



Fuel level sensor

eurosens Dizzi



Installation manual
v.2

Content

1. Introduction	3
2. Sensor specification	4
3. Choose a place for the installation.....	8
3.1. Prepare	8
3.2. Testing the installation place	9
4. Attaching of the sensor	14
4.1. Attaching by the metal tape.....	14
4.2. Sensor mounting with a help of magnets	15
5. Electric connection	16
6. Sensor configuration	17
7. Tank calibration.....	22
8. Troubleshooting and repair.....	23
9. Storage	24
10. Support.....	24
11. Contacts.....	24

1. Introduction

The Operation Manual contains guidelines and rules which refer to Eurosens Dizzi fuel level sensors (hereinafter sensors), developed by JSC Mechatronics, Vilejka, Belarus (mechatronics.by).

Ultrasonic level sensor Eurosens Dizzi is used for non-contact (non-invasive) level measurement of acoustically transparent liquids.

Level measurement is performed by the external echolocation through the bottom of the tank. You can measure also other parameters of liquid when sensor is installed at sidewall of the tank.

Sensor interfaces are:

- RS-485 (LLS, MODBUS protocol)
- Analog (voltage 0-5Volts)
- Frequency modulation
- Pulse-width modulation
- Discrete output

2. Sensor specification

Table 2.1 – Main parameters

Parameter name	Units	Value	Notes
General			
Meduim		Acoustically trans- parent	Sensor pre-sets: Gasoline, diesel fuel, LPG
Thickness of the vessel wall	Mm	0.5 ... 10	(for steel)
Operation temperature range	°C	- 40 ... + 80	
Protection class		IP67	
Operation time		Not limited	
Measurement			
Max measurement range	mm	3000	Base option – 500mm
Averaging data interval	S	60	Can be customized
RS485 port baud rate		2400, 4800, 9600, 19200, 38400, 57600, 115200	Default – 19200, can be changed
Power supply			
Voltage range	V	+11 ...+30	(intrinsically safe 11 ... 18V)
Max current consumption	mA	25	
Interface			
Serial		RS-485	LLS
		RS-485	MODBUS
Others		Voltage, U	0...5 V
		Frequency, F	500...2000 Hz
		PWM	500...2000 Hz, 10...90%
		Logic	0...5V
Dimensions			
Size	mm	φ60x13,7	
Cable length	mm	900	
Weight, no more than	Kg	0,2	

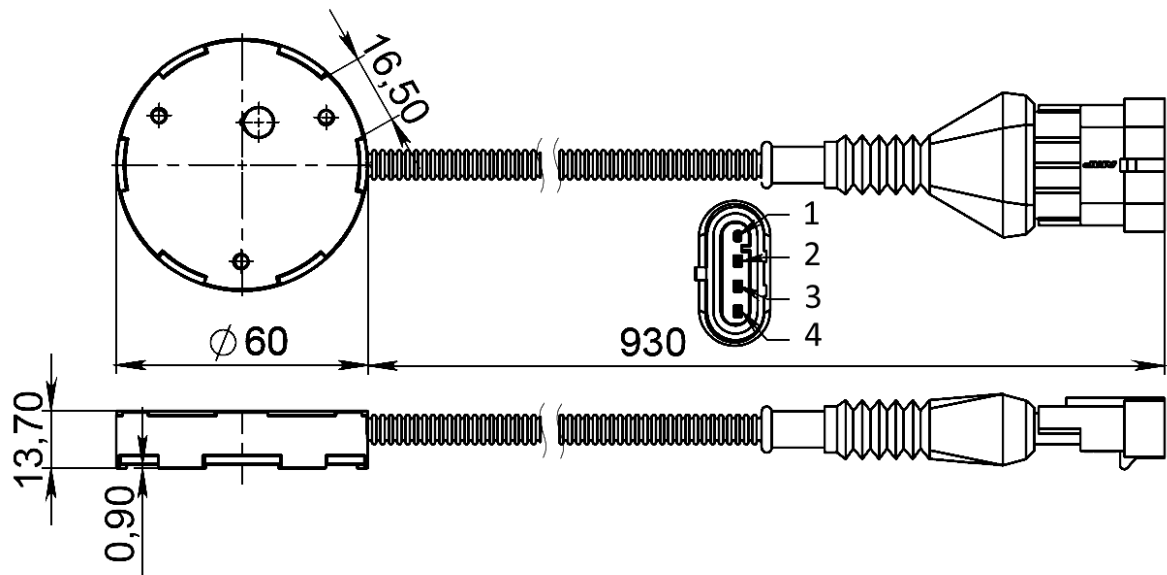


Fig. 2.1. Sensor dimensions

Table 1. Sensor pinout

<i>Pin</i>	<i>Wire colour</i>	<i>Назначение</i>	<i>Примечание</i>
1	Brown	Power «-»	
2	Blue	Power «+»	
3	Yellow	RS485-A, Voltage output, logic output	Type of interface is set in configuration
4	Black	RS485-B, Frequency, PW, logic output	

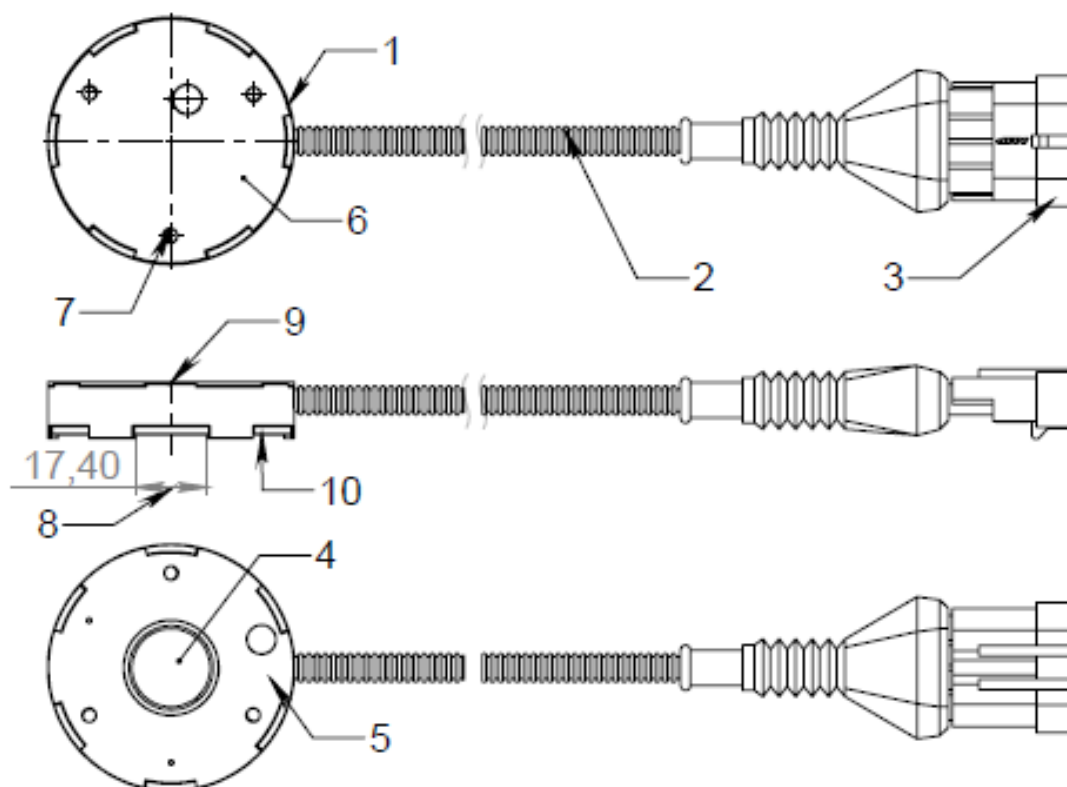


Fig. 2.2 Sensor appearance

1. Casing
2. Cable
3. Connector
4. Piezoelectric transducer
5. Upper cover
6. Bottom cover
7. Assembly holes
8. Assembly grooves
9. Upper side
10. Bottom side



Fig. 2.3. Sensor appearance

Table 2. Sensor accessories

Name	Qty	Note	
Cable	1	5 or 7 meters	
Clamp tape with lock	1	3 meters	
Magnet mounting	1	Instead of clamp tape	
Glue	2	2-component glue	
Acoustic gel	1	20мл	
Cable tie	15	200 x 3,6 mm	
Fuse 0,1 A, 250 V	2	05 x 20 mm	

3. Choose a place for the installation

3.1. Prepare



Installation sensor tank should be filled with a liquid at least $\frac{2}{3}$ of the volume and should have the horizontal orientation.

- 3.1.1. Prepare tools and materials for installation.
- 3.1.2. Choose sensor installation location and clean it from dirt and rust. It is recommended to prepare several possible installation places.
- 3.1.3. Install sensor at the lowest point in the center of the tank.
- 3.1.4. No walls or other structural elements of the tank should interfere the sensor signal direction.



Do not install the sensor on the welding.

- 3.1.5. The working surface of the sensor should be parallel to the liquid surface, i.e., horizontal..

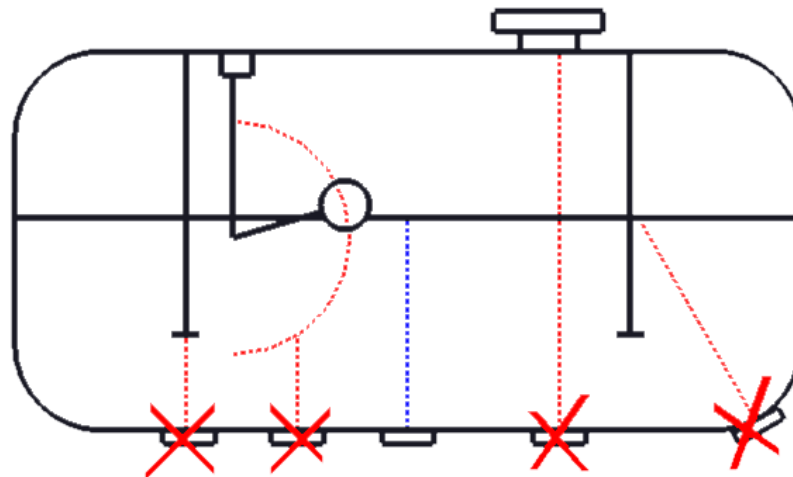


Figure 3.1. Choosing an installation place

- 3.1.6. Connect sensor to PC with a help of USB/RS-485 adapter.

3.2. Testing the installation place

- 3.2.1. Installation place must be checked by the special software "CAY Oscilloscope". To do this, you must first lubricate the working surface of a homogeneous liquid without air bubbles, and press the sensor to the installation place for monitoring the quality of the signal waveform.



Without lubrication layer sensor will not work!

The presence of sand or any other particles in the acoustic contact zone is unacceptable!

- 3.2.2. Sensor cable should be oriented as it is supposed to be connected .
- 3.2.3. At the time of installation install a fixed gain coefficient (other than "Auto") = 25 in CAY Oscilloscope.
- 3.2.4. Slowly change the position of the sensor, to achieve maximum amplitude of the first echo signal. Also check the parameter "installation quality".



The best installation place for the sensor would be a place where there are a several echoes, as well as where the amplitude of the first echo signal is maximized at the lowest gain.

3.3 Testing the installation place

«CAY Oscilloscope» software is used to find the best place of Eurosens Dizzi installation.

- 3.3.1. Connect the sensor to PC Run CAY_Oscilloscope software.
- 3.3.2. Click «Settings» - Section 1 at fig. 3.2

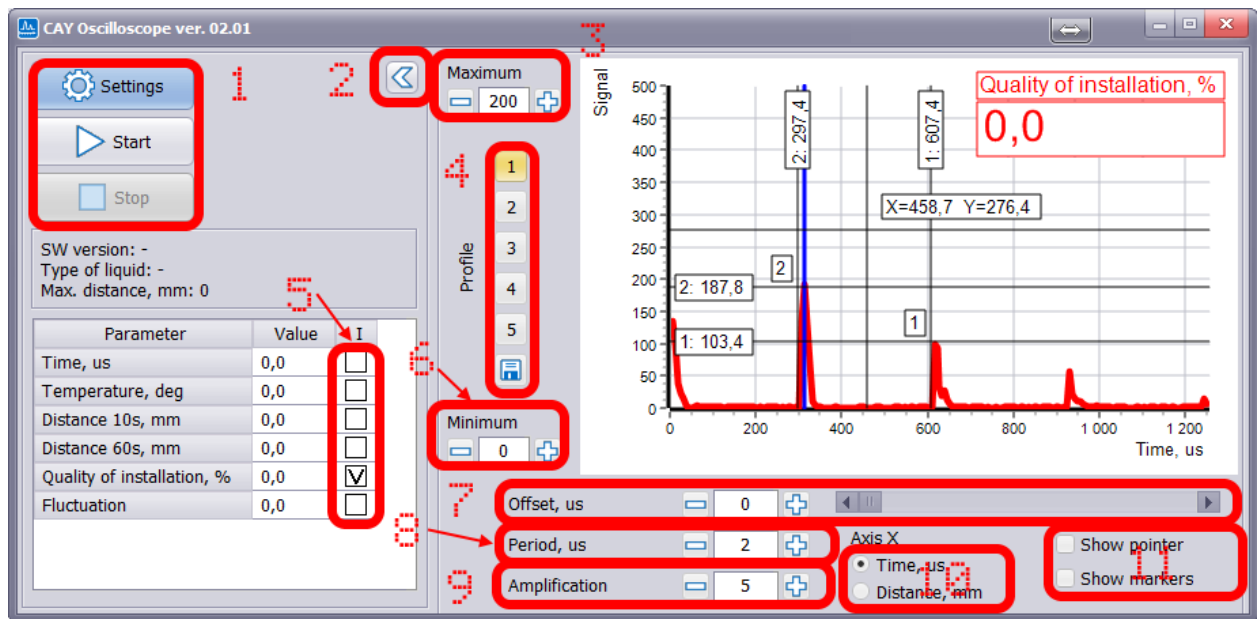


Fig.3.2 Main Oscilloscope window

3.3.3 At «General» tab set COM-port settings and choose the language, fig. 3.3

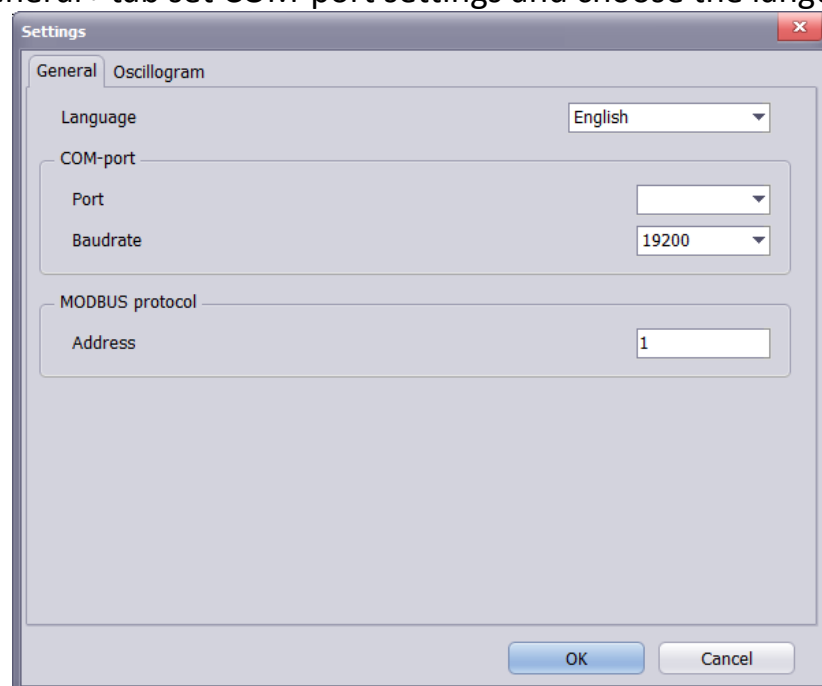


Fig. 3.3

3.3.4 On the “Oscilloscope” tab we can make settings of oscilloscope data chart appearance (Fig. 3.4). Some parameters also can be changed from the main Oscilloscope window (block 4 at Fig. 3.5)

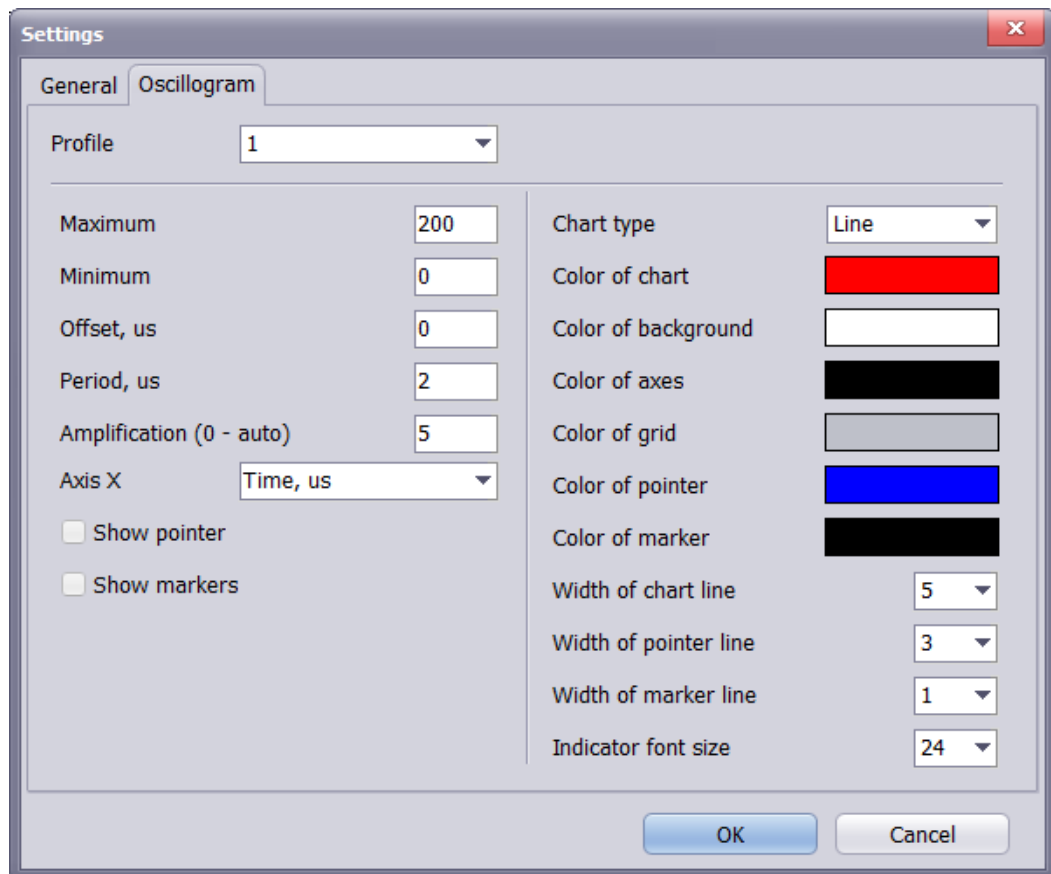


Figure 3.4

On the main screen we can see several sections of the interface, (see Fig.3.5)

Section 1. Main buttons, to set up measurement, run and stop measurements.

Section 2. This button is used to hide a section.

Section 3 and 6. Setting Y-axis limits.

Section 4. Profile presets and saving current settings to the chosen profile.

Section 5. Parameters to be displayed at the data chart.

Section 7. Horizontal offset of oscilloscope window

Section 8. Resolution in time units

Section 9. Amplification factor control. To find the installation place is recommended to set this value in 19...22 range.

Section 10. X-Axis units - time/distance

Section 11. Switch ON current signal level and markers. Use markers to note the best signal level.

During the sensor installation you must take into account:

- Amplitude of the signal
- Number of reflections
- Quality of installation
- Disturbances and “fake” reflections

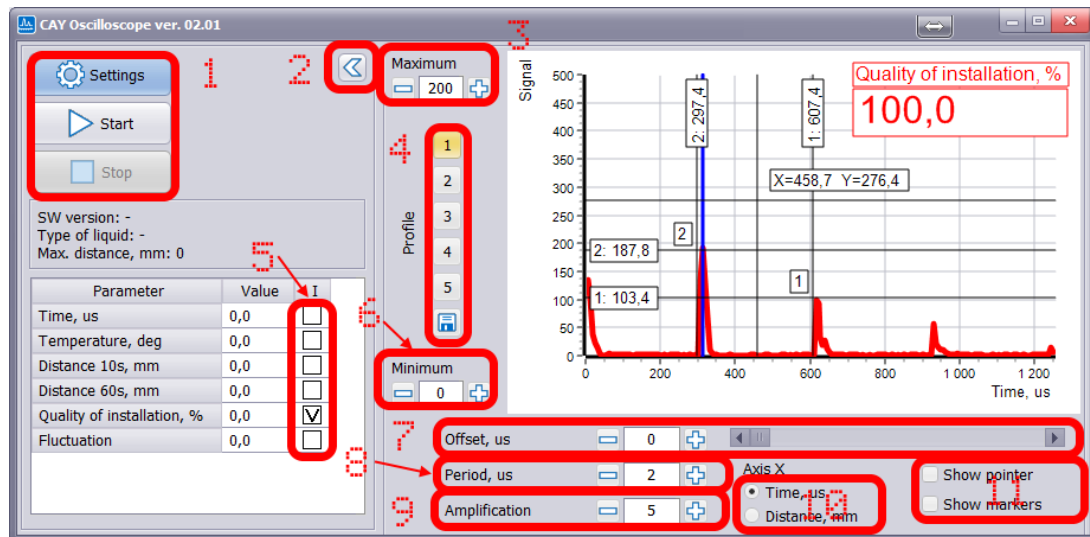
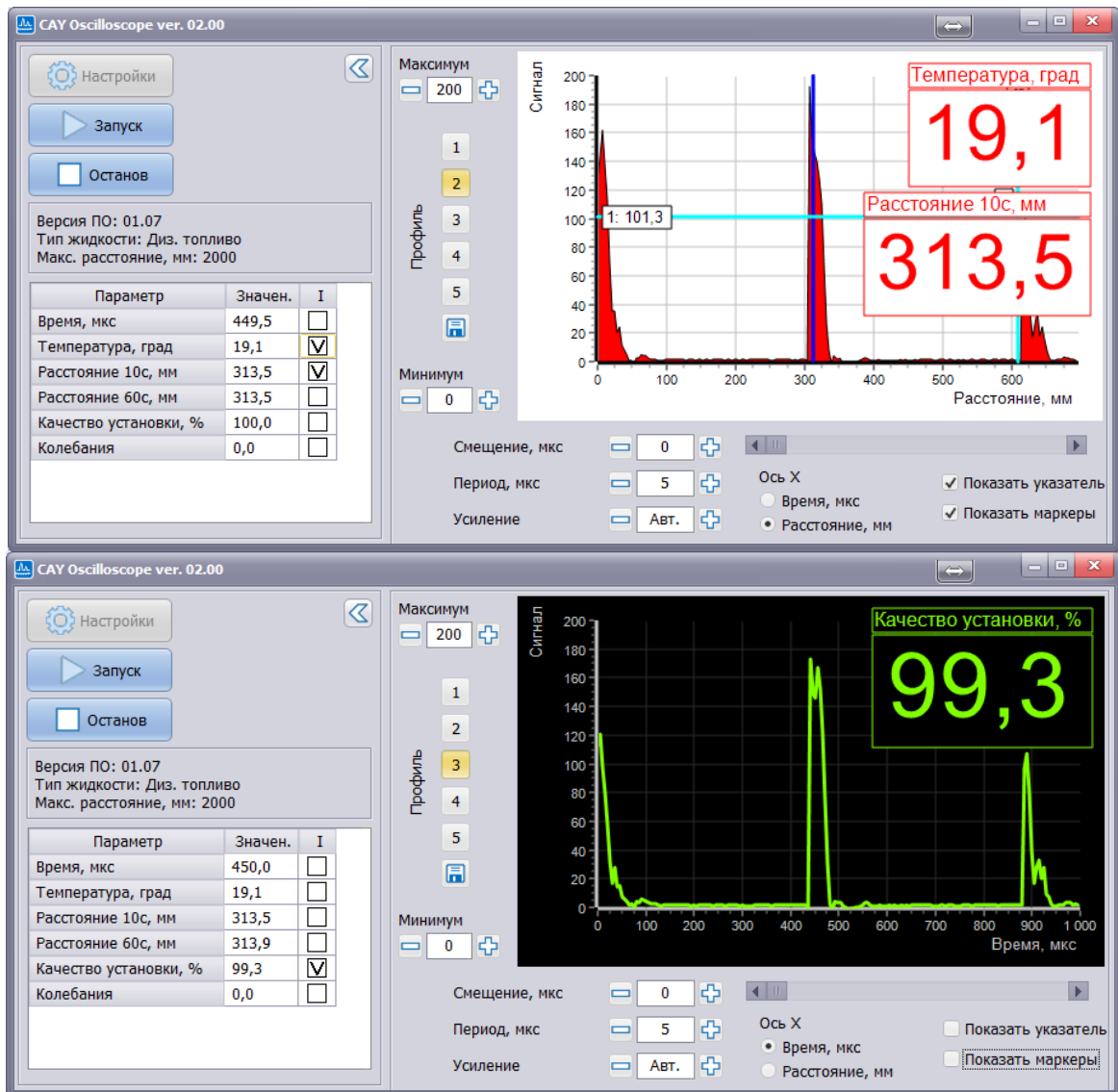


Figure 3.5 – main interface

+



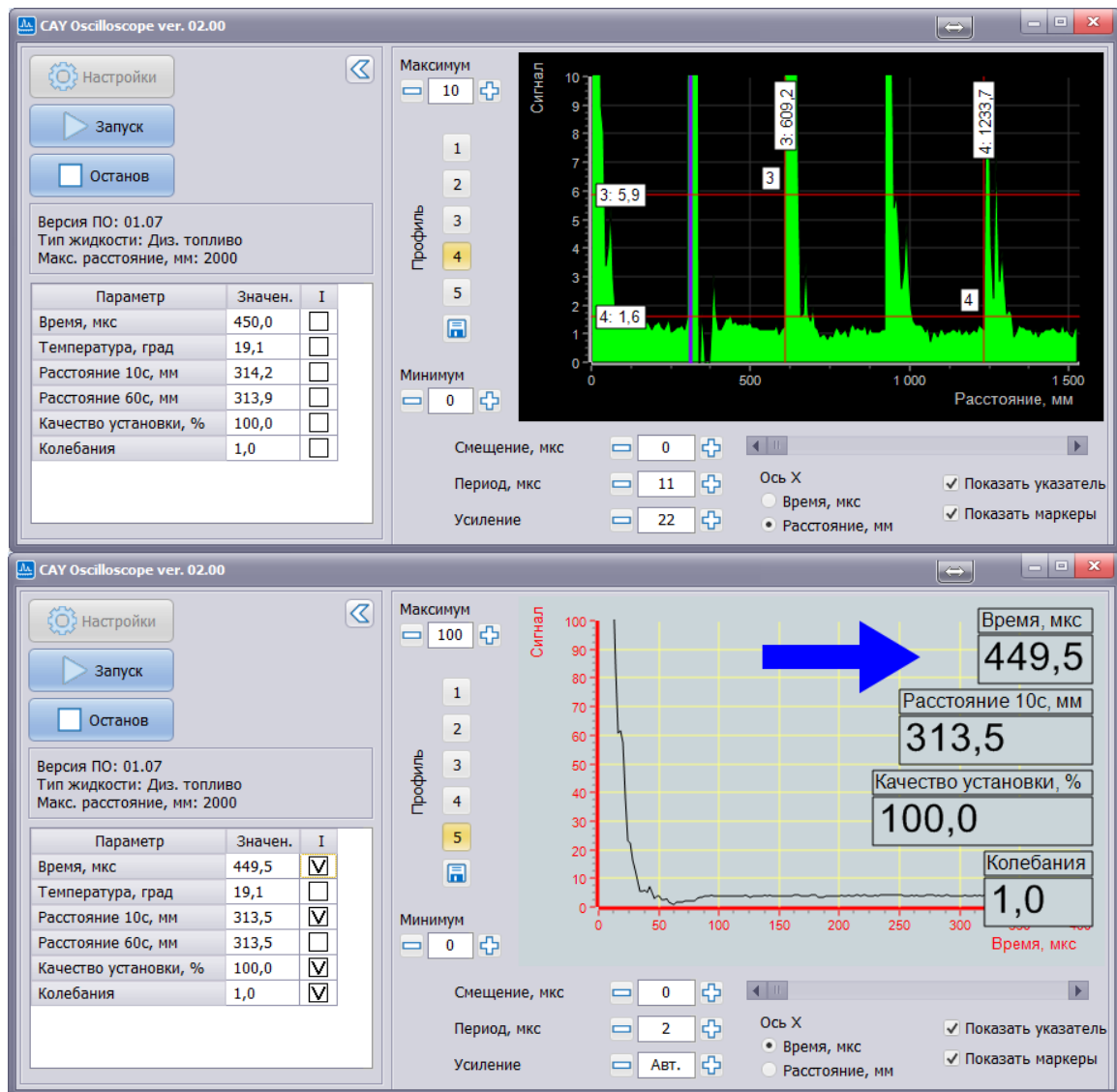


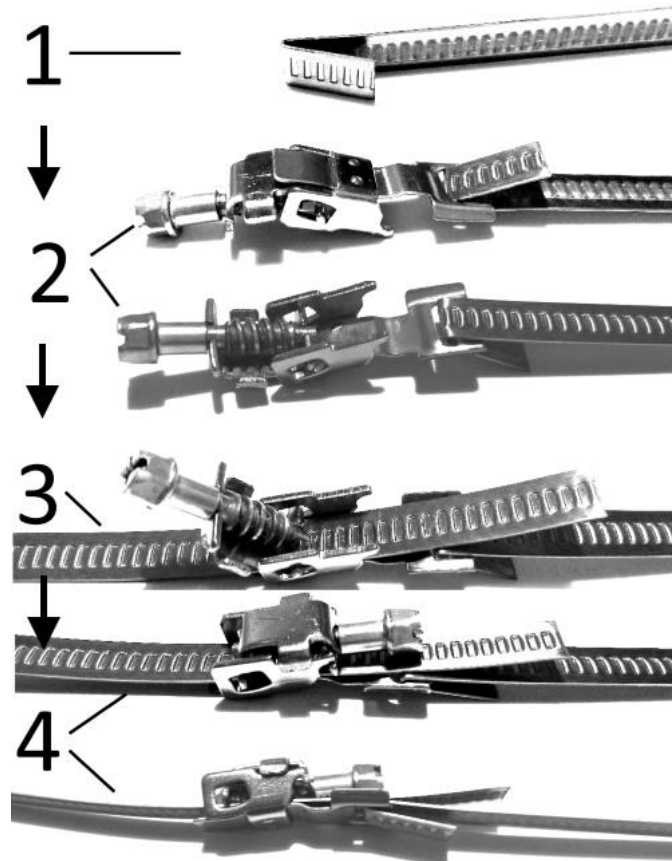
Fig 3.6 Examples of profiles

The arrow shows us that signal is placed outside of oscilloscope window. We need to increase the resolution (Section 8) or make an offset of the oscilloscope window (Section 7).

4. Attaching of the sensor

4.1. Attaching by the metal tape

4.1.1. Secure a lock on the metal tape as shown on the picture below (fig.



4.1).

Fig. 4.1

4.1.2. Wrap the tape around the tank, so that it passes through the center of the best location of the sensor installation and screw the lock in a convenient location for tightening.

4.1.3. Pull the tape so you can take it out without a lot of effort (fig.4.2).



Fig. 4.2

- 4.1.4. Clean and dry the installation location and the top cover of the sensor.
- 4.1.5. Connect sensor to the PC, run the software "CAY_Oscilloscope".
- 4.1.6. Prepare the glue according to recipe.
- 4.1.7. Gently press the sensor to tank, bubbles and dirt in the area of installation are not allowed.
- 4.1.8. Bend the free end of the tape, to prevent access to the lock screw and seal as shown on the figure 4.3.



Fig. 4.3

- 4.1.9. Fill by glue the gap between the top of the sensor and bottom of the tank.

4.2. Sensor mounting with a help of magnets

- 4.2.1. The centers of the magnets should be aligned with the center of the sensor and equidistant from it for the even distribution of the mechanical load.
- 4.2.2. For mounting to the cylindrical surface magnet and the sensor are located in manner that line crosses their centers, parallel to the axis of the cylindrical surface.
- 4.2.3. Clean the installation location from paint and rust.

- 4.2.4. Clean and dry the installation location and the top cover of the sensor and magnets.
- 4.2.5. Connect sensor to the PC and run the software "CAY_Oscilloscope".
- 4.2.6. Prepare a glue.
- 4.2.7. Attach the metal band to the magnets and put the nuts on.
- 4.2.8. Add glue to the magnets and install them to the tank.
- 4.2.9. Add glue to the center of sensor surface.
- 4.2.10. Gently press the sensor to tank, bubbles and dirt in the area of installation are not allowed.
- 4.2.11. While monitoring the signal quality, tighten the nuts. When tightening the nuts exclude detaching of magnets from the tank.
- 4.2.12. Seal the nuts.
- 4.2.13. Full by glue the gap between the top of the sensor and bottom of the tank.

5. Electric connection



ATTENTION!

1. Before installation it is necessary to power OFF the electric circuit of the vehicle. To do this, use the battery circuit breaker (ground switch) or disconnect the battery connectors.
2. It is recommended to clamp Dizzi cable together with a wiring to the vehicle chassis.
3. Remember that casing of the Dizzi has electric connection with "ground" wire. Direct connection to the vehicle battery at the vehicles with battery circuit breaker (ground switch) is NOT recommended. Connect "ground" wire after the ground switch.

6. Sensor configuration

- 6.1. Measure the distance from the bottom of the tank to the maximum level.
- 6.2. Run the program "CAY_Configuration" and make necessary settings. Please, refer to the Dizzi Configuration manual.



All other software which use COM-port must be closed before writing new configuration to the sensor!

- 6.3. Make COM-port settings and choose an interface language.

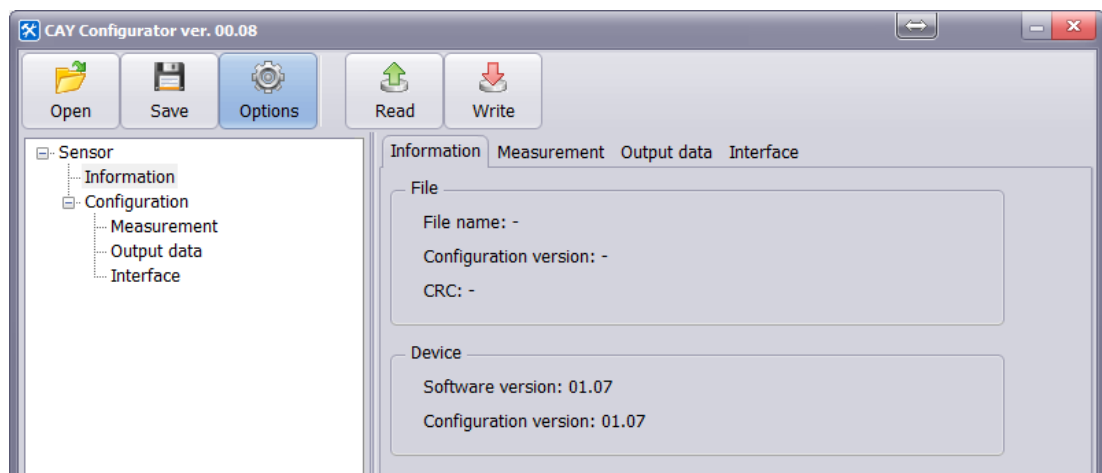


Fig. 6.1

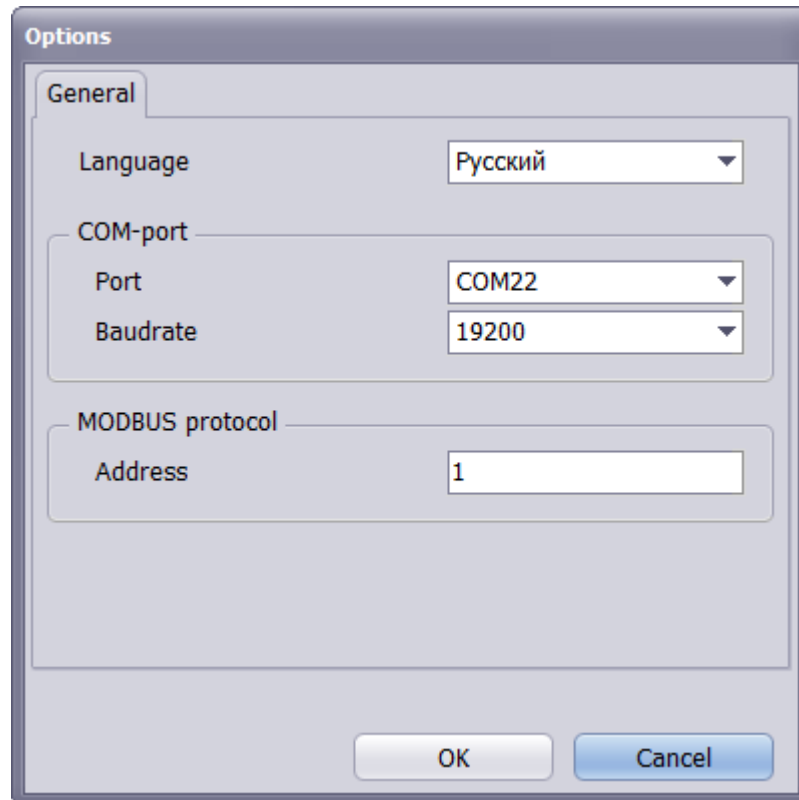


Fig. 6.2

6.4. Connect the sensor to the PC and click “Read”

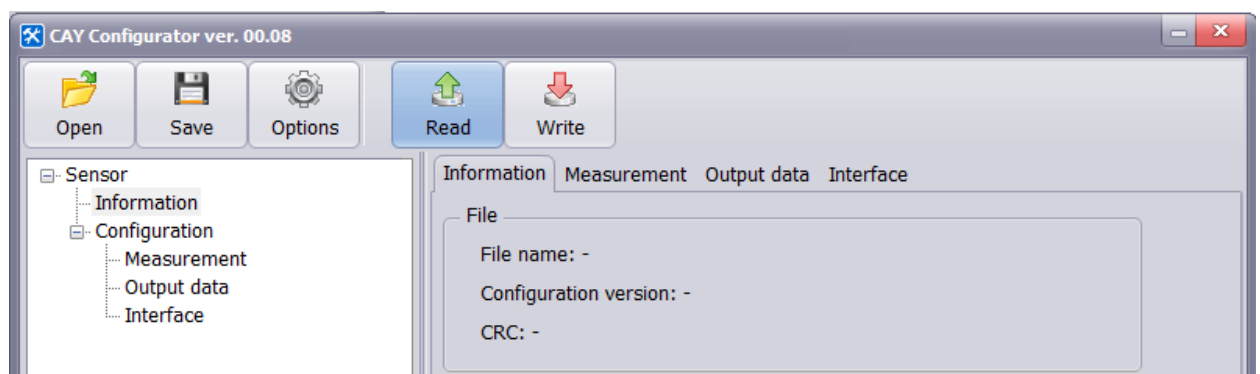


Fig. 6.3

6.5. In “Measurement” tab you can make settings:
 Choose the type of liquid

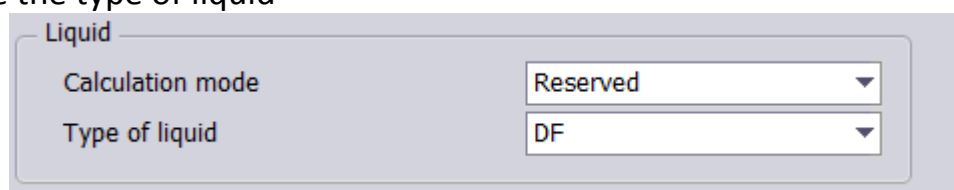


Fig. 6.4

- Reserved – you can choose from the list. (DF – diesel fuel, RON – gasoline fuel, LPG – propane.
- Minimum – Minimum measurable distance. We recommend to set no more than 30mm. At shorter distance the sensor can provide not reliable data.
- Maximum – Max measurable distance of measurement.
- Type of tank- Cylinder tanks have its own features.

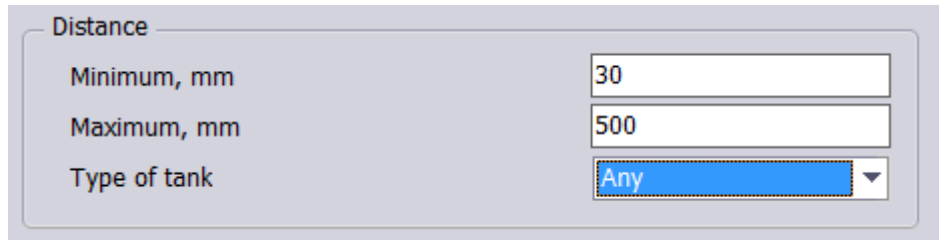


Fig. 6.5

6.6. «Output data» tab

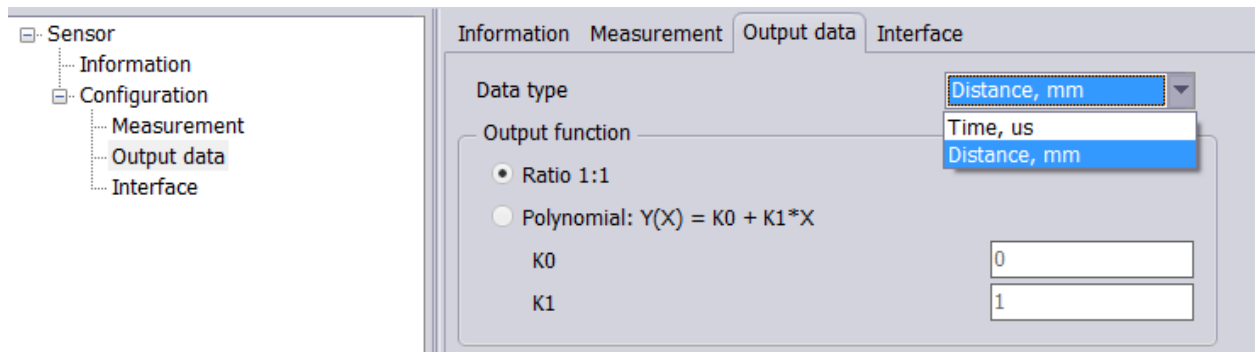
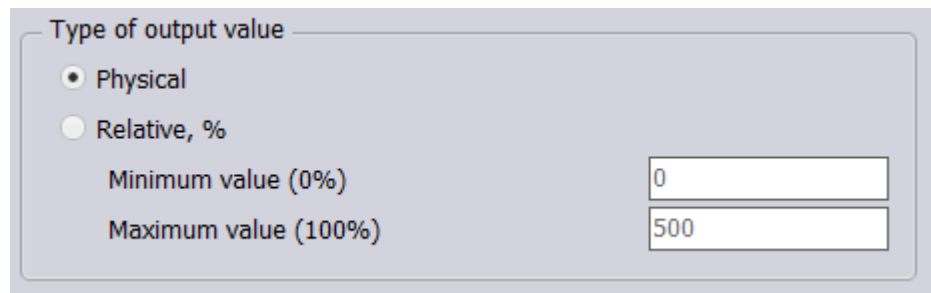


Fig. 6.6

- 6.6.1. Sensor message contains level (distance) or sound propagation time value.
- 6.6.2. Output value may have a scale factor and offset (polynomial function). For example, “distance” with 1:1 ratio will give millimeters as a sensor output value.
- 6.6.3. Type of output signal can be absolute or relative to the sensor range



Type of output value

☒ Physical

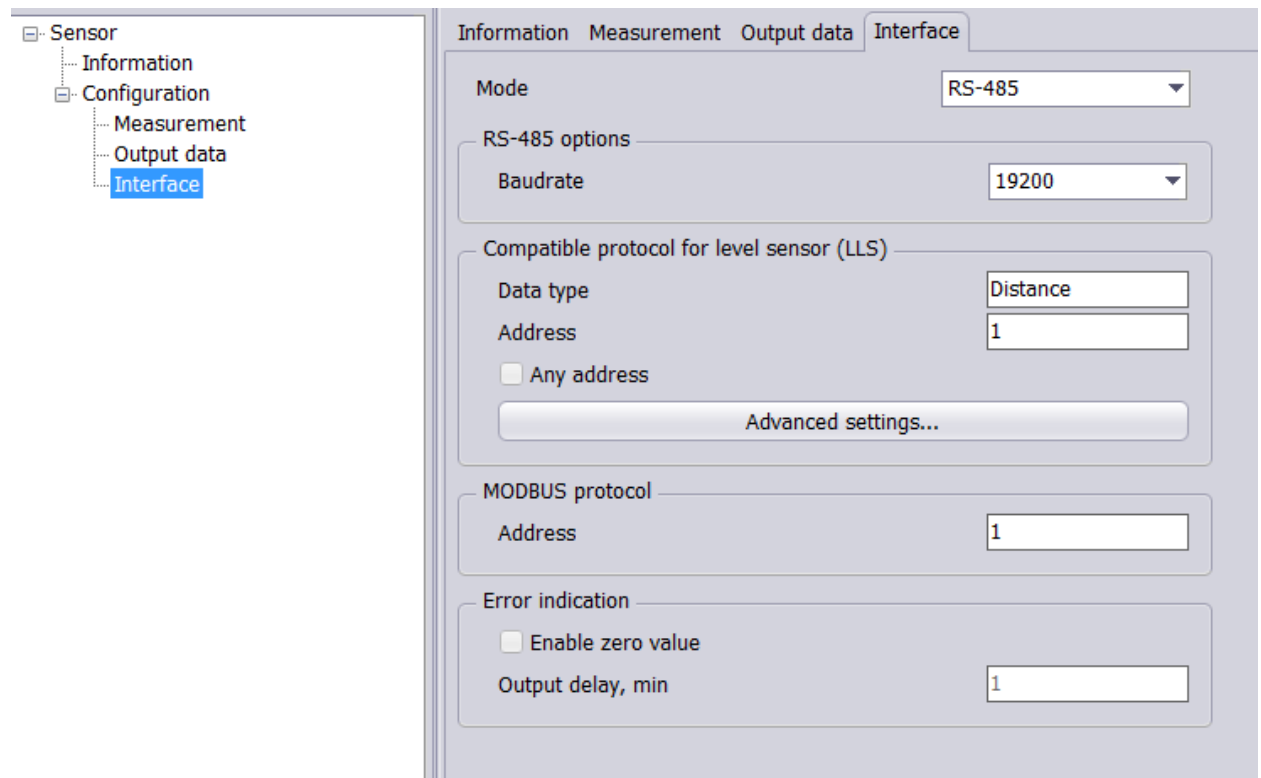
☐ Relative, %

Minimum value (0%)

Maximum value (100%)

Fig. 6.7

6.7. «Interface tab»



Sensor

- Information
- Configuration
- Measurement
- Output data
- Interface

Information Measurement Output data Interface

Mode

RS-485 options

Baudrate

Compatible protocol for level sensor (LLS)

Data type

Address

☐ Any address

Advanced settings...

MODBUS protocol

Address

Error indication

☐ Enable zero value

Output delay, min

Fig. 6.8

6.7.1. Choose the type of output interface

RS485

Fuel level sensor protocol details (LLS):

Baud rate

Address in RS485 network

MODBUS

MODBUS address (same address must be set in the Oscilloscope software).

6.7.2 Advanced settings of the LLS protocol:

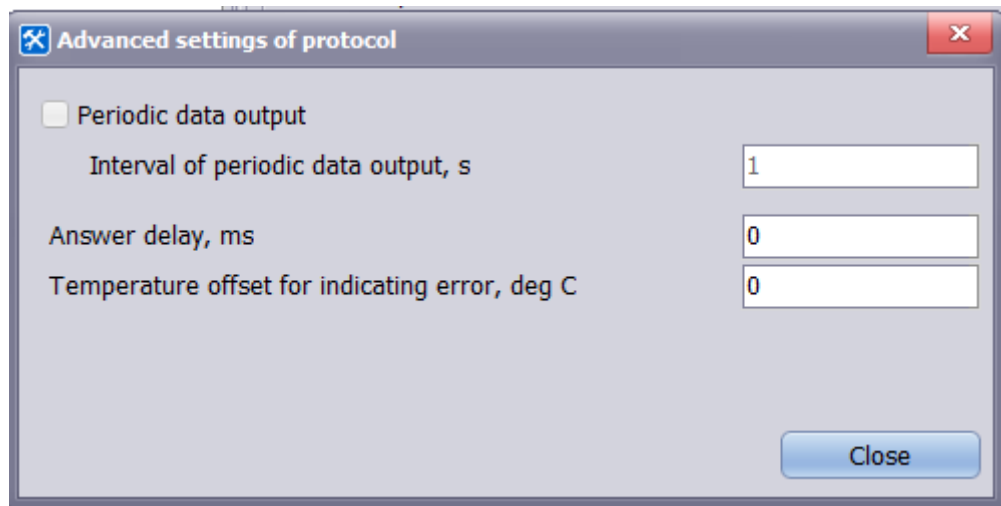


Fig. 6.9

- For some GPS trackers it is necessary to switch Periodic data output from sensor ON. You can set the interval of this event.
- Answer delay – sometimes it is required to change the sensor response time after external request.
- Temperature offset – you can set up the diagnostic code of data validity as temperature offset by pre-determined value.

6.7.3. Pulse output

FM – Frequency modulation

- Minimum value of sensor
- Maximum value of sensor
- Minimum frequency (corresponds minimum value of sensor)
- Maximum frequency (corresponds maximum value of sensor)

PWN – Pulse-width modulation

- Minimum value of sensor
- Maximum value of sensor
- Frequency
- PWM (corresponds minimum value of sensor), %
- PWN (corresponds maximum value of sensor), %

6.7.4. Error indication

Is used to show “No Signal” situation. You can choose preset value of output signal to show this error as diagnostic code.

Enable zero value. When ON – “No Signal” situation will be resulted in zero output value. When OFF – sensor sends last correct value.

Error indication

☐ Enable zero value

Output delay, min

1

Frequency for indicating error, Hz

100

Fig. 6.10

7. Tank calibration

The calibration of tank is needed to receive level -> volume table of conversion. The sensor measures the length directly in units of length and allows replacement of the sensor without new tank calibration. Calibration can be performed in several ways.

Tank refilling method. . The liquid is poured by the known portions. Both liquid level and liquid volume are registered in the table

No	Level, mm	Volume in the tank, liters
1...20		

This table is a tank characteristic and can be processed by external software.

8. Troubleshooting and repair

In case of malfunction of eurosens Dizzi please contact your dealer.
Eurosens Dizzi can be repaired only by certified service center or manufacturer.
Simple troubleshooting can be made according to the table 8.1

Problem	Possible reason	How to fix
Connection to PC		
Device error	Network address of sensor is wrong (or not correct address of sensor in configuration software)	Change an address
	Sensor cable is damaged	Fix
	Sensor is not powered ON	Connect power 12...24 B
Device is not supported	Old version of firmware	Update the software
Searching for installation place		
No signal	Arrow at display, no signal at display	See Oscilloscope software manual
	Automatic gain	Set the gain value to 19...22
	No lubrication between sensor and tank surface	Add lubrication to the sensor surface, prevent air gap
	Sensor surface (tank surface) is not parallel to the liquid surface	Change installation place or tank position
	Defects of the tank coating, corrosion	Clean the installation surface
Connection to the receiver (GSM device, etc)		
Receiver can't see the data from sensor	Receiver can't handle receive/transmit modes very fast	Set other delay value (see figure 6.7.2 of the configuration manual)
Maintenance		
Horizontal cylinder. Level drops, No signal events. Peaks during half-filled volume.	Tank is rotated relative its horizontal axis.	Align tank in proper position (sensor surface must be parallel to the horizontal plane.
Bad operation in dry weather	Glue layer is not solid.	Glue the sensor again.

9. Storage

- 9.1. Eurosens Dizzi sensors should be stored in closed, dry premises.
- 9.2. Storage is allowed only in original package at temperature from -50 to +40 ° C and relative humidity up to 100% at 25° C.
- 9.3. Do not store Eurosens flow sensors in the same room with substances that cause corrosion of the metal and / or contain active agents.
- 9.4. Storage life of eurosens flow sensors should not exceed 12 months.

10. Support

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11. Contacts

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