

3) In the new window select the tab **"CAN-bus"** and fill in the table **"CAN messages"** with sensors' IDs, which will be used during monitoring process.

For the weighing system to operate correctly, it is necessary to set an ID for each sensor in the Configurator.

E.g. (fig. III - 1), the three sensors in a weighing system have the following IDs:

ID 1CE6F112 for a displacement sensor (leaf spring suspension),

ID 1CE6F101 and ID 1CE6F401 for the two pressure sensors (installed in the air line of the air spring suspension).

It is recommended to make notes regarding the location of the installed sensors and their IDs.

4) Enter sensors' IDs manually (can be seen in the Configurator). There are three sensors in the abovementioned example (fig. III - 1):

1. displacement sensor with ID 1CE6F112,
2. pressure sensor with ID 1CE6F101,
3. pressure sensor with ID 1CE6F401.

5) In the table **“CAN messages”** select message bytes to be used.

DPS CAN message structure:

- **First two bytes** (0-1) – unsigned double-byte number; the angle is calculated in radian (e.g., if you receive 3141, it means that the lever position is 3.141 radian).
- **The next two bytes** (2-3) – mean the same as the first two bytes (sensor value in radian).
- **The last 4 bytes** (4-7)- unsigned four-byte number, load in kg received from the sensor calibration table.

The most convenient way is to work with the values in kg, thus the last four bytes will be used in each sensor’s message (fig. III - 2).

6) Go to the tab **“Protocol settings”,** then go to **“User parameters”** and select the sensor parameters that will be transmitted to the monitoring system. Those will be the last four bytes of each sensor (fig. III - 2).
7) Complete the configuration and save it in the tracker by clicking the button **“Load to Device”.**
8) After setting the GPS tracker, check the values in window “**Telemetry**” and in tab **“User Parameters”** in the main window of the GPS tracker Configurator (fig. III - 3).

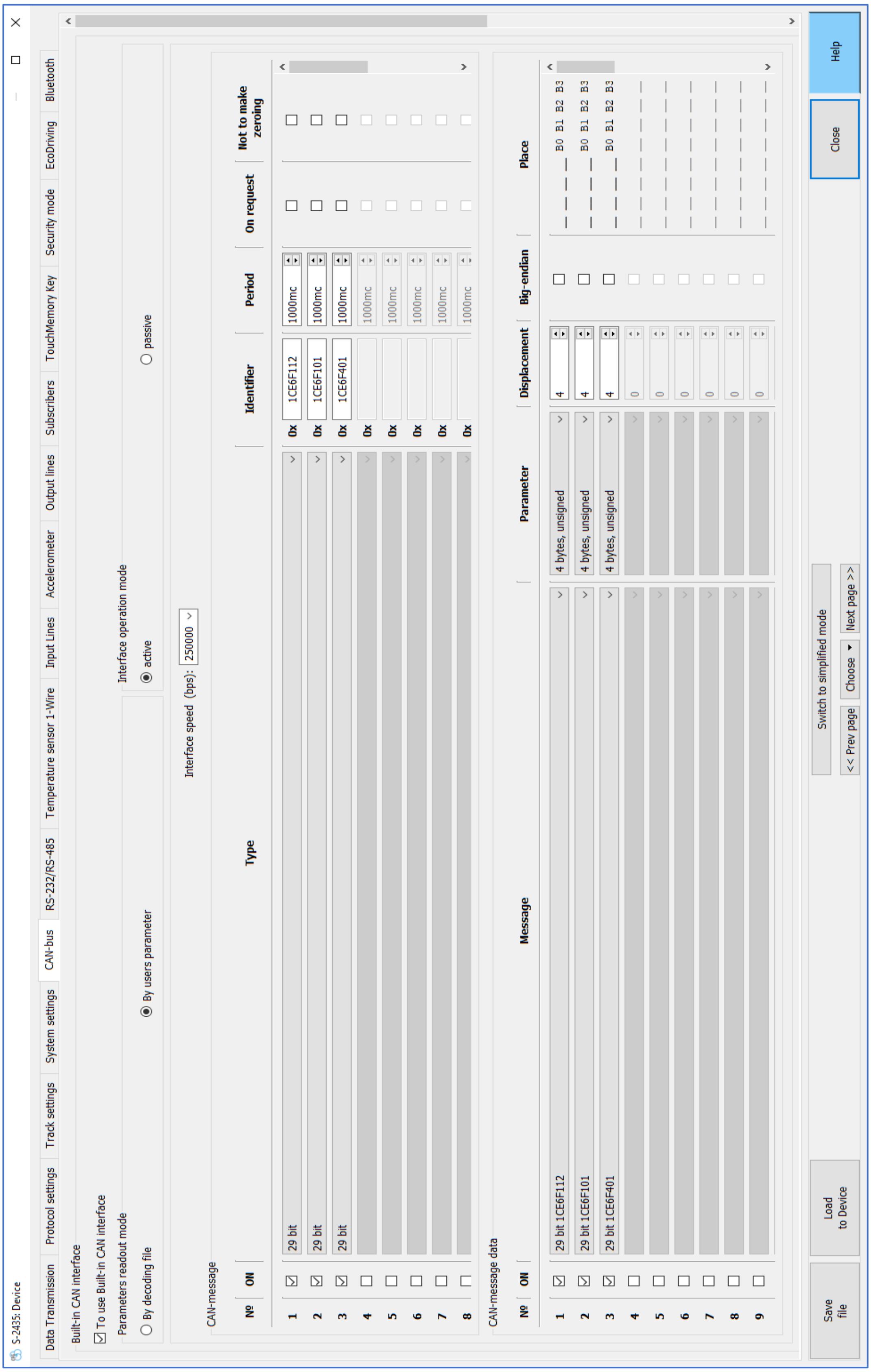

fig. III - 1. CAN-bus

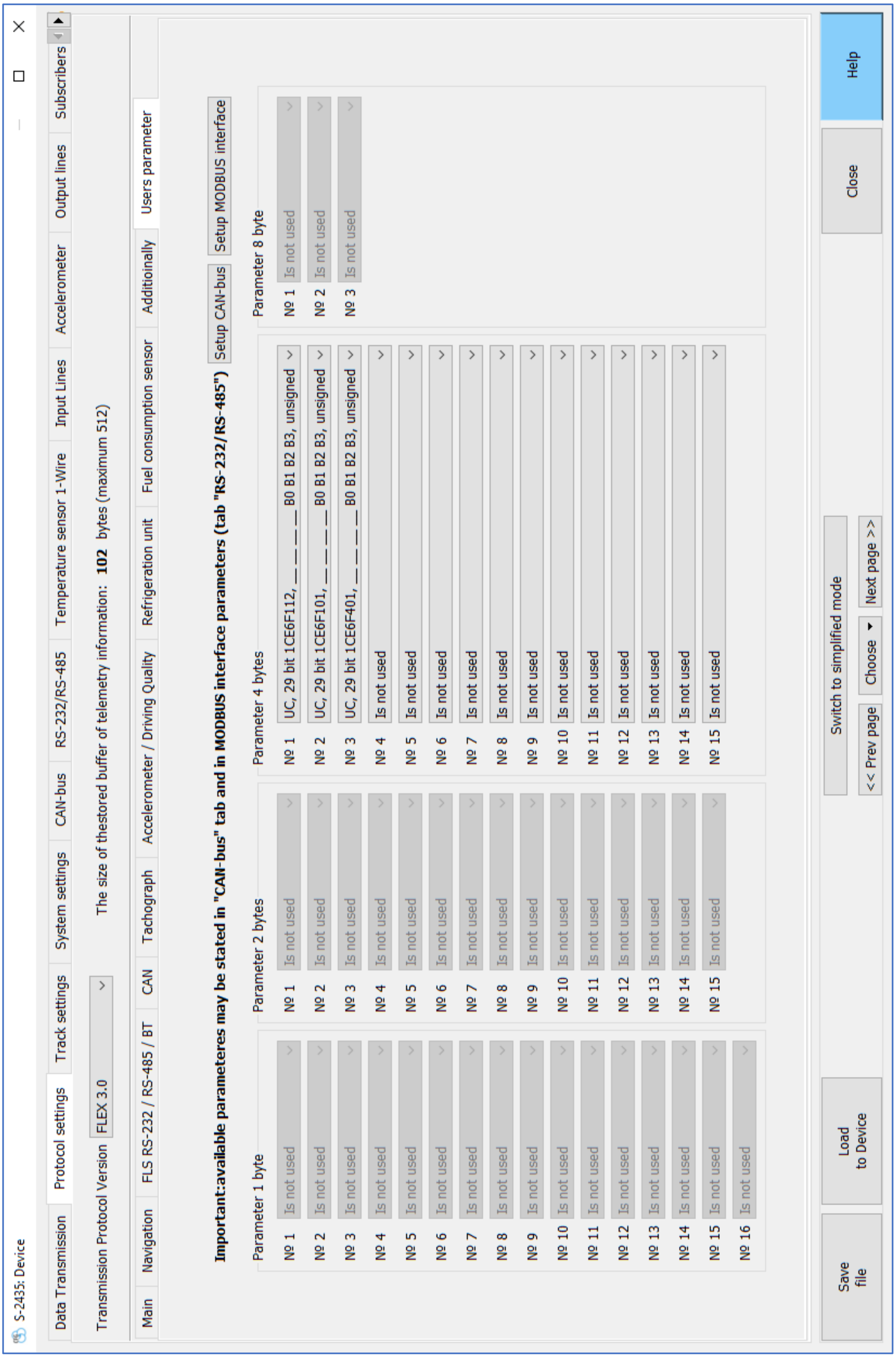

fig. III - 2. Protocol settings

fig. III - 3. User parameters

9) After configuring the tracker, set up data reception from the axle load sensors in **Wialon**.
10) Create a new unit or use the existing one that has an installed weighing system with axle load sensors eurosens DPS CAN.

The unit **TestWeightCAN** is used as an example.

11) Go to unit properties and select the tab **"Sensors"**.
12) Click the button **"+New"**, enter the name of the sensor and choose its properties (fig. III - 4).

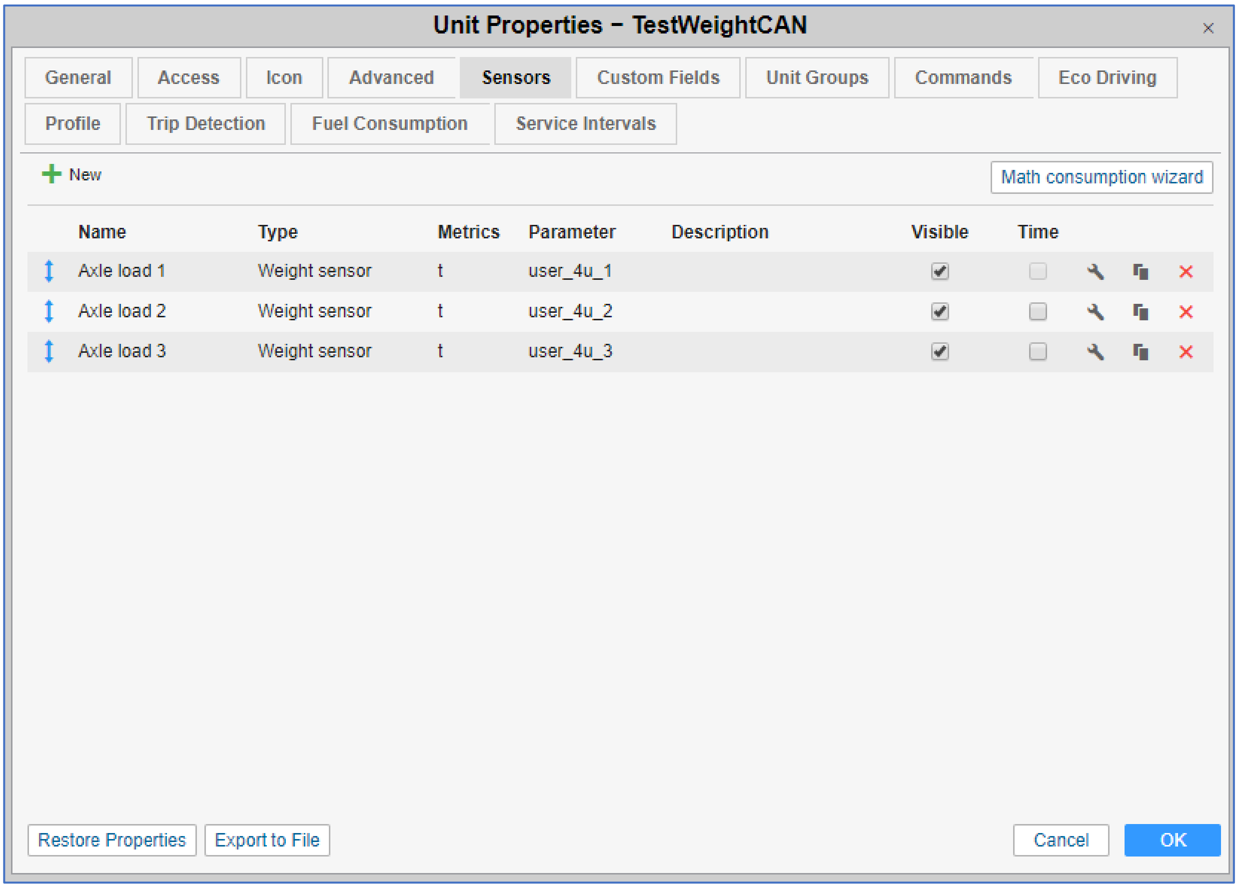

fig. III - 4. Unit properties

13) In the tab **"Parameter"** select **user_4U_1** for the sensor with Address 1, **user_4U_2** for the sensor with Address 2, etc., if there are more sensors used (fig. III - 5):

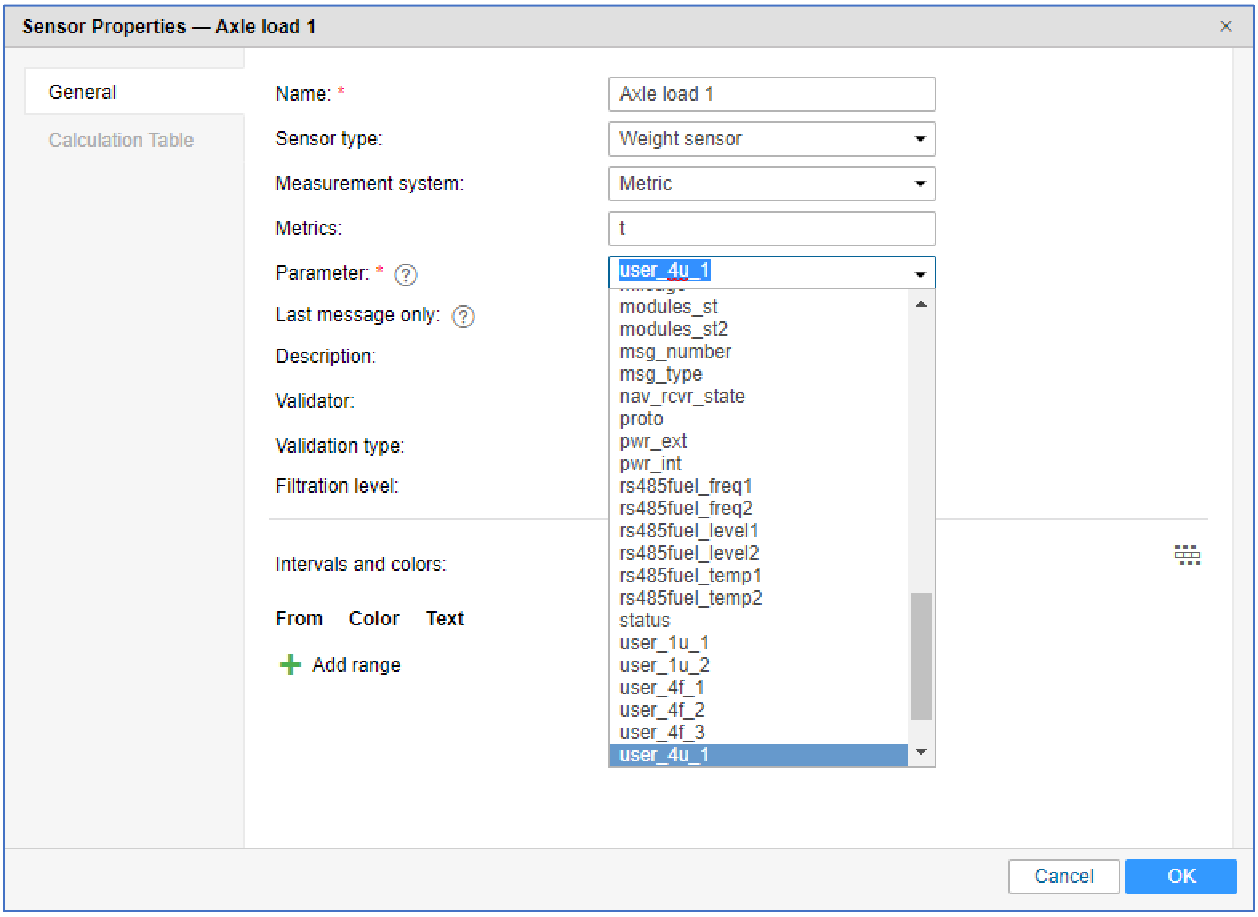

fig. III - 5. Tab “Parameter”

Once the necessary number of sensors is created (there are 3 of them in the example), you can work with the data being received. If the calibration wasn’t performed in the sensor’s Configurator, you can set the values in the monitoring system.

In the example, the sensors send values in kg. Wialon uses tons by default (fig. III - 6):

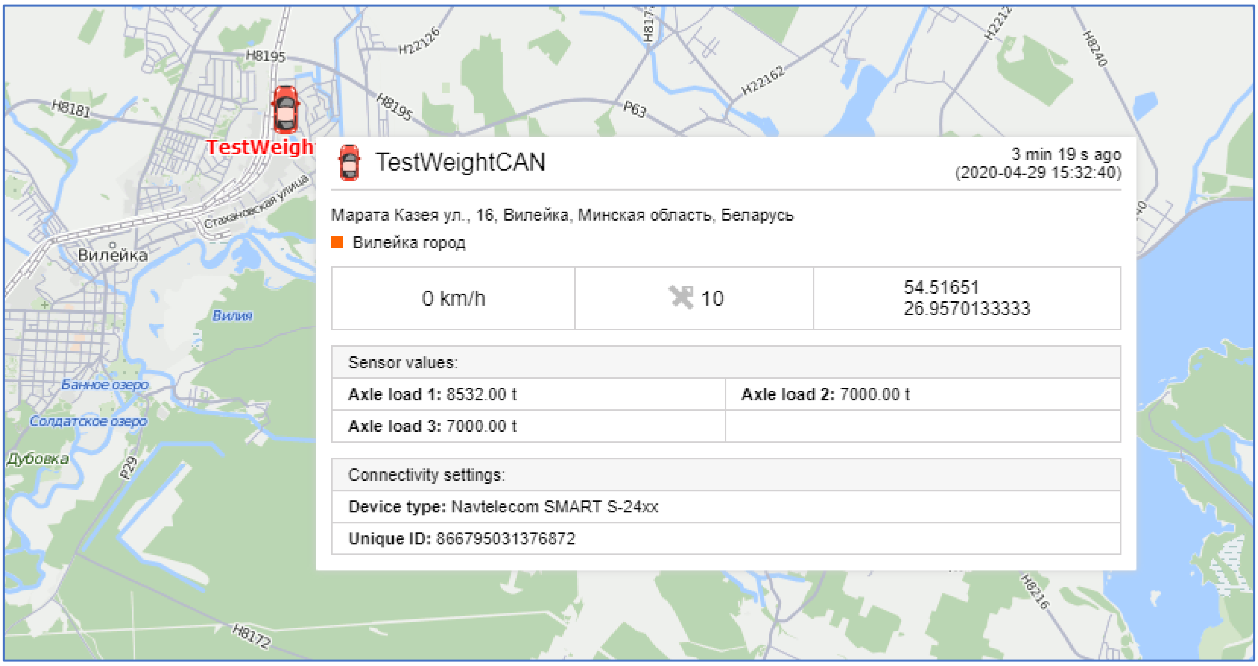

fig. III - 6. Axle load values

To convert the values in tons, use the calibration table in the sensor's properties ([fig. III - 7](#)):

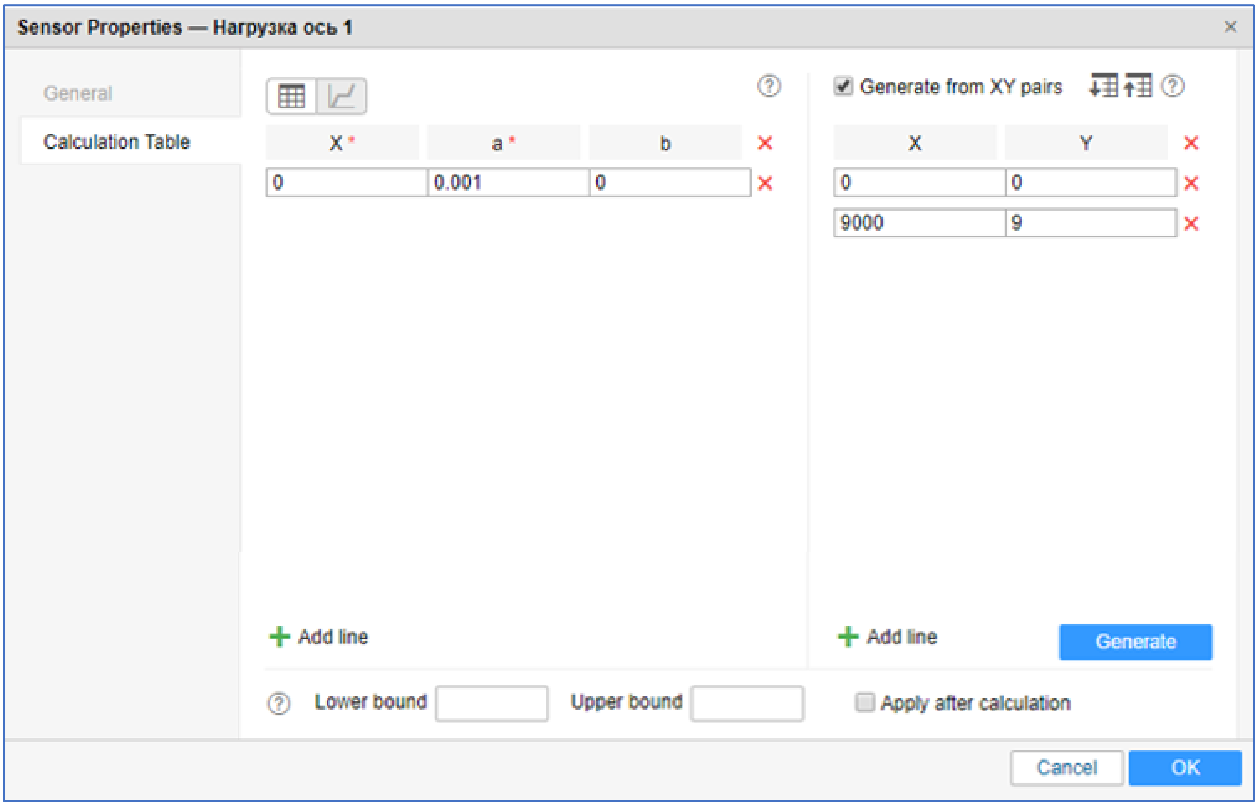

fig. III - 7. Calibration in monitoring system

Finally, the monitoring system will show the following data (fig. III - 8):

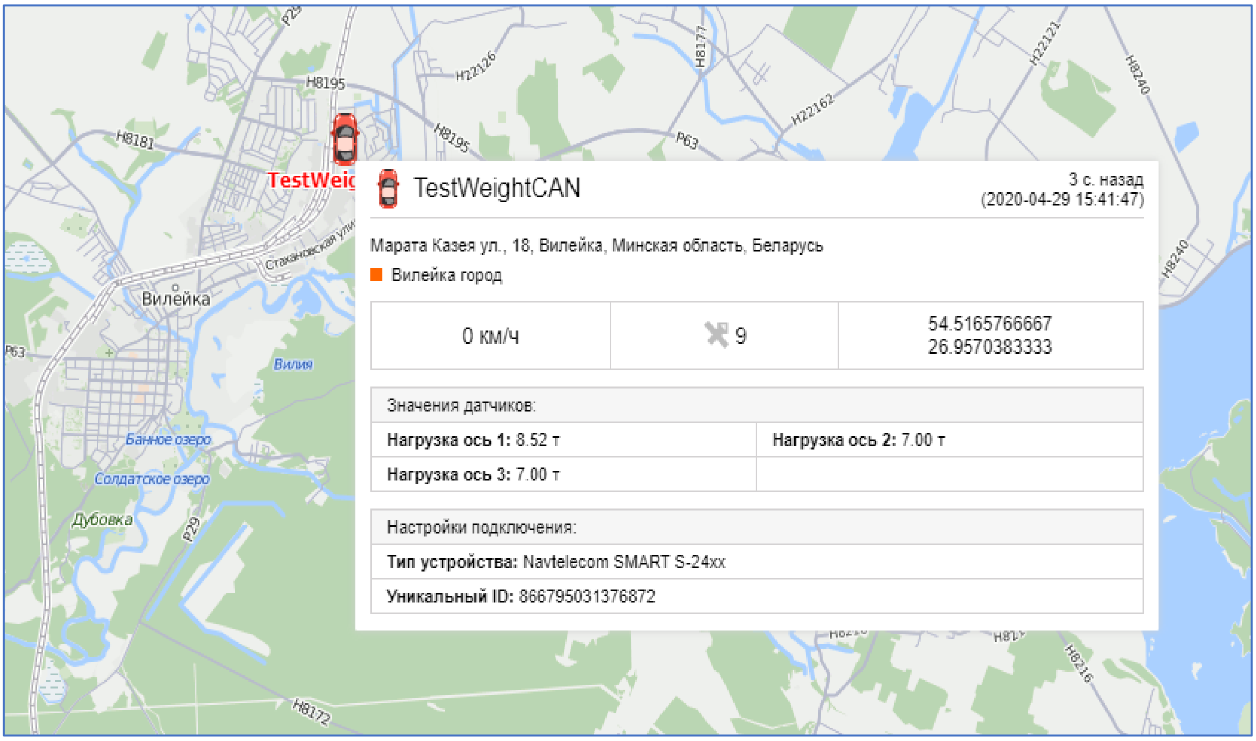

fig. III - 8. Data from monitoring system

Then, using sensor properties and validation, you can create the sensors that will calculate the cargo weight and the truck weight.

APPENDIX IV. AXLE LOAD SENSOR eurosens DPS CAN, GPS TRACKER NAVTELECOM SMART 2435 AND GPS TRACKING PLATFORM WIALON

You can start setting up the weighing system after you have installed the required number of axle load sensors on the vehicle, powered on the sensors and connected RS-A and RS-B lines of the sensors and the GPS tracker. The maximum number of sensors is limited by the properties of the tracker.

1) Connect the GPS tracker to the PC, or connect to the tracker remotely.
2) Open the Configurator of the tracker, e.g. **NTC Smart Configurator v3,** and select **“Read device configuration”** (fig. IV - 1).

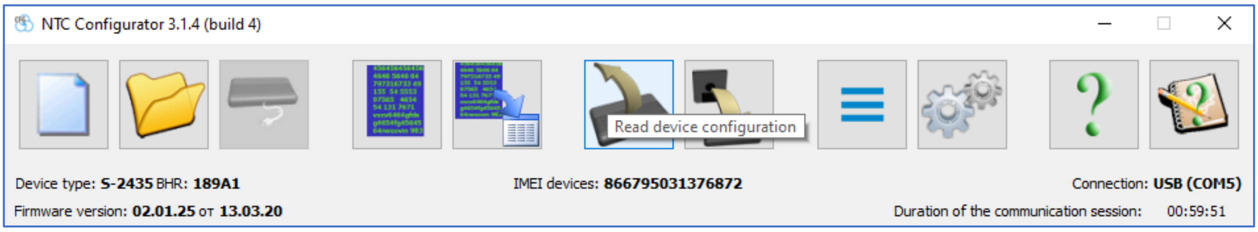

fig. IV - 1. Reading device configuration

3) In the new window to go the tab **“Protocol settings”** and select **“FLS RS-232/ 485/BT”** and tick sensor addresses which will be used during monitoring process (fig. IV - 2).

For the weighing system to operate correctly, it is necessary to set an address for each sensor in the Configurator.

E.g., if two sensors are used, they must have Address 1 and Address 2 respectively. If three sensors are used, then they must have Address 1, Address 2, Address 3.

It is recommended to make notes regarding the location of the installed sensors and their addresses.

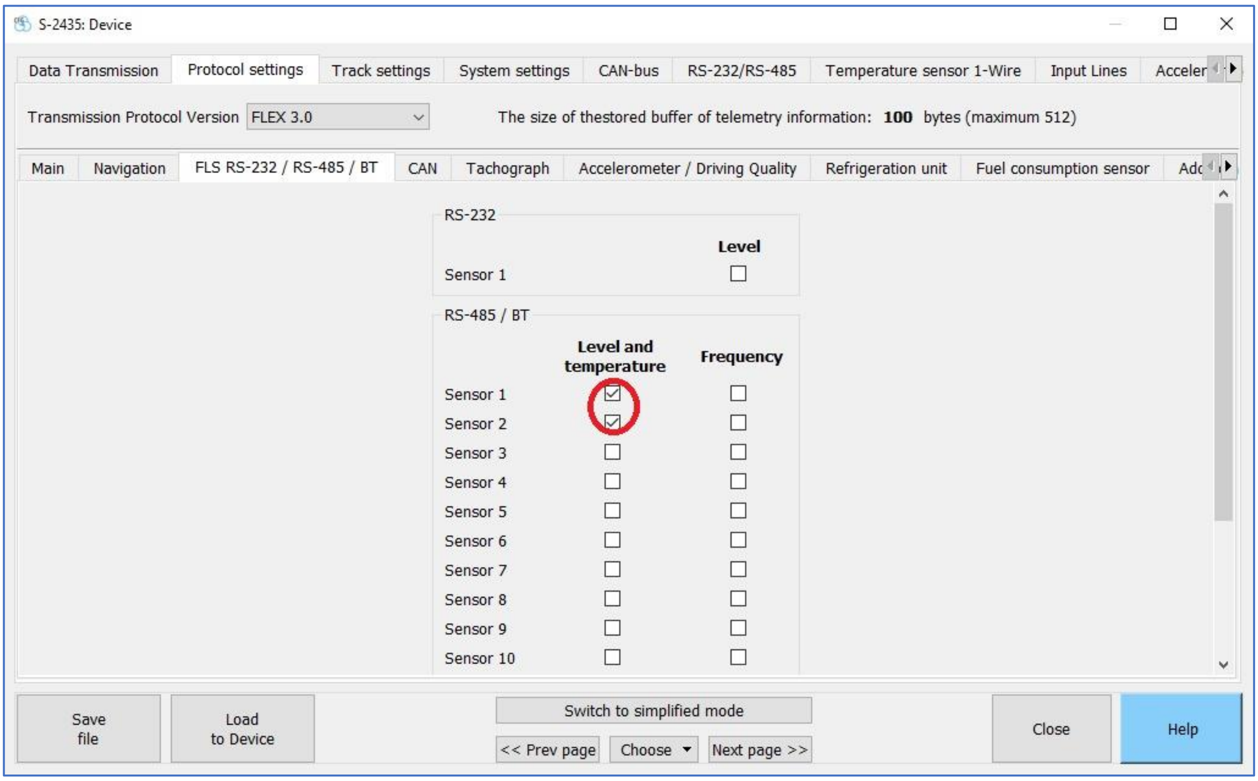

fig. IV - 2. Protocol settings

4) Go to the tab “**RS-232/RS-485**”, there in the section **RS-485** select the data rate of 19200 bps and Device 1: FLS (fig. IV - 3).
5) In the section **“FLS”** select the “LLS-compatible” sensor type with extended range and tick the options **“To connect sensor”** for every sensor that is used in the system, and specify their network addresses.

E.g., if two sensors are used in the weighing system (one sensor is installed on the rear axle of the truck, and the other one – in the air line of the trailer suspension), it is convenient to indicate Address 1 for the truck axle and Address 2 for the trailer axle (fig. IV - 3).

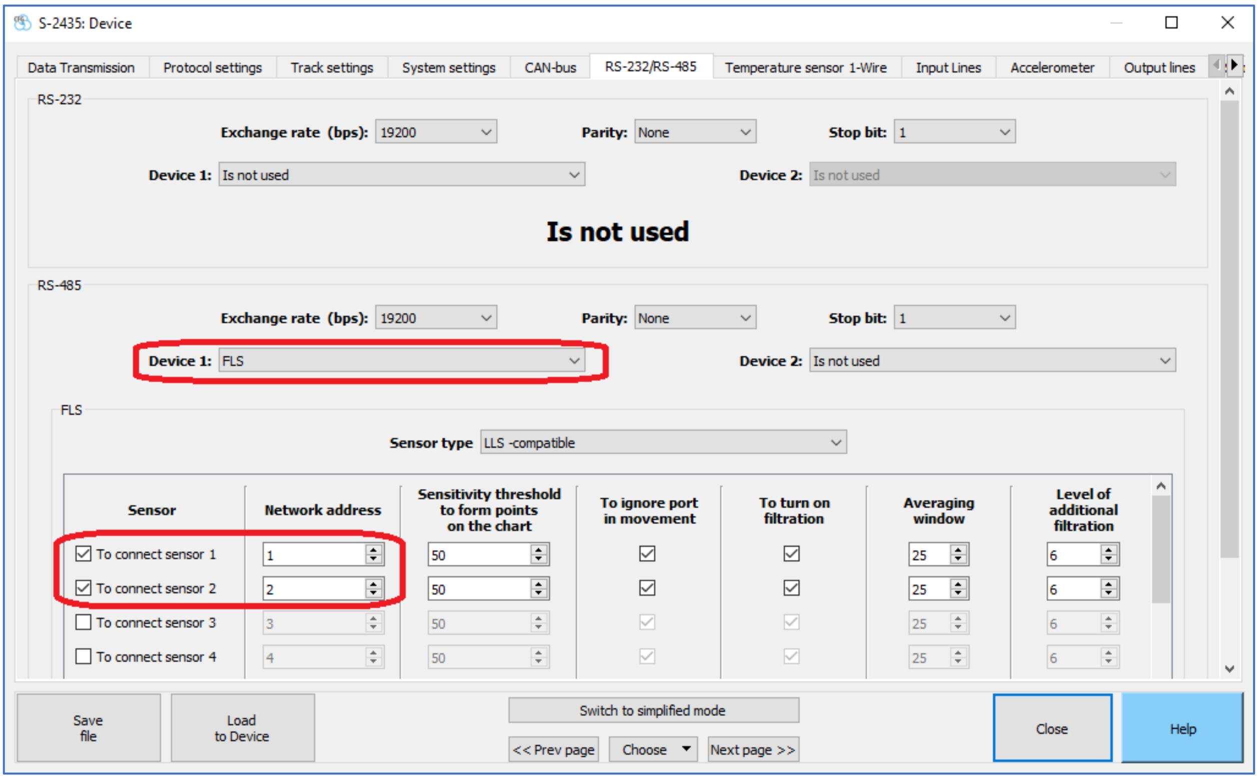

fig. IV - 3. Setting network address

6) Complete the configuration and save it to the tracker by clicking the button **“Load to Device”.**
7) After setting the GPS tracker, check the values in the tab “**Telemetry**” in the main window of the GPS tracker Configurator (fig. IV - 4).
8) After configuring the tracker, set up receiving the necessary data from the axle load sensors in **Wialon**.
9) Create a new unit or use the existing one that has an installed weighing system with axle load sensors eurosens DPS 485/DDS 485.

The unit **TestWeight485** is used as an example.

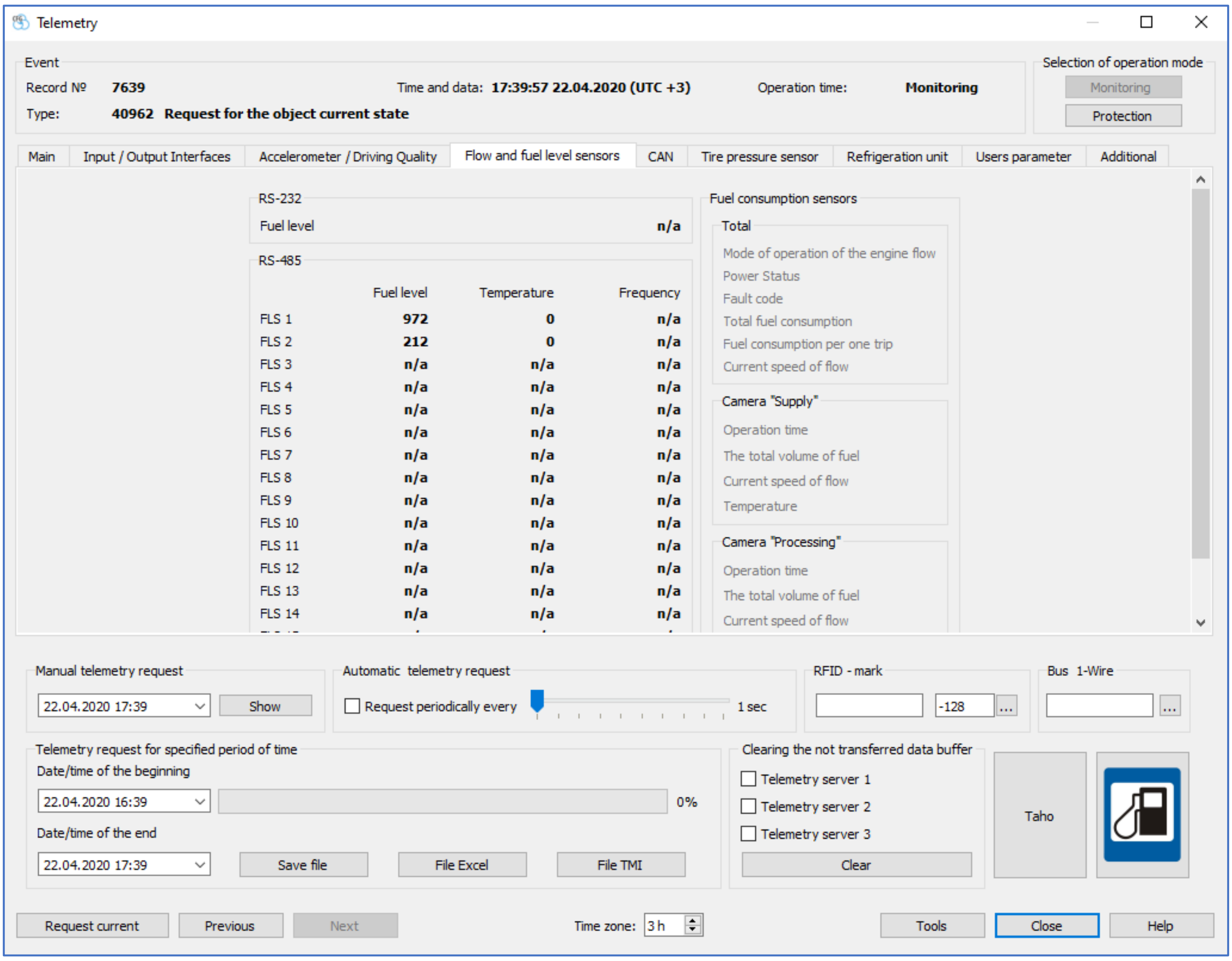

fig. IV - 4. Telemetry

10) Go to unit properties and select the tab **"Sensors".**

11) Click the button **"+New"**, enter the name of the sensor and choose its properties (fig. IV - 5).

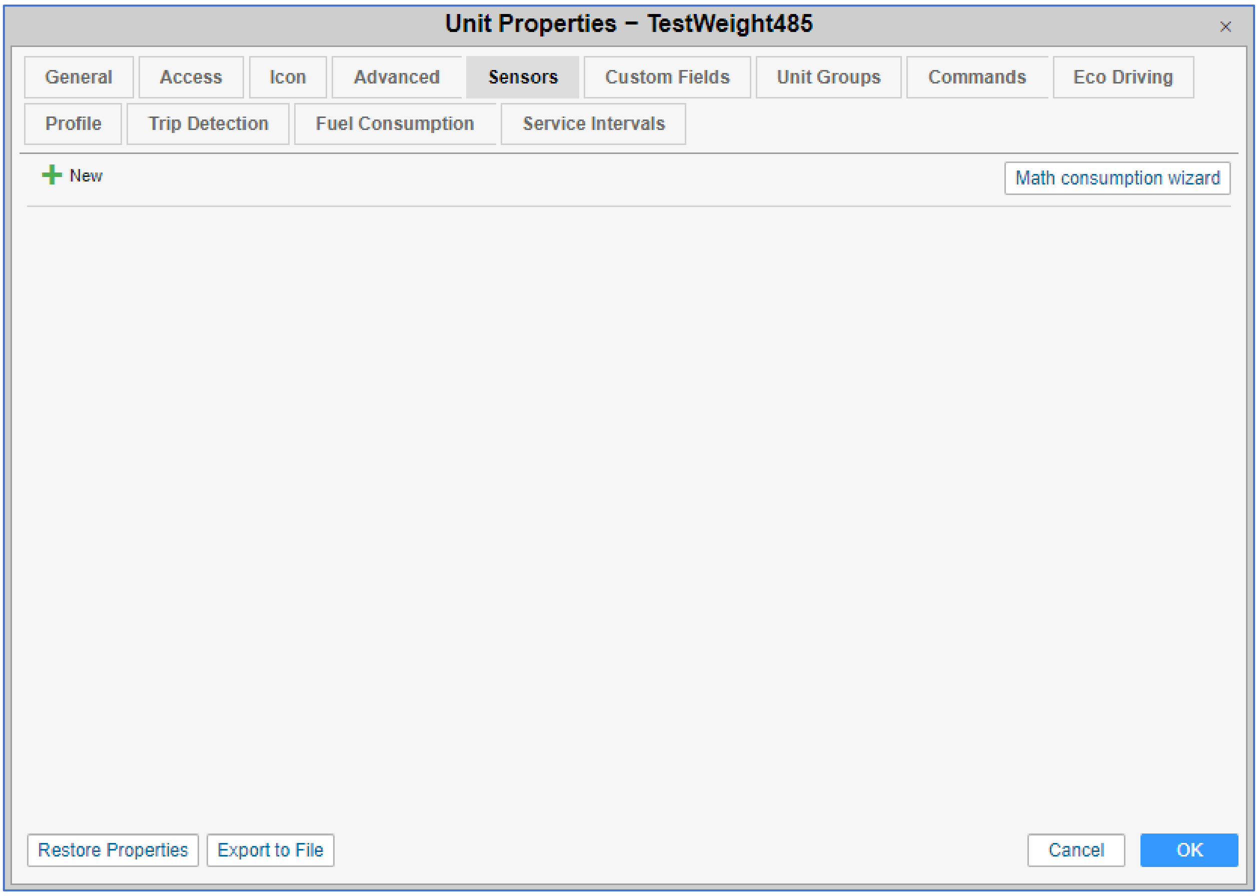

fig. IV - 5. Unit properties

12) In the tab **"Parameter"** select **rs485fuel_level1** for the sensor with Address 1, **rs485fuel_level2** for the sensor with Address 2, etc., if there are more sensors used (fig. IV - 6).

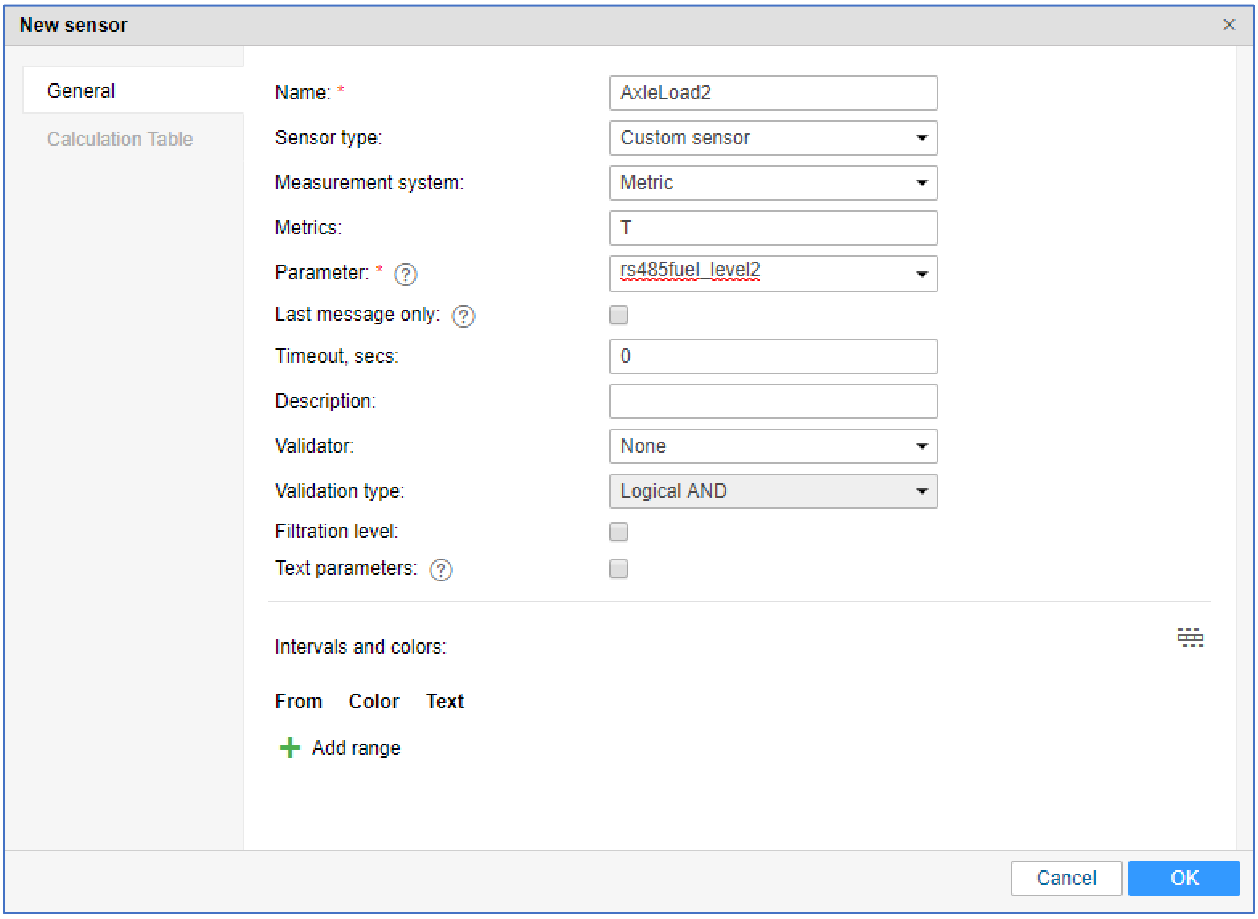

fig. IV - 6. Tab “Parameter”

Once the necessary number of sensors is created (there are 2 of them in the example), you can work with the data being received. If the calibration wasn’t performed in the sensor’s Configurator, you can set the values in the monitoring system (fig. IV - 7):

- record the incoming signal from the sensor in column X;
- record data from the scales in column Y.

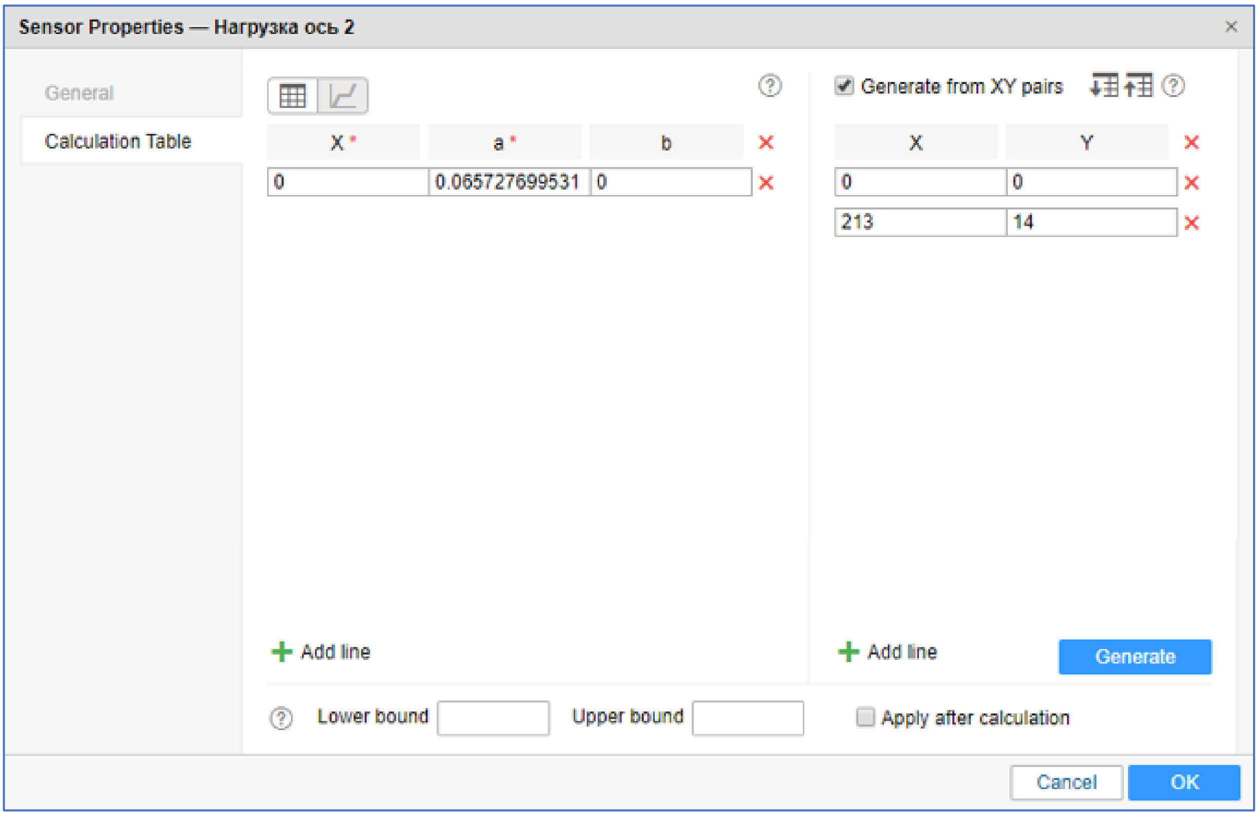

fig. IV - 7. Calibration in monitoring system

Finally, the monitoring system will show the following data (fig. IV - 8):

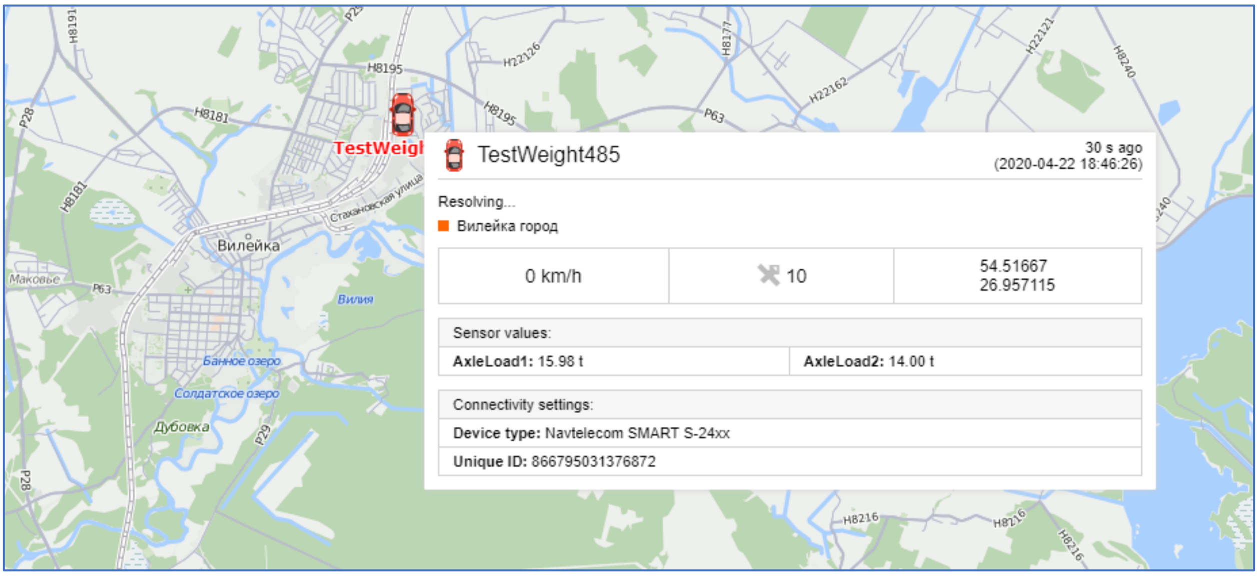

fig. IV - 8. Data from monitoring system

Then, using sensor properties and validation, you can create the sensors that will calculate the cargo weight and the truck weight.

APPENDIX V. AXLE LOAD SENSOR eurosens DDS RS AND GPS TRACKER TELTONIKA CONNECTED BY RS485 INTERFACE

You can start setting up the weighing system after you have installed the required number of axle load sensors on the vehicle, powered on the sensors and connected RS-A and RS-B lines of the sensors and the GPS tracker. The maximum number of sensors is limited by the properties of the tracker.

Connect to the sensor and set up RS485 address. Remove "Ignore" option (fig. V. 1).

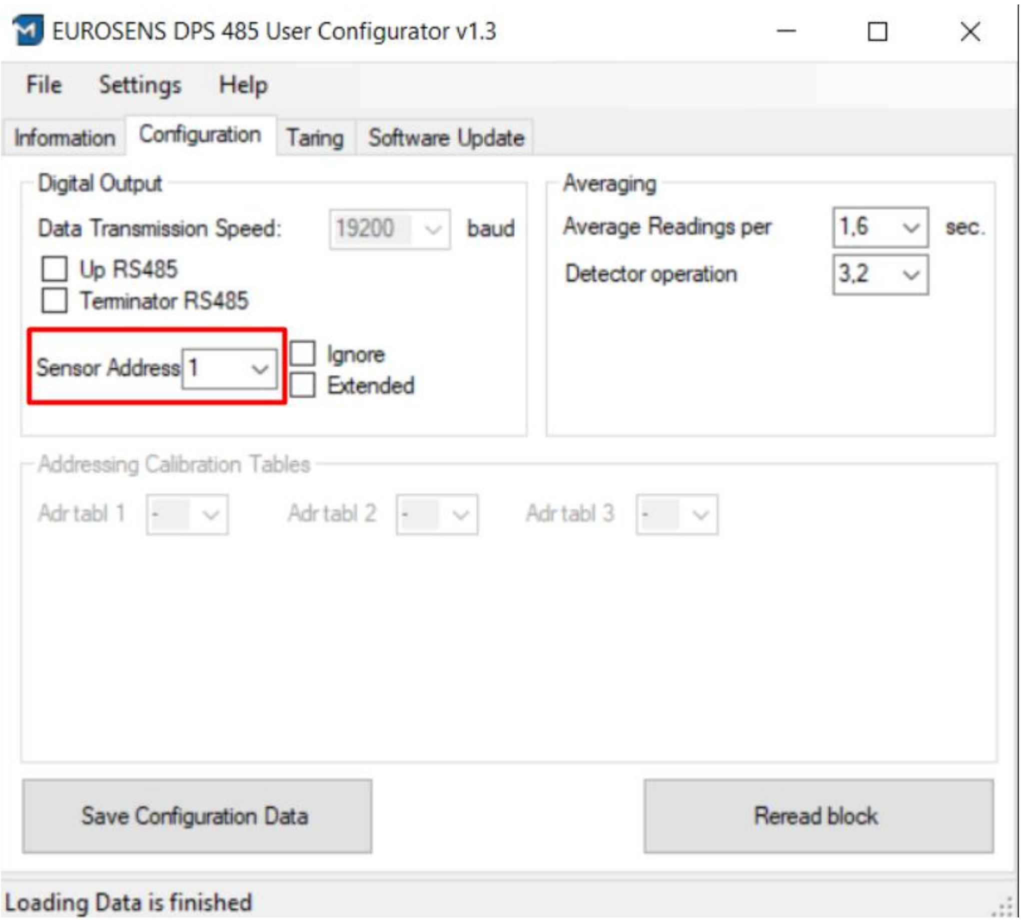

fig. V. 1. Sensor settings

Connect the GPS tracker to the PC and start Teltonika configurator.

In the Teltonika settings go to RS232/RS485 section, for RS485 interface choose LLS mode and baudrate 19200 (fig. V. 2). In RS485 LLS sensors set addresses for connected sensors, for example LLS 1 Address – axle load sensor with address=1. You can connect up to 5 sensors per RS485 interface of Teltonika, each having its unique address.

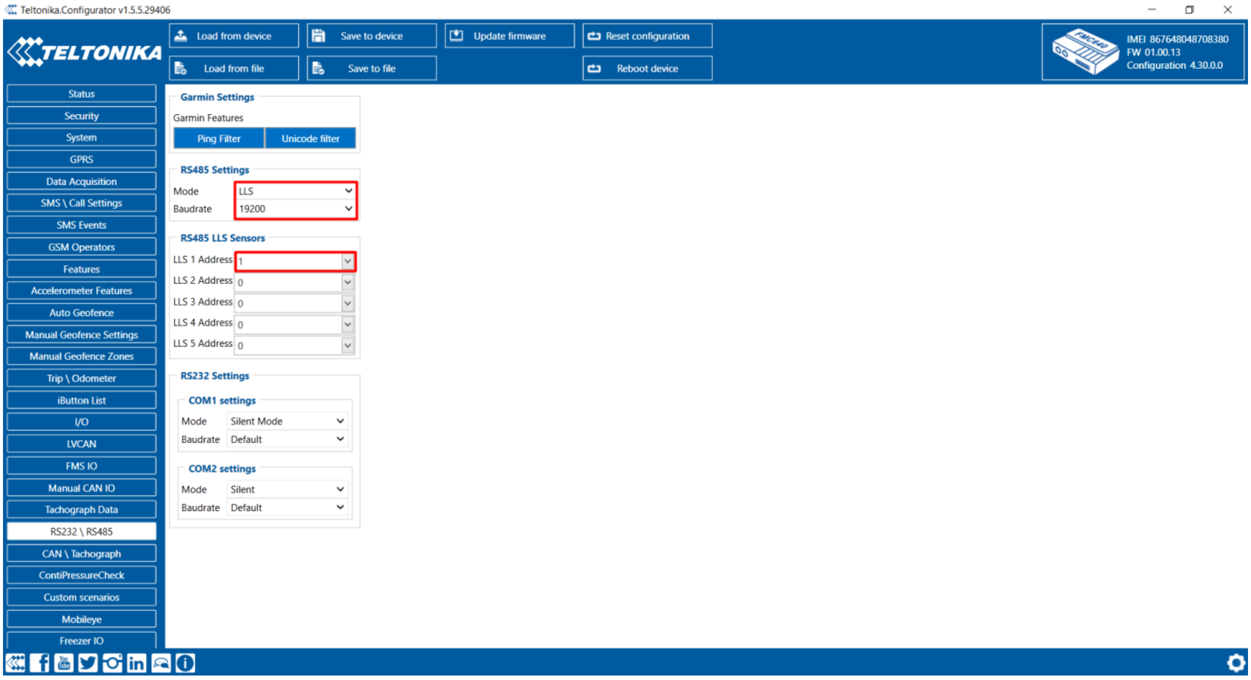

fig. V. 2

In the I/O section find the LLS parameters and set option “Low“ for **fuel level** for connected sensors (fig. V. 3). Save settings to GPS tracker and connect sensor. Data from sensor appears.

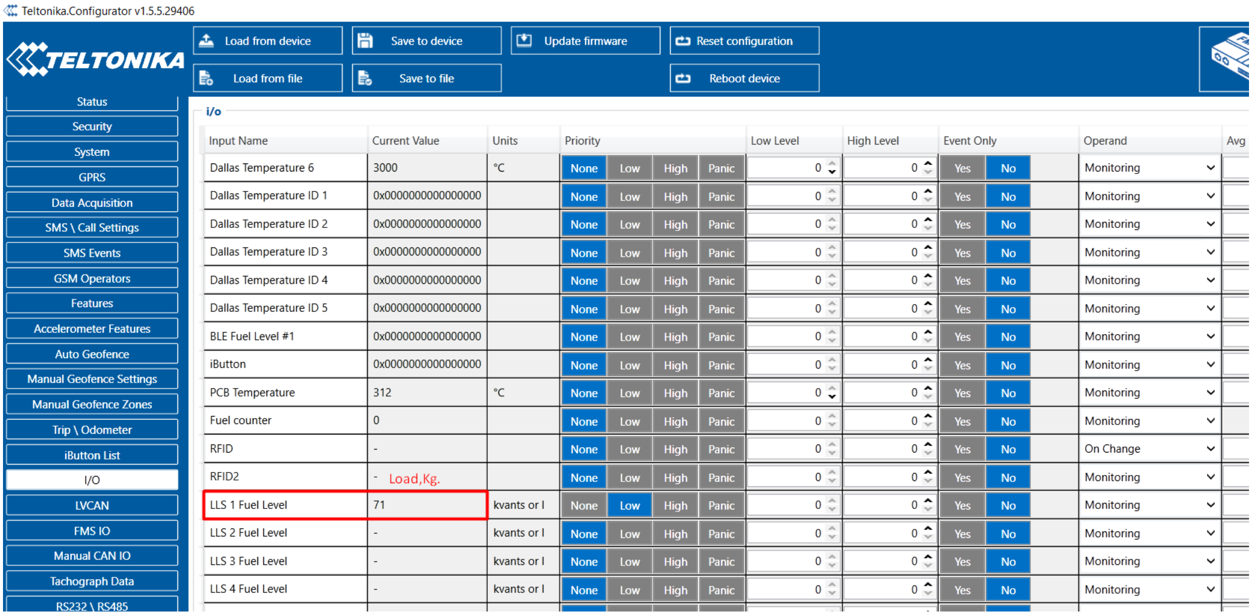

fig. V. 3

LLS 1 Fuel Level – axle load from sensor in kg.

According to Teltonika Wiki, on server side LLS 1 Fuel level (axle load in kg) – io_201, You can see other io numbers there : https://wiki.teltonika-gps.com/view/FMB640_Teltonika_Data_Sending_Parameters_ID

APPENDIX VI. CONNECTION TO TELTONIKA GPS TRACKER USING CAN BUS INTERFACE

For operation via CAN bus interface the sensor must be configured as shown on fig VI. 1. In the **PGN** field you can change the default CAN bus ID for this sensor. Set **SA** (source address) field to 1. It is necessary to set the **SA different for each sensor** if you connect several sensors to the CAN interface.

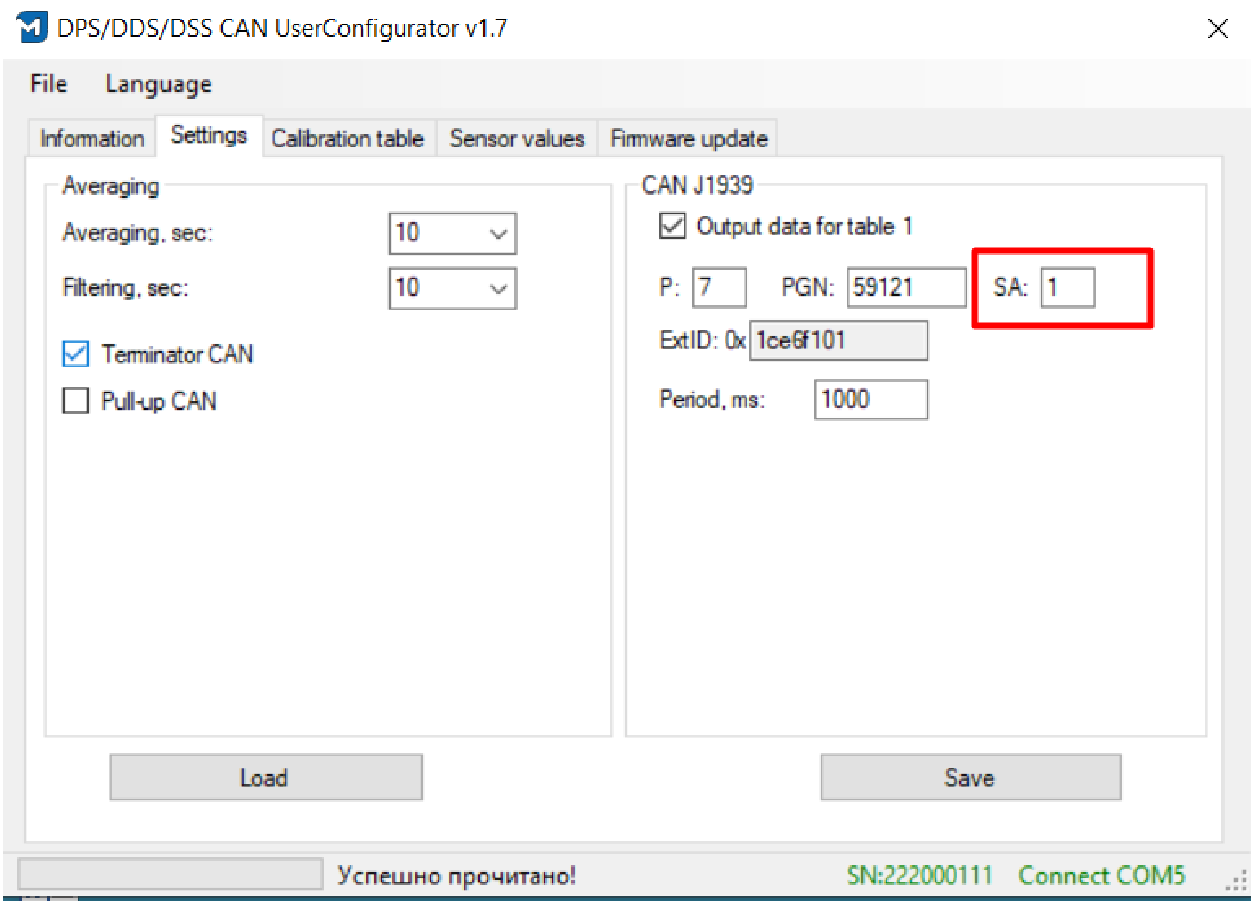

fig VI. 1

In Teltonika configurator go to CAN interface settings and choose **Normal** mode of operation and **250 kbps speed** (fig VI. 2). Choose the CAN data source – CAN1 or CAN2.

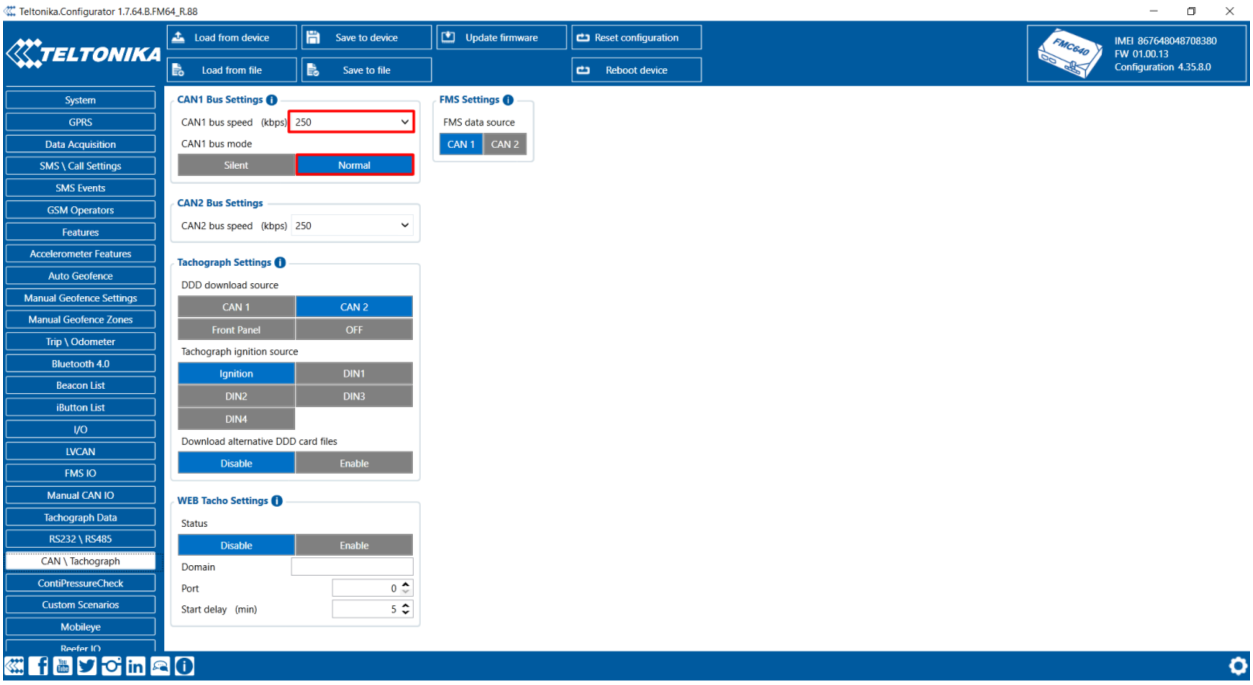

fig VI. 2

Then we need to set up the CAN bus identifiers. Put the CAN bus identifiers from the sensor settings (**Ext_ID field**) into CAN ID fields according to the fig VI. 3.

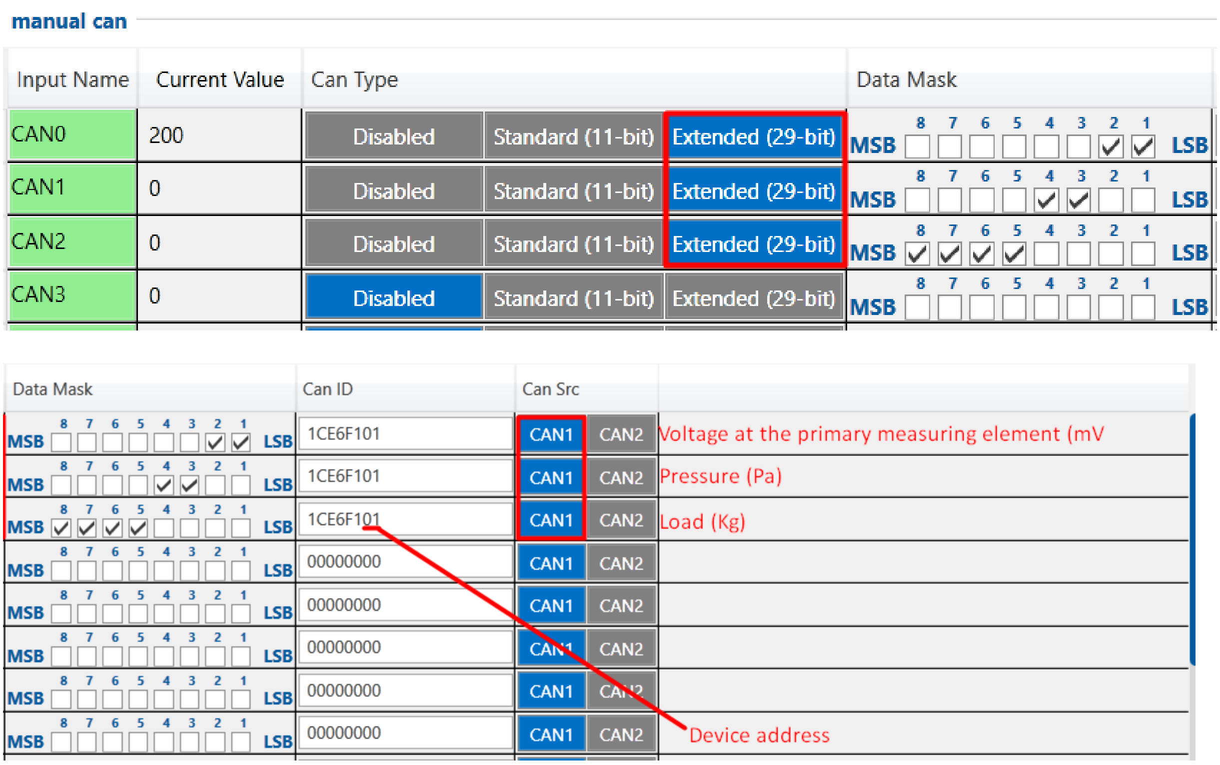

fig VI. 3

Save configuration to Teltonika device.

Connection of sensors via CAN to the GPS tracker is carried out according to the scheme shown on fig VI. 4. It is possible to connect several sensors to one CAN interface port, also it is possible to simultaneously use other sensors supporting CAN protocol.

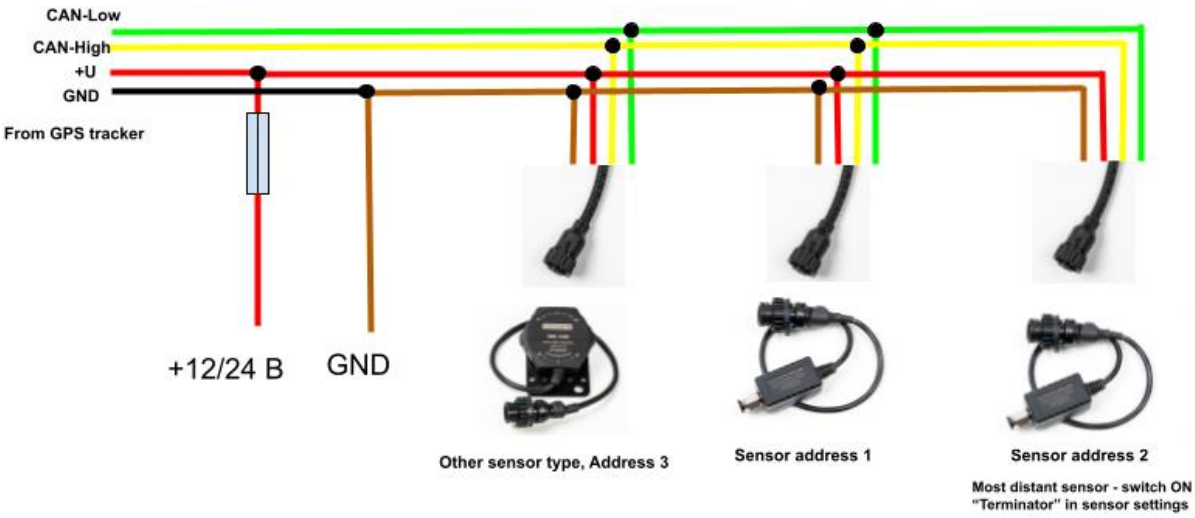

fig VI. 4

After sensor connection data appears on Manual CAN IO tab (fig VI. 3). The sensor values should be calculated taking into account the Resolution and Offset values specified in the description of CAN messages (Appendix I).

Axle load value – in kilograms.

Voltage of internal sensing element – in millivolts.

According to Teltonika Wiki, on server side Manual CAN parameters are numbered – io_145, io_146, etc.

You can see other io numbers there : https://wiki.teltonika-gps.com/view/FMB640_Teltonika_Data_Sending_Parameters_ID

APPENDIX VIII. DIMENSIONS

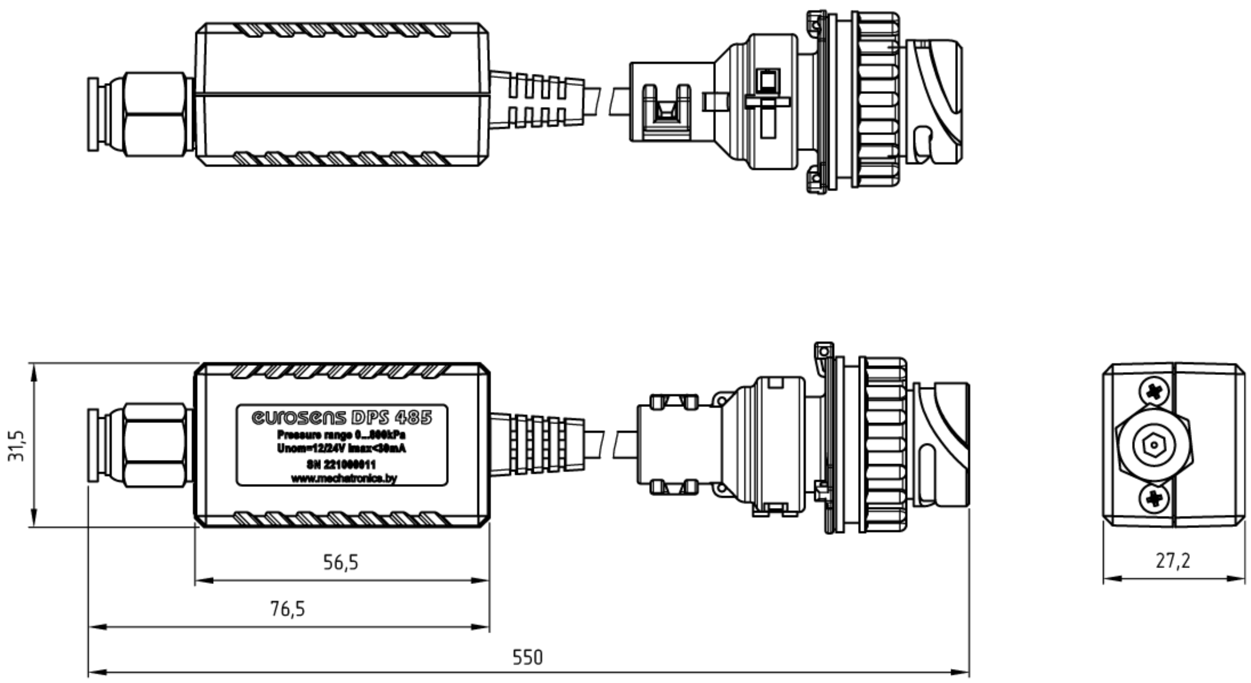

fig. VII-1. eurosens DPS dimensions

APPENDIX VIII. EXAMPLE OF THE CALIBRATION PROCEDURE

Consider the following example:

Two Eurosens DPS pressure sensors are installed on the towing vehicle (one each in the left and right air suspension circuit). Eurosens DDS displacement sensors are also installed on the second and third axles of a three-axle trailer with mechanical suspension. We will store the calibration tables on the server side so that we don't have to connect to the sensors installed on the machine to perform the calibration.

We need to measure the actual axle loads on all axles.

We drive the front axle of the tractor on the scale (Fig. VIII. 1) and measure the load on the front axle **N1_empty** (kg). Record the output value of the left-circuit sensor **Sens1L** and the right-circuit sensor **Sens1R**, coming to the GPS tracking system.

Fig. VIII. 1. First calibration point

Next we measure the coupled axles of the towing vehicle. We cannot place only one of these axles on the scale due to the dimensions of the scale and the vehicle. Therefore, we measure the total load on the coupled axles at once (Fig. VI. 2). Due to the impossibility of measuring the individual load on each of the paired axles using platform scales, we will assume that they are the same.

Fig. VIII. 2. Calibration of the rear axles of the truck

Record the output value of the left circiut sensor **Sens2L** and the right circuit sensor **Sens2R** (they will differ slightly from the first measurement data). Record the readings of scales **N2_empty** (sum of axes 2 and 3).

Next we weigh the tractor axles. We cannot place only one of these axles on the scales due to the dimensions of the scales and the vehicle. Therefore, we measure the total load on all closely spaced axles **N3** at once. Due to the impossibility of measuring the individual load on each of the axles using platform scales, we will assume that they are the same.

Fig. VIII. 3

We record the value of the 5th axle sensor **Sens5** and the 6th axle sensor **Sens6**, as well as the trailer axle weights on axles **N3_empty**.

Now we can create sensors in the GPS tracking platform system and add the first point to their calibration tables. First tractor axle - since we have 2 circuits, we will take the average value.

Axle 1 load sensor	X	Y
Empty	**(Sens1L + Sens1R)/2**	**N1**

For axes 2 and 3, the actual measured load is divided by 2, equally for each axis.

Axle 2 load sensor	X	Y
Empty	**(Sens2L + Sens2)/2**	**N2/2**

Axle 3 load sensor	X	Y
Empty	**(Sens2L + Sens2)/2**	**N2/2**

The first axle of a trailer with leaf spring suspension is not equipped with an axle load sensor, so it will be calculated in the same formula with the second axle:

Trailer axle load 1-2	X	Y
Empty	**Sens5**	**N3/3**

Last trailer axle has its own sensor

Trailer axle load 3	X	Y
Empty	**Sens6**	**N3/3**

In order for the GPS tracking platform to be able to calculate axle load values, a second point must be added to all calibration tables for the fully loaded state of the truck. They are obtained in the same way.