

MEASURING WITH MICROMETERS UNDER MICROSCOPES

Micrometric eyepiece: is a crystal disc about 19 or 25 mm in diameter, which has engraved a scale of 10 mm in length divided into 100 equal parts of 0.1 mm each.

Micrometer objective: It is a scale of 1 mm length divided into 100 equal parts of 0.01 mm each, engraved on a transparent slide of 26mm x 76 mm.

MEASURING WITH THE MICROMETRIC EYEPIECE

To make a measurement with the micrometric eyepiece, you should remember that between each division there are 0.1 mm distance, this represents on the object to observe a distance equal to 0.1 mm divided by the magnifications of the lens. Let us take an example, if you want to measure an object with the objective of 40X magnifications, you will see that it occupies 32 divisions through the micrometric eyepiece, therefore the size of the object is: $32 \times 0.1 \text{ mm} / 40 = 0.08 \text{ mm}$

MEASURING WITH THE MICROMETRIC EYEPIECE AND MICROMETER OBJECTIVE

To make this measurement, it is necessary to do 2 operations:

1. Calibration of the microscope with the micrometer objective, using the same observation conditions to observe the sample, let us say: same lens, eyepieces, interpupillary distance, diopter adjustment, user, etc....
2. Measurement of the object using only the micrometric eyepiece.

For better accuracy, it is possible to do the first operation again and take as calibration the mean factor of both, in case they are not very different.

How to calibrate the microscope:

- The user (microscopist) will put the microscope under the same conditions as it uses to observe a sample to be measured.
- It will put the micrometer objective on the stage so that, a division of the micrometer objective matches a division of the micrometric eyepiece.
- From the moment both divisions match, without moving the micrometric focus knob and stage, locate a new point where two other divisions match.
- Count how many divisions of the micrometric eyepiece are between the two points and how many divisions are between the micrometer objectives.
- Let us say as an example that with one of the objectives there are 72 divisions in the micrometer eyepiece that match 18 divisions of the micrometer objective, then the formula will be:

$$18 \times 0.01 / 72 = 0.0025 \text{ mm}$$

- In this case it means that each division of the micrometer eyepiece are 0.0025 mm.

How to measure on the sample?

- Remove the micrometer objective from the microscope stage.
- Do not modify the microscope observation conditions.
- Place the object to be measured on the stage.
- Count how many divisions of the micrometer eyepiece the sample occupies, for example if sample occupies 64 divisions, you can now calculate the result; in this case it is:

$$64 \times 0.0025 \text{ mm} = 0.16 \text{ mm}$$

You have to do this process with all objectives you are using in your microscope.