

## Proving Rings

### UNCERTAINTY

- Series 50 - 0.075% of capacity.
- Series 200 - 0.025% of capacity.
- Series 100 - 0.05% of capacity.
- Series 1000 - 0.0125% of capacity.

### USES

Calibration of physical testing machines, load cells, rocket thrust stands, weighing systems and other force measurement equipment.

### CAPACITIES

500 to 1,000,000 pounds in compression or tension/compression models. Series 50 and Series 1000 Proving Rings are available in compression only and are in limited capacities. Proving Rings of all series and models are available in metric capacities.

### GENERAL DESCRIPTION

Morehouse Proving Rings are recognised throughout the World as the most accurate, consistent and reliable force calibration standard available. Constructed of a carefully forged and machined steel load ring with a vibrating-reed/micrometer screw deflection measuring apparatus, it conforms precisely to specifications that were established by the National Institute of Standards and Technology (copy available on request). Proving rings are available for use in compression only or as a combination model for both tension and compression use. The combination model has threaded external bosses and attachable pulling rods to make it easily adaptable for use in tension. All series of proving rings meet ASTM specifications for calibration testing machines.

**Series 50** Proving Rings are referred to as low profile proving rings in that they are specifically designed to fit into the limited openings of concrete testing machines. Available in high capacity compression models only.

**Series 100** Proving Rings are generally recognized as the proving ring most suitable for calibrating most materials testing machines.

**Series 200** Proving Rings are normally used for calibrating load cells in standards laboratories and for calibrating materials testing machines when a lower uncertainty is desired than that obtainable with Series 100 proving rings.



## Ring Dynamometers



### UNCERTAINTY

0.05% of range at predetermined calibrated loads.

### USES

Calibration of universal testing machines, mechanical and hydraulic presses, weighing systems and other force measurement equipment.

### CAPACITIES

100 to 300,000 pounds. Higher on special order in either compression or combination tension/compression models. Available in metric capacities.

### GENERAL DESCRIPTION

The ring dynamometer is constructed of a steel load ring with a fully-jeweled precision dial indicator to show the deflection under load. To assure consistent accuracy, each dial indicator used has passed a rigid screening process. The dial reading is easily translated into pounds by referring to a calibration report included with each instrument. Standard ring dynamometers are calibrated at loads from one-tenth capacity to full capacity report included with each instrument. The special loads can be calibrated in lieu of the standard loads.

## Proving Ring

### 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 uncompromising conformance to the principles originally established and maintained by the National Institute of Standards & Technology (NIST), Gaithersburg, USA. 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 the 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. By precision measurement of this 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

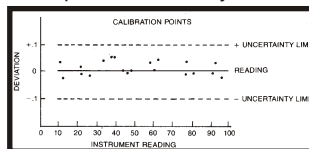
The deflection, or change of diameter of the ring under load, is measured by a precision micrometer and a vibrating reed mounted diametrically within the ring. In practice, the reed is vibrated and the dial of the micrometer is turned until it advances into the path of the vibrating reed, dampening out the vibrations. At this point, a reading is taken. This procedure is repeated throughout the calibration. The sensitivity of the vibrating reed and micrometer is equivalent to .000005 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 minute thread wear. The number of divisions on the micrometer dial and the graduation of the index 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 a divisions, the resolution capability is one part in 20,000. 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 & Technology or in our laboratory using standards directly traceable to the NIST. 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 rings and their specifications are described on the following pages.

## The Immutable Importance of ASTM Standard E-74

### Example of Uncertainty Determination



Note : The uncertainty limits were obtained statistically from the calibration points by taking 2.4 times the standard deviations (as specified by ASTM E-74)

While all Morehouse Proving Rings are still manufactured according to the design specifications originally established by the National Institute of Standards & Technology, they are now calibrated according to a more exacting standard established by the American Society for Testing and Materials. This 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-measuring 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 established two different loading ranges, Class AA and Class A, for force measuring instruments involved in the calibration of materials testing machines.