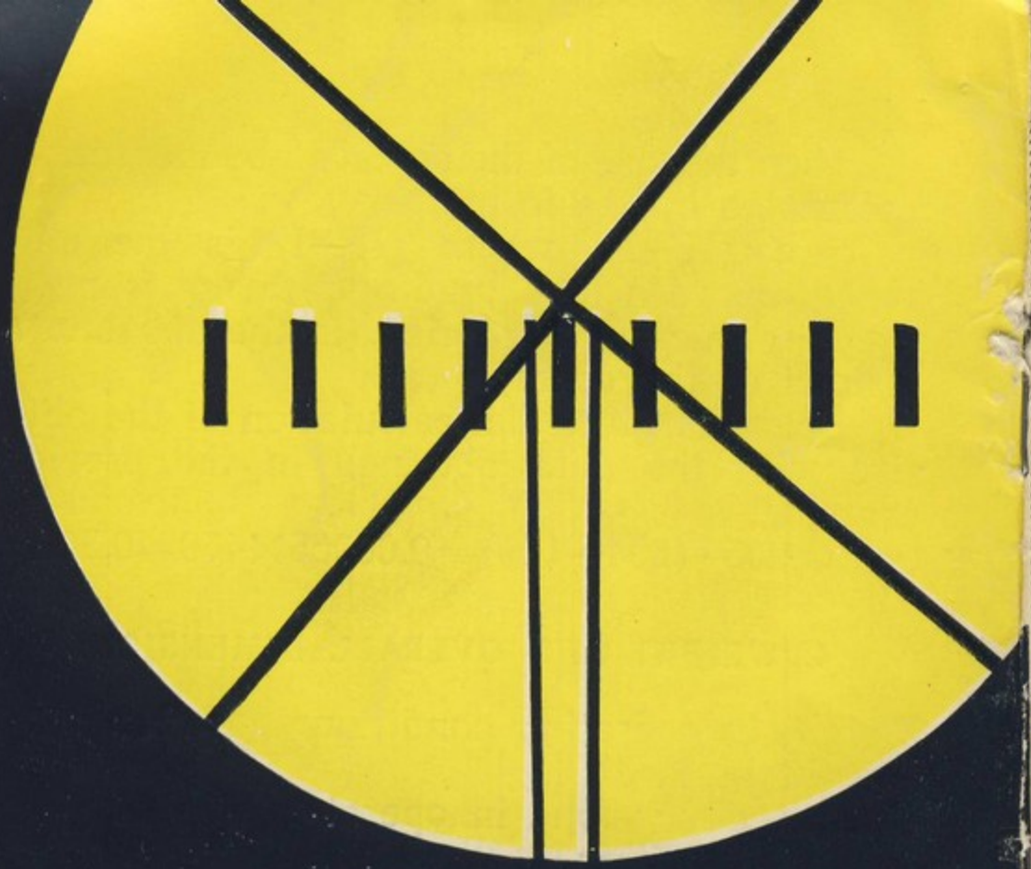
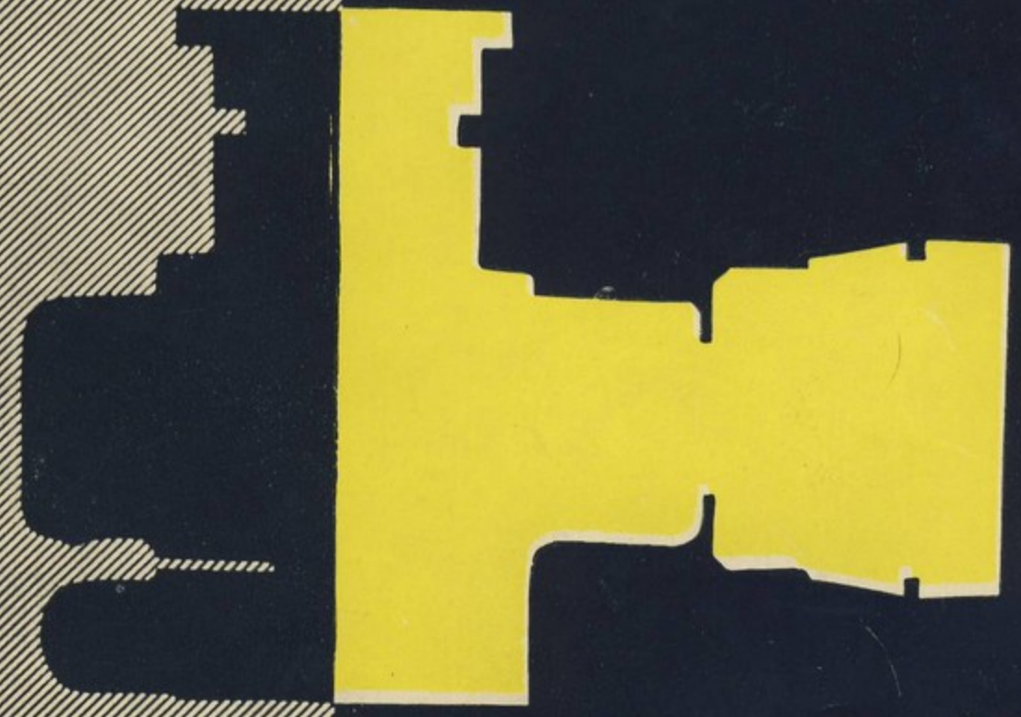


USSR

EYEPIECE SCREW MICROMETER MOB-1-15^{x}



EYEPIECE SCREW MICROMETER

MOB-1-15^{x}

Description

USSR

CONTENTS

1. APPLICATION

The eyepiece screw micrometer MOB-1-15^{x} is an accessory to the microscope and used for measuring linear size of objects observed through the microscope.

The micrometer MOB-1-15^{x} consists of a 15x compensating eyepiece with a mechanism of diopter adjustment in the range of ±5 diopters and a reading mechanism.

A stationary scale with 1 *mm* graduations and a movable reticule with a cross-hair are in the focal plane of the eyepiece.

The reticule movement is actuated by the rotation of the micrometer screw. Millimeters are read on the stationary scale, while hundredth parts of a millimeter on the drum of the micrometer screw.

Measurements are taken in the range of 0 to 8 mm.

2. DESIGN

(Figs. 1 and 2)

The eyepiece micrometer consists of a housing *1*, base *2* with a clamp, compensating eyepiece *3* with a mechanism of diopter adjustment, scale *5* in a mount fixed in housing *1*,

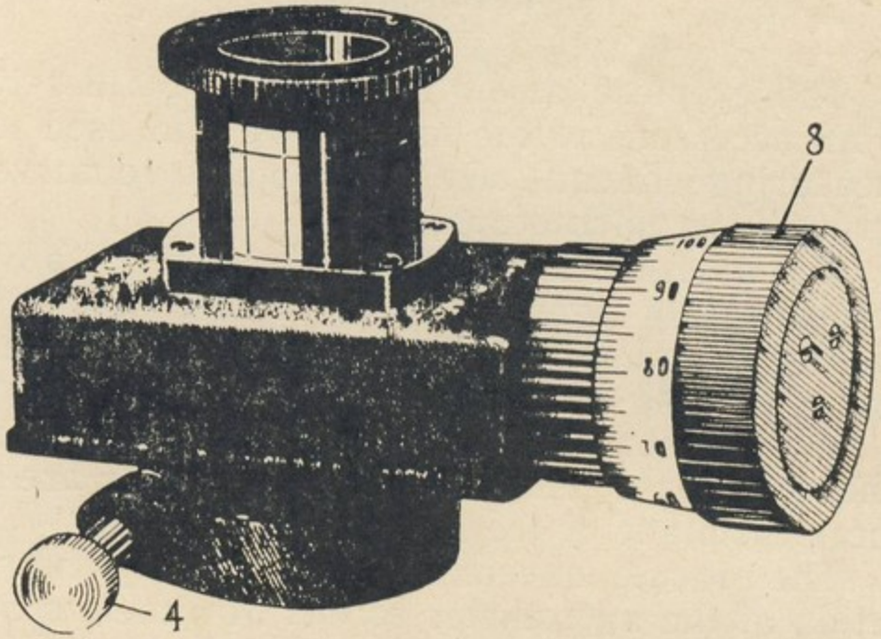


Fig. 1. General View of the Eyepiece Screw Micrometer:

4 — knurled screw to fix the eyepiece screw micrometer on the microscope draw tube; *8* — reading drum

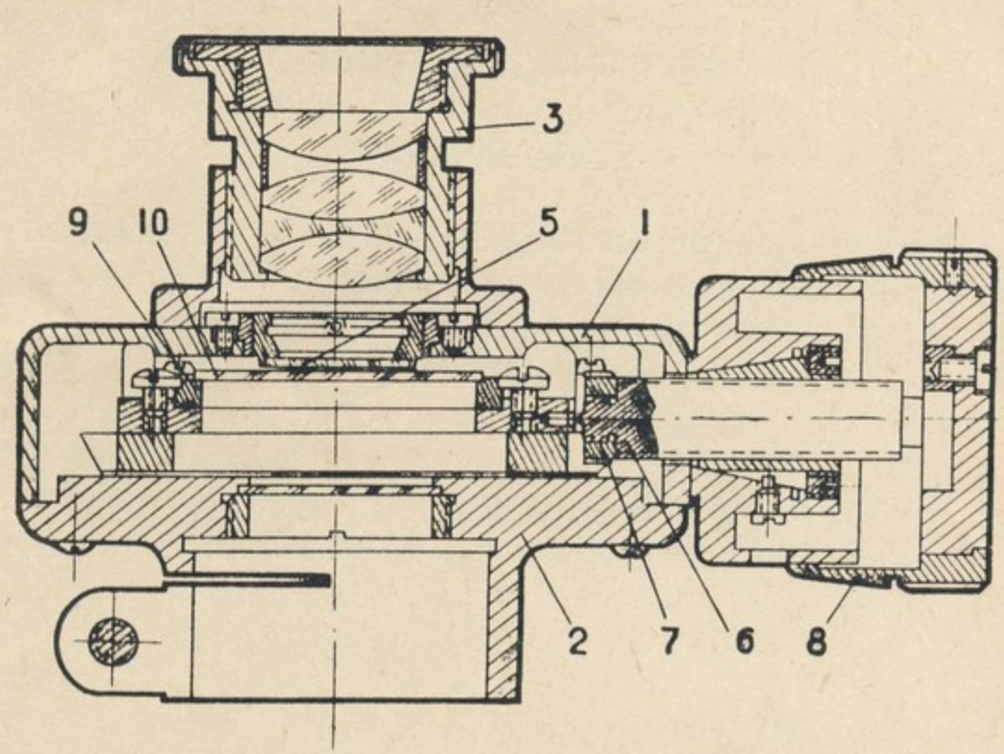


Fig. 2. Sectional View of the Eyepiece Screw Micrometer:

1 — housing; *2* — base; *3* — eyepiece; *5* — scale; *6* — reading mechanism screw; *7* — locking nut; *8* — reading drum; *9* — slide; *10* — reticule

and reading mechanism which, in its turn, comprises a screw *6*, locking nut *7*, reading drum *8*, and slide *9* with a reticule *10*.

The clamp of the eyepiece micrometer is put on the draw tube of the microscope and fixed by means of a knurled screw *4*.

3. OPERATING INSTRUCTIONS

Scale Reading

The size of the object image is determined by the eyepiece screw micrometer. A stationary

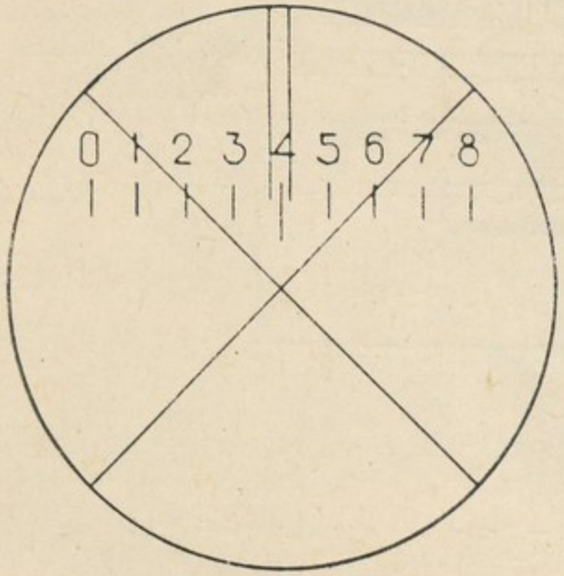


Fig. 3. Glass Plate Cross-Hair

glass plate with a scale (0 to 8 mm) each graduation of which represents 1 mm is placed in the focal plane of the micrometer eyepiece. Herein is another movable glass plate with a cross-hair and index lines (Fig. 3). This plate is connected with the fine micrometer screw so that when the micrometer screw is rotated, the cross hair and the lines are moved in the field of view of the eyepiece relative to the stationary scale.

The screw pitch is 1 mm. Thus, one revolution of the screw drum corresponds to the movement of the lines and the cross-hair in the field of view of the eyepiece by one graduation on the scale. Hence, the stationary scale in the field of view serves for reading full revolutions of the screw drum, i. e. for reading full millimeters of the movement of the eyepiece cross-hair.

The screw drum is graduated into 100 parts. When the drum is rotated by one graduation, the cross-hair moves by 0.01 mm. Hundredth parts of a millimeter are read on the drum scale. The final reading on the eyepiece micrometer scales is summed from the readings on the stationary scale and the screw drum.

The reading on the stationary scale in the field of view is determined by the position of the index lines, i. e. by the number of full divisions on the scale by which the index lines have been shifted from the zero division.

The reading on the drum of the micrometer screw is taken in the same way as on a conventional micrometer, i. e. one determines the division on the drum scale opposite to the index maked on the stationary sleeve of the screw.

Let us assume that the index lines in the field of view are between graduations "5" and "6" on the scale in the field of view of eyepiece, while the drum index is opposite graduation "35" on the drum scale. Then we count up the full millimeters on the scale in the field of view of the eyepiece and see that the index lines have not reached graduation "6", thus, the reading will be 5.00 mm.

As one graduation on the scale of the drum represents 0.01 mm, the reading on the drum will be $0.01 \times 35 = 0.35$ mm.

The final reading on the eyepiece scales will be $5.00 + 0.35 = 5.35$ mm.

Determination of Magnification of Microscope Objective

An object micrometer put on the microscope stage is used for measuring linear magnification of the microscope objective. The eyepiece micrometer is put on the eyepiece tube of the

microscope draw tube up to the stop and fastened on it by screw *4*. In case of the draw tube of the telescopic type its length should be adjusted. Then adjust it on the definite image of the cross-hair by rotating eyepiece *3* by its knurled part. Focus the draw tube on the definite image of the object micrometer scale and start the measurement of the objective magnification.

Take some divisions on the object micrometer scale which go into $^2/_3$ of the eyepiece field of view. While measuring it is not recommended to use the whole eyepiece field of view, as the quality of the image on the edges is somewhat lower than in the middle.

For convenient measuring set the zero division on the object micrometer scale at a distance of $^1/_3$ of the field of view radius from the edge. Then viewing through the eyepiece, by turning the drum clockwise, bring the centre of the eyepiece cross-hair to the image of the zero graduation line on the scale of the object micrometer and take readings from the scales of the eyepiece micrometer.

Viewing through the eyepiece by turning the drum clockwise bring the centre of the cross-hair to the image of the graduation line which is at a distance of $^1/_3$ of the radius of

the field of view from the edge and take readings from the scales of the eyepiece micrometer for the second time. Count up the number of the object micrometer scale divisions taken in measuring, determine the difference between the readings from the eyepiece micrometer scales and substitute the obtained results in the formula (1):

$$\beta = \frac{II \quad I}{z \cdot a},$$

where:

β — linear magnification of the objective lens;

II — I — the difference between two readings taken from the scales of the eyepiece micrometer;

z — the number of the object micrometer divisions taken in measuring;

a — the value of one division of the object micrometer scale.

Example. The first reading taken from the eyepiece micrometer scale is 2.50 mm, the second one is 6.35 mm, the number of the object micrometer scale divisions taken in measuring is 25, each graduation of the object micrometer scale is 0.01 mm.

Then,

$$\beta = \frac{6.35 - 2.50}{0.01 \times 25} = \frac{3.85}{0.25} = 15.4x.$$

Thus, the objective lens magnification is 15.4x.

Measurement of Object Size

When the objective lens magnification is determined, one may proceed to the measurement of the object viewed through the microscope.

For this purpose the object micrometer is removed from the microscope stage and replaced by the object to be measured. Focus the microscope draw tube on the sharp image of the object and start the measurement of the size of the image in the plane of the eyepiece micrometer cross-hair.

For measurement viewing through the eyepiece and turning the drum clockwise, bring the centre of the cross-hair on the edge of the object image; take the first reading from the micrometer scales.

Likewise bring the cross-hair on the image of the other edge of the object and take reading from the micrometer scale for the second time. Determine the difference between the readings which will be the size of the object image. To determine the size of the object itself the difference obtained is divided by the linear magnification of the objective lens which is determined by formula (1) of the present instructions.

Example. The reading taken from the scales of the eyepiece micrometer with the cross-hair on one edge of the object image is 1.65 mm, on the other edge of the object image — 6.34 mm, the difference between the readings is 4.69 mm, the magnification of the objective lens is 15.4x.

Then the size of the object to be measured will be:

$$t = \frac{4.69}{15.4} = 0.305 \text{ mm} \qquad (2)$$

In some cases the size of the object is convenient to be determined as follows.

Determine the movement of the cross-hair in the plane of the object when the screw is turned by one division of the drum using the following formula:

$$E = \frac{0.01}{\beta}, \qquad (3)$$

where:

E — the division value of the drum scale in the object plane;

0.01 — the movement of the eyepiece cross-hair when the screw is turned by one division of the drum scale;

β — the linear magnification of the objective.

For example, with the object magnification 15.4x we have

$$E = \frac{0.01}{15.4} = 0.000649 \approx 0.00065 \text{ mm}$$

Then the size of the object to be measured is calculated by the formula

$t = E \cdot (II - I)$, where (II—I) is the difference between the readings taken from the eyepiece micrometer scales (in the absolute divisions of the drum).

Below is given the calculation of the object size with the data obtained in the previous example.

$t = 0.00065 \cdot (634 - 165) = 0.00065 \times 469 \approx 0.305$ m

4. WEIGHT AND OVERALL DIMENSIONS

Weight in operating condition	212 g
Weight in case	380 g
Overall dimensions in operating condition	60×45×80 mm
Overall dimensions of case	48×92×120 mm