

Morehouse Proving Rings



The calibration standard against which all others are measured

The Morehouse Proving Ring is recognized wherever highly accurate force measurement calibrations are performed as the premier standard. This reputation has been earned by years of established and maintained by the National Institute of Standards and Technology. Morehouse is dedicated to the design, manufacture and application of proving rings, which can be used with confidence in standards laboratories and throughout industry. The reliability, repeatability and accuracy of Morehouse Proving Rings are unequalled and unchallenged by any other force measurement device. Only direct loads of qualified deadweights are more precise.

The Ring

It has been proven that a steel ring made of correct steel alloy and properly manufactured will perform as a nearly perfect elastic member. When forces are applied along the diameter of the ring, the diameter will change, or deflection, the amount of the applied load can be determined. To properly utilize this characteristic, Morehouse machines proving rings from special alloy steel forgings. The external bosses, as well as the internal to which the deflection measuring apparatus is attached, are machined as an integral part of the ring. This costly but essential method of making the ring is the only known way to assure long term reliability.

The Deflection-Measuring Apparatus

A precision micrometer measures the deflection, or change of diameter of the ring under load, and a vibrating reed mounted diametrically within the ring. In Practice, the reed is vibrated and the dial of the micrometer is turned until it advances into the path of the vibrating reed, dampening out the vibrations. At this point, a reading is taken. This procedure is repeated throughout the calibration. The sensitivity of the vibrating reed and the micrometer is equivalent to 0.00005 of an inch. The micrometer mechanism is carefully machined and assembled to deliver extreme and lasting accuracy. It even has an automatic longitudinal adjustment to compensate for a minute thread wear. The number of divisions the micrometer dial and the graduation of the dial will vary by type of proving ring. For example, a Series 1000 Proving Ring will have about 2000 major divisions at full load. When combined with a vernier index for readings to one-tenth of division and estimating to one-twentieth of a division the resolution is one part in 40,000. Of all the deflection measuring devices developed, none has ever matched the micrometer / reed type for lasting precision and rugged dependability.

The Ultimate Instrument

After assembly, the proving rings are calibrated against known standards to ASTM specification E-74, either at the National Institute of Standards and Technology or in our laboratory using standards directly traceable to the institute. The characteristics of each proving ring depend on the requirements of the intended application. For this reason, Morehouse produces a series of proving rings offering a range of performance specifications varying primarily in degrees of accuracy. This permits you to select the proving rings your calibrations require without paying for unnecessary reserve accuracy.

The Immutable Importance of ASTM Standard E-74

While Morehouse proving Rings are still manufactured according to the design specifications originally established by the National Institute of Standards and Technology, they are now calibrated according to a more exacting standard established by the American Society for Testing Materials. The standard, designated ASTM E-74, clearly defines the methods to be used in the calibration of all force-measuring instruments. More importantly it specifically states the requirements force standards must meet and specifies the procedure for determining the accuracy of each instrument calibrated according to the ASTM standard E-74. Accuracy in proving rings and all force measuring instruments calibrated according to this method is specified in terms of uncertainty. The definition of “uncertainty” in ASTM E-74, is “a statistical estimate of the limits of error in forces computed from the calibration equation of a force measurement instrument.” “Calibration,” is the comparison of an unknown instrument or gauge with a known standard to determine its probable uncertainties or deviation from reading that can be expected in its use.

ASTM E-74 also establishes two different loading ranges. Class AA and Class A, for force measuring instruments that are in turn used to calibrate materials testing machines with the lower limit of use being 2000 times the uncertainty.

Series 50 Proving Rings

The Series 50 Proving Rings are designed for specific applications requiring high capacities with low profiles. They are particularly well suited for the calibration of concrete testing machines and other types of testing machines with limited daylight openings.

Other Morehouse Proving Rings are designed to give the greatest possible deflection under load to achieve maximum accuracy. The design criteria, however, requires large outside proving ring diameters. In high capacity proving rings, the size is prohibited in many applications.

The series 50 proving rings are produced only in higher capacities where size is critical. Because of their low profile, they are also lighter in weight than comparable capacities in larger diameter rings resulting in easier handling.

While the amount of deflection under load is reduced in the Series 50 proving rings, it is still sufficient to provide low uncertainties with good readability. An adjustable vernier index supplied with the proving ring may be set at zero at no-load condition to further simplify readings during calibrations. Series 50 proving rings fall well within the specifications outlined in ASTM E74 for standards used in class A loading ranges.

Series 100 Proving Rings

The classic series 100 proving ring is the forerunner of the entire current series of Morehouse proving rings. It is perhaps the most widely used and respected proving ring in the world. It has been the field calibration standard preferred by many experienced operators for more than 60 years and most of the original rings still in use. The Series 100 proving ring offers all the accuracy, reliability and consistency ever needed for many force calibrations. It is recommended for calibrating materials, sting machines, torque-measuring dynamometers, thrust stands and other force measuring systems. The micrometer dial is read with a single index line pointer. However, a vernier index pointer is available as an optional accessory. All capacities are available in compression types and combination compression / tension types with threaded external bosses to which pulling rods may be attached for use in tension calibrations.

Series 200 Proving Rings

The Series 200 proving ring, while similar to the series 100, has three performance proven features, which increase its accuracy. It has a larger 200 -division dial, higher resolution and greater deflection under load. As a result, its uncertainty is reduced and operator confidence is improved. Ease of use is further increased with the adjustable vernier index. Readings to $1/10$ a division and interpolation to $1/20$ division are possible. Because the index is adjustable, the dial will actually read zero on the no-load reading. The series 200 proving rings are suggested for calibrating load cells and materials testing machines where high degrees of accuracy are desired. All capacities are available in compression types and combination compression / tension types with threaded external bosses to which pulling rods may be attached for use in tension calibrations.

Series 1000 Proving Rings

The extremely low uncertainty and high-resolution capability of the Series 1000 Proving Ring has never been equaled by any other secondary force standard. Every Series 1000 proving ring is calibrated by primary standards with direct trace ability to the National Institute of Standards and Technology. In addition, the resulting “Report of Calibration” issued by the force calibration laboratory is included with the ring. Therefore, the series 1000 proving ring is the perfect choice for use in standards laboratories where the highest possible accuracy is required and direct trace ability preferred.

The uncertainty of the series 1000 proving ring is 0.0125% of capacity. For example in a proving ring of 1000 pound-force capacity, the uncertainty would be 0.125 pound-force.

This capability results from the ring design, which allows greater deflection under load than other proving rings.

The increased change in diameter can be measured in up to 2000 major divisions on the micrometer dial. A vernier index further improves readability to one-tenth of a major dial division and makes possible interpolation to one-twentieth of a division.

To facilitate calibrations, the Series 1000 proving rings are equipped with an electrical read vibrator, a dial revolution counter, a vernier index, a carbide micrometer contact to minimize wear and a ball seat in the top boss.

Why buy Morehouse Proving Rings?

Reliability - It has been proven that a steel ring made of the correct steel alloy and properly manufactured will perform as a near perfect elastic member. The Morehouse Proving if used and maintained properly can last indefinitely. In fact, several of our Rings manufactured in the late twenties and early thirties are still in use.

Accuracy - Depending on your calibration needs a Morehouse Proving Ring can provide you with an accuracy of .075% to .0125% of capacity. To simplify this, assume you want to measure 100lbf, depending on what series* Morehouse Ring you are using the uncertainty can range from .075lbf to .0125lbf.

Repeatability - Proving Rings unlike other force measuring instruments are not sensitive to rotation/positioning problems.

Ease of Use - People who have used Morehouse Proving Rings often swear by them because of there ease of use, excellent accuracy and reliability.