MICROMETER

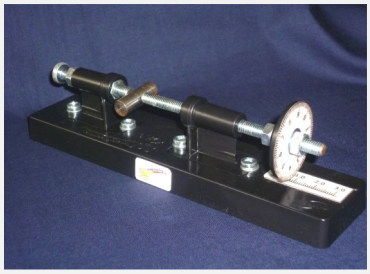
TEACHERS/TUTOR NOTES & WORKSHEETS

The project will take probably two sessions for assembly and test.

BACKGROUND

- Mechanical engineering parts have to be made accurately so that they fit together precisely. For instance the combination of a cylinder and piston to contain a gas or fluid would result in too much leakage without a very small clearance between them. Even with piston rings or seals the clearance would be measured in tens of microns. Similarly ball bearings will not work or share the load unless the balls are of the same diameter. In this case the balls are matched in diameter to a few microns.
- There is a necessity to be able to measure these dimensions to within a few microns and the micrometer was invented to do this.
- When an engine contains a number of different parts made on different machines, it is necessary to make those parts to controlled tolerances (ranges of acceptable measurements) so that they fit together on assembly. Again micrometers are used to achieve these tolerances. If the parts of the engine wear out and spares are necessary, they must be made to the tolerances to be sure that they fit.
- In mass production –for instance in the motor car industry – the various parts may be made in different factories or indeed in different countries and it is necessary that everyone agrees on the dimensions. An International Standard exists to which all measuring instruments are calibrated. The British Standards for length, weight, and all similar measurements are kept at Teddington and all British measuring instruments have to be calibrated to these. The British Standards are themselves referred to International Standards in Switzerland.
- Nowadays length measurements are made with very sophisticated instruments using digital readouts but the micrometer is still in use on the workshop floor. With today's digital controlled machines the same tolerances are maintained.
- Without micrometers and other precision measuring instruments it would not have been possible to achieve the Industrial development that we now enjoy.

MICROMETER



Session 1:

Blackboard

Methods of measuring length.

Ruler -- Tape Measure -- Gauge -- Radar.—Surveyor's Measuring Wheel

MICROMETER, laser, etc.

Screw Threads.

Pitch of thread - In this case it equals 1 mm. i.e. 1 turn of the shaft moves the shaft by 1mm. and 1/2 turn = 1/2mm. etc.

Decimals

Position of decimal point.

Divisions on linear scale gives 1/10 of centimetre

Divisions on circular scale gives 1/100 and 1/1000 of centimetre.

Practical

1. Assemble anvil and spindle blocks.
2. Screw blocks to base.
3. Assemble spindle and anvil bars.

Session 2

Blackboard

Revision

Practical

1. Complete assembly.
2. Adjust circular scale so that "0" is at "6 o clock when micrometer is closed.
3. Glue linear scale in position.
4. Adjust.
5. Measure thickness of paper.
6. Competition: "who has thickest hair"

Websites

https://en.wikipedia.org/wiki/Micrometer

www.upscale.utoronto.ca/PVB/Harrison/Micrometer/Micrometer.html

MICROMETER

WORKSHEET

1. Write down three ways of measuring length.

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2. Draw a screw thread and mark the pitch of the thread.

3. If the screw is turned 1/4 of a turn how many 1/1000 ths of a centimetre has it moved forward?

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   Write this as a decimal of a centimetre.

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4. What is the thickness of a piece of paper/

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   How high would a stack of 500 sheets be?

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5. Write a story about how your Mum measured your bedroom for new wallpaper.

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