

Calipers: Ideal for Measurements on the Go George Schuetz, Mahr Federal Inc.

Although it has been around for a long time, the caliper is still an extremely versatile and useful tool for making a wide range of distance measurements (both ODs and IDs). While micrometers are more accurate, they have a limited measurement range (typically several inches). The caliper; on the other hand, can span from two inches to four feet depending on the length of the scale. External measurements are made by closing the jaws over the piece to be measured, while internal measurements are made by opening up the inside diameter contacts.



Three Types

There are three different types of caliper. Today which are available in a machinist's tool chest.

Vernier. The Vernier caliper was the original design and is still the most rugged. Graduated much like a micrometer, it requires the alignment of an etched scale on the Vernier plate with an equally spaced scale running the length of the tool's handle. Skilful alignment of the tool and interpretation of the reading is necessary to achieve the measurement tool's stated accuracy.

Dial. A dial caliper is the second-generation caliper. Similar to the construction of the Vernier caliper. This style replaces the Vernier scale with a dial indicator. The indicator fixed to the movable jaw and engaged with toothed rack on the body of the unit. The dial, which is typically balanced (i.e., can move in either plus or minus directions from zero) may be graduated in either inch or metric units.

The dial caliper is a dual-purpose tool for making either direct or comparative measurements. To make a comparison, first measure the reference dimension and set the dial indicator to zero then measure the compared dimension. The indicator will show how much the compared dimension varies from the original (plus or minus).

Another useful feature of the dial caliper are jaws, which slide past each other to allow contact points or depth rod extensions to fit into narrow openings for small ID measurements.

Digital. In the last 20 years, the digital caliper has made its way onto the shop floor. The latest designs provide many numerous electronic features, which make the device easier to use but add little in the way of cost. These include; larger digital displays, easy switching between inch and metric units on the readout. Tolerance indications digital output to electronic data collection systems, waterproofing for harsh shop environments, zero setting anywhere along the caliper's range and retention of the zero setting even when the caliper turned off. With no moving parts in the readout, the digital caliper is exceptionally durable, standing up to some of the toughest manufacturing environments.

Concerns

Care and Respect. Like any measurement tool, the caliper treated with care and respect. Do not use it for purposes for which it never intended (such as prying things apart). Wipe it clean after using and do not throw it on the workbench. For dial calipers be particularly wary of dirt, which can accumulate on the rack, throwing measurements off and ultimately damaging the indicator. Store a caliper in its case. If it is going to be there for a while apply a thin coat of oil to the jaws to inhibit corrosion.

Wear and Calibration. Check the caliper often for wear as well as burrs, scratches on the jaws and contacting surfaces. A simple way to do this is to pass a master disc along the jaws while inspecting for wear or taper. Like any measurement tool, a caliper mostly calibrated at least once a year or more often when use is heavy or there are multiple users of the same instrument.

Proper "Feel". While the caliper is a versatile tool, it is not one of the most precise. Skill is required for positioning the tool and interpreting the measurement result. As the user develops his "feel" for the tool, his measurement results become more consistent.

While the digital caliper may take some of the guess work out of reading the measured value, it still requires skill on the part of the user to apply the tool properly to the dimension measured. The jaws of the caliper must be square or perpendicular to the part. They held firmly against the part but not to the point of deflecting them. The part mostly kept as close as possible to the frame of the measurement tool.

Knowing its Limits. The rule of ten says that a measurement tool should have ten times more resolution than the tolerance of the dimension. Calipers typically read in 0.001" units. So if the tolerance is tighter than ± 0.005 ", a micrometer (or some other higher accuracy tool) is the way to go.

The humble caliper is a surprisingly versatile tool for a wide range of general-purpose distance measurements. With a little skill, you can make a fast direct measurement or comparison in seconds and move on quickly to your next important task.

With the number of micrometers on the shop floor and in inspection areas these days, it is important to understand the degree of confidence that one can expect from these instruments. Whether it is a screw thread or digital micrometers, the level of precision depends on two factors: the inherent accuracy of the reference (the screw thread or the digital scale) and process errors.