Guide - Eyepiece Reticles

- The terms ocular and eyepiece mean the same thing.

- The terms reticle, reticule and graticule mean the same thing

- It is not normal to have a calibration certificate for an eyepiece reticle. The reason for this is that the reticle is installed in the eyepiece and all of the optics on the microscope can effect the size measured by the reticle. It is normal practice to use a stage micrometer to calibrate the complete microscope. See also Technical Note - *Microscope Calibrating with a Stage Micrometer*.

- Size conversions and equivalents.

1mm = 1000µm	1inch = 1000thou	1mm = 39.4thou
0.1mm = 100µm	0.1inch = 100thou	1thou = 0.0254mm
0.01mm = 10µm	0.01inch = 10thou	
0.001mm = 1µm		

- It is far better to increase the objective magnification than use a reticle with finer details.

  A recent example had a customer that wanted to have a reticle with a horizontal scale to measure spores of 2-5µm in diameter. They said they normally used a 10x objective. We answered as follows:-

  'In this case, our NE1, which has a 10mm scale subdivided into 0.1mm divisions will measure 0-1mm when used with a 10x objective lens. Each division will represent 0.01mm (10um). This will not be good enough to measure spores in the 2um - 5um region. If you use a reticle with a smaller scale in the eyepiece it is very difficult to read so the answer is for the customer to use the 40x objective. Now the 10mm scale will measure 0-0.25mm and each division will represent 2.5um. If the customer is able to use the 100x objective then the measurements can be even more accurate as each division will represent 1um'.

- The diameter of the reticle is important to ensure it fits the eyepiece you have. Pyser has compiled a database of various manufacturers, eyepieces and the size of reticle required to fit them. For more info please check the *Reticle Diameters for Common Microscopes PDF-file.*

- When we select an eyepiece reticle we are only concerned with the objective magnification.

  The mathematics of microscope magnification is very simple – all you do is divide the size of the feature on the reticle by the objective magnification to get the size that it will actually measure at the stage. Thus a 10mm length scale when used with a 10x objective will measure 1mm at the stage. The same 10mm length reticle when used with a 40x objective will measure 0.25mm (250µm at the stage).

  If you want to look at another way, if you have a 10µm at the stage and are using a 40x objective lens this will be magnified to 400µm (0.4mm) at the reticle image plan. The next section gives more sizing information.

  The eyepiece merely magnifies the image on the reticle.

▪ Table Relating Stage Size and Objective Magnification with Size at Reticle Image Plane.

The two columns on the left hand side show the size of the specimen or feature at the stage. Along the top are typical objective magnifications. So, if you want to measure something that is about 50µm using a 40x objective lens this will actually be 2mm at the reticle image plane. A reticle with a 10mm scale in 0.1mm divisions (Our NE1) or one with a 5mm scale in 0.05mm divisions (Our NE5) may be suitable.

Measurement at Stage (m)	**Measurement at Stage (mm)**	**1X**	**1.25X**	**2X**	**5X**	**10X**	**20X**	**40X**	**100X**
1m	0,001mm	1m	1,25m	2m	5m	10m	20m	40m	100m
5m	0,005mm	5m	6m	10m	25m	50m	100m	200m	500m
10m	0,010mm	10m	12,5m	20m	50m	100m	200m	400m	1mm
20m	0,020mm	20m	25m	40m	100m	200m	400m	800m	2mm
50m	0,050mm	50m	60m	100m	250m	500m	1mm	2mm	5mm
100m	0,1mm	100m	125m	200m	500m	1mm	2mm	4mm	10mm
200m	0,2mm	200m	250m	400m	1000m	2mm	4mm	8mm	20mm
500m	0,5mm	500m	600m	1mm	2,5mm	5mm	10mm	20mm	50mm
1000m	1mm	1000m	1,25mm	2mm	5mm	10mm	20mm	40mm	100mm
10000m	10mm	10000m	12,5mm	20mm	50mm	100mm	200mm	400mm	1000mm

▪ Colour of reticle lines does not matter in a microscope eyepiece. All lines, whatever their colour, block the light from the specimen/stage so the pattern will always appear dark against a brighter background.

▪ For mor information please check the *Measuring with a Microscope-PDF-file*.