



## Datasheet for optical unit – electronic template OKO CHECK EASY 70

### 1. GENERAL GUIDELINES

1.1. The electronic template OKO CHECK EASY 70 is designed for evaluating the compliance of the object and the reference image in transmitted light. It is used for checking and sorting products in single-unit and serial production.

The electronic template OKO CHECK EASY 70 can be used in various fields of activity, for example:

- tool production
- jewelry production
- production of elastomers
- numerous other applications

1.2. The product is powered by a single-phase AC power supply with a voltage of  $220\pm 10$  V and a frequency of  $50\pm 1$  Hz.

1.3. The product should not be operated indoors

- with a higher vibration;
- with a chemically active medium;
- with temperatures below  $+15^{\circ}\text{C}$  and above  $+25^{\circ}\text{C}$ ;
- with relative air humidity: less than 45% or more than 75% at  $25^{\circ}\text{C}$ ;
- with a dust concentration of more than  $0.75\text{ mg / m}^3$ ;
- atmospheric pressure less than 84 kPa or more than 107
- with unstable power supply;
- with the presence of powerful external electrostatic and magnetic fields
- with the intensity of the external electric field according to GOST 63254 76 more than  $0.3\text{ V / m}$

**ATTENTION! Do not connect the Product to the power supply without grounding.**

**Please read carefully before using the Product with this guide.**



## 2. SAFETY REQUIREMENTS

- 2.1. Before starting operation of the unit (hereinafter - the Product) check the wall outlet, make sure there are no visible external damage to the connecting cables and on the unit case. Do not plug the Product into outlet with a damaged protective cover.
- 2.2. The product should be installed on a hard smooth horizontal surface at a height of no less than 0.5 m from the floor. The distance between the back wall of the Product body and the wall shall be at least 0.2 m.
- 2.3. The Product should not be installed closer than 2 m from heating devices and windows.
- 2.4. Connecting cables connected to the back surface of the Product body shall be in a free state - any deformation of the connecting cables may cause the Product to fail.
- 2.5. Normal operation of the Product is possible only when it is connected to a properly grounded separate power outlet.
- 2.6. It is forbidden to connect the ground wire on the power outlet to the zero wire of a single-phase electrical network. Grounding the outlet of the power supply shall be made by a certified specialist, otherwise the manufacturer is not responsible for moral and physical damage, and also disclaims warranty obligations.
- 2.7. In geographical areas with increased thunderstorm activity, the power grid is necessary to equip with a surge protector.
- ATTENTION! It is forbidden to connect another high-current device equipment or devices that cause high-frequency interference or strong starting pulse loads to the electrical network to which the Product is connected (and devices connected to it).
- 2.8. In the case of switching on the network power supply Products, lighting, household appliances and other small power surge noise that occurs when turning on/off shall be provided by the network filters or devices of uninterrupted power supply.
- 2.9. It is strictly forbidden to connect and disconnect cables from external devices peripherals when the Product is powered on and external devices. It is also forbidden to connect external devices and Products to power outlets with different phases.
- 2.10. It is forbidden to connect non-standard and (or) self-made devices to the Product peripherals, non-standard and / or damaged cables.
- 2.11. Do not touch simultaneously the Product and the devices that have natural grounding (gas stove, radiator, water tap, etc.). It is also forbidden to connect the Product to the power supply with wet hands.
- 2.12. The service life of the Product set by the manufacturer is 5 years, provided that mandatory preventive maintenance at the manufacturer's service center at least once a year.

### 3. ARRANGEMENT

The basic OKO CHECK EASY 70 elements (Fig.3.1) are as follows:

- Hikvision automation industrial color camera with 6Mp resolution, full-frame lens with low distortion indices, protective cover (1);
- built-in Lenovo Thinkcenter personal computer
- display 13.3 inches, resolution 1920 x 1080 pixels (2)
- dust-proof industrial keyboard (3)
- lamp with slide (4)
- case with tripod installed (5)
- ports for connecting devices to the installation. USB3.0-2 pcs (6)
- HDMI connection port - 1pc (7)
- toggle switch (8)
- industrial controller OVEN PLC150
- optionally can be equipped with a top illumination device
- calibration high-precision image - checkerboard
- calibration high-precision image of the camera height setting above the upper surface of the object - Microscope Micrometer Calibration Ruller
- height adjustment mechanism (9)
- OKO\_easy software
- communication hardware and other equipment
- shipping container.

#### **TECHNICAL DATA**

- overall dimensions without packaging: (LxBxH) - 640x820x610
- weight: 75kg
- material of the body and tripod structure: alloy steel, steel, aluminum B95, chrome coating.
- power supply voltage: 220/230V AC
- peak power consumption: 85 W

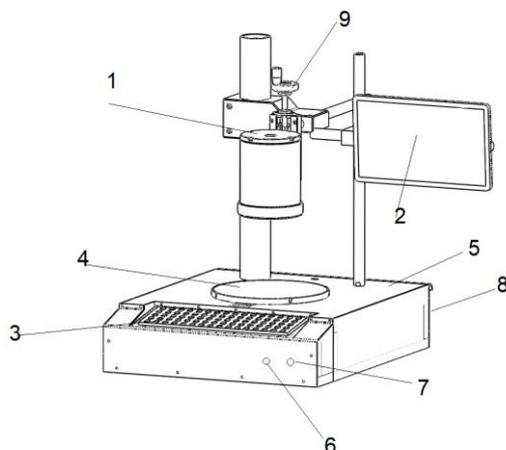


Fig. 3.1. Circuit installation diagram



#### 4. PRODUCT PREPARATION FOR USE.

- 4.1. ATTENTION! After transporting and storing the Product at sub-zero temperatures, keep it at room temperature for at least 6 hours before turning it on.
- 4.2. Select the installation location of the Product in accordance with the recommendations of this manual (see the section "Safety requirements") and your personal preferences.
- 4.3. Remove the Product from its original packaging.
- 4.4. Install the Product in the selected location in accordance with the recommendations contained in the "Safety requirements" section of this manual.
- 4.5. Connect cables from the keyboard, manipulator, mouse, monitor, and other external devices. The connection scheme for external devices depends on the specific Product model.
- 4.6. Connect the power cable to the Product.
- 4.7. Plug the power cable into the power outlet (power requirements - see the sections "General guidelines", "Technical data", "Safety requirements" of this manual).
- 4.8. Set the switch on the back panel of the Product case to the "I" position
- 4.9. Turn on additional devices in accordance with the instructions provided with them



## 5. OPERATION DESCRIPTION.

- 5.1. Type of measurement: outlines in transmitted light.
- 5.2. Axes of displacement: none. The tripod design. Manual fixing.
- 5.3. Compensation of distortion: digital (the machine can be equipped with a telecentric lens).
- 5.4. The size of the measurement object: from 0.5 mm to 70 mm (depending on the lens used, the size of the lighting surface and the height of the camera installation)
- 5.5. Contour overlay accuracy up to  $\pm 0.1$  mm
- 5.6. Repeatability of the result  $\pm 0.1$  mm
- 5.7. Measurement time: 1-4 seconds. The measurement time depends on the similarity of the object and the reference image.
- 5.8. The ability to upload a reference projection of the product in image formats with extensions:\*. BMP (monochrome, 16 color, 256 color and 24 bit images),\*. JPEG, PNG.
- 5.9. 21 sets of user settings (3 groups of objects with 7 projections in each group).
- 5.10. The ability to process the reference image with pre-installed freely distributed image editors on the machine PC
- 5.11. Creating a reference image by shooting an object.
- 5.12. Positioning of the object under study is invariant with respect to the rotation angle of the reference model within  $140^\circ$
- 5.13. Operating system: WINDOWS family
- 5.14. Measuring the distance from a point to a point on the contour of an object is similar to measuring with a caliper. The measurement accuracy is up to  $\pm 0.08$  mm for typical measurements. A typical measurement for installation is measurement of a straight line segment that forms angles in the range from  $65$  to  $115^\circ$  (conditionally close to right angles) with tangents at contour points. Indicators of accuracy are reduced as the deviation from the conditionally right angles to the tangents of the points of the contour. See figure 5.1.

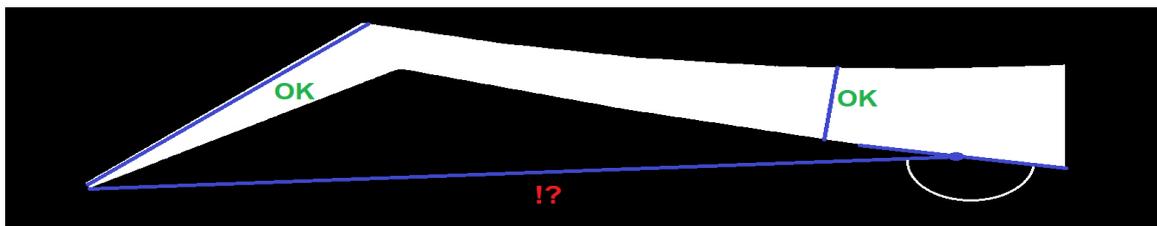


Fig. 5.1. Measurements with predicted accuracy and measurements of uncertain accuracy.

- 5.15. For each projection, you can set up to 10 custom measurements of distances.
- 5.16. Calibration and adjustment of the optical scheme of installation are made by the manufacturer. For self-calibration of the device, the high-precision calibration image (checkerboard) is included in the supplied equipment. Calibration is optional if the factory

settings of the optical system are not violated. The calibration procedure is used to obtain the value of the conversion factor for pixel distances to metric values. To calibrate it is necessary to place the calibrating image of the chessboard in the field of view of the camera and enter the settings menu by clicking the button to call the calibration procedure.  Then follow the instructions of the program. Please note that the procedure for or accepting results ('Accept') can take up to 5 minutes of computing time.

5.17. The OKO CHECK EASY 70 installation can be equipped with paid commercial metrological SOFTWARE for carrying out a wide range of metrological measurements in serial and single productions. Measurements are made automatically according to the preset measurement scheme. See figure 5.2. (Specify the cost of the software.)

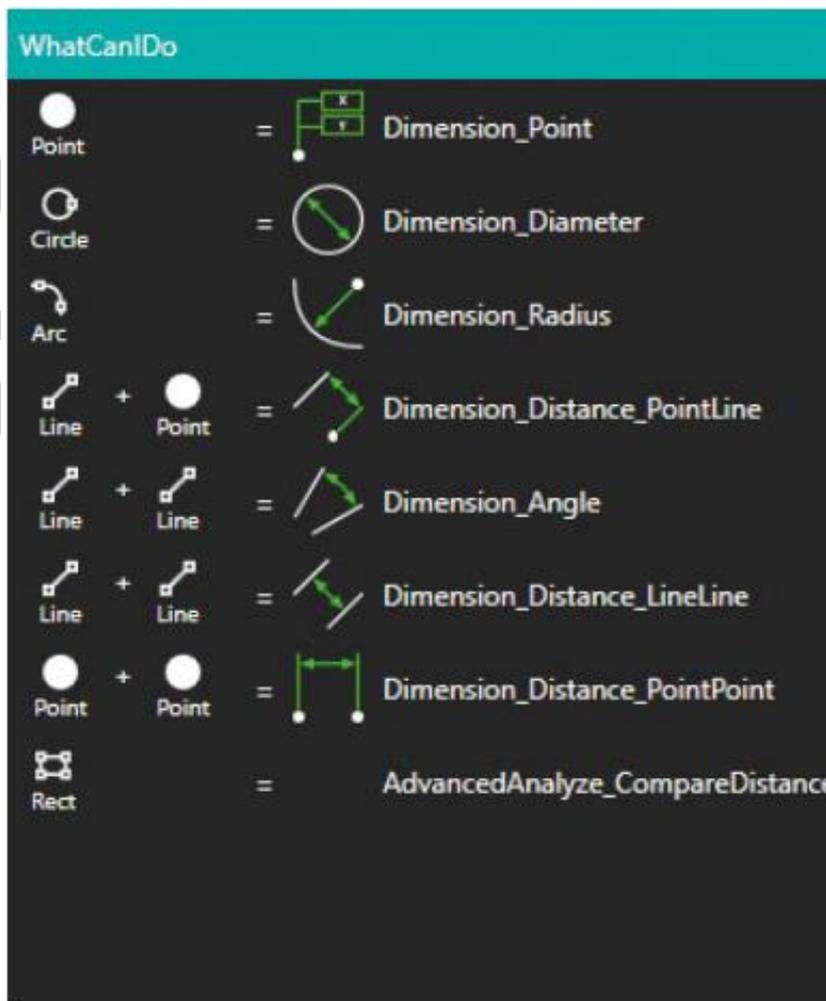


Fig 5.2. Possible measurements of purchased and optionally installed HORUS software

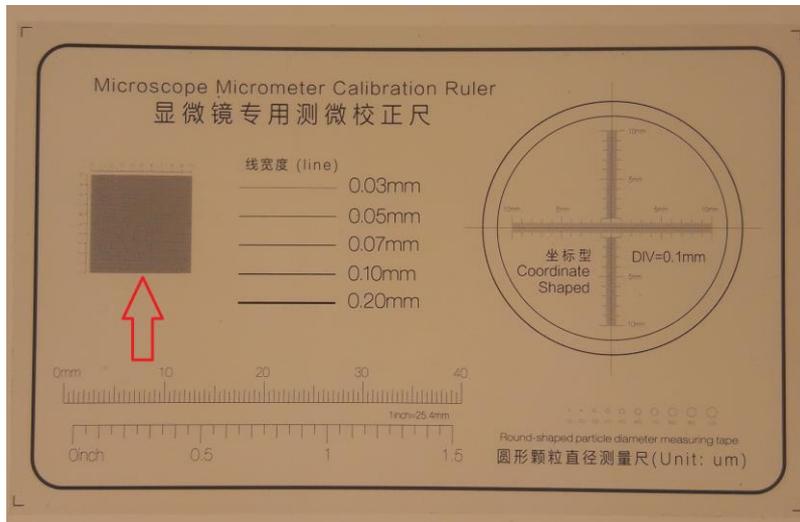
## 6. OPERATION PROCEDURE.

- 6.1. Connect the unit to mains and turn the main switch on the pull-out panel of the unit case.
- 6.2. If the SOFTWARE is not running automatically, run the file OKO\_easy.exe
- 6.3. The OKO\_easy Software does not support the CAD environment. Preparation of the reference image is required. Prepare a reference image in a convenient image editor or engineering program. The image shall have a dimension of 2036x2036 pixels. Have one of the following extensions:\*. BMP (monochrome, 16-color, 256-color, and 24-bit images),\*. JPEG, or PNG. The reference image shall be scaled based on the value of the distance coefficient in pixels and

metric values (PixToMetric). By clicking the button in the “Settings” window  a built-in image editor opens where you can prepare the image. The image of the reference object shall be white on a black background. In the graphical editor in the lower left corner, you can select the current value of the conversion factor of pixel length values into metric values. To do this, select the value “mm-OKO” in the “Unit” field. The measurements taken will be displayed in metric coordinates.

- 6.4. The alternative way to get a reference image is to shoot and prepare a reference object using the TAKE REFERENCED PHOTO button in the “Settings” menu.
- 6.5. Easy class machines are equipped with a frame lens with low distortion indices. Such optical schemes require maintaining the same distance from the entrance pupil of the objective to the surface of the measured object. Therefore, to correctly measure the object, you need to raise or lower the camera using the flywheel on the camera movement mechanism, having previously loosened the lock handle, to ensure the sharpness of the object being shot. To correctly adjust the height of the camera above the photographed objects of different heights and to ensure the required level of image sharpness, a special calibrating image is included with the installation, which can be placed on the surface of the object under study and find the position of maximum sharpness by rotating the flywheel. To do this, place the Microscope Micrometer Calibration Ruller on the object of interest. Open the camera settings window in the

measurement settings menu . Follow the instructions from Hikrobotics’ MVS software to ensure that the calibration image is displayed at its maximum digital zoom. The most convenient fragment on the calibration image is the segment pointed to by the red arrow. The highest color contrast of the visible “grains” in the image indicates that the correct distance from the entrance pupil of the optical circuit to the upper surface of the object being shot has been found.



- 6.6. Place the measured object on the slide.
- 6.7. Enter the main menu. Select a dimension group. Press projection number (from 0 to 7). Select the monitoring mode using the buttons: “ESC”, “BrackSpace”, or “S”. The “Q” key returns to the “Main” menu (see Appendix 2). For repeated measurements, you can select the projection number once. For subsequent measurements, the projection number is assigned automatically. You can also continue measuring by using the external button.
- 6.8. Make measurement settings by opening the “Settings” menu using the button 
- 6.9. Pressing the “ESC”, “BrackSpace”, or “S” keys will perform the corresponding measurement. The “Q” key returns to the “Main” menu (see Appendix 2).
- 6.10. Follow the installation software instructions
- 6.11. The machine provides shooting of the object by pressing the external button, which is connected to the connection socket on the drawer at the rear of the machine.

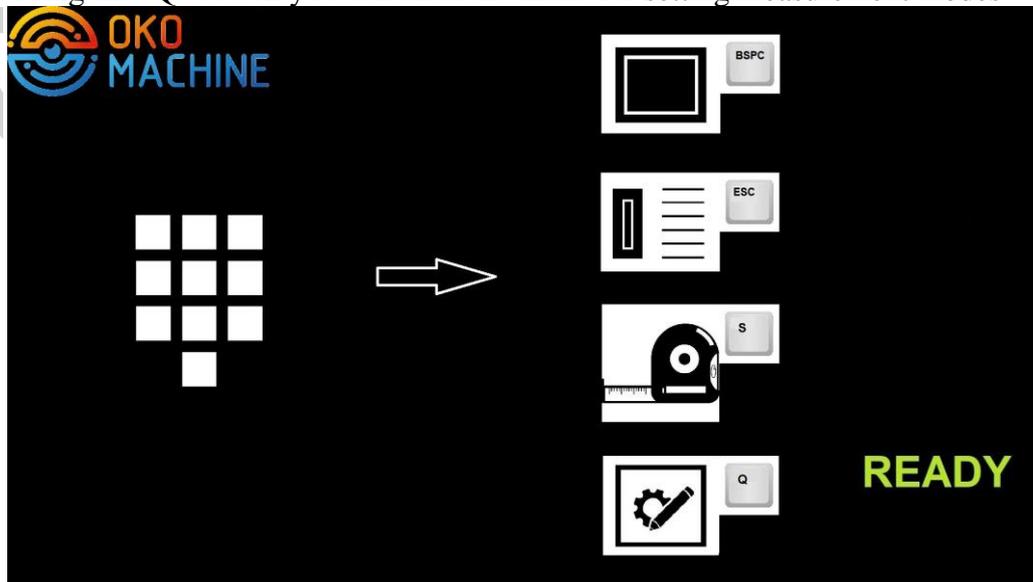
**7. MASUREMENT MODES.**

- 7.1. "ESC" (UNALIGNED HORIZONT) – two sizes specified on the combined image along the horizontal line of pixels that has the maximum size discrepancy. At the bottom, the size obtained by measuring the reference image, at the top – the measured object. The following parameters are also shown on the screen: the percentage of overall similarity (GENERAL ALIGNMENT), the lower and upper tolerance of discrepancies as a percentage (min/max), and the percentage of horizontal alignment of the maximum discrepancy (size,%). See Appendix 1.
- 7.2. The green color indicates the "excess" of the object's material in relation to the reference image. Red indicates a lack of material.
- 7.3. "BrackSpace" - the mode in which the combined image is displayed without dimensions. This mode allows you to visually evaluate the similarity of the reference image and the object.
- 7.4. "S" - the mode in which measurements will be made from the contour point to the contour point on the line drawn in the menu called by the SIZE TUPLE button. A sample window with dimensions in "S" mode can be seen in Appendix 3. The points for building straight lines that intersect the points of the image contour can be obtained from any graphics editor or



engineering program. By clicking the button  in the settings menu, you can open the built-in image editor that is pre-installed in OKO CHECK EASY 70.

- 7.5. Using the "Q" button you can enter the menu for setting measurement modes



## 8. MEASUREMENT SETTING.

See figure 8.1 and the description of parameters below

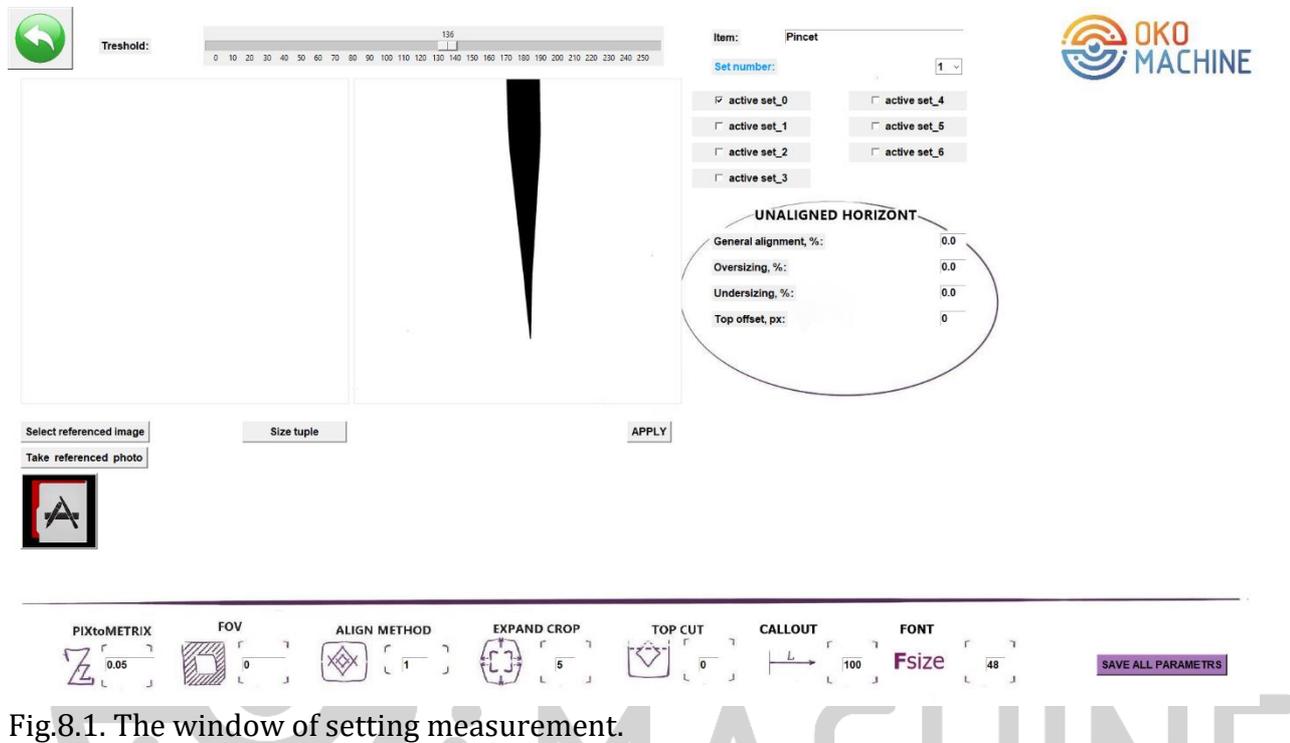


Fig.8.1. The window of setting measurement.

User-defined settings are applied exclusively to a specific projection (see figure 6.1 Set number).

Item – Name of the measurement group.

Set number - measurement number in the group. One group can have 8 independent sets of measurements. By selecting the number of the user measurement, the user switches to one of the 8 groups of parameters

Threshold – parameter for image binarization. Depending on the value of this parameter, pixels with different brightness values belong to the background or to the measurement object. By default, it is 127.

Apply – applies the settings from the image without saving.



PIXtoMetrix – coefficient for converting distance values in pixels to metric measurements. Installed by the manufacturer. By default, it is 0.0409141. One pixel corresponds to 0.0409141 millimeters of physical magnitude.

FOV – value in pixels of the border width along the image perimeter for deleting objects along the image edge. By default, it is 25.

ALIGN METHOD - uses 2 types of overlay of the observed and reference image: 0 - for images that fall completely into the observation area, 1 - for objects that may fall partially into the observation area. By default, it is set to 1. The second method is used for elongated objects along which the selected segment of the object's length is of interest.

EXPAND CROP - the parameter specifies the size of additional fields around the combined image. Necessary for correct display of dimensions. By default it is 100

TOP CUT - this parameter affects the result of image combinations. By default it is 0

CALLOUT - size of extension lines for placing dimensions. By default, it is 35.

FONT - font size for indicating measurements made. By default, it is 36.

FILL GAP - internal areas in the image of the filmed object in which there is no material can be painted over.

Return button to the Start menu (green arrow in the upper-left corner)

SAVE ALL PARAMETERS - save all the parameters.

SELECT REFERENCED IMAGE – selection of the reference image.

TAKE REFERENCED PHOTO - getting a reference image by photographing a reference object.

SIZE TUPLE - building lines based on two points. The intersection of this contour line gives the image segments whose lengths in metric terms give the desired dimensions in millimeters. To determine the coordinates of points, open the reference image in the graphics editor and select 2 points of the contour in sequence. The X and Y coordinates of the point of interest are displayed in the lower right corner of the editor screen. Enter the points into the SIZE TUPLE shape. When finding coordinates, increase the scale, zooming in on the fragment of the desired point to refine the coordinate values

#### UNALIGNED HORIZON parameters

General alignment - parameter for allowing general image discrepancy, %

Oversizing – the upper parameter for allowing the maximum size of the reference image to be exceeded, %

Undersizing - the lower tolerance parameter, %

Top offset - indicator for ignoring the top part of images. Used when analyzing objects that exceed the camera's field of view, %



In this editor, you can analyze the resulting image interactively. To do this, follow these steps:

- open image

- select units of measurement: mm-oko (for measuring in millimeters), inch-oko (for measuring in inches), px (for measuring in pixels). See figure 8.2.

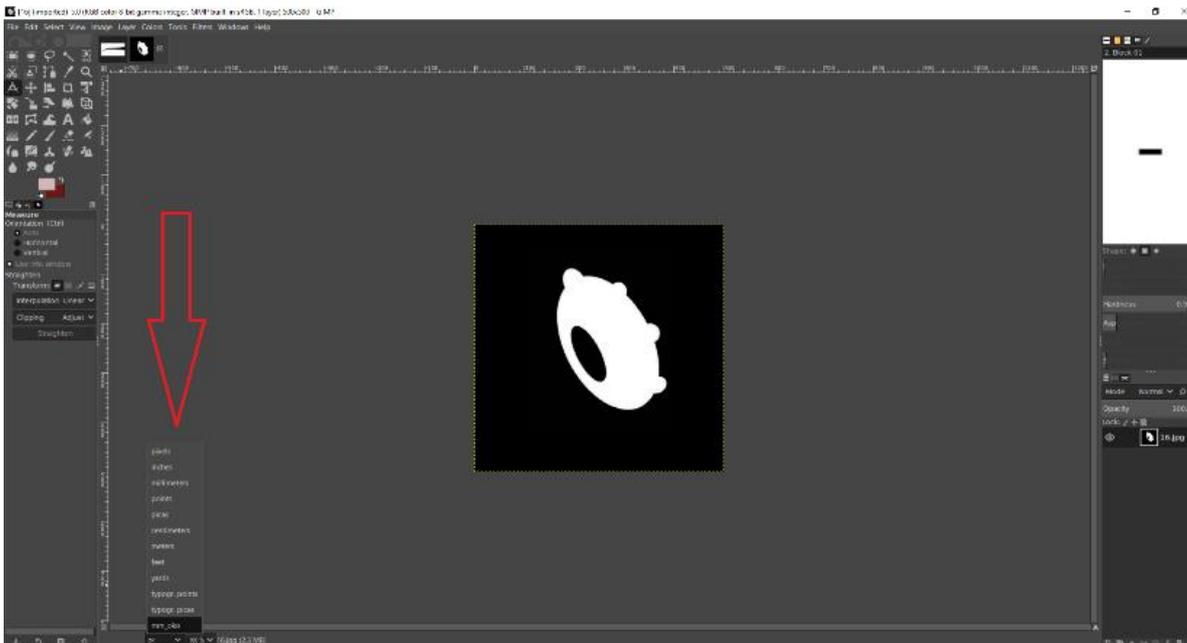


Fig. 8.2. Selection of the unit of measurement in the image editor.

-select the Measure Tool and perform measurements interactively.



## **9. MAINTENANCE**

- 9.1. General care of the Product by the owner involves the removal of dust and dirt from surfaces.
- 9.2. General care of the Product is carried out only when the power supply of the Product and external devices is turned off. The power supply cables shall
- 9.3. be removed from the socket the power supply.
- 9.4. Removal of dust and dirt is made with a soft cloth moistened with a special solution, or with special wet wipes.
- 9.5. In order to avoid getting moisture inside the Product (which may cause the Product to fail), it is forbidden to wash the Product or submerge the Product in liquid.

## **10. TRANSPORTATION RULES**

10.1. The Product is transported by any type of covered transport, packed in its original packaging, in a position that corresponds to the orientation, protection, etc., marked on the original packaging.

## **11. WARRANTY REPAIR**

11.1. If the Product or its components fail during the warranty period, the product owner is entitled to free warranty repair.

11.2. Free warranty repair of the Product is performed only during the warranty period specified in the Product purchase and sale agreement. The total warranty period for the Product is extended for the duration of the warranty repair.

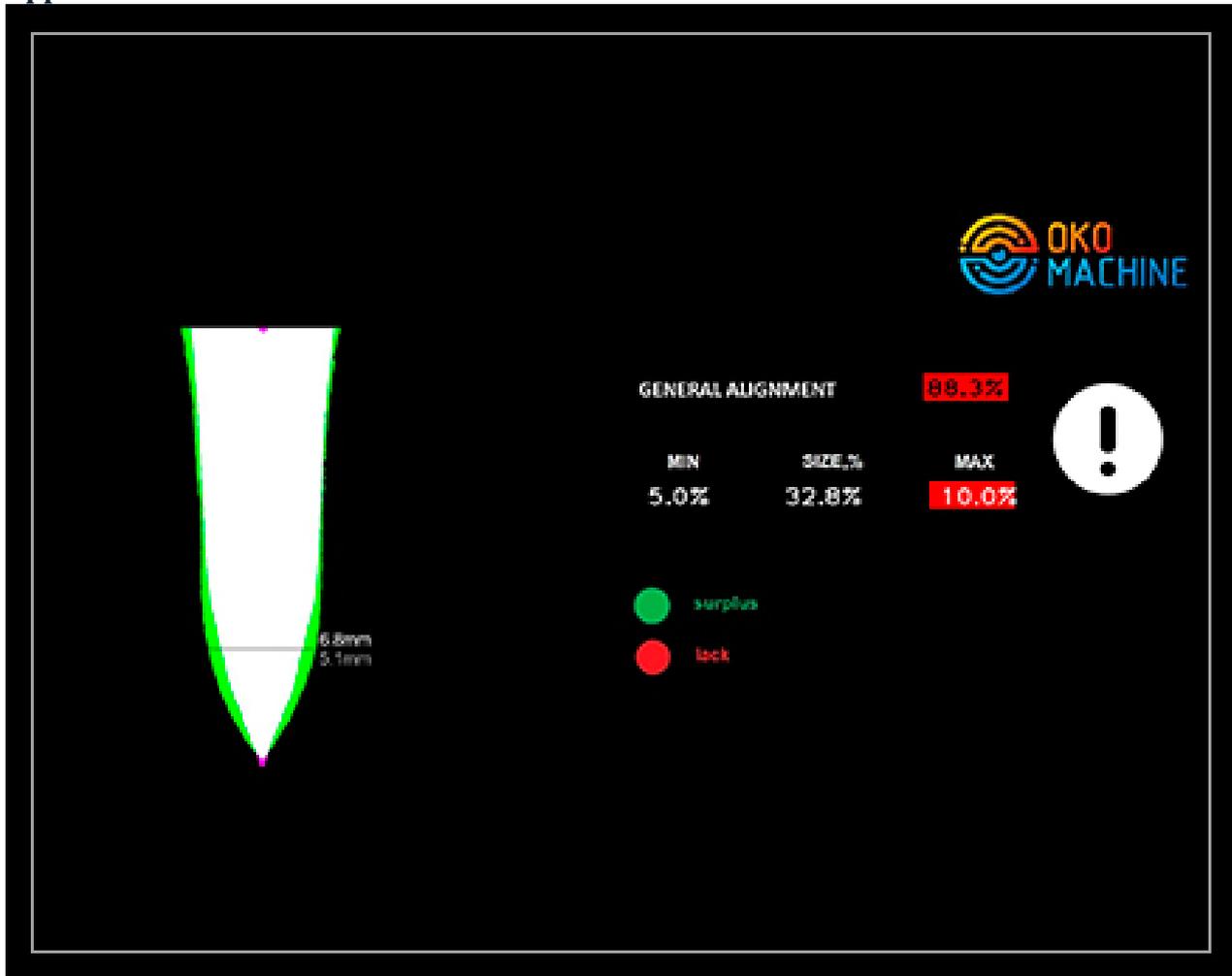
11.3. Replaced defective parts of the Product are the property of the manufacturer.

11.4. The following Products (parts of the Product) are not subject to replacement under the warranty:

- lost their appearance;
- having electrical destruction of conductors, parts, chips or traces of thermal overheating of parts;
- Products with traces of external influences or repairs;
- Products with traces of exposure to chemicals, including water, or with traces of foreign objects;

11.5. - After the warranty period expires, the Product is repaired on a general basis

Appendix 1. View of the "UNALIGNED HORIZON" window».





## Appendix 2.

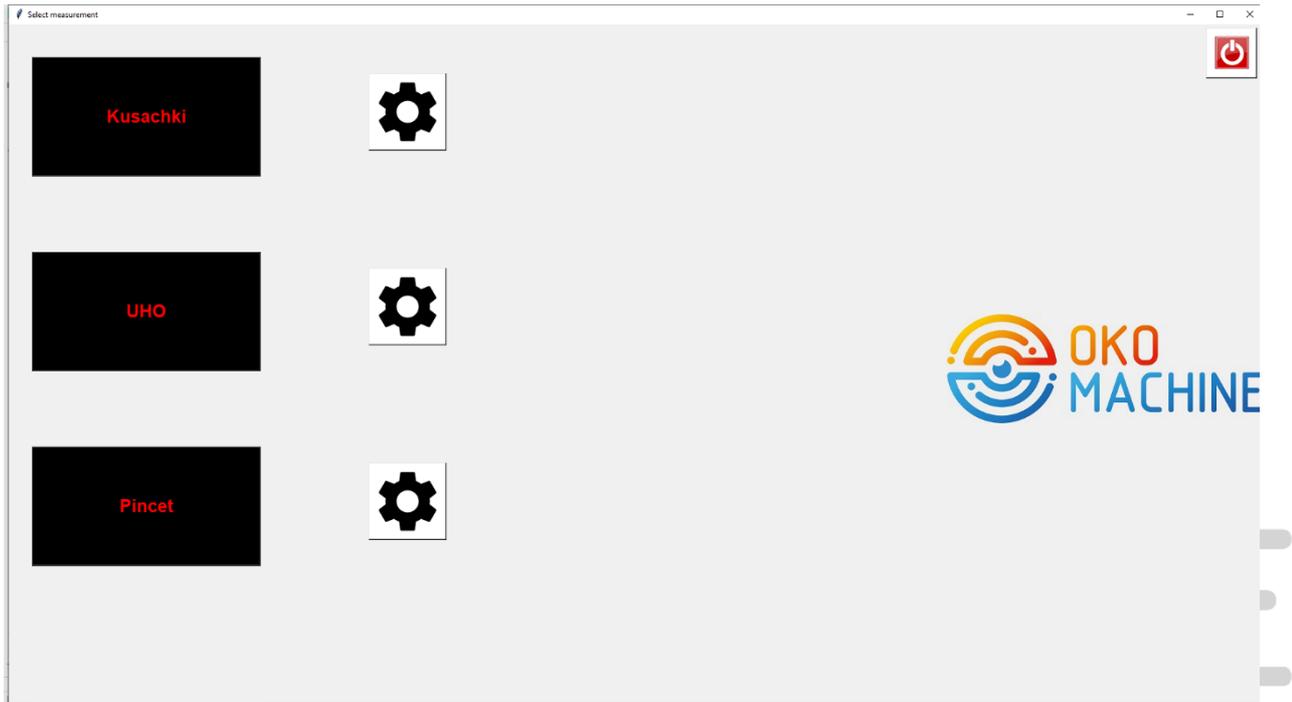
### Description of software and settings

#### 1. "Main" Menu

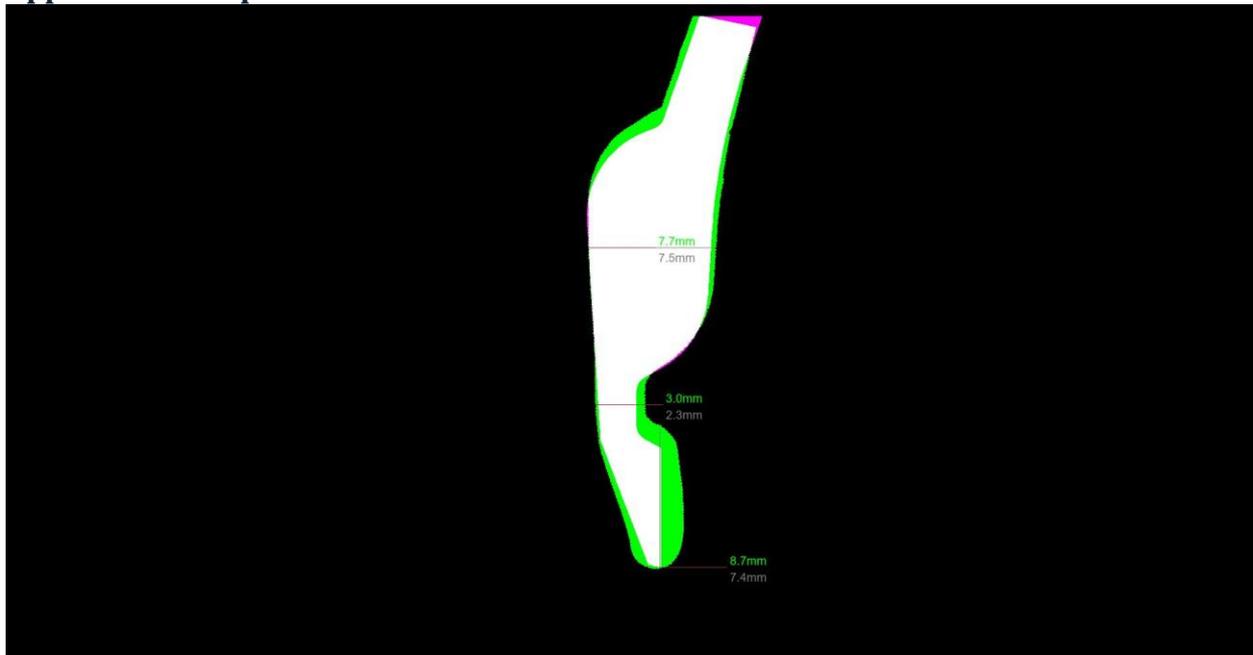
-name of the group of objects

-buttons for corresponding settings 

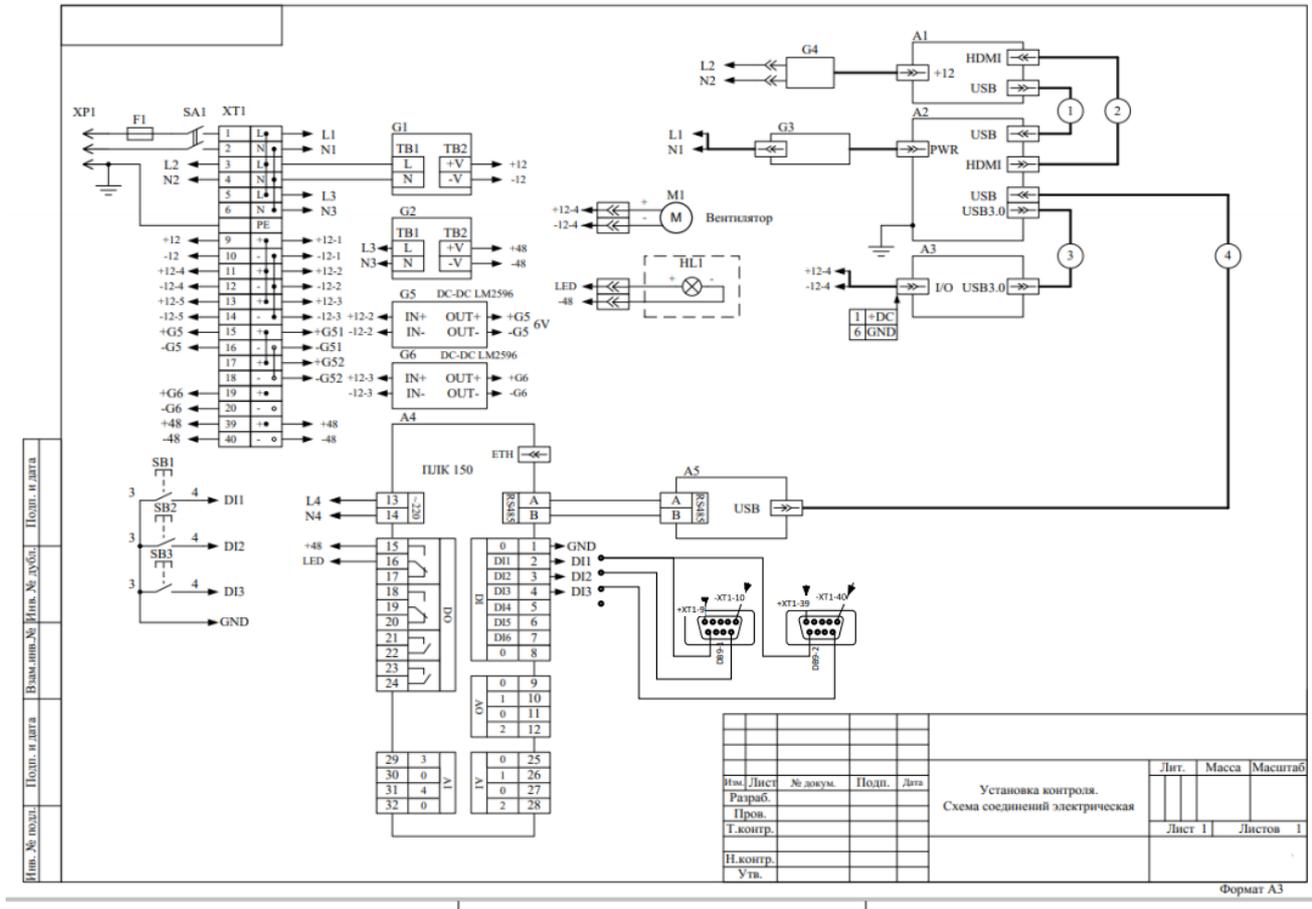
- exit button 



Appendix 3. Sample window with dimensions in "S" mode



## Appendix. 4. Electrical circuit diagram



Director of "OKO-MACHINE" LLC

Anton Rusetskiy

Manufacturer:

"OKO-MASHINA" LLC  
 19 Kirghizskaya str., ABK-1  
 Kharkov, Ukraine  
[www.oko-machine.com](http://www.oko-machine.com)  
[info@oko-machine.com](mailto:info@oko-machine.com)

Address: 19 Kirghizska str.,  
 Kharkiv, 61105

[www.oko-machine.com](http://www.oko-machine.com)

Tel./fax (057)7 212 312  
 cell. (050)323 43 50  
 e-mail: [info@oko-machine.com](mailto:info@oko-machine.com)



Address: 19 Kirghizska str.,  
Kharkiv, 61105

[www.oko-machine.com](http://www.oko-machine.com)

Tel./fax (057)7 212 312  
cell. (050)323 43 50  
e-mail: [info@oko-machine.com](mailto:info@oko-machine.com)