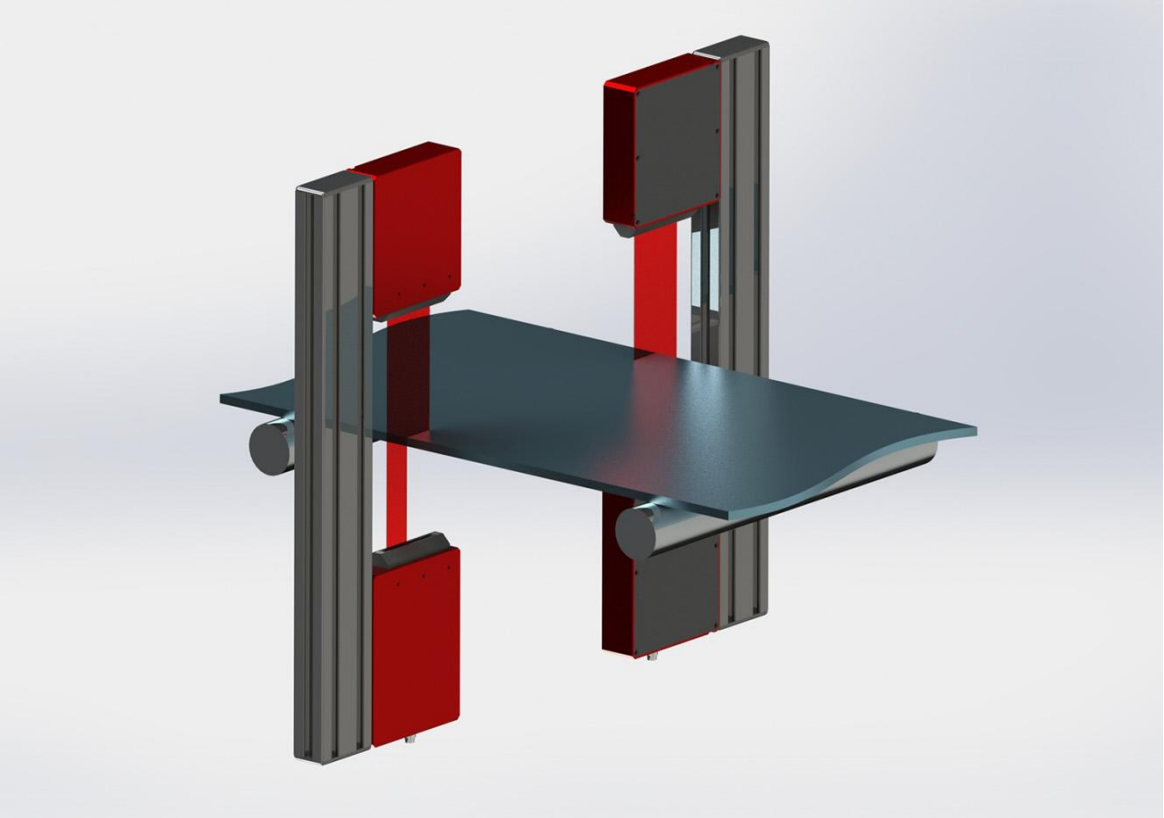


# WIDTH MEASUREMENT SYSTEM

## RF590 Series

**User's manual**

# Contents

# 1. Safety precautions

- Use supply voltage and interfaces indicated in the system specifications.
- In connection/disconnection of cables, the system power must be switched off.
- Do not use the system in locations close to powerful light sources.
- To obtain stable results, wait about 20 minutes after sensor activation to achieve uniform sensor warm-up.
- The indication device must be grounded and connected to the grounding bus by a separate branch.



# 2. CE compliance

The system has been developed for use in industry and meets the requirements of the following Directives:

- EU directive 2014/30/EU. Electromagnetic compatibility (EMC).
- EU directive 2011/65/EU, “RoHS“ category 9.

# 3. Laser safety

The system makes use of optical micrometers containing light-emitting diodes. Micrometers belong to Class 1 according to IEC/EN 60825-1:2014. The following warning label is placed on the housing:


The following safety measures should be taken while operating the micrometer:

- Avoid staring into the laser beam during a prolonged time period.
- Do not disassemble the micrometer.

# 4. General information

The system is intended for non-contact measuring of width of sheet materials such as tapes, boards, plates, and so on. It is a stand-alone software and hardware system that contains optical micrometers and the indication device.

System parameters can be changed for a specific task.

# 5. Structure and operating principle

The measurement method is based on the use of Optical micrometers (micrometer), which measure the position of edges of sheet material.

Depending on the width of the object, two versions of the system are possible: the system with one micrometer and the system with two micrometers.

## 5.1. Optical micrometers

The micrometer operation is based on the so-called 'shadow' principle. The micrometer consists of two blocks – transmitter and receiver. Radiation of a LED is collimated by a lens. With an object placed in the collimated beam region, shadow image formed is scanned with a CCD photo-detector array. A processor calculates the position of the object (sheet material) from the position of the shadow border (borders). The system can contain optical micrometers of RF651 series or of RF656 series:

https://riftek.com/eng/products/~show/sensors/optical-micrometers

## 5.2. System configuration



Depending on the width of the object, two versions of the system are possible: the system with one micrometer (the working range of the micrometer is greater than the width of the object), Scheme #1, and the system with two micrometers (the width of the object is greater than the working range of the micrometer), Scheme #2.

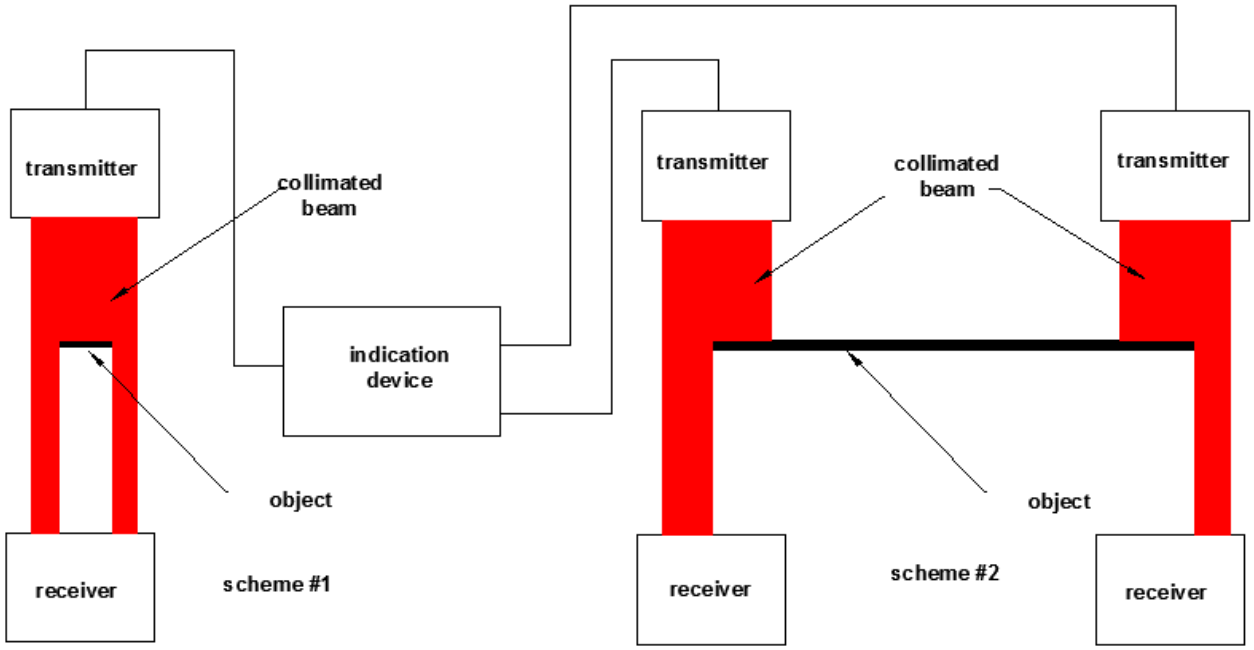



**Figure 1. Scheme #1 with one micrometer (left) and Scheme #2 with two micrometers (right)**

## 5.3. Indication device

The indication device is intended to receive information from micrometers, analyze and display the measurement results.

Micrometers must be connected via the special connectors mounted on the housing of the indication device. The LCD display with the touch screen shows information. When the width value exceeds the tolerances, the operator will be notified by an audible alarm. The width value output is based on the analysis of values received from the micrometer (micrometers) and calculated for the given averaging time, and is repeated with periodicity equal to the averaging time.

Overall and mounting dimensions of the indication device:

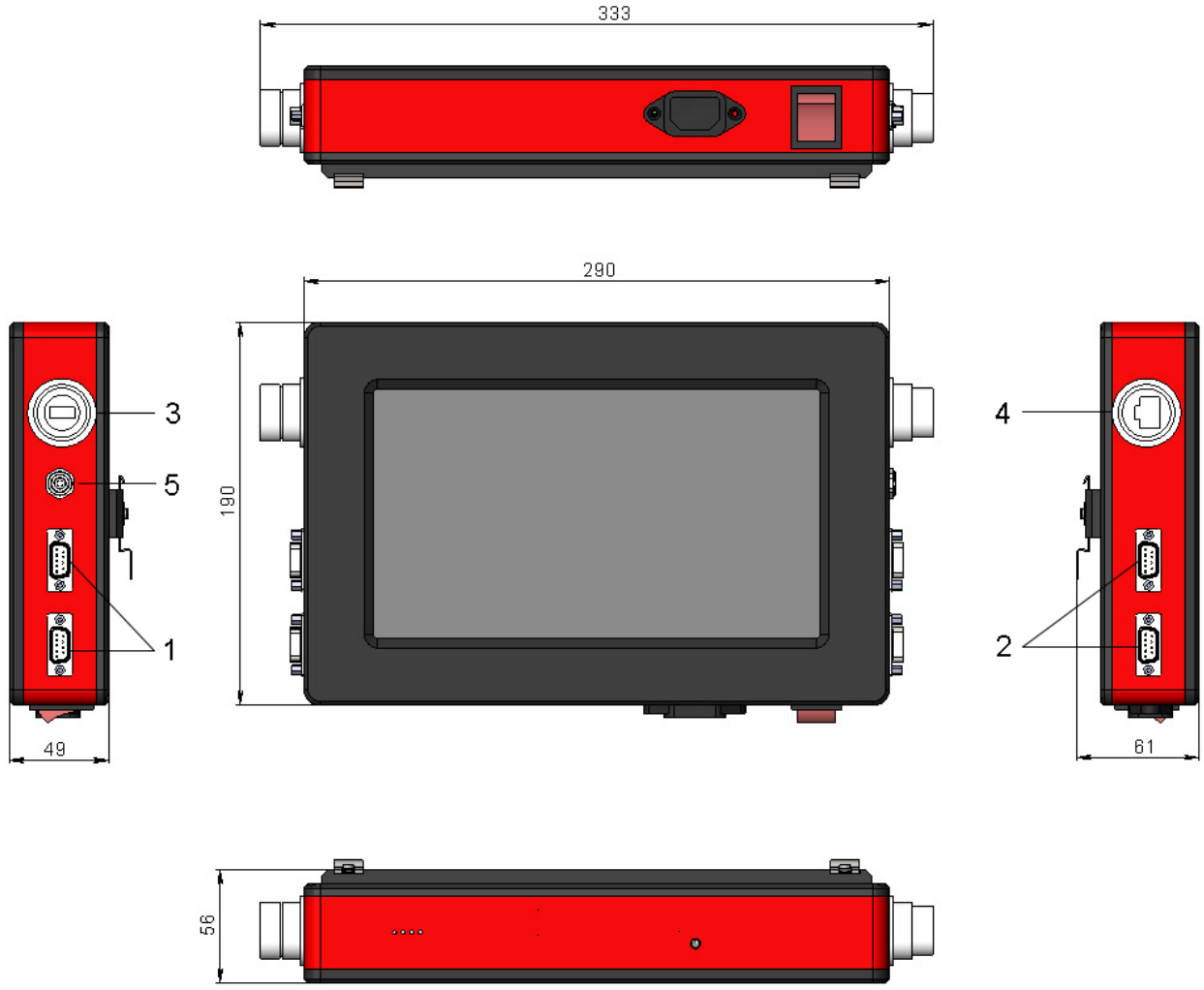



**Figure 2. Overall and mounting dimensions of the indication device**

Designations:
1 - DB9 connectors for connecting the micrometers;
2 - DB9 connectors for connecting the micrometers;
3 - USB;
4 - Ethernet;
5 - Encoder input and Logical output.

# 6. Basic technical data

| Parameter | | Value |
|---|---|---|
| Width measurement range, mm | | by request |
| Width measurement accuracy, µm | | up to +\-1 µm, depending on the accuracy of the micrometer used in the system |
| Input interface (micrometers connection) | | RS485 |
| Output interface (result transfer) | | Ethernet |
| Logical output (OK/NOK) | | Open collector |
| Encoder input | | TTL |
| Software update, data transfer | | USB |
| Measurement speed, measurements/second | | up to 10000 |
| Power supply, V | | 220 V (±10 %) AC, with frequency of 50 (±1) Hz |
| Power consumption, W | | 10 |
| Operating conditions | Ambient temperature, °C | +1..+35 |
| | Relative humidity, % | 65 (at 25°C) |

**Note:** System parameters can be changed for a specific task.

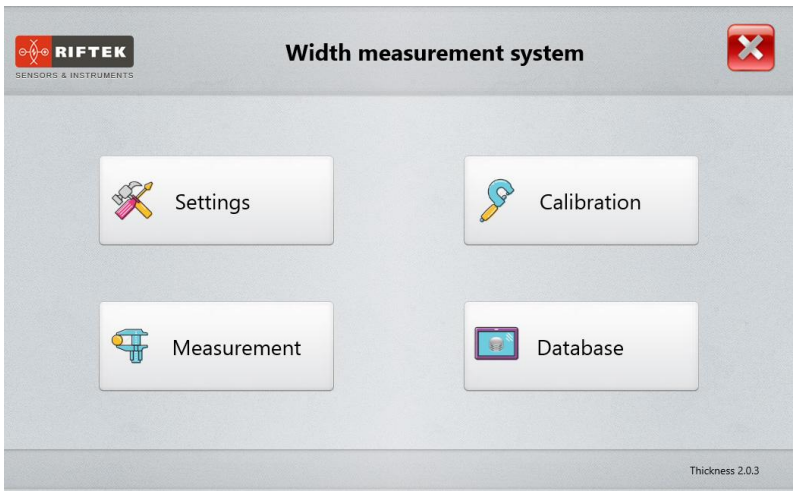
# 7. Example of item designation when ordering

**RF590-MIN/MAX-SERIAL-N**

| Symbol | Description |
|---|---|
| MIN | Minimum width of the controlled object. |
| MAX | Maximum width of the controlled object. |
| SERIAL | Type of the micrometer serial interface: RS485 - 485, or Ethernet - ET. |
| N | Number of logic outputs. |

# 8. Service program

When you switch on the indication device, the main program window appears:




Buttons assignment:

| Button | Assignment |
|---|---|
| Settings | Open the "Settings" window. |
| Measurement | Open the "Thickness measurement" window. |
| Calibration | Calibrate the system. |
| Database | Browse the database. |

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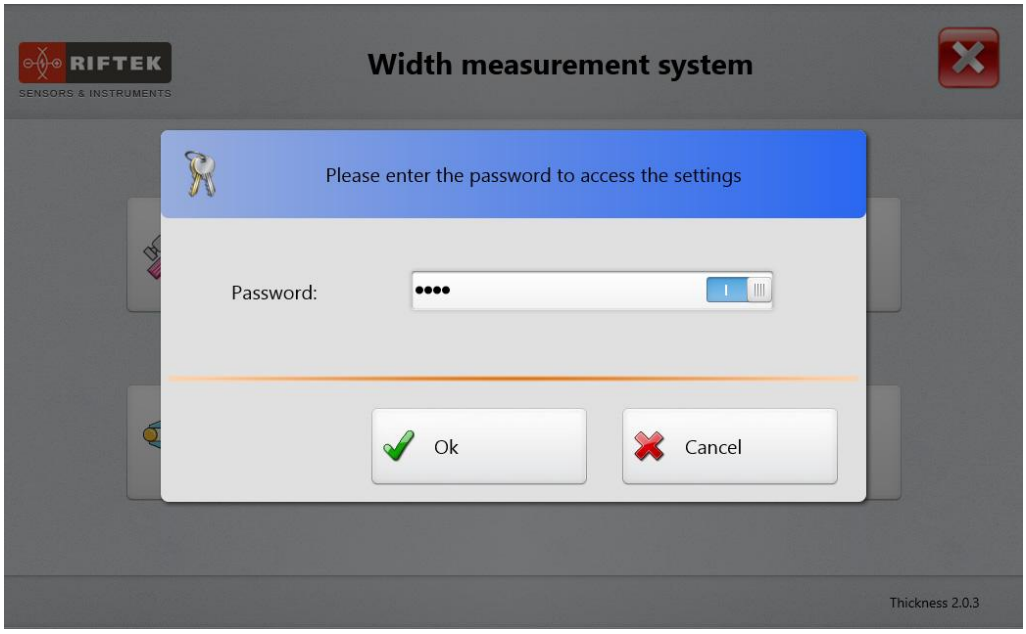
## 8.1. Settings

Before starting to work with the system, it is necessary to configure parameters. Tap the **Settings** button in the main window. The program will require a password. When initially installed, the program accepts the following password: 1111. Enter the password and tap **Ok**.

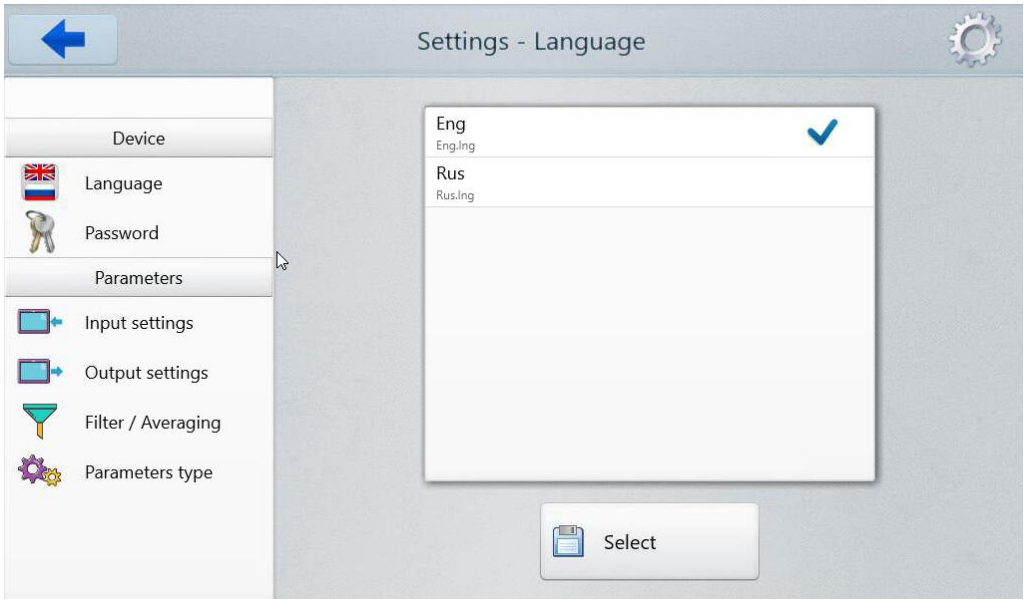



How to change the password, see Par. 8.1.1.2.

### 8.1.1. Device settings

#### 8.1.1.1. Language

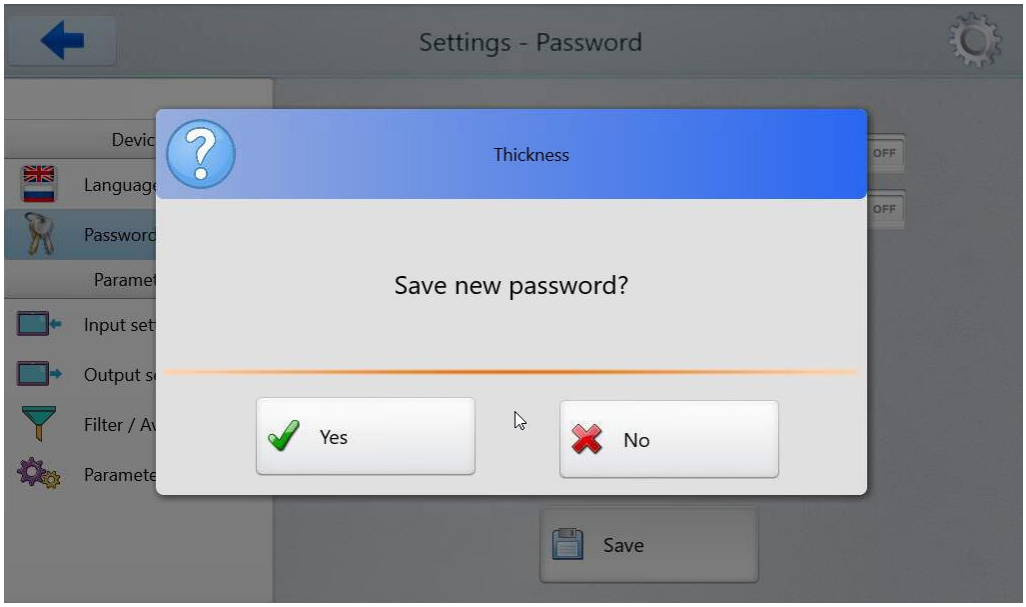
In order to change the language of the program, tap **Language**, select the language support file, and tap **Select**.



### 8.1.1.2. Password

To change the password, tap **Password**. Then enter a new password, confirm it, and tap **Save**.


The program will prompt you to confirm the action:

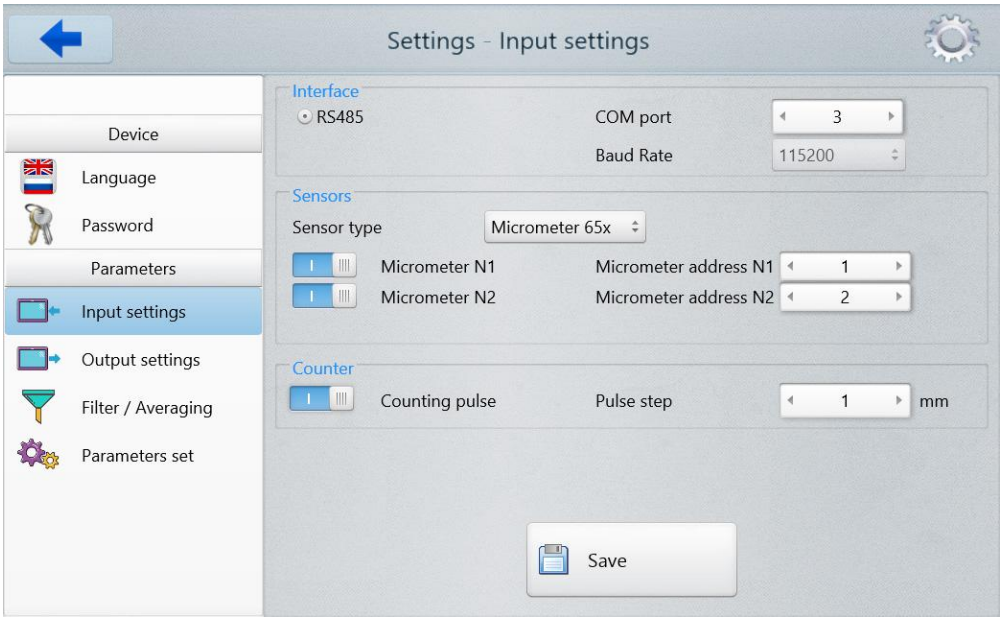



Select "Yes" to save a new password, or select "No" to cancel the action.

## 8.1.2. Parameters

### 8.1.2.1. Input settings

The **Input settings** tab:




In the Interface settings area, the user can specify the COM port number and the baud rate.

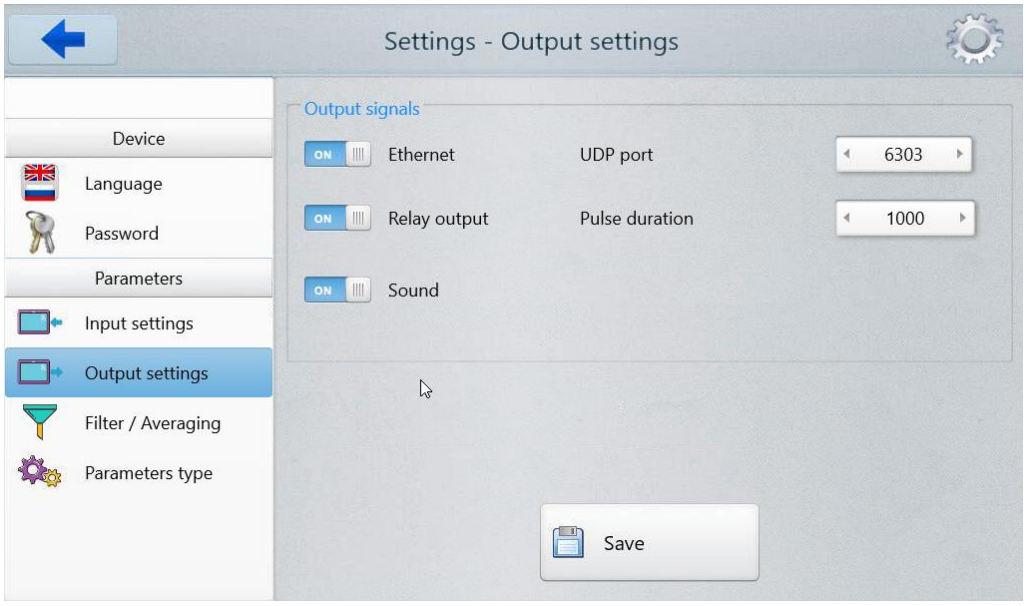
In the Sensors settings area, the user can select the sensor type (60x or 65x), enable the sensors (ON / OFF buttons), and specify their network addresses.

In the Counter settings area, the user can enable the counter and specify the pulse step. **Note:** In this case, the pulse means, for example, the pulses from the encoder that characterize the movement of the object under control.

To save the changes, tap **Save**.

### 8.1.2.2. Output settings

The **Output settings** tab:

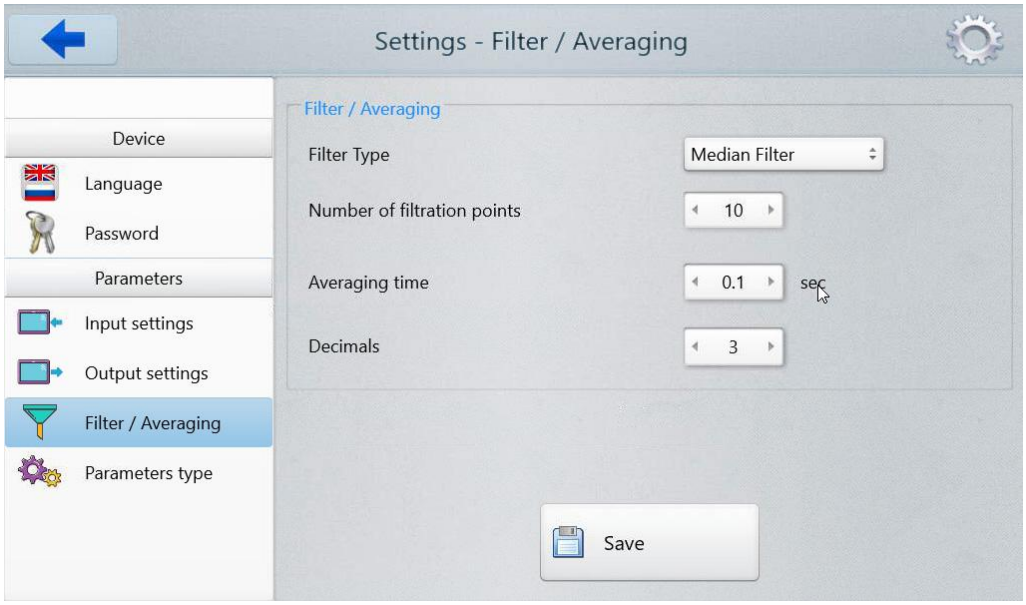


In the **Output settings** tab, the user can:
- enable the Ethernet interface;
- specify the UDP port;
- enable the relay output;
- enable an audible alarm ("Sound");
- specify the audible alarm duration ("Pulse duration").

To save the changes, tap **Save**.

### 8.1.2.3. Filter / Averaging

The **Filter / Averaging** tab:




Filtering is intended to lower the noise of the measurement signal which results in a better resolution. The description of parameters is given in the table below.

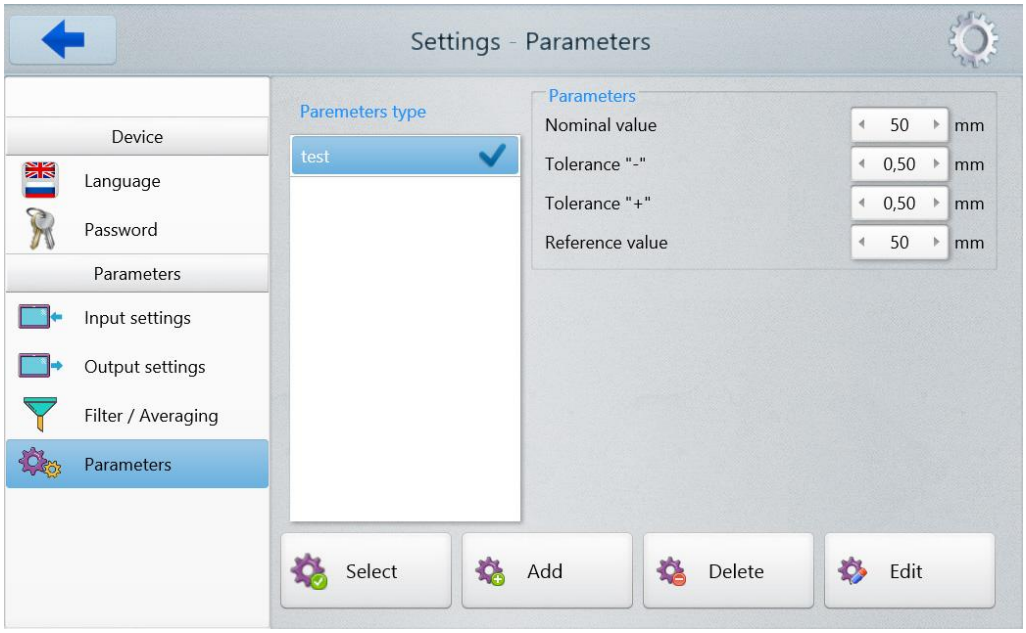
| Parameter | | Description |
|---|---|---|
| Filter type | No filtering | Without filtering. |
| | Moving Average | The selectable number of filtration points for successive measured values is used to calculate and issue the arithmetic average. Each new measured value is added, the first (oldest) measured value is removed from the averaging. |
| | Median Filter | The median is formed from a preselected number of filtration points for measurement values. The incoming measured values are also sorted again after each measurement. Afterwards, the average value is output as the median. If an even number is selected as a number of filtration points, the two average measurement values are added and divided by two. |
| Number of filtration points | | This parameter is used to specify the number of measurement values to which the filter applies. |
| Averaging time | | The time for which the measurement results will be output/saved (for example, every 0.1 s). |
| Decimals | | The number of decimals for the measurement results. |

To save the changes, tap **Save**.

### 8.1.2.4. Parameters type

To work with the system, you need to select a set of parameters that will be used when you start the measurement process.

The **Parameters** tab for the measurement system:




- ***Selecting a set of parameters***

To select a set of parameters for using in the measurement process, tap it in the list of sets, and then tap the **Select** button.

- ***Adding a new set of parameters***

Tap the **Add** button, specify the nominal value, tolerances, and reference value.

- ***Deleting a set of parameters***

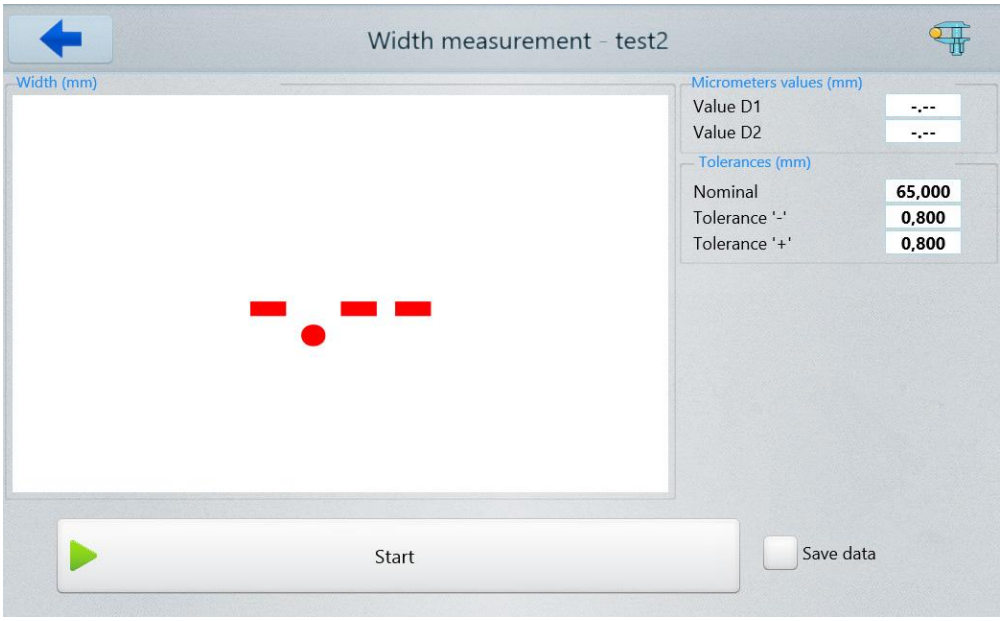
Tap it in the list of sets, and then tap the **Delete** button.

- ***Editing a set of parameters***

Tap it in the list of sets, and then tap the **Edit** button.

## 8.2. Measurement

Tap the **Measurement** button in the main window. On the screen:

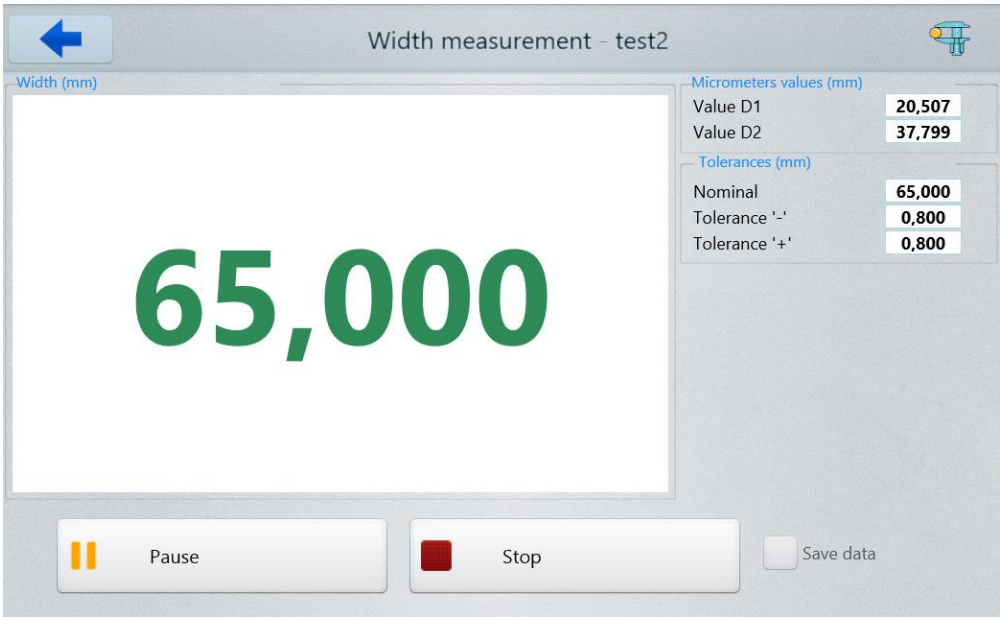



This window displays:

- name of the selected set of parameters (to the right of the window name);
- current width value (big green (or red) digits);
- values from the micrometers (**Value D1** and **Value D2**);
- nominal width value (**Nominal**);
- tolerances (**Tolerance '-'** and **Tolerance '+'**).

Tick the **Save data** box, if you want to save the measurement data to the database.

To start the measurement process, tap the **Start** button. On the screen:




If needed, you can tap the **Stop** button to stop the measurement process, or tap **Pause** to pause the measurement process.

When the width value does not exceed the tolerances, it will be displayed in green color, otherwise - in red color.

## 8.3. Calibration

The width of the object is controlled within the working range of the micrometer (micrometers). For the measurement according to Scheme #1 (one micrometer), the calibration is not required. For Scheme #2 (two micrometers), it is necessary to perform the calibration procedure using the object of the known width.

Follow the steps below to perform the calibration procedure properly:

- Install the sample of the known thickness in the control area.
- Go to the **Settings** window. Tap **Parameters**, select a set of parameters, and make sure that the value in the **Reference value** field corresponds to the actual sample thickness value. If it doesn't, enter the actual sample thickness value into the **Reference value** field.
- Go back to the main menu and tap the **Calibration** button. The **Calibration** window appears. You will see a name of the selected set of parameters to the right of the window name. The **Calibration** window:


- Tap the **Connect** button in order to connect to the micrometers.

The **Calibration** window:

- Tap the **Start** button in order to start the measurement process. Parameters **Value D1**, **Value D2**, **Width** and **Calibration point** take values equal to the values of micrometers in the micrometer coordinate system.
- Tap the **Calibration** button in order to start the calibration process. Parameters **Value D1**, **Value D2** and **Calibration point** are the values of micrometers in the micrometer coordinate system. The **Width** parameter (sample width value) takes values equal to the values of the micrometer in the coordinate system of a base surface, on which the sample is installed. The **Calibration** window:


- If the **Width** value is equal to the **Reference value**, it means that the calibration procedure was done properly. Tap the **Save** button.

## 8.4. Database

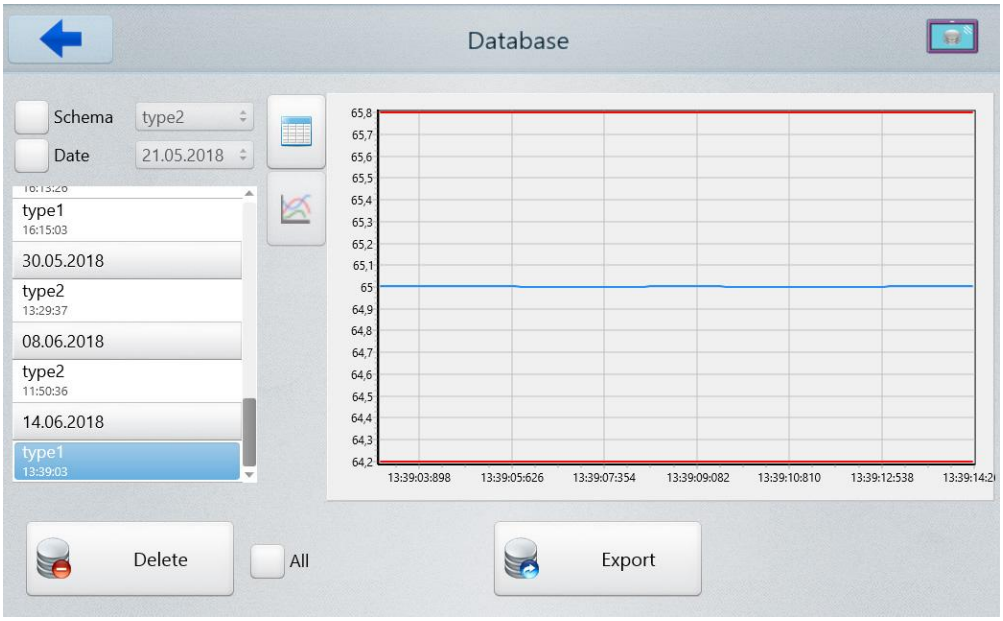
During the system operation, the thickness values are written to the database (if the **Save data** option is enabled, see Par. 8.2.).

Tap the **Database** button in the main window. The **Database** window appears.

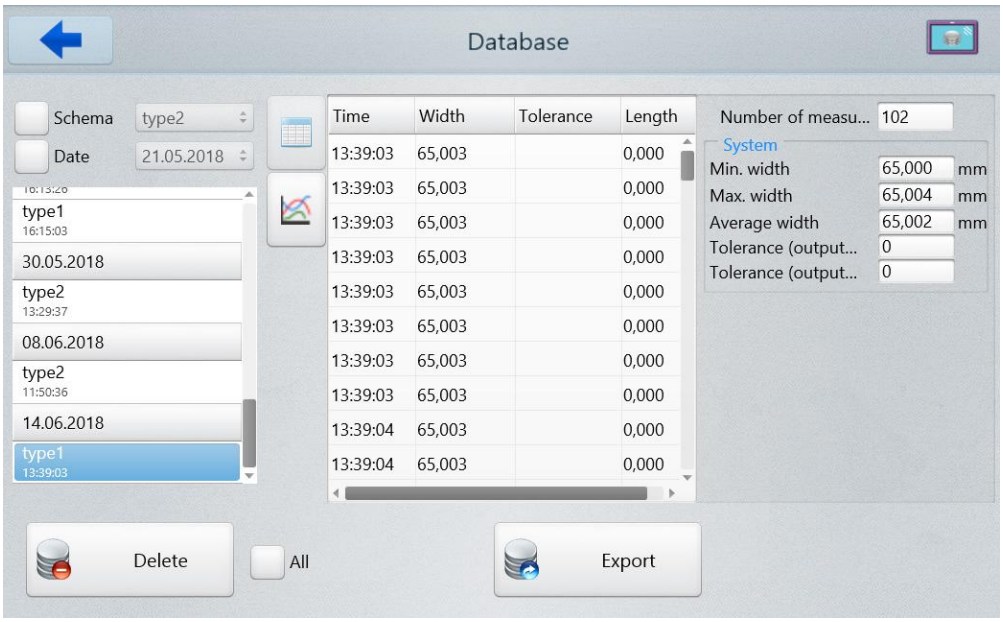
Select a set of measurements (you can find a list of sets to the left side of the window).

The data can be presented both in graphical form and in tabular form.

To browse the data in graphical form, tap  . On the screen:




To browse the data in tabular form, tap  . On the screen:




To work with the table, use a vertical scrollbar.
To delete a single measurement, tap it in the table and then tap the **Delete** button.
To delete all measurements, tick the **All** box, and tap the **Delete** button.
The data can be exported to CSV, XLS, and XML.
To export the data, tap the **Export** button, and select a format.

# 9. Operating the system

Follow the steps below:

- Install the micrometers.
- Set parameters (see Par. 8.1.2).
- Perform the calibration procedure (see Par. 8.3).
- Start the measurement process (see Par. 8.2).

## 9.1. Ethernet interface

The Ethernet interface is used only to transmit the width value.

### 9.1.1. Factory parameters table

| Parameter | Value |
|---|---|
| Destination IP address | 192.168.1.200 |
| Gateway IP address | 192.168.1.1 |
| Subnet mask | 255.255.255.0 |



### 9.1.2. Data packet format

The sensor transmits the UDP packet to destination port 6303.
The packet consists of a header field (8 bytes) and a data field (4 bytes).
Data field:
- byte 0, byte 1 : beginning of the packet - [0x55,0xAA]
- byte 2, byte 3 : device serial number
- byte 4, byte 5 : packet number
- byte 6, byte 7 : data size - [4 bytes]
- byte 8, byte 9, byte 10, byte 11: measurement result

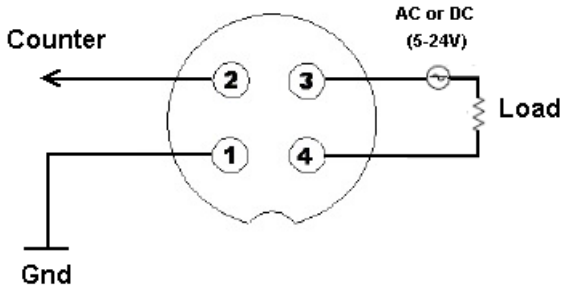
Example of data packet:
55h, AAh, 6Dh, 5Dh, 79h, 02h, 04h, 00h, 8Ah, C0h, 08h, 00h
55h, AAh - beginning of the packet
6Dh,5Dh - device serial number [s\n 23917]
79h, 02h - packet number [cnt = 633]
04h, 00h - data size [4 bytes]
8Ah, C0h, 08h, 00h - data [D = 0008C08Ah = 573578]
The result (in mm) is calculated by the following formula:
X=D/10000 = 573578/10000 = 57,3578 mm

## 9.2. Encoder input and Logical output

The open collector is triggered when the width value exceeds the tolerance.
View from the side of connector contacts used in the system is shown below.

**Binder on cable**

**pins 1,2 - Pulse input**
**pins 3,4 - Relay output**



# 10. Technical support

Technical assistance related to incorrect work of the system and to problems with a service program is free.

Requests for technical assistance should be addressed to fae@fae.it, or by phone 02 55187133.

# 11. Warranty policy

Warranty assurance for the Width Measurement System RF590 Series - 24 months from the date of putting in operation; warranty shelf-life - 12 months.



# 12. Revisions

| Date | Revision | Description |
|---|---|---|
| 18.06.2018 | 1.0.0 | Starting document. |

# 13. Distributors

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