PLTW Engineering

12/Reverse Engineering 1 of 4 – Precision Measurement

May 18, 2020

12/EDD

Lesson: **5/18/2020**

Objective/Learning Target: Students will be able to explain the four types of measurements that can be made using dial calipers, utilize the correct nomenclature when talking about of the parts of the dial caliper, and accurately read a dial caliper.

What is reverse engineering?

Reverse engineering is taking apart an object to see how it works in order to duplicate or enhance the object.

How can we fully analyze the functionality of a part without knowing its design?

The answer is we must fully measure each part to see how they work. At this point, we are doing reverse engineering.

What is reverse engineering?

Take a look at the video of a student's reverse engineering project.

Squirt gun reverse engineering

What is reverse engineering?

Each of the parts and pieces in the video were drawn in diagram form.

However, if we were to actually design the molds and forms to remake the parts of this squirt gun, we would need to make much more precise design drawings and technical communication.

To do this we would need precise measurements.

Precision measurement

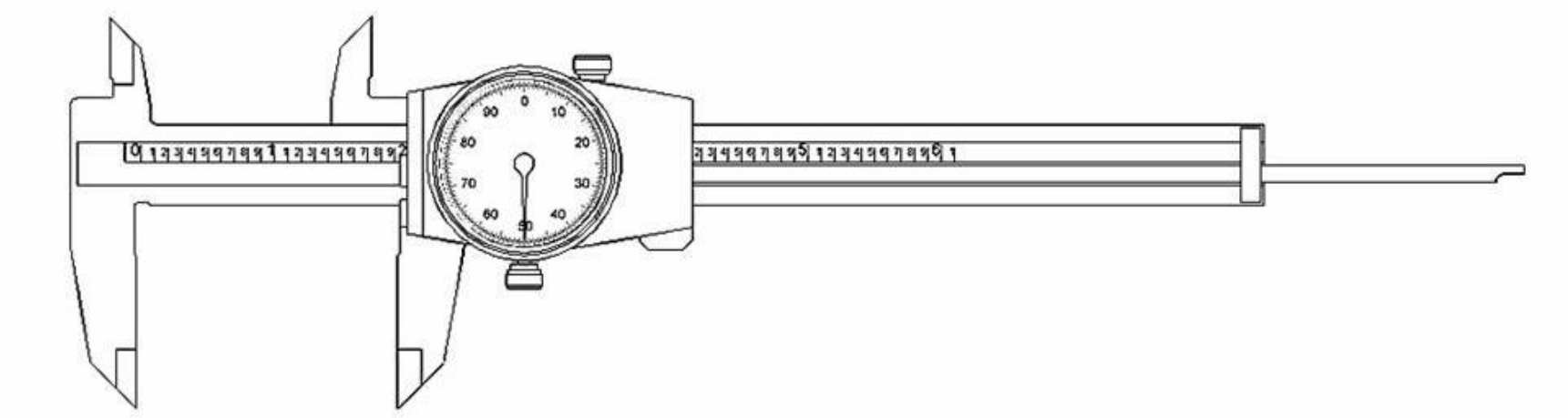
There are many different types of precision measurement tools.

Specific hand tools can measure accurately to .001”.

Today we will look at one of those tools, the dial caliper.

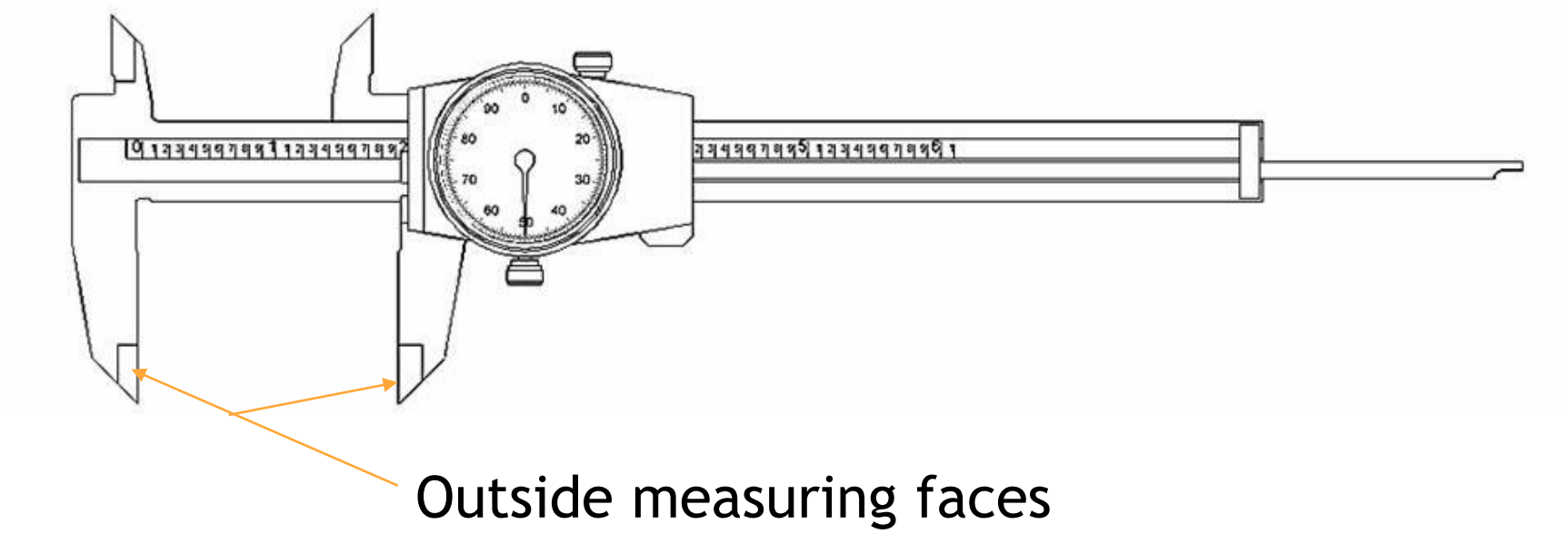
Dial Calipers

Dial calipers are arguably the most common and versatile of all the precision measuring tools used be engineers and manufacturers.



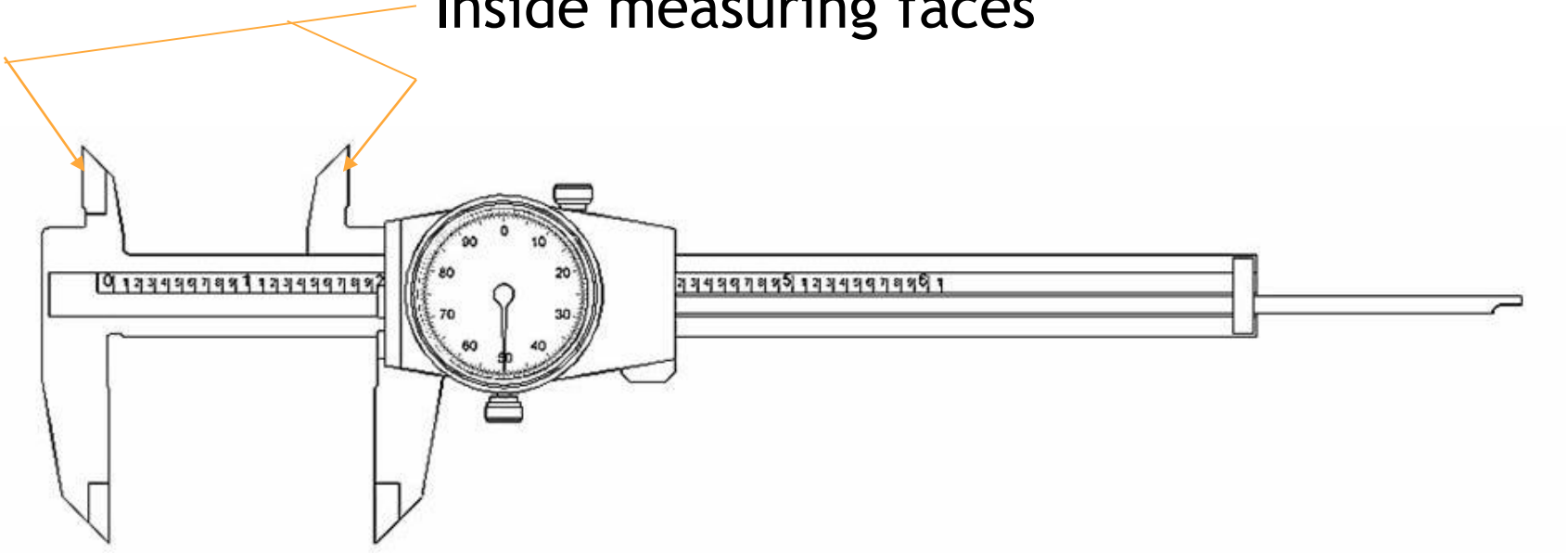
Dial Caliper Measurements

There are 4 methods to use when measuring with a dial caliper.



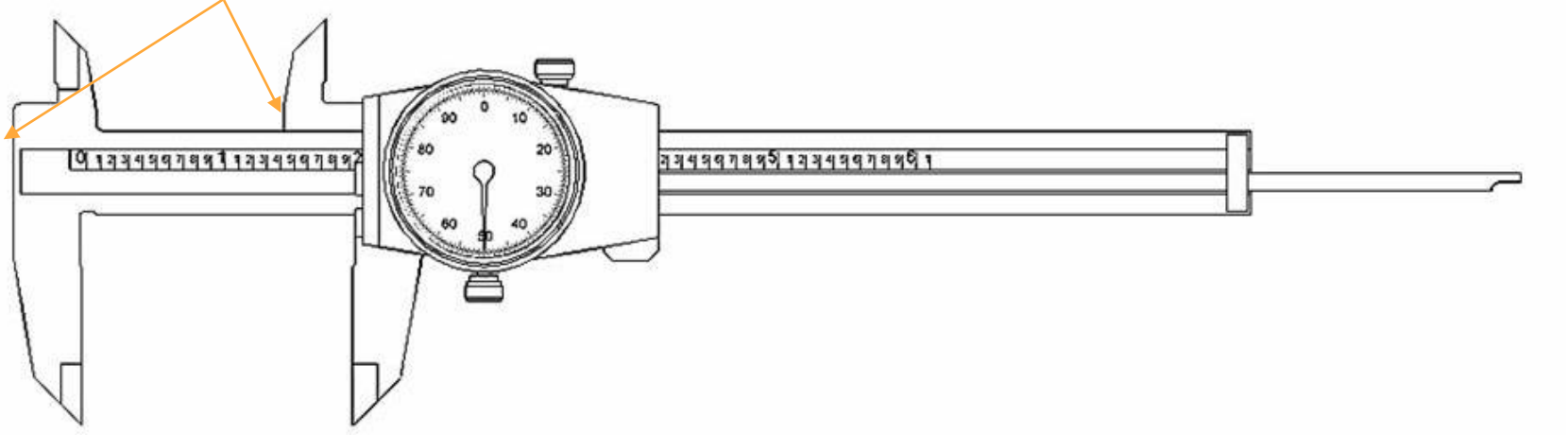
Dial Caliper Measurements

Inside measuring faces



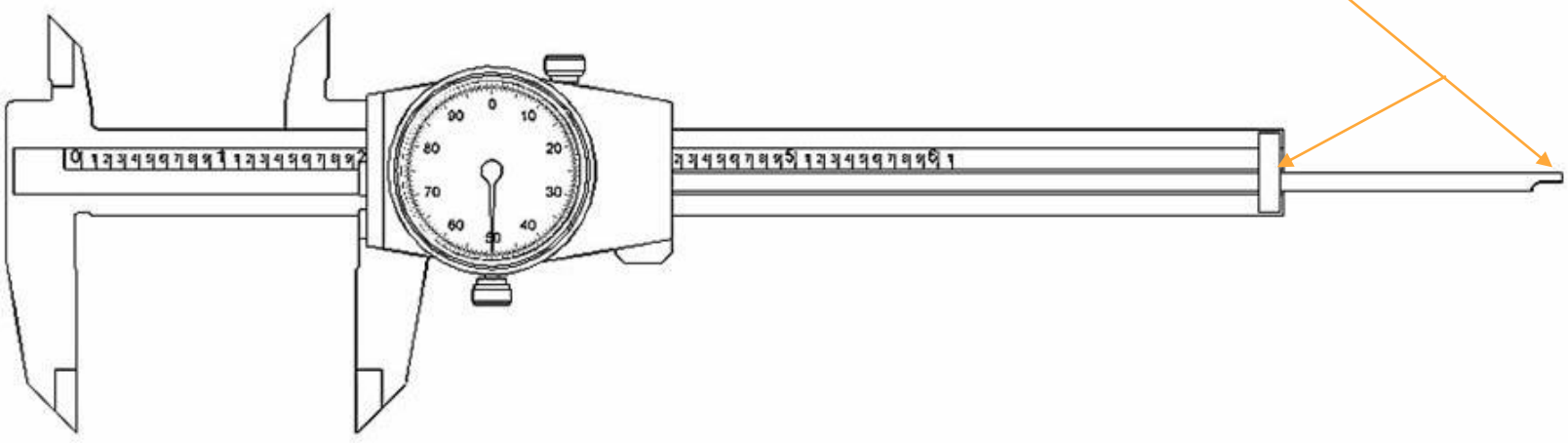
Dial Caliper Measurements

Step measuring faces



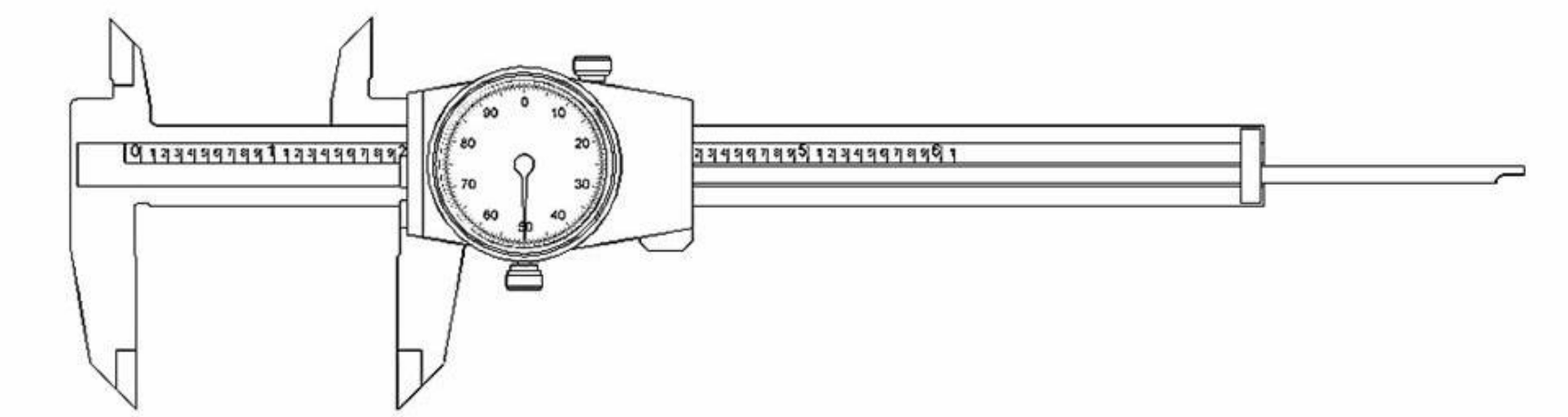
Dial Caliper Measurements

Depth measuring faces



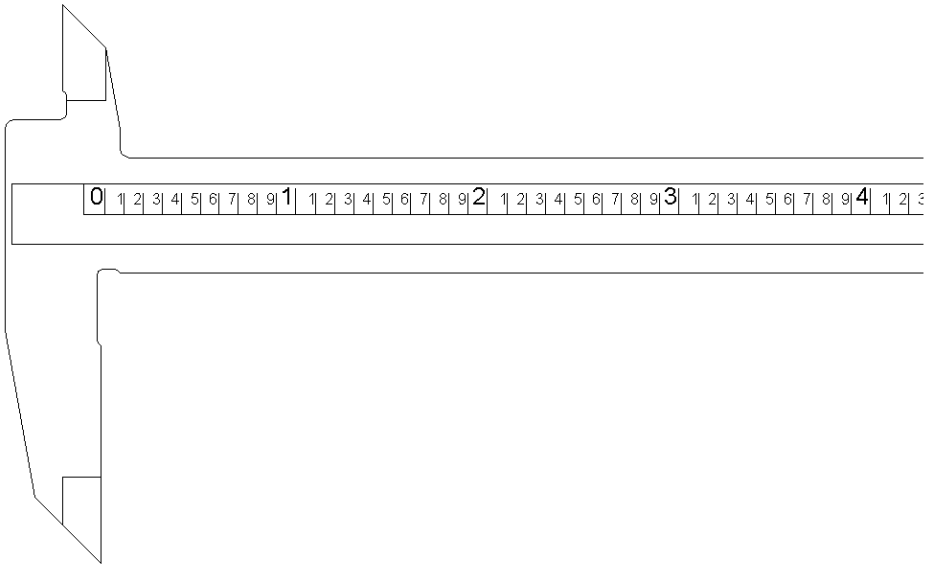
Dial Calipers

A standard dial caliper can measure up to 6 inches.



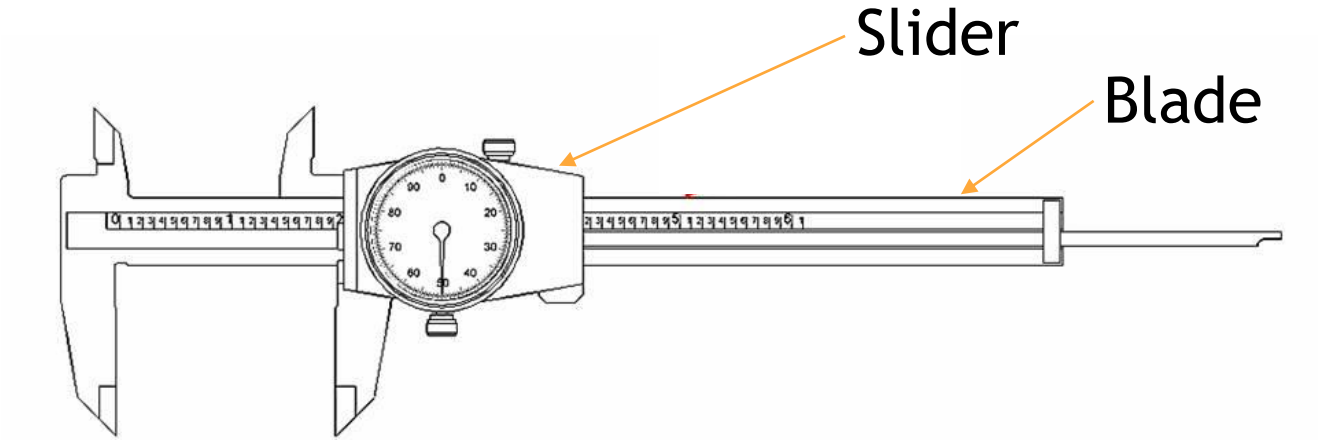
Reading Dial Calipers

The blade scale shows each inch divided into 10 increments. Each increment equals .100”.



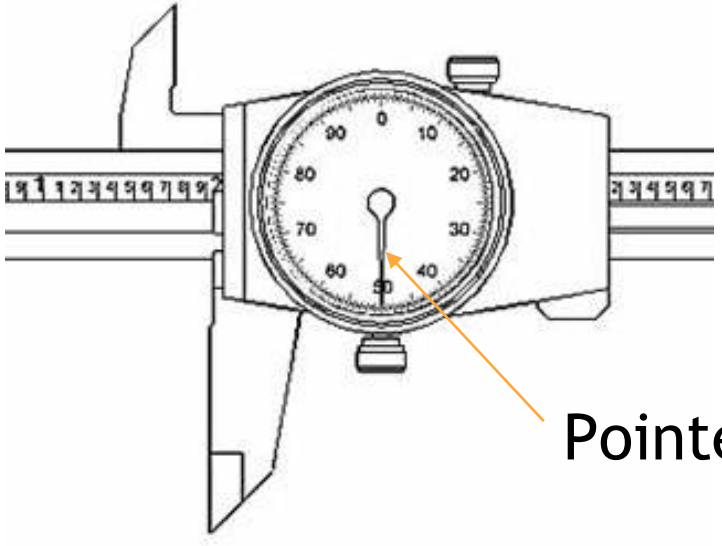
Reading Dial Calipers

The blade is the part that does not move.
The slider moves along the blade and is used to adjust the distance between the measuring surfaces.



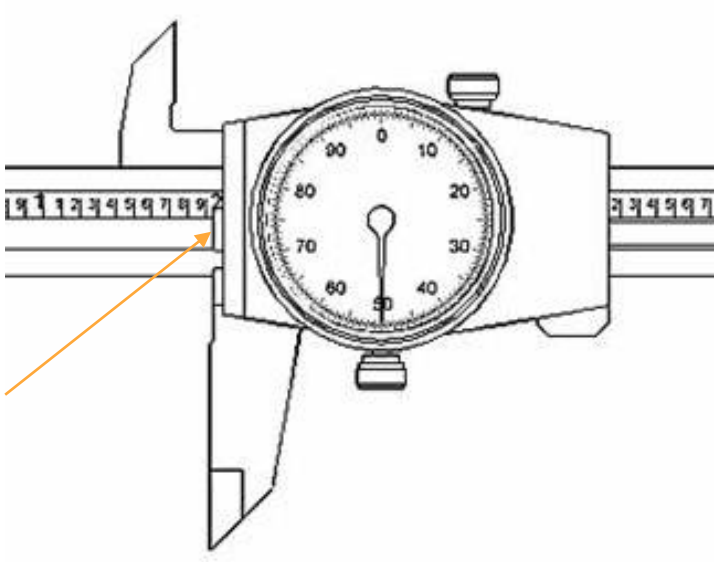
Reading Dial Calipers

The pointer rotates within the dial as the slider moves back and forth along the blade.



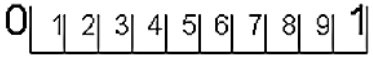
Reading Dial Calipers

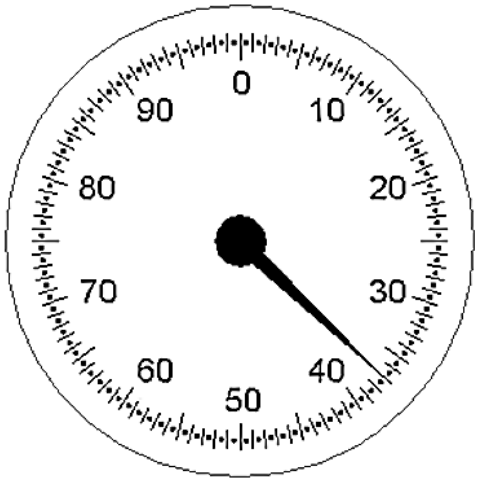
The reference edge keeps track of the first digit in the number if it is <1 and the first and second digit in the number if >1.



Dial Calipers

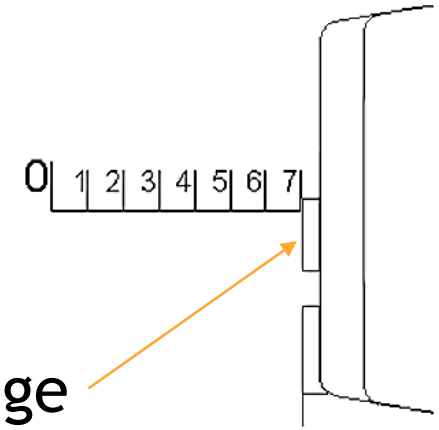
The dial is divided 100 times, with each graduation equaling one thousandth of an inch (.001)



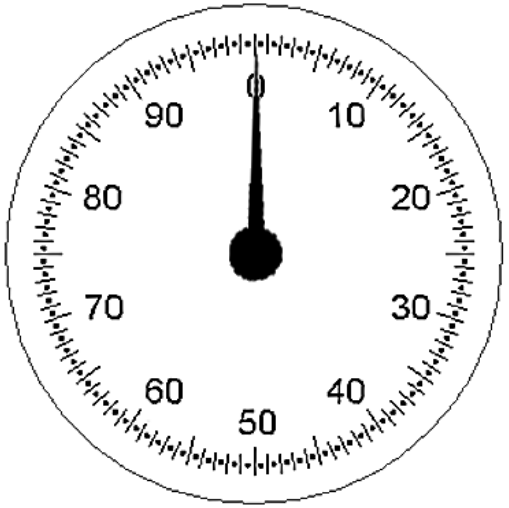


Dial Calipers

Every time the pointer completes one rotation, the reference edge on the slider will have moved the distance of one blade scale increment .100”

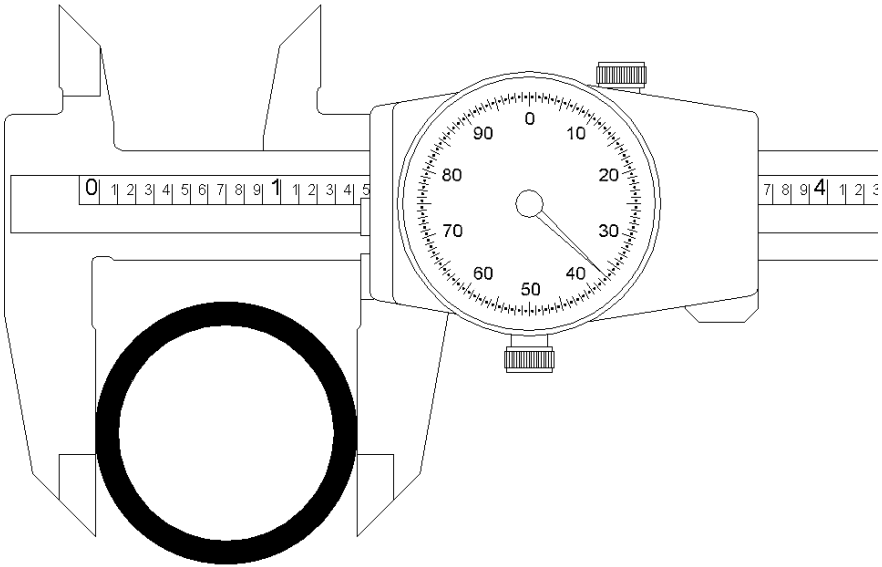


Reference edge



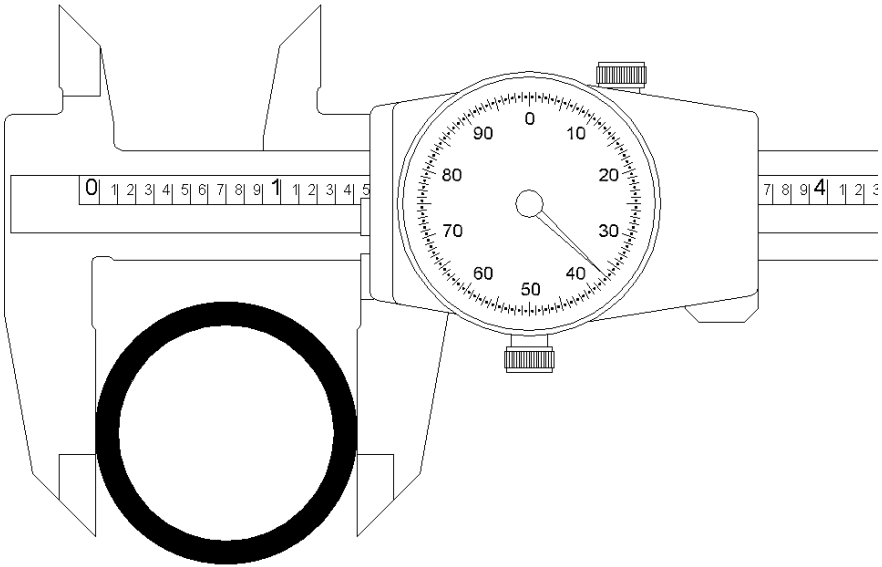
Dial Calipers

To determine the outside diameter of this pipe section, the user must first identify how many inches are being shown on the blade scale.



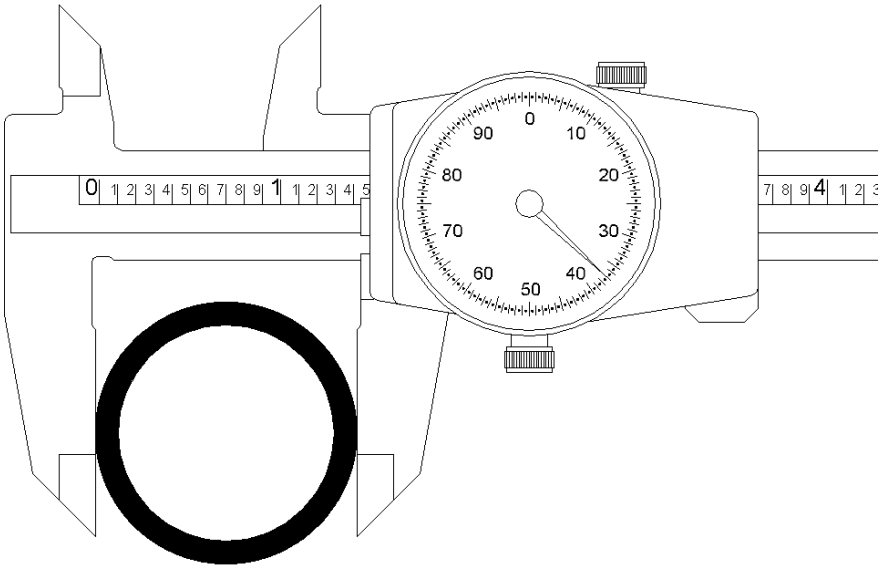
Dial Calipers

You can see the blade scale has completely passed 1 and the reference edge is past the .4



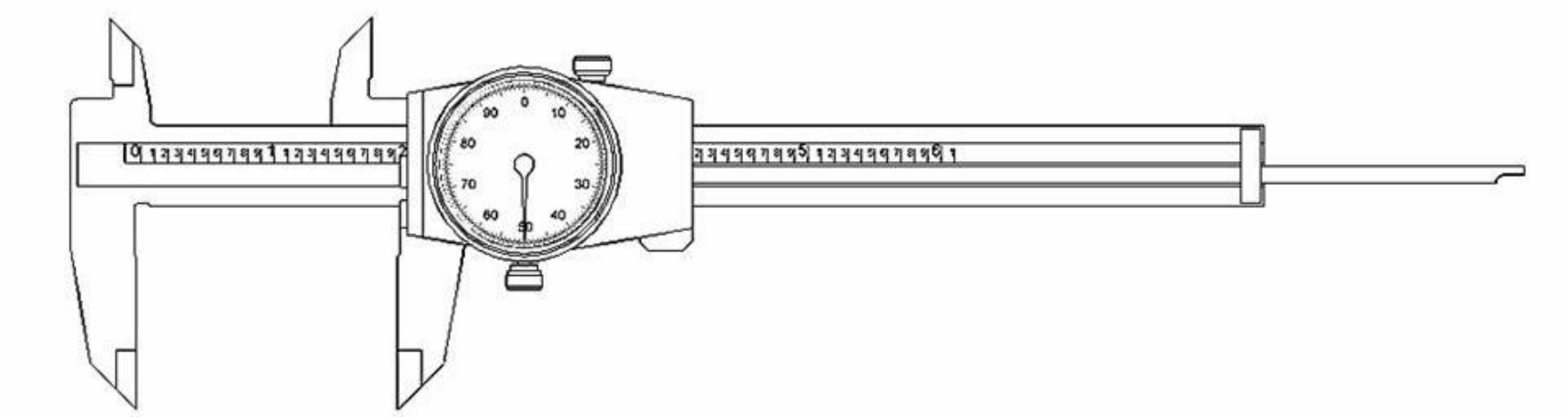
Dial Calipers

You can see the dial is pointing to 37. So we add that number to our 1.4 giving us a measurement of 1.437”



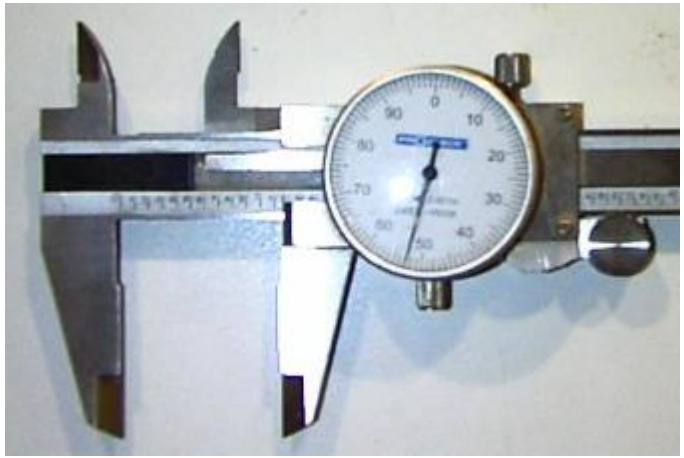
Dial Calipers

That is how you would read a dial caliper. Now lets practice.



Dial Calipers

Record your reading of the dial caliper.



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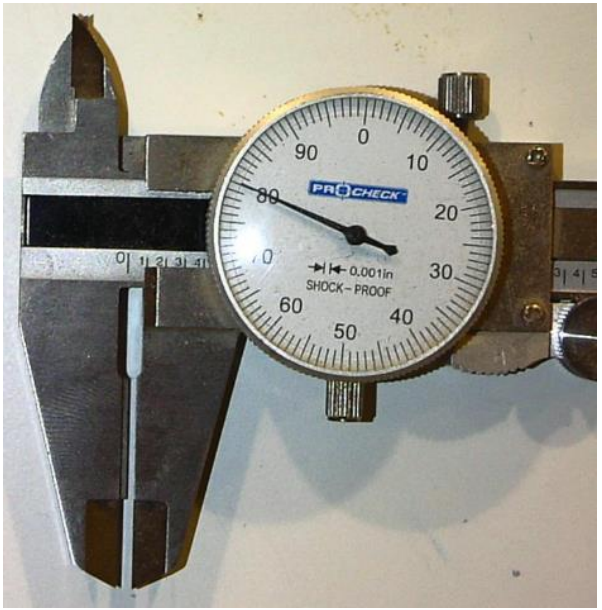

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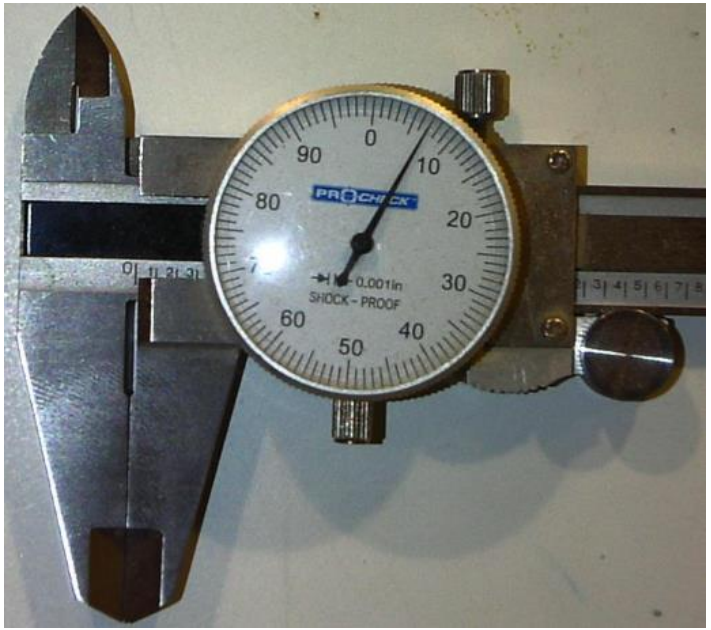

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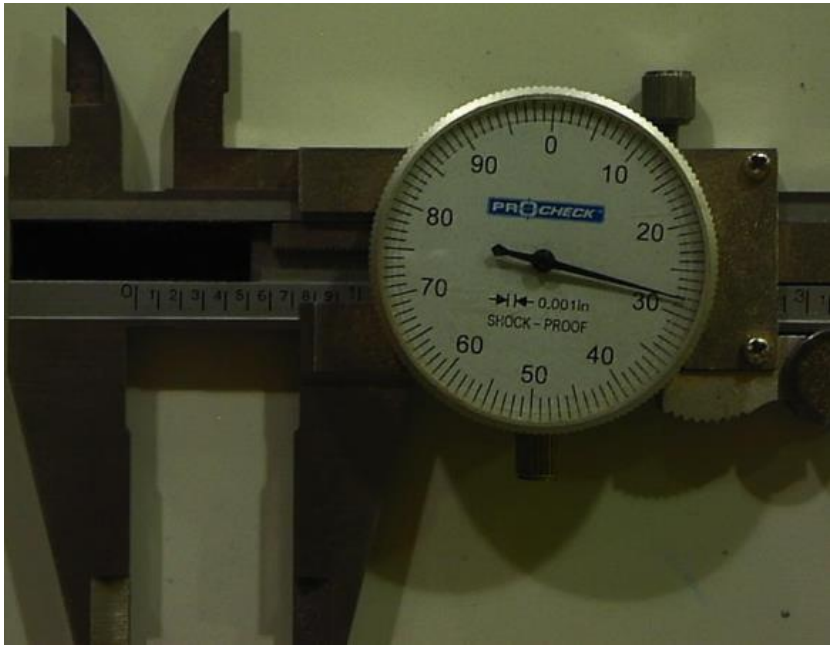

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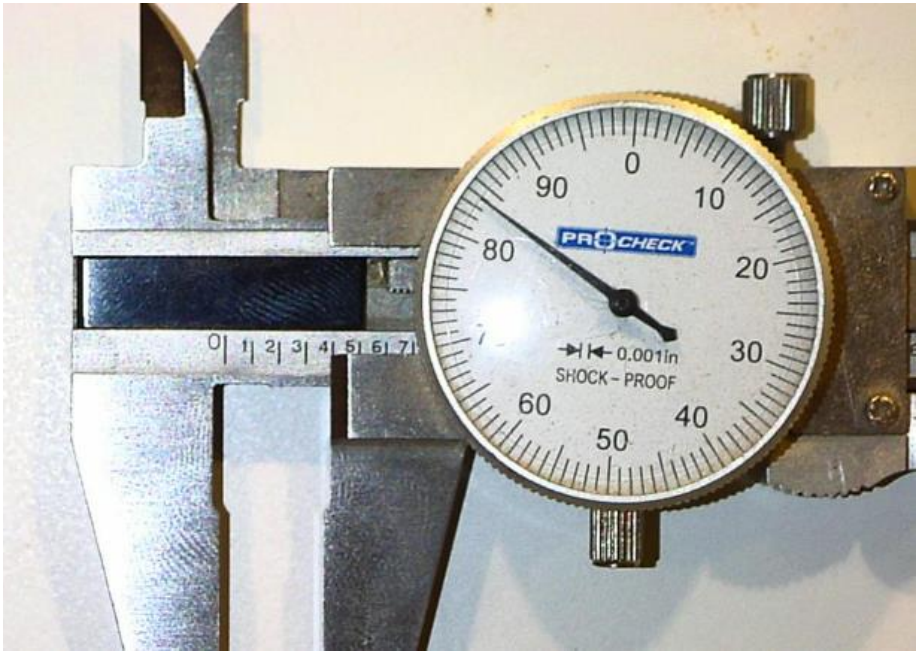

Helpful links

Youtube tutorial on dial calipers

Metalworking Matt shows how to read a dial caliper