



Measuring

User Manual

Accessories for measuring tasks

- **Stage micrometer (1) for calibration**
- **Graticules with various measuring pitches (2) in mm and inches**
- **Graticule with mesh (3)**
- **Graticule with co-ordinate grid**

Lengths are measured using the graticules with measuring pitches, e.g. 12mm : 120 or 5mm : 100.

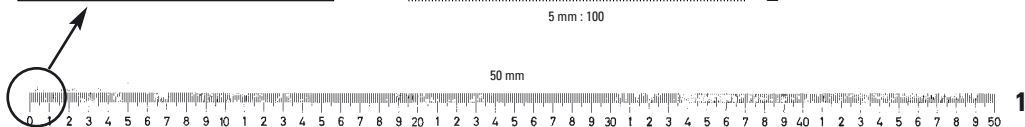
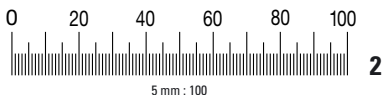
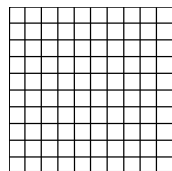
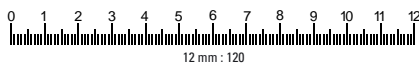
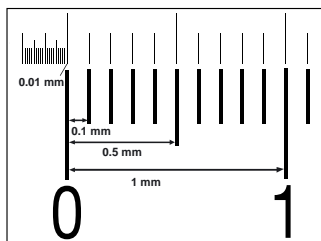
Counting cells, nuclei and the suchlike within one particular area can be undertaken using the grid plate with mesh.

Calibrating When calibrating with the stage micrometer, the value of an interval is defined on the eyepiece grid plate in relation to the specimen magnification.

Angle measurements can be taken with the aid of the graticule with co-ordinate grid and the angular division on the rotary polarisation table.

Eyepieces Please refer to the instrument's directions for use with regard to using the graticule in eyepieces. **Two** adjustable eyepieces are required for equipment with measuring graticules so that the sharpness can be set precisely.

Software for measuring tasks If you take digital photographs with your stereomicroscope or macroscope, we would recommend the Leica IM image archiving and image management software with measuring module for interactive measuring, inscribing and marking.



Care, cleaning



Avoid corrosive cleaning agents and materials which will scratch the surfaces.

Observe the information relating to care in the operating manual for your instrument.

- Do not keep unused graticules and stage micrometers in the original containers in which they were supplied.

You will not cause any damage by undertaking cleaning with

- soft, dry hairbrushes
- bellows
- optical cleaning cloths
- cotton buds
- fine, soft, non-fluffing cloths: if removing fingerprints, dampen cloth; if dealing with stubborn dirt, soak cloth in alcohol.

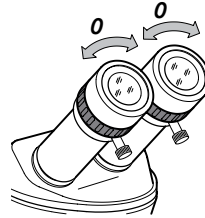
Setting diopters and grid plate



Co-ordinate the eyepieces precisely to your eyes as described until you can clearly see the graticule and specimen at the same time (free from parallax).

Preparations

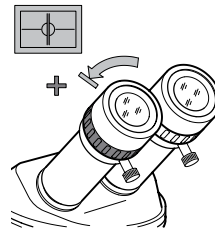
- ▶ Set distance from eye, eyepieces, illumination etc. as described in the instrument's directions for use.
- ▶ Set «0» diopters on both eyepieces.
- ▶ Illuminate field of vision without specimen.



Use graticule to regulate eyepiece

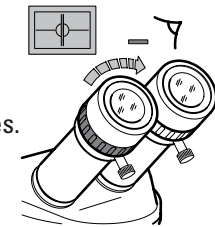
Do not look into the eyepieces.

- ▶ Turn eyepiece with graticule anticlockwise until it reaches the stop.



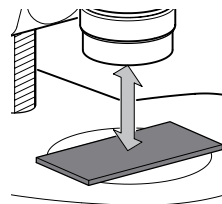
Look into the eyepieces

- ▶ Slowly turn eyepiece with graticule clockwise until you can clearly see the measurement lines.
- No longer adjust eyepiece with grid plate.

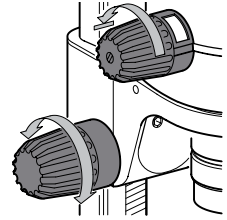


Focusing test specimen

- ▶ Place test specimen (e.g. stage micrometer) under the lens.



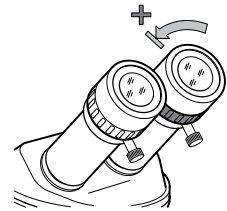
- ▶ Select the lowest magnification.
- ▶ Observe specimen through the eyepiece with graticule and focus.
- ▶ Select the highest magnification.
- ▶ Use focusing drive to optimise sharpness.



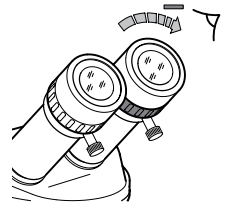
Regulate eyepiece without graticule

Do not look into the eyepieces

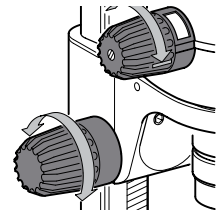
- ▶ Turn eyepiece without grid plate anticlockwise until it reaches the stop.



- ▶ Select the lowest magnification.
- ▶ Observe specimen through the eyepiece without graticule and slowly turn eyepiece clockwise until the eye clearly sees the specimen.



- ▶ Select the highest magnification.
- ▶ Observe specimen through both eyepieces.
- ▶ If necessary, use the focusing drive to re-focus.



Checking eyepiece is free of parallax

- ▶ Look into the eyepieces and slightly move your head.
 - Graticule and specimen must not move towards one another, i.e. they must be clearly focused in one plane (free of parallax). If this is not the case, please repeat the process.

Calibrating graticules

Why calibrate? The graticule is only magnified by the eyepiece. The total magnification of the specimen does however depend on the lens, magnification changer, eyepiece and additional tube possibly used (e.g. coaxial lighting sources) and changes whenever these factors are altered.

When calibrating with the stage micrometer, the value of an interval on the graticule is defined in relation to the specimen magnification. The true dimensions of a specimen can only be established once the calibrated value has been defined.

You do not have to calibrate ... if you only undertake relative measurements or comparisons.

You have to calibrate ... if you need absolute measurement values.

Only calibrate once The calibration value of each of your optics/magnification combinations used only has to be established once. Keep a table of the appropriate calibration values (refer to example on page 12).

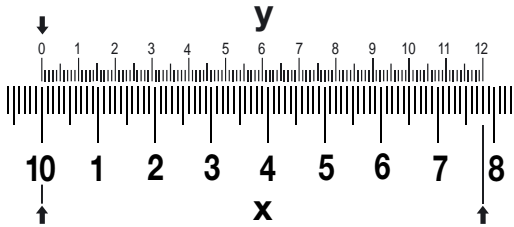
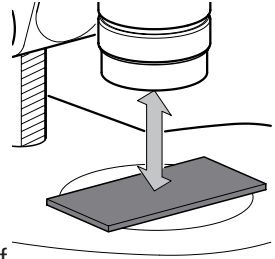
Engaging zoom settings When working with instruments with engageable zoom settings (Leica MZ6, MZ7₅, MZ9₅ etc.) or adjustable stops (Leica S6 models etc.), the specific magnifications can always be re-produced exactly (refer to directions for usage for the stereo-microscope).



When using instruments with zoom magnification changers without engageable setting stages, inaccuracies could arise when again undertaking settings. If a high degree of measurement precision is required, you should therefore undertake calibration whenever changing magnification.

Calibrating

- ▶ Place stage micrometer on the table insert and set sharpness.
- ▶ Select the magnification with which you will later want to take measurements.
- ▶ Set eyepiece graticule and lens micrometer to be free of parallax (see page 4).



- ▶ Align stage micrometer (X) close to and in parallel with the eyepiece graticule (Y).
- ▶ Focus both pitches down to a single point.
In the example: 0 and 10
- ▶ Count: The number of mm (inches) of the stage micrometer (X) corresponds to a certain number of intervals on the eyepiece graticule (Y).
In the example: 7,8mm on the stage micrometer corresponds to 120 intervals on the eyepiece graticule
- ▶ Calculate calibration value using calibration formula and note down.

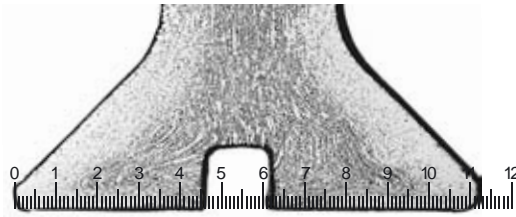
Calibration formula

- X** stage micrometer: number of mm (inches)
Y eyepiece graticule: number of intervals

$$\frac{X}{Y} \text{ mm (inch)} = \text{calibration value mm (inch)}$$

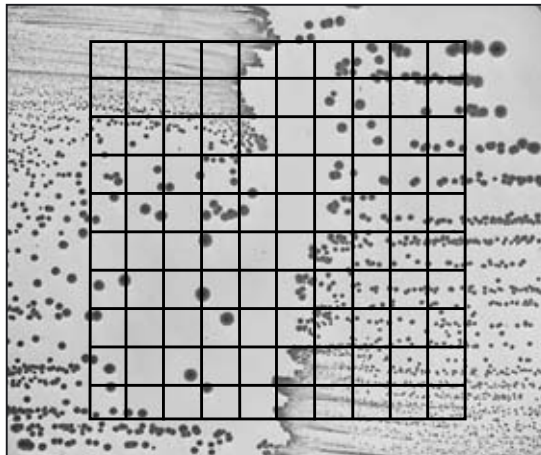
Measuring, counting

Measuring length



- ▶ Remove the stage micrometer and focus on a specimen.
- ▶ Count how many intervals on the eyepiece graticule cover the measurement distance required.
- ▶ Multiply the number of intervals by the calibration value.
The result is the absolute length of the measurement distance in mm (inch).

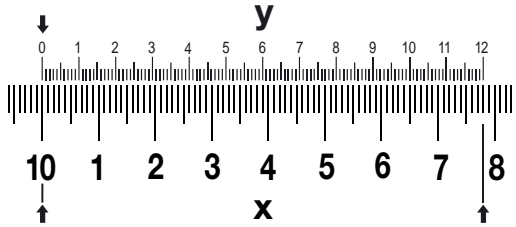
Counting



- ▶ Remove the stage micrometer and focus on the specimen.
- ▶ Count particles (cells) within a known area.
 - The area may comprise several squares.

Examples

1. Measuring pitch 12mm : 120



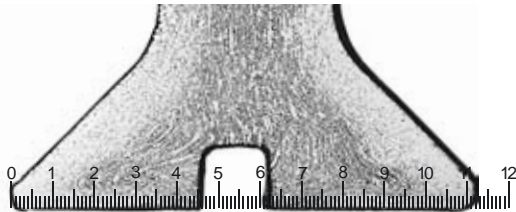
Stage micrometer with 0.1mm graduation

Calibrating

7.8mm on the stage micrometer (X)

≈ 120 intervals on the eyepiece graticule (Y)

$$\frac{7.8}{120} \text{ mm} = 0.065 \text{ mm calibration value}$$



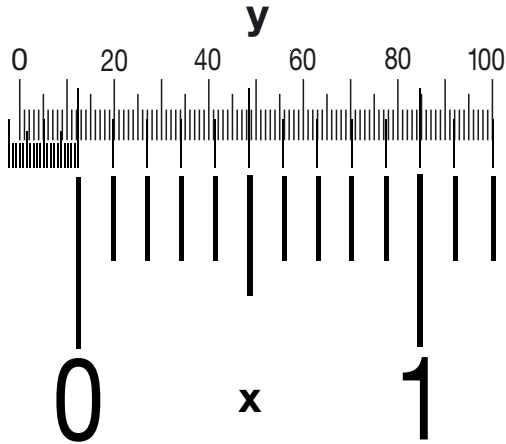
Measuring

Intervals on the eyepiece graticule: 112

Result:

112 intervals \times 0.065mm = 7.3mm length of measurement distance

2. Measuring pitch
5mm : 100



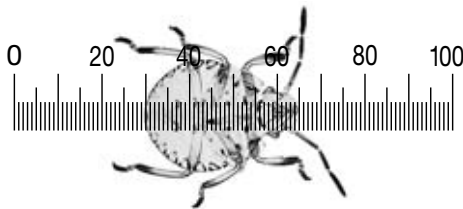
Stage micrometer
with 0.1mm
graduation

Calibrating

1.37mm on the stage micrometer (X)

≅ 100 intervals on the eyepiece graticule (Y)

$$\frac{1.37}{100} \text{ mm} = 0.014 \text{ mm calibration value}$$



Measuring

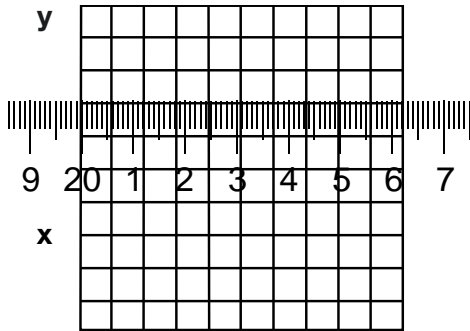
Intervals on the eyepiece graticule: 34

Result:

$$34 \text{ intervals} \times 0.014 \text{ mm} = 0.47 \text{ mm length}$$

**of measurement
distance**

3. Mesh pitch
 $100 \times 1\text{mm}^2$

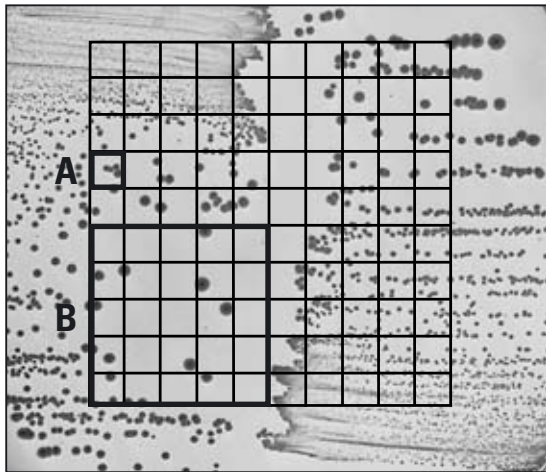


Calibrating

6.2mm on the stage micrometer (X)

≅ 10 intervals on the eyepiece graticule (Y)

$$\frac{6.2}{10} \text{ mm} = 0.62\text{mm calibration value}$$



Counting

Area of boxed in square A: 0.38mm^2

Result: 4 cells per 0.38mm^2

Area of boxed in square B: 9.5mm^2

Result: 16 cells per 9.5mm^2

Table

Calibrating

1. Focus stage micrometer.
2. Count:

_____ number of mm (inches) on the stage micrometer (X)

÷

_____ number of intervals on the eyepiece graticule (Y)

3. Calculate calibration value (one interval of the eyepiece graticule):

$$\frac{X \text{ _____}}{Y \text{ _____}} = \text{_____ mm (inch) calibration value}$$

Measuring

4. Focus on specimen rather than stage micrometer.
5. Count and calculate:

_____ number of intervals on the eyepiece graticule

×

_____ mm (inch) calibration value = _____ mm (inch) length of measurement distance

Instrument	Magnification stage	Lens	Tube factor	Eyepieces	Graticule	Calibration value

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