Micrometers

An outside micrometer, as in Figure 15–19, is a tool used to measure outside diameters with great precision. It is the tool of choice when measuring camshaft and crankshaft surfaces. These measurements require great precision, usually to a thousandth of an inch (0.001″) or a hundredth of a millimeter (0.01 mm). These are very small measurements. This page is approximately 0.003″ or 0.08 mm thick.

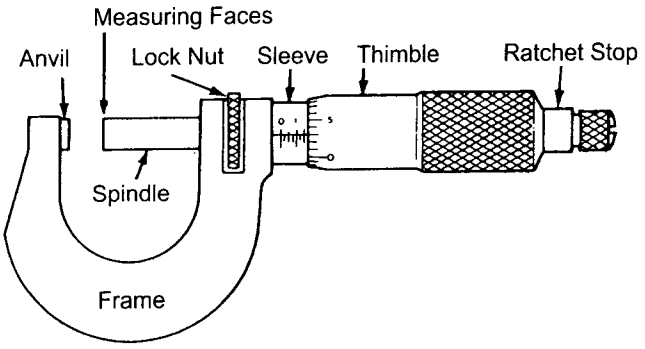

Figure 15–19

When the thimble is turned, the spindle is moved toward the anvil, pinching the part to be measured between these two surfaces. The amount of the measurement is read from the sleeve and thimble. The sleeve of a non-metric micrometer is marked with 10 major divisions. Each major division is equal to 0.100″. All ten major divisions equal 1 inch (Figure 15–20). These major divisions are further marked into four smaller divisions called minor divisions. Each minor division is equal to 0.025″, as shown in Figure 15–21.

The thimble is marked in 0.001″ increments and is mounted to the sleeve with screw threads so that each complete revolution of the thimble is equal to 0.025″ (Figure 15–22) and moves exactly one minor division on the sleeve.

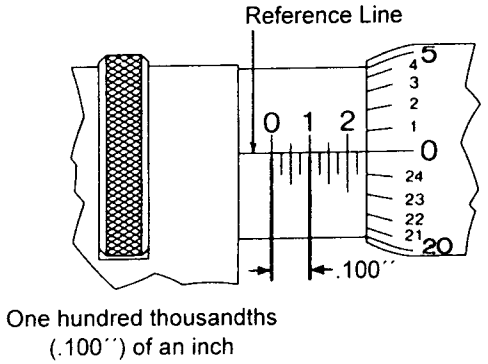

Figure 15–20

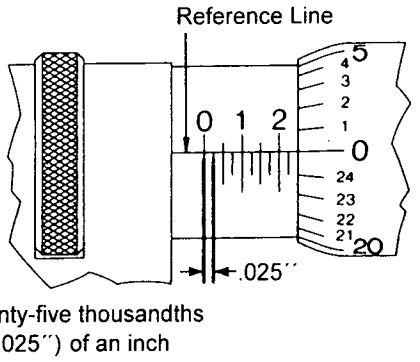

Figure 15–21

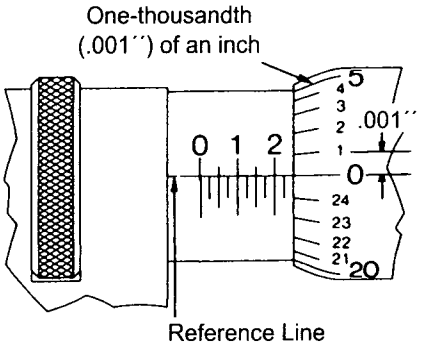

Figure 15–22

To read a micrometer, you must add together the two marks on the sleeve and the reading on the thimble. That means that you add the major division reading, the minor division reading after the highest major division mark, and the number of marks on the thimble that are indexed with the reference line.

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■ EXAMPLE 15–8

In Figure 15–23, you see the sleeve and thimble of a micrometer that has measured a part and is ready to be read. Determine the reading on this micrometer.

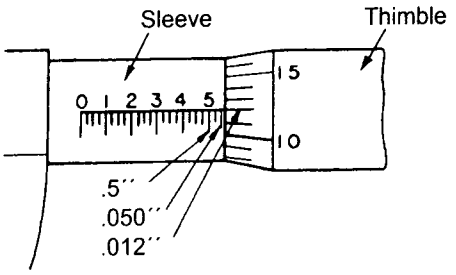

Figure 15–23

Solution

First, notice that there are five major divisions showing. Since each major division equals 0.100″, five divisions equal 0.500″. Next, notice that two minor divisions are showing *past* the 5 mark. Each minor division is equal to 0.025″, so two minor divisions equal 0.050″. Finally, the reading on the thimble shows that the 12 mark is indexed with the reference line, or 0.012″.

Adding these three figures together, you find

$$\begin{array}{r} 0.500 \\ 0.050 \\ +\ 0.012 \\ \hline 0.562 \end{array}$$

Thus, the micrometer in Figure 15–23 reads 0.5620.

Outside micrometers come in many different sizes. The micrometer shown in Figure 15–19 is a 0″–1″ model. This means that the readings are a direct measurement. If it was a 1″–2″ micrometer, the sleeve and thimble reading would be added to 1 inch. If it was a 2″–3″ model, the reading would be added to 2 inches. This would continue for larger models.

Metric outside micrometers are read much the same as those using the U.S. customary system. The sleeve is marked off in 1 mm marks above the reference line (Figure 15–24) and 0.5 mm marks below the line (Figure 15–25). The thimble has 50 marks on it, and each mark is equal to 0.01 mm (Figure 15–26).

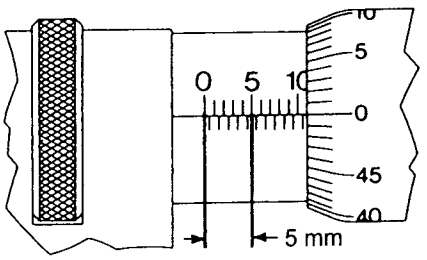

Figure 15–24

To read a metric micrometer, you must add together the upper and lower divisions or marks and the marks on the thimble.

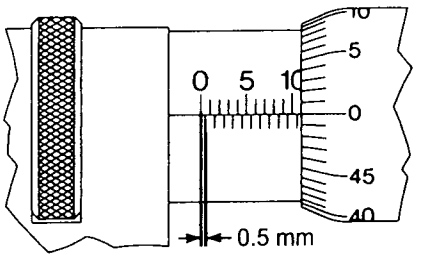

Figure 15–25

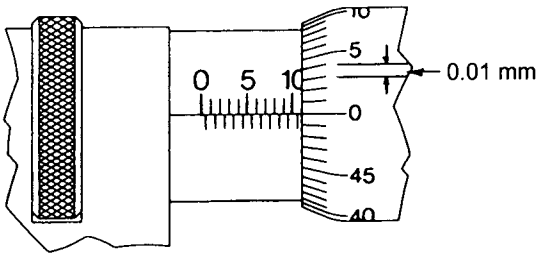

Figure 15–26

■ EXAMPLE 15–9

What is the reading on (the metric micrometer in Figure 15–27)?

Solution

There are 13 marks above the reference line. This equals 13 mm. You can also just see one lower line showing *past* the 13 mm line. This means that you must add 0.5 mm to your reading. Finally, you can see the reference line is aligned with the 28 mark on the thimble. That means that there are 0.28 mm showing on the thimble. When all three readings are added, you obtain

$$\begin{array}{r} 13.00 \text{ mm} \\ 0.50 \text{ mm} \\ +\ 0.28 \text{ mm} \\ \hline 13.78 \text{ mm} \end{array}$$

So, the micrometer in Figure 15–27 has a reading of 13.78 mm.

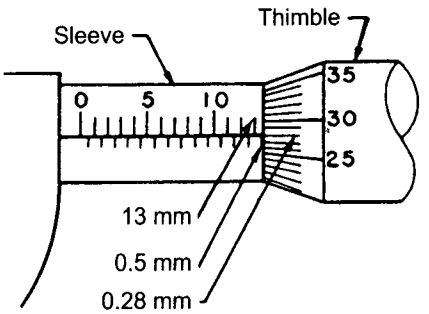

Figure 15–27

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