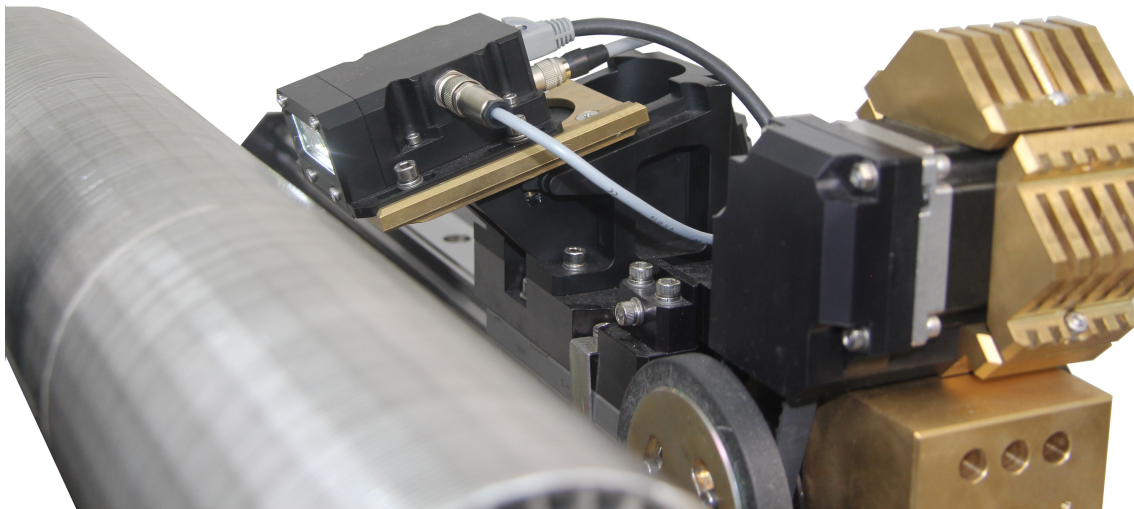




**RIFTEK**  
Sensors & Instruments



# WIRE FILTER SLOT GAPS INSPECTION MACHINE

**User's manual**

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## 1. Safety precautions

- Only persons who have studied this User's Manual are allowed to operate the Wire Filter Slot Gaps Inspection Machine (hereinafter referred to as the "machine").
- Use supply voltage and interfaces indicated in the specification.
- When connecting/disconnecting cables, the machine must be powered off.

## 2. CE compliance

The machine 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.

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## 3. General information

The machine is designed for non-contact automated control of the dimensions of wire filter gaps (Johnson filters).

## 4. Controlled parameters

The figure below shows the types of wedge wire used in filters and the parameter to be controlled. Each slot gap is measured, the result is displayed in digital and graphical form. The measurement results are controlled for going beyond the specified tolerances.

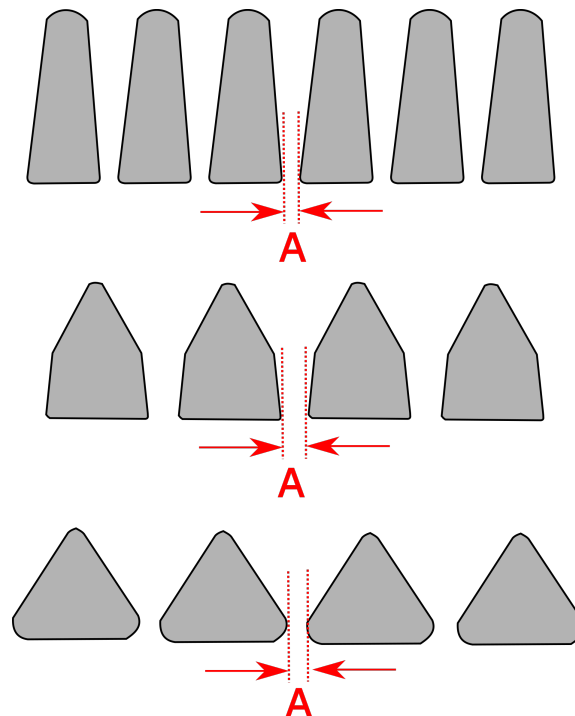


Figure 1 - Controlled parameters

Designations:

A - filter gap width.

## 5. Structure and operating principle

### 5.1. Structure

The machine contains a frame (1) installed along the filter. The frame carries the linear motion system (2). An industrial camera (4) with LED illumination is installed on the carriage (3) of the linear motion system. In the extreme position of the carriage (outside the controlled filter), the calibration template (5) is installed. The machine is powered and controlled via a central computer using specialized software.

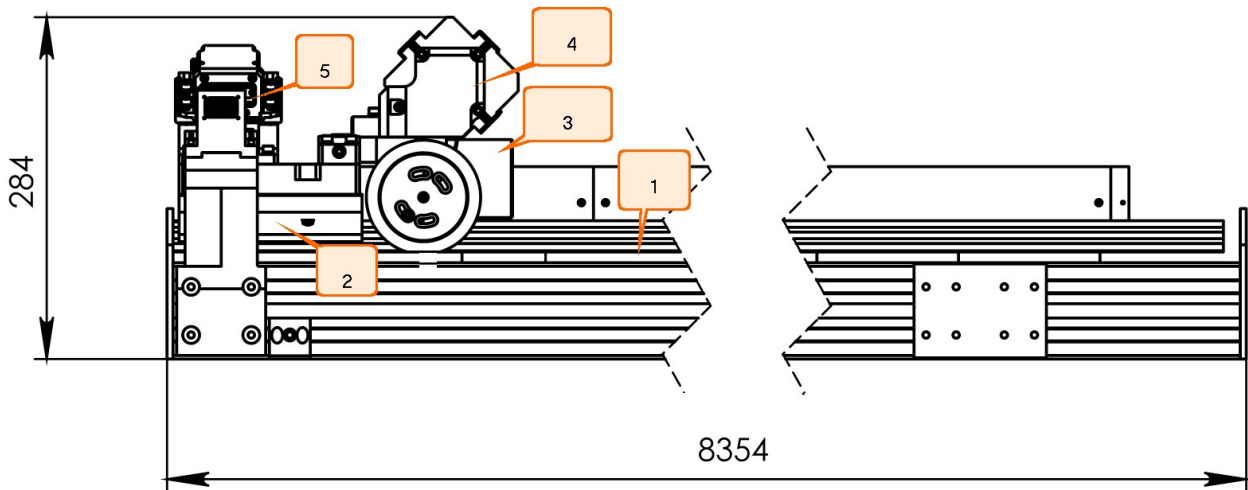


Figure 2 - Block diagram and general view of the system

### 5.2. Overall and mounting dimensions

The overall dimensions of the machine are shown in Figure 2. The overall dimensions of the central computer rack are shown in Figure 3.

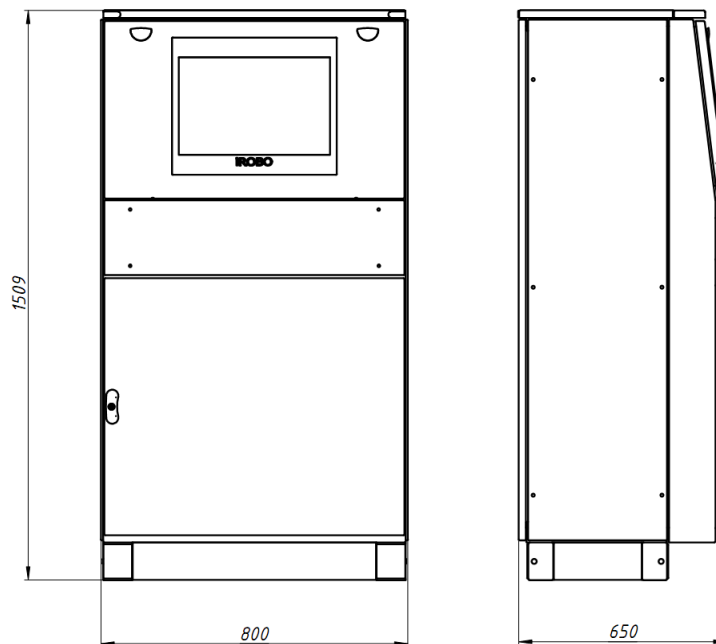


Figure 3 - The overall dimensions of the central computer rack

### 5.3. Operating principle

The machine is installed along the filter. The industrial camera is placed in such a way that its field of view is located in the diametrical section of the filter. The camera moves along the filter and captures the image of its surface. Before scanning the filter, the system is auto-calibrated by measuring the built-in template. The software analyzes the received image and calculates the dimensions of the gaps. The process is repeated for different positions of the filter as it gradually rotates around the axis.

Data from the camera is processed on the central computer. If the values of the parameters go beyond the specified limits, a corresponding warning is displayed on the screen of the central computer.

## 5

## 6. Basic technical data

### 6.1. System

Parameter	Value
Measurement object	Wire filters
Controlled filters length, up to, m	8 (can be changed on request)
Controlled gaps, mm	0.05...2
Wire width, mm	1...4
Gap measurement error, mm	$\pm 0.010$ (when the curvature of the part is within $\pm 4$ mm)
Scan speed, up to, mm/s	100
Power supply	Three-phase AC network with frequency $(50 \pm 1)$ Hz, rated voltage 220/380 V with voltage tolerance $\pm 10\%$
Power consumption, W	400
Operating mode	Round-the-clock operation
Operating conditions	Workshop (temperature 10...30°C, relative humidity at T=25°C no more than 80%)
Readjustment for measuring another part	Not required if readjustment is not associated with a shift in the position of the filter axis outside the scan area
Computer	Industrial computer, 19" touch screen
Computer console dimensions, mm	1509x800x550

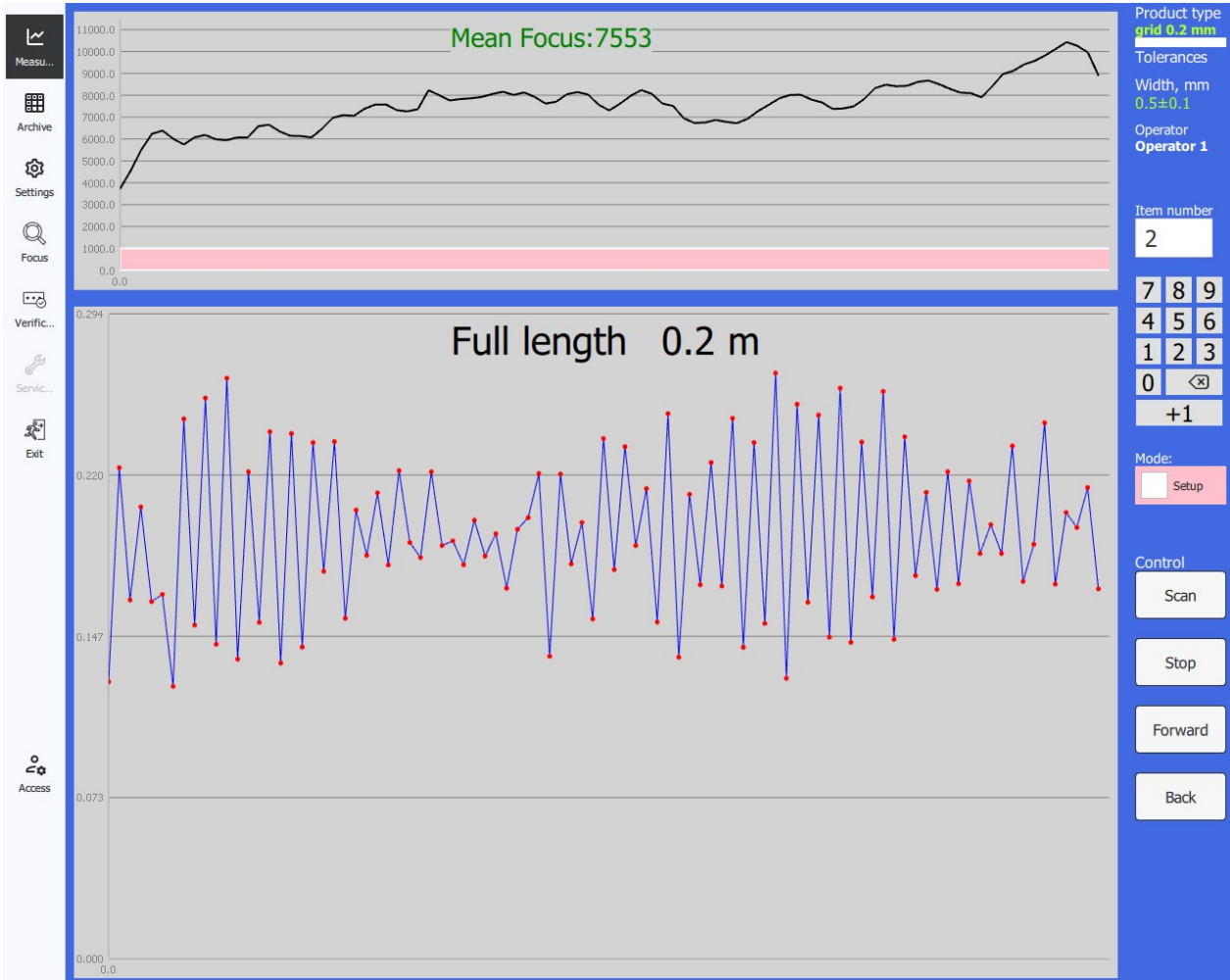
### 6.2. Camera

Parameter	Value
<b>Industrial camera</b>	
Scan area size, pixels	1440x100
CE compliance	RoHS, FCC Class B, CE, IP30, GenlCam, UL, KC, EAC
Operating ambient temperature, °C	0...+50

## 7. Software

### 7.1. Main window

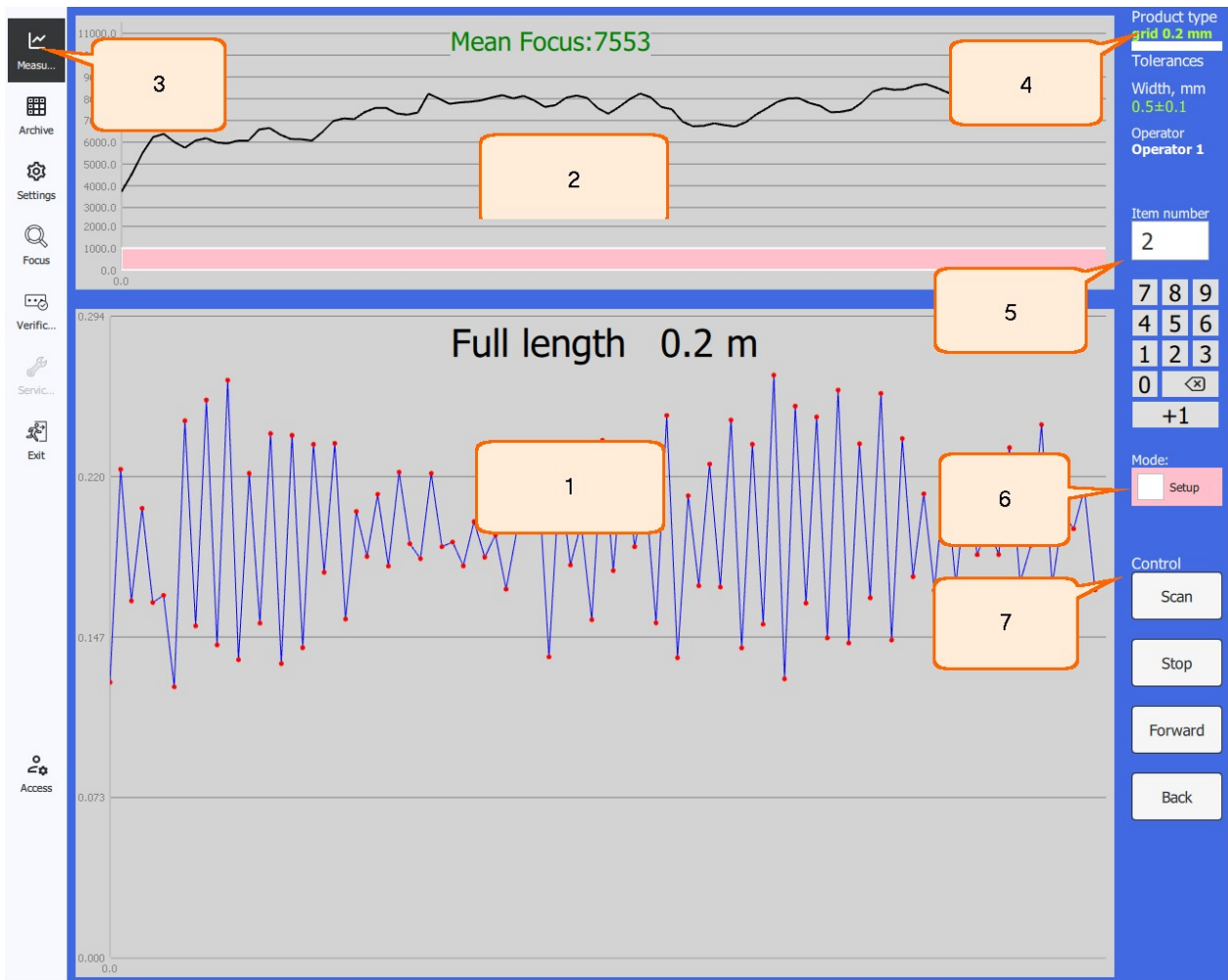
After turning on the power of the system, the main program window will appear on the screen of the central computer:



In the left part of the window there are menu buttons for selecting operating modes and configuring system settings. In the central part there is a window for displaying the results. The results are displayed depending on the selected mode - graphs, tables, camera images, etc. In the right part of the window there are buttons for controlling the motor of the linear motion system and the scanning process.

## 7.2. "Measurement" section

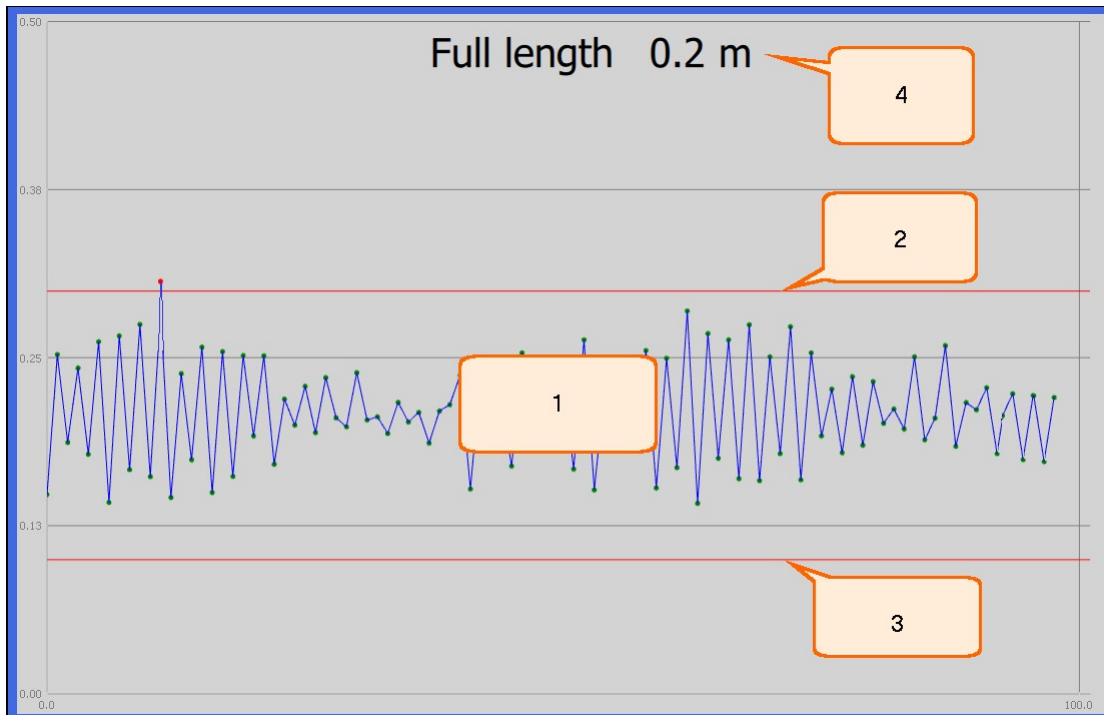
The **Measurement** section is designed to display the measurement results and control the geometric parameters of wire filter gaps.



#	Name	Description
1	"Gap size graph" panel	Displays the measured width of the wire filter gaps.
2	"Focus graph" panel	Displays the focus quality.
3	"Measurement" button	Designed to go to the "Measurement" section.
4	"Information" panel	Displays the current system settings (product type, tolerances, operator name).
5	"Current item" panel	Displays the serial number of the item being measured.
6	"Mode" checkbox	Sets the operating mode: setup or measurement.
7	"Motor control" panel	Designed to start/stop the scanning process, as well as to control the movement of the motor.

### 7.2.1. "Gap size graph" panel

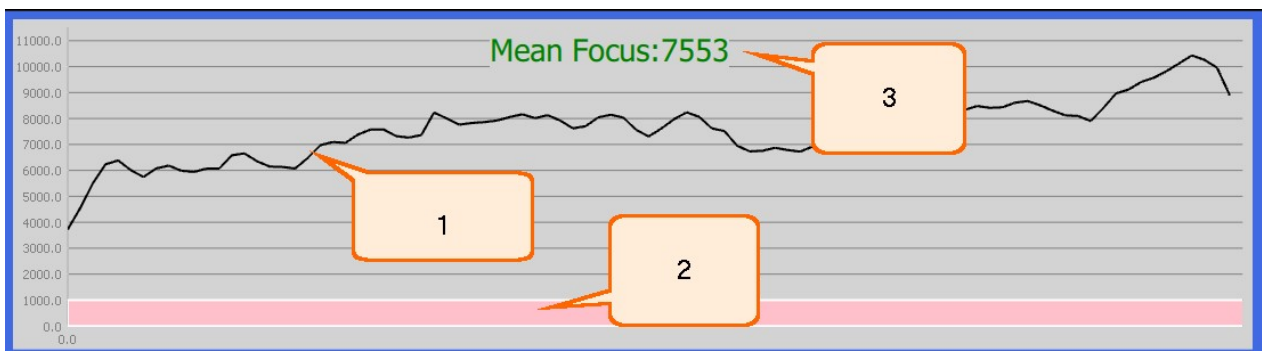
This panel is designed for graphical display and control of measurement results.



#	Name	Description
1	Gap width graph	Displays the measured width of the wire filter gaps. If the width is within the tolerances, the points on the graph are displayed in green, otherwise they are in red.
2	Upper tolerance line	Displays the upper tolerance value as a horizontal line.
3	Lower tolerance line	Displays the lower tolerance value as a horizontal line.
4	Total length	The total length of the wire filter in meters.

### 7.2.2. "Focus graph" panel

This panel displays a parameter that characterizes the quality of focusing of the surface of the measured wire filter. As the distance between the camera lens and the filter surface increases or decreases, the quality of focus deteriorates and the value of the parameter decreases. A distinctive feature of the system is the automatic correction of the measurement result depending on the quality of focusing, which is especially important when measuring curved filters. The declared accuracy is maintained when the filter curvature is up to  $\pm 4$  mm.



#	Name	Description
1	Focus value graph	This parameter characterizes the quality of focus.
2	Nominal focus level	The level is estimated automatically and affects the amount of focus correction that can be enabled in the settings.
3	Mean focus value	Displays the mean focus value.

### 7.2.3. "Information" panel

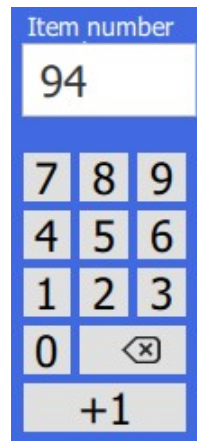
This panel displays the measured width of the wire filter gaps, product type, and operator's name.



Settings can be changed in the **Settings** menu (see [Main window](#)).

### 7.2.4. "Current item" panel

This panel displays the serial number of the measured product under which it will be stored in the database.



The operator can use the virtual keyboard to enter the serial number of the product or increase the current serial number by 1. By default, the last serial number (increased by 1) of this type of product from the database is used.

### 7.2.5. "Mode" checkbox

Use this checkbox to set the operating mode: setup or measurement.



In the "Setup" mode, the scan results are displayed on the screen and are not written to the database.

In the "Measurement" mode, the scan results are saved to the database.

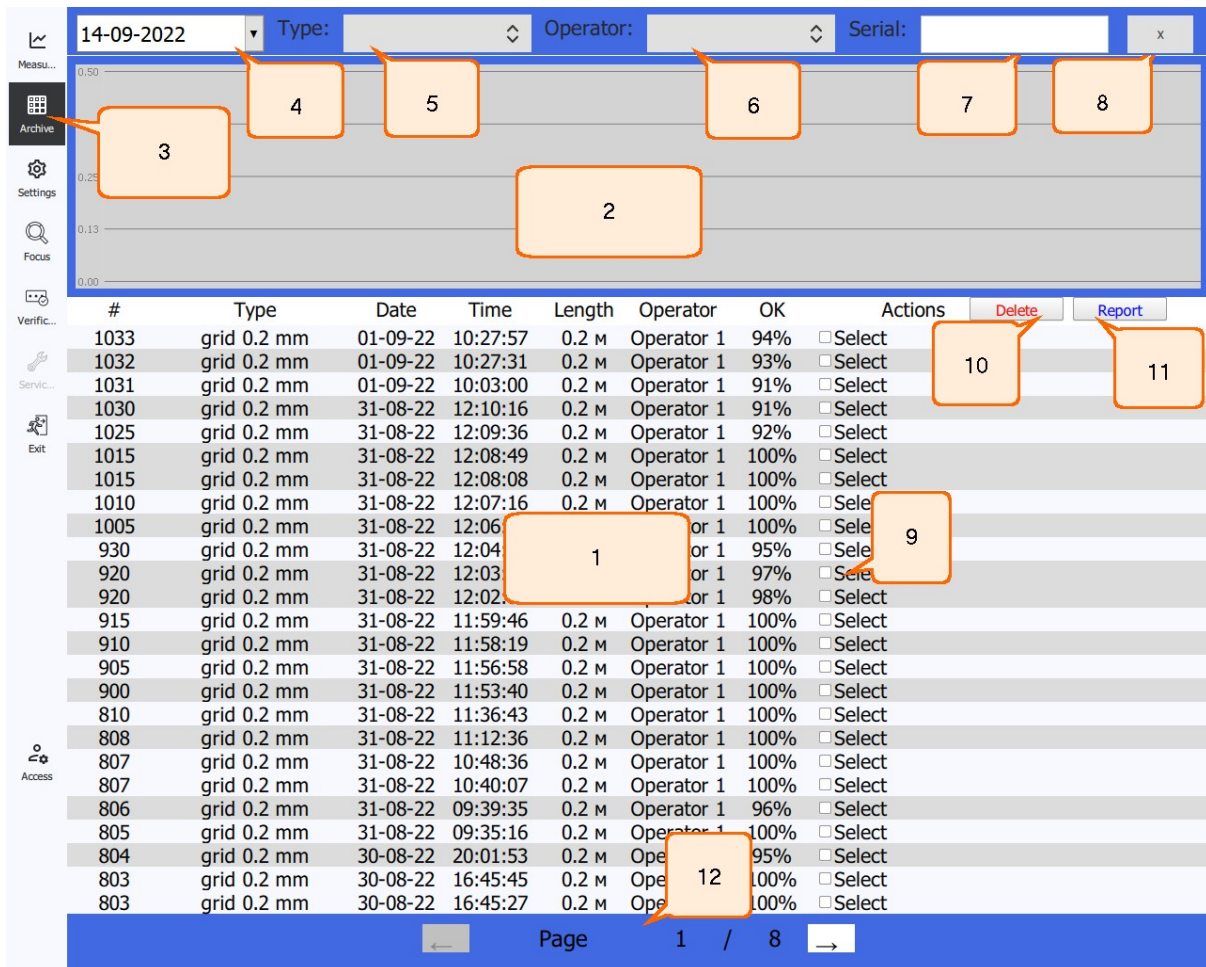
### 7.2.6. "Motor control" panel

The buttons are intended to control the movement of the motor of the linear motion system.



### 7.3. "Archive" section

The "Archive" section is intended for displaying and editing measurement results, as well as filtering and displaying the results by date, product type, operator's name and serial number of the product.



The screenshot shows the 'Archive' section of the software interface. At the top, there are filter fields for Date (14-09-2022), Type, Operator, and Serial. Below these is a graph area with callouts 2, 3, 4, 5, 6, 7, and 8. The main part of the interface is a table of measurement results. Callout 1 points to the table header, callout 9 to the 'Actions' column, callout 10 to the 'Delete' button, and callout 11 to the 'Report' button. Callout 12 points to the bottom of the table. The table contains the following data:

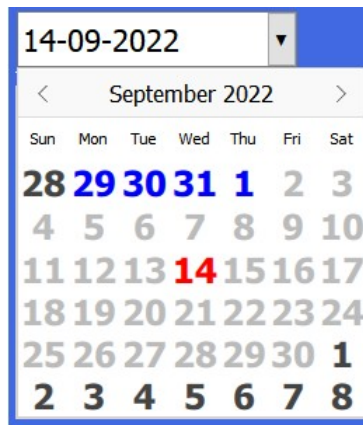
#	Type	Date	Time	Length	Operator	OK	Actions
1033	grid 0.2 mm	01-09-22	10:27:57	0.2 m	Operator 1	94%	<input type="checkbox"/> Select
1032	grid 0.2 mm	01-09-22	10:27:31	0.2 m	Operator 1	93%	<input type="checkbox"/> Select
1031	grid 0.2 mm	01-09-22	10:03:00	0.2 m	Operator 1	91%	<input type="checkbox"/> Select
1030	grid 0.2 mm	31-08-22	12:10:16	0.2 m	Operator 1	91%	<input type="checkbox"/> Select
1025	grid 0.2 mm	31-08-22	12:09:36	0.2 m	Operator 1	92%	<input type="checkbox"/> Select
1015	grid 0.2 mm	31-08-22	12:08:49	0.2 m	Operator 1	100%	<input type="checkbox"/> Select
1015	grid 0.2 mm	31-08-22	12:08:08	0.2 m	Operator 1	100%	<input type="checkbox"/> Select
1010	grid 0.2 mm	31-08-22	12:07:16	0.2 m	Operator 1	100%	<input type="checkbox"/> Select
1005	grid 0.2 mm	31-08-22	12:06:00	0.2 m	Operator 1	100%	<input type="checkbox"/> Select
930	grid 0.2 mm	31-08-22	12:04:00	0.2 m	Operator 1	95%	<input type="checkbox"/> Select
920	grid 0.2 mm	31-08-22	12:03:00	0.2 m	Operator 1	97%	<input type="checkbox"/> Select
920	grid 0.2 mm	31-08-22	12:02:00	0.2 m	Operator 1	98%	<input type="checkbox"/> Select
915	grid 0.2 mm	31-08-22	11:59:46	0.2 m	Operator 1	100%	<input type="checkbox"/> Select
910	grid 0.2 mm	31-08-22	11:58:19	0.2 m	Operator 1	100%	<input type="checkbox"/> Select
905	grid 0.2 mm	31-08-22	11:56:58	0.2 m	Operator 1	100%	<input type="checkbox"/> Select
900	grid 0.2 mm	31-08-22	11:53:40	0.2 m	Operator 1	100%	<input type="checkbox"/> Select
810	grid 0.2 mm	31-08-22	11:36:43	0.2 m	Operator 1	100%	<input type="checkbox"/> Select
808	grid 0.2 mm	31-08-22	11:12:36	0.2 m	Operator 1	100%	<input type="checkbox"/> Select
807	grid 0.2 mm	31-08-22	10:48:36	0.2 m	Operator 1	100%	<input type="checkbox"/> Select
807	grid 0.2 mm	31-08-22	10:40:07	0.2 m	Operator 1	100%	<input type="checkbox"/> Select
806	grid 0.2 mm	31-08-22	09:39:35	0.2 m	Operator 1	96%	<input type="checkbox"/> Select
805	grid 0.2 mm	31-08-22	09:35:16	0.2 m	Operator 1	100%	<input type="checkbox"/> Select
804	grid 0.2 mm	30-08-22	20:01:53	0.2 m	Operator 1	95%	<input type="checkbox"/> Select
803	grid 0.2 mm	30-08-22	16:45:45	0.2 m	Operator 1	100%	<input type="checkbox"/> Select
803	grid 0.2 mm	30-08-22	16:45:27	0.2 m	Operator 1	100%	<input type="checkbox"/> Select

At the bottom of the table, there is a pagination bar showing 'Page 1 / 8'.

#	Name	Description
1	«Table» panel	The latest measurements from the database in the form of a table.
2	«Graph» panel	The latest measurements from the database in the form of a graph.
3	«Archive» button	Menu button to go to this section.
4	«Date» element	Filtering by date.
5	«Type» element	Filtering by product type.
6	«Operator» element	Filtering by operator.
7	«Serial number» element	Filtering by product serial number.
8	«Reset» button	Reset filters (4)-(7) and display the latest measurements.
9	«Select» checkbox	Selected database records will be displayed in (1) and (2), and can also be deleted (10) or printed as a report (11).
10	«Delete» button	Selected records (9) will be deleted from the database.
11	«Report» button	Selected records (9) will saved as a report.
12	Page	Selecting a page with scan results. By default, there are 25 records per page.

### 7.3.1. "Date" panel

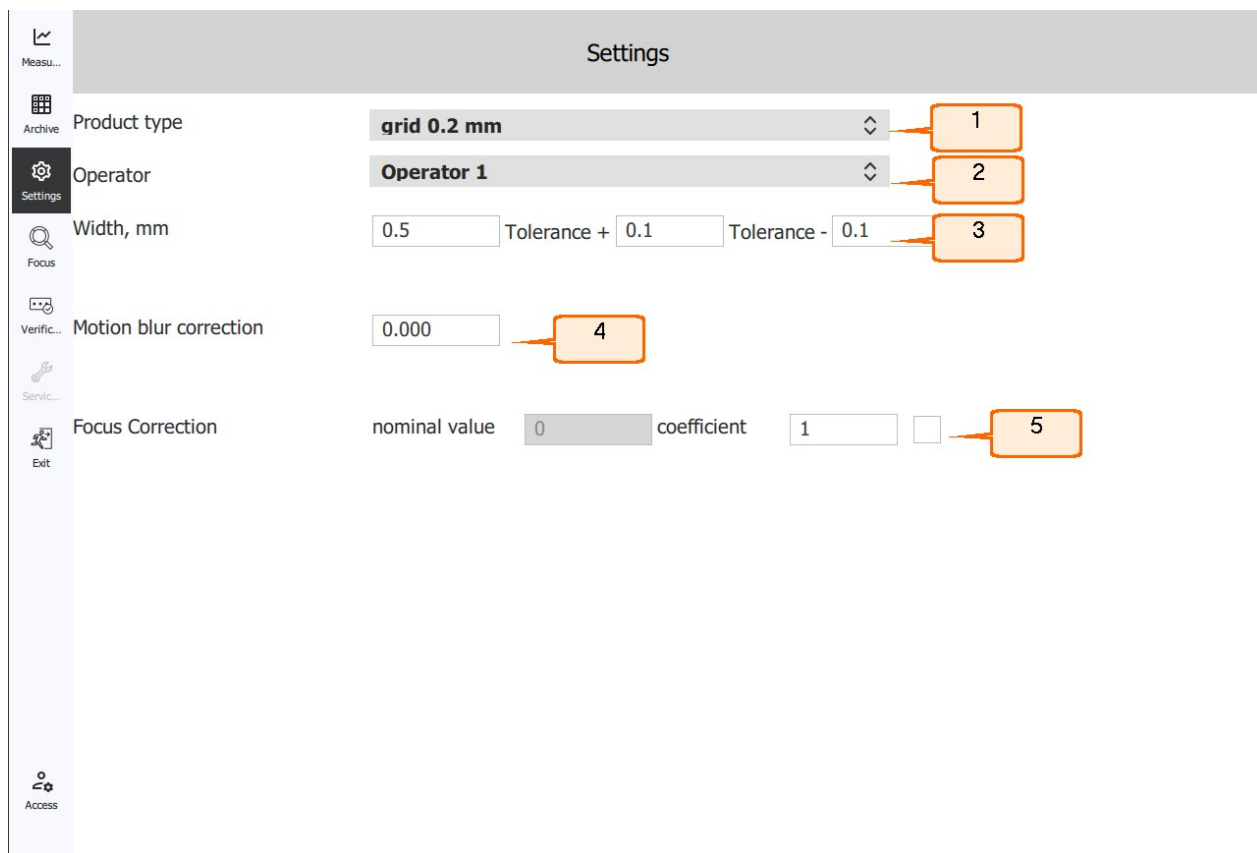
This panel is designed to select the measurement date.



Dates for which measurements are available are highlighted in blue. The selected day is highlighted in red.

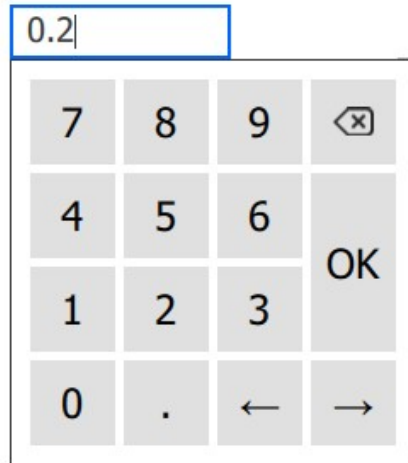
## 7.4. "Settings" section

The **Settings** section is designed to change the software settings.



#	Parameter	Description
1	Product type	Selecting the product type. Possible values are taken from the database.
2	Operator	Selecting the operator. Possible values are taken from the database.
3	Width	Setting the nominal value and tolerances for the wire filter gap width. Fields: Width, mm - nominal value. Tolerance "+/-" - permissible deviations from the nominal value.
4	Motion blur correction	The amount of correction of the measured value due to image blur during the movement of the camera along the wire filter. The value is calculated automatically and cannot be changed by the user.
5	Focus correction	The amount of correction of the measured value due to the deterioration of focus when the camera approaches or moves away from the surface of the wire filter. The nominal value means the amount of focus at the beginning of the measurement. The coefficient sets the amount of correction per unit reduction in focus from the nominal value. The value is calculated automatically. It is possible to disable this type of correction using the corresponding checkbox (5).

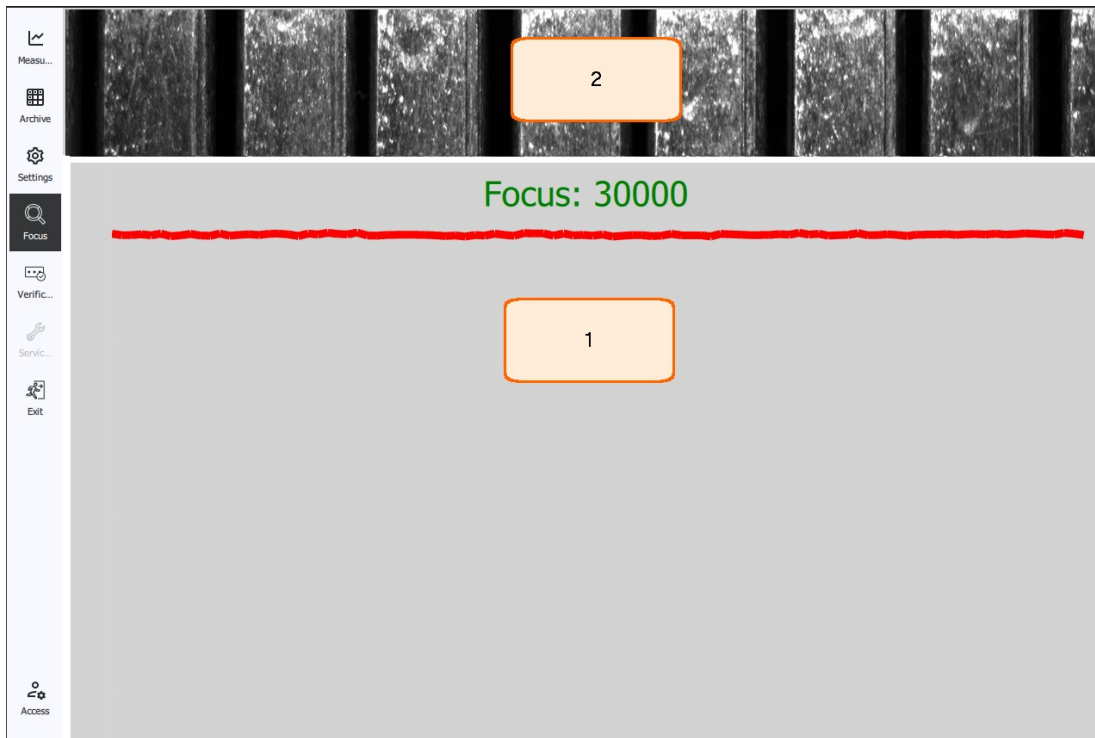
To change the value, select the input field.  
The virtual keyboard will appear below the input field.



After editing, click the **OK** button on the virtual keyboard. The value will be changed and the virtual keyboard will be hidden.

### 7.5. "Focus" section

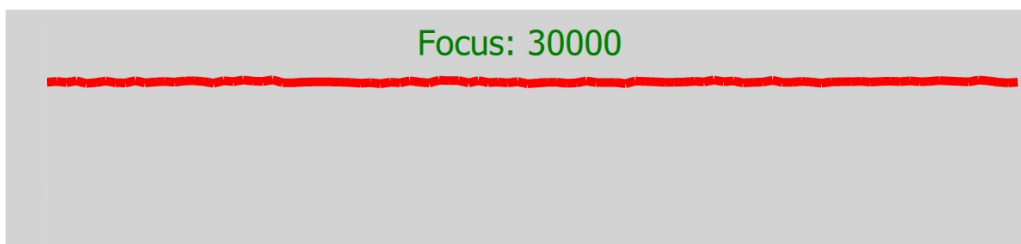
The "Focus" section is designed to set the relative position of the camera and the wire filter. General view of this section:



#	Name	Description
1	«Focus» panel	Displays the camera focus value when measuring wire filter gaps.
2	«Camera» panel	Camera image.

### 7.5.1. "Focus graph" panel

This panel displays the value of the focus parameter for the image coming from the camera.



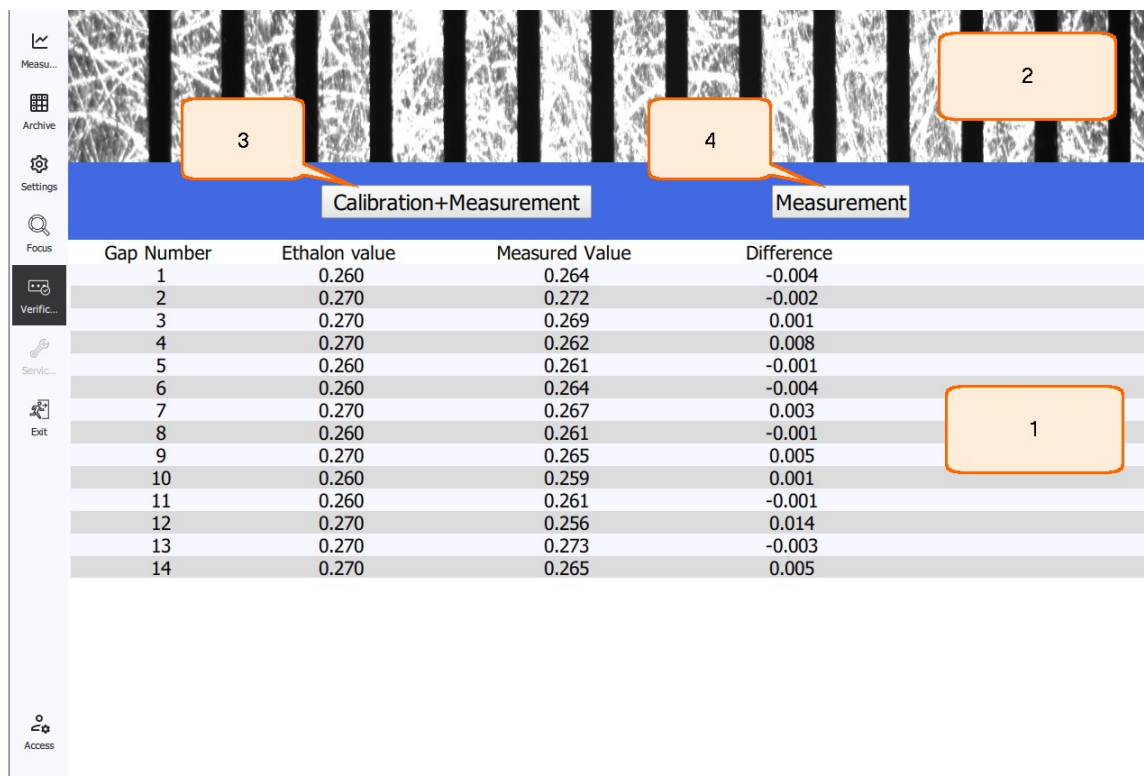
The latest measured values are displayed both as a graph and as text. The color indicates the proximity of the current value to the maximum observed at the moment:

- Green color - the current value of the focus quality parameter is more than 90% of the maximum observed value.
- Black color - the current value is more than 50% of the maximum observed value and less than 90%.
- Red color - the current focus value is less than 50% of the maximum observed value.

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### 7.6. "Verification" section

The "Verification" section is designed to verify the system using the built-in reference grid.






Gap Number	Ethalon value	Measured Value	Difference
1	0.260	0.264	-0.004
2	0.270	0.272	-0.002
3	0.270	0.269	0.001
4	0.270	0.262	0.008
5	0.260	0.261	-0.001
6	0.260	0.264	-0.004
7	0.270	0.267	0.003
8	0.260	0.261	-0.001
9	0.270	0.265	0.005
10	0.260	0.259	0.001
11	0.260	0.261	-0.001
12	0.270	0.256	0.014
13	0.270	0.273	-0.003
14	0.270	0.265	0.005

#	Name	Description
1	«Verification table» panel	The table displays the verification results: gap number, reference value, measured value and their difference in mm.
2	«Camera» panel	The image from the camera that was used for the measurement.

#	Name	Description
3	«Calibration+Measurement» button	Clicking this button starts the calibration and measurement of the reference grid.
4	«Measurement» button	Clicking this button starts the measurement of the reference grid using the existing calibration data.

## 7.7. Others

Button	Description
 Access	Activate the <b>Service Menu</b> button
 Servic...	Open the <b>Service Menu</b> page. Deactivated by default.
 Exit	Exit the program.

## 8. Intended use

### 8.1. Preparation for use

Preparation of the system includes:

- Visual inspection.
- Turning on the system.

#### 8.1.1. Visual inspection

Before operating, make sure that there is no external damage to the system:

1. Check the condition of cables and ground wires.
2. Check the condition of the camera lens and, if necessary, cleanse it with a soft cloth.

The industrial camera is virtually maintenance-free. Like other optical systems, the camera is sensitive to dust and spatter on the glass. Cleaning should be done with a soft cloth. Do not use aggressive cleaning agents.

#### 8.1.2. Turning on the system

1. Supply power to the central computer.
2. Start the software on the central computer.

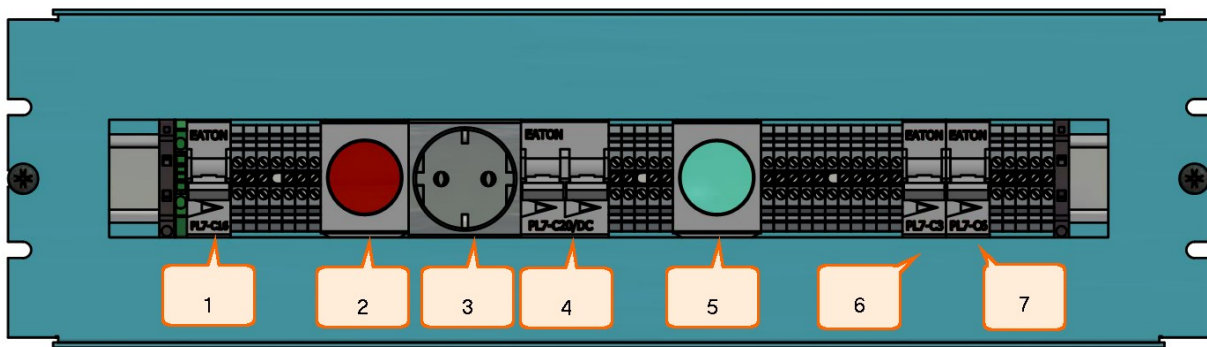
### 8.2. Measurement procedure

1. Turn on the system as described in par. [Turning on the system](#).
2. Place the wire filter to be measured along the frame.
3. Move the camera to the beginning of the wire filter manually or using the motor control buttons (see the "[Motor control](#)" panel).
4. Go to the "[Focus](#)" section and move the camera (or wire filter) until the maximum value of the focus parameter is reached.
5. Move the camera to the end of the wire filter and then move the wire filter until the maximum focus is reached.
6. Move the camera to the reference grid and then change the position of the reference grid until the maximum focus is reached.

7. Go to the ["Measurement" section](#), clear the ["Mode" checkbox](#) and click the "Scan" button. The product will be scanned without saving the results to the database. The ["Focus graph" panel](#) will display the distribution of focus along the scan line. A decrease in focus indicates an increase or decrease in the distance between the camera lens and the filter surface. In places with a significant deviation of focus, correction of the distance between the camera lens and the filter surface is required. Due to motion blur, the absolute focus is less than when the camera is stationary.
8. Tick the ["Mode" checkbox](#), enter the serial number of the product if necessary (see the ["Current item" panel](#)) and click the "Scan" button. The product will be scanned and the result will be saved to the database.

### 8.3. Power-up circuit

The switches are located at the bottom of the central computer rack.



#	Element	Description
1	Input 220V	Input power circuit breaker.
2	Indicator 220V	Input voltage indicator (red).
3	Output connector 220V	Additional power connector for an external device.
4	Output 24V	Dual circuit breaker for common output power supply.
5	Indicator 24V	Output voltage indicator (green).
6	Output 24V	Computer power circuit breaker.
7	Output 24V	Peripherals power circuit breaker.

### 8.4. Turning off the system

1. Exit the program (see [Others](#), "Exit" button) and shut down the operating system.
2. Turn off the power of the central computer (see [Power-up circuit](#)).

## 9. Maintenance

### 9.1. General information

Maintenance of the system is carried out to ensure its constant readiness for operation and to prevent premature failure. Maintenance includes preventive measures aimed at identifying and eliminating defects, and at ensuring the normal operation of the system. It is necessary to carry out daily maintenance work.

### 9.2. Safety precautions

Observe the safety precautions outlined in Section [1](#) of this User's Manual.

## 9.3. Maintenance procedure

### 9.3.1. Daily maintenance work

Daily maintenance work includes:

- Visual inspection.
- Checking for completeness.
- Checking for damage to structural elements, power and measuring cables and connectors.
- Checking the linear motion modules and the windows of sensors for dirt and, if necessary, cleansing them with a soft, lint-free cloth.

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## 10. Warranty policy

Warranty assurance for the Wire Filter Slot Gaps Inspection Machine – 24 months from the date of putting in operation; warranty shelf-life – 12 months.

## 11. Revisions

Date	Revision	Description
12.09.2022	1.0.0	Starting document.

## 12. Distributors

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