# EYEPIECE GRATICULES (RETICLES)

These are discs marked with scales or patterns, which fit into the eyepiece at the plane of the intermediate image. This is the position of the specimen image produced by the objective lens of the microscope. Therefore, the scale or pattern is viewed superimposed on this image.

In Huygenian eyepieces of older design the graticule is placed on the field aperture at the internal plane of focus.

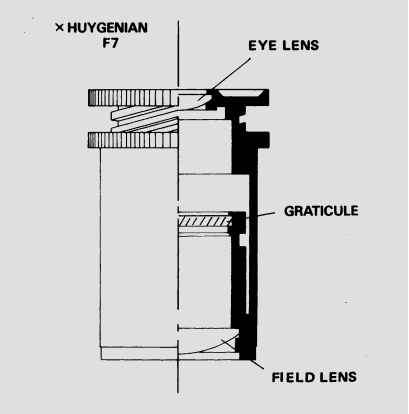
With modern Huygenian designs the graticule is held firmly within a recessed cell by a retaining ring, all within the body of the eyepiece. Such eyepieces are available from Graticules. [See part F7 in Optical Measurement Instruments brochure].

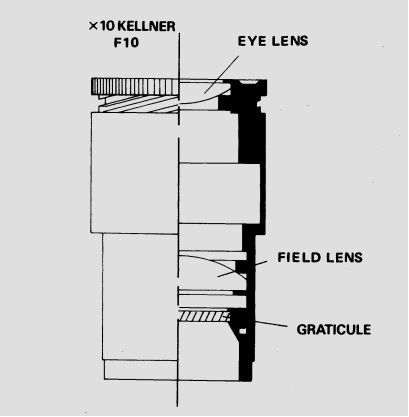
It should be noted however, that some eyepieces of Huygenian design need the graticule to be fitted by a qualified technician. In such cases contact the equipment manufacturer or distributor.

In Kellner or Ramsden eyepieces the graticule is held by a retaining ring at the external plane of focus. (See part F10 in Optical Measurement Instruments brochure).

We stock most graticules in 16, 19 and 21mm diameters. Other diameters are normally supplied within 2 weeks. When ordering please state the diameter of graticule required. Nominal glass thickness is 1.5mm. Image reading correct through the glass.

The Optical Measurement Intruments brochure is available by calling Pyser-SGI.




## Eyepiece Graticules to Customer Specifications

See also Section 7 of this catalogue.

When sending details to us for a special eyepiece graticule it is essential that you include the following information:-

1. External diameter of the graticule disc.
2. Calibration of microscope. It is essential that you give calibration details of the objective magnification you intend to use on your microscope. See following section for information on calibration.

   e.g. If you have a x2 objective magnification and you want each division of the graticule to represent 1mm in terms of the specimen, then each division will have to be 1mm x 2 (size of objective) = 2mm.
3. Line thickness. This will vary depending on the power of your eyepiece and we will be happy to offer advice. As a guideline it is suggested that, with a x10 eyepiece, lines should be from 10 to 12 microns.
4. Precise drawing of the pattern with the accuracy and tolerances required. Clearly specify on the drawing whether dimensions quoted refer to the size of details on the graticule or of the object to be measured.



We manufacture components (encoder discs, graticules, metal foils, resolution standards) to custom design, if it is not in the catalogue please contact us for pricing information.

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## Calibration of Microscopes (Calibration Factor Calculation)

In general, the total magnification of your microscope can be determined by simply multiplying the objective power by that of the eyepiece.

| Objective | Eyepiece | Total Magnification |
|---|---|---|
| x20 | x10 | 200 |

For most work, especially with modern optics, this is sufficient. However, where actual size is critical it is often necessary to modify the dimensions, so when ordering eyepiece graticules the following information is needed:-

A calibration factor.

Objective magnification.

Eyepiece magnification.

Graticule diameter.

Make and model of microscope.

To calibrate the instrument, fit the microscope with an eyepiece scale and appropriate stage micrometer. Compare the length of the stage micrometer with the eyepiece scale. An exact calibration factor can then be calculated.

**Example:-**
Using a 40x objective, a circle in the eyepiece requires a diameter of 4000 microns (4mm) to coincide with or read a 100-micron circle on the stage. The factor is therefore defined as 4.

## Alternatively:-

With the stage micrometer and eyepiece graticule in place, the microscope is focused in the normal way. The eyepiece scale now becomes superimposed upon the enlarged image of the stage micrometer.

Move the stage micrometer until the zeros on each scale are coincident. Further along another coincident point will be found. The relationship between the two points can now be seen and calculated.

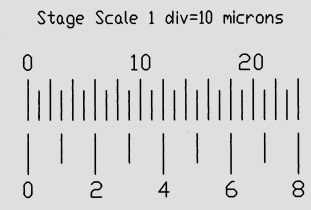
a) Number of units = $\frac{\text{Number of stage micrometer divisions}}{\text{Number of eyepiece scale divisions}}$

On scale shown a) there are 24 stage micrometer divisions which align with 8 eyepiece scale divisions. Therefore each eyepiece division is:- 24/8 = 3 units

b) In this case the 17 divisions on the stage micrometer line up with divisions 1 to 8 on the eyepiece scale. Thus 17/7 = 2.42857 units. If the unit of the stage micrometer is 10 microns, then each division = 24.2857 microns. In practical terms this figure may be rounded to 24 or 24.3

c) It is possible that there is no second point of coincidence. Then on microscopes with an adjustable tube length coincidence can be obtained by lengthening or shortening the tube. Where there is no tube length adjustment, all measurements will be approximate.

a)

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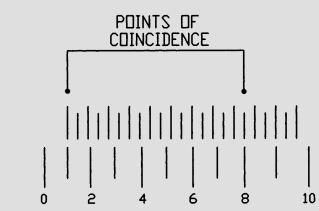
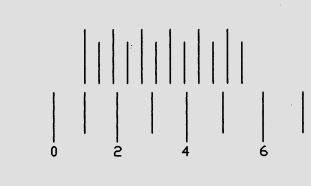



c)

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