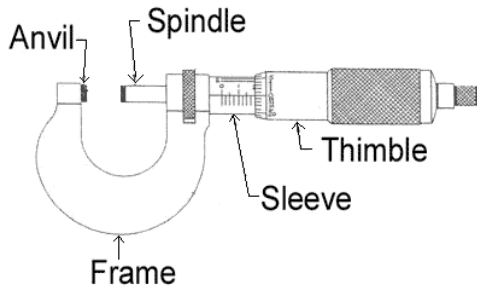


Instructor Notes

Lesson Objective: Students will be able to correctly use a micrometer to measure accurately within $1/1000^{\text{th}}$ of an inch. Students will be able to correctly add and subtract micrometer readings.

Important terminology for Micrometers:



Anvil – The shiny part that the spindle moves toward, and that the sample rests against.

Frame- The C-shaped body that holds the anvil and barrel in constant relation to each other. It is thick because it needs to minimize flexion, expansion, and contraction, which would distort the measurement. The frame is heavy and consequently has a high thermal mass, to prevent substantial heating up by the holding hand/fingers. This is where you hold the micrometer.

Spindle – The shiny cylindrical component that the thimble causes to move toward the anvil

Sleeve - The round component that does not move with the linear scale on it. This part contains the $1/10^{\text{th}}$ and $1/100^{\text{th}}$ markings

Thimble – The part that your thumb turns. This part contains the $1/1000^{\text{th}}$ markings

Understanding place value

Tens	Ones	.	Tenths	Hundredths	Thousandths
5	1	.	6	0	9
	5	.	0	7	5
	0	.	1	4	0

Write each number and say it correctly.

The decimal point is read as the word “AND”

51.609 Fifty-one AND six hundred nine thousandths (Notice not to say six hundred “and” nine)

5.075 Five AND seventy-five thousandths

0.14 Fourteen hundredths

Instructor Notes

How to read a micrometer:

<http://www.stefanelli.eng.br/en/aka-micrometer-caliper-outside-inch-thousandths.html>

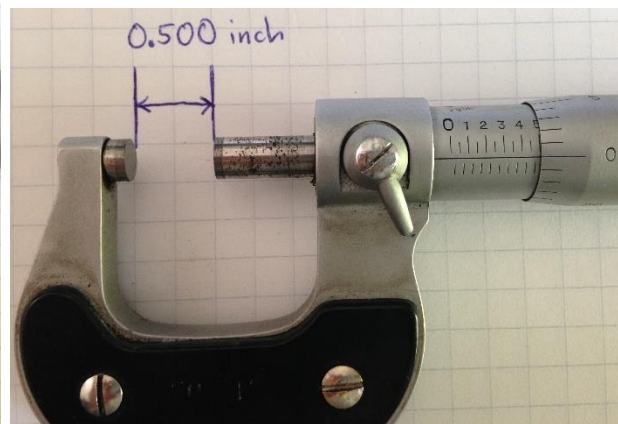
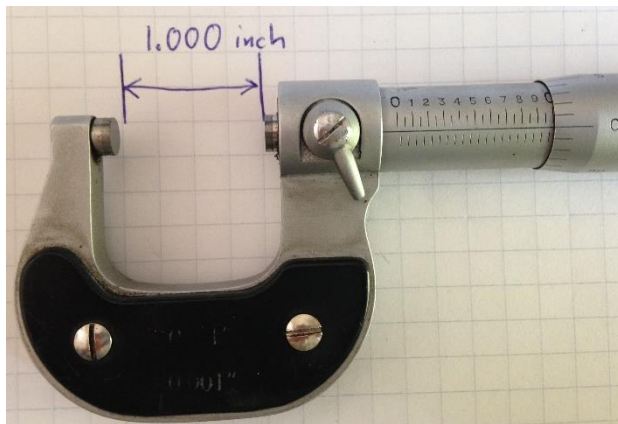
- this site allows the instructor/student to rotate the dial and see the change in measurement.

<http://www.linnbenton.edu/auto/day/mike/read.html>

- this site provides practice examples

Discuss the scale of the micrometer. Measures 0 to 1 inch objects with a precision of 0.001 inches

Show the 1.000 inch reading, 0.500 inch reading, and 0.25 inch reading as shown below:



Instructor Notes

Discuss the large number scale on the sleeve. Each number is in tenths (1/10). Complete the table.

0	1	2	3	4	5	6	7	8	9	10	
0/10	1/10	2/10	3/10	4/10	5/10	6/10	7/10	8/10	9/10	10/10	inches
0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	inches

Discuss the quarter marks and half marks. Half marks are located above the centerline between the large numbers. In the photo shown below, the quarter marks are located below the centerline.



Have the students close the spindle/anvil gap so that the scale reads 0.000 inches. Have students turn the micrometer thimble and count the number of rotations to go from 0.000 to 0.100 inches on the scale. They should observe that it takes four complete revolutions starting with the thimble at the zero mark to go from 0.000 to 0.100 inches. This means that each turn is 1/4 of 1/10 inch. Do the multiplication:

$$\frac{1}{4} \cdot \frac{1}{10} = \frac{1}{40} \text{ inch per complete rotation of thimble}$$

Convert your fraction answer to a decimal using long division

Complete the table.

0 turns	1 turn	2 turns	3 turns	4 turns	
0.000	0.025	0.050	0.075	0.100	inches

Instructor Notes

Once again, have the students close the spindle/anvil gap so that the scale reads 0.000 inches. Discuss the thimble scale. Have the students determine how many increments exist. They should notice 25 increments. Starting at zero, discuss the increasing measurements as they rotate the thimble.

0.000 0.001 0.002 0.003 0.022 0.023 0.024 0.025 (thimble at 0 again)

0.026 (thimble at 1) 0.027 (thimble at 2) 0.028 (thimble at 3)

0.048 (thimble at 23) 0.049 (thimble at 24) 0.050 (thimble at 0 again)

0.051 (thimble at 1) 0.074 (thimble at 24) 0.075 (thimble at 0 again)

0.076 (thimble at 1) 0.099 (thimble at 24) 0.100 (thimble at 0 again)

Instructor Notes

Have the students turn the micrometer to zero again. Students

Example 1: Turn the thimble so that the micrometer reads 0.075 inches

(three full turns from 0.000)



Try it: Turn the thimble so that the micrometer reads 0.094 inches

(three full turns from 0.000 plus an additional 19 increments – $0.075 + 0.019 = 0.094$)



Example 2: Turn the thimble so that the micrometer reads 0.231 inches

(one full turn beyond 0.200 plus an additional 6 increments – $0.225 + 0.006 = 0.231$)



Try it: Turn the thimble so that the micrometer reads 0.550 inches

(two full turn beyond 0.500)

