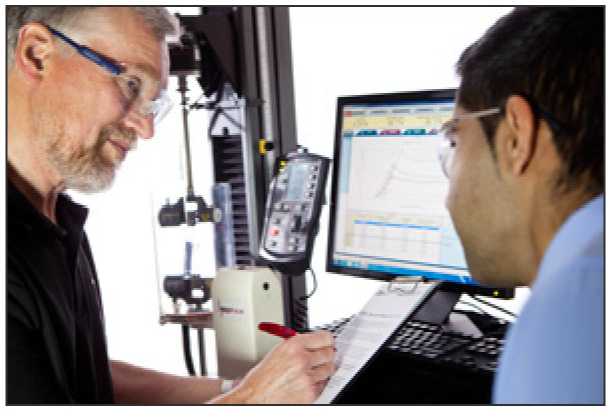
Issue 59

In This Issue

The Difference is Measurable – Measurement Uncertainty in Calibration



Instron's reputation depends upon the quality of its products, the accuracy of its measuring devices, such as load cells and extensometers, and its services to regularly verify that those devices are performing to a required standard. For many years, the tag line "The Difference is Measurable" has shown our commitment to this accuracy. But how do we show it in practice?

A measurement offers a quantitative value to a property of an item. How heavy is it? How long is it? How hot is it?

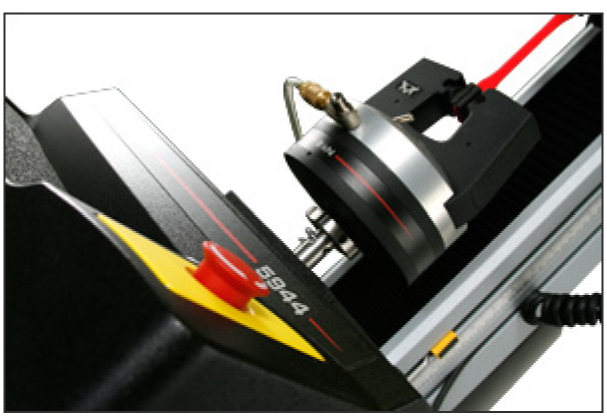
No measurement can be said to be completely accurate. There is always some degree of doubt about the result of a measurement. For example, there may be some degree of inaccuracy in the measuring device itself. There may be differences in how people perform or read a measurement. That doubt is called the uncertainty of the measurement.

Good practices, such as regular maintenance and traceable calibrations, careful calculations, regular training, and accurate and consistent record keeping, all help to maintain system performance and increase measurement accuracy. However, to properly judge the quality of any measurement, we need to quantify and report the uncertainty associated with that measurement.

We need to know two things: the width, or interval, of the margin of uncertainty, and how confident we are that the true value is within that margin. For example, we might say that the gauge length of a specimen measures 25 mm, having an uncertainty of measurement of 0.11 mm with a 95% confidence level. This means that we are 95% sure that the gauge length is between 24.89 mm and 25.11 mm. The uncertainty statement is an indication of the quality of the measurement.

In short, any measurement result is only complete when a statement of the uncertainty in the measurement accompanies it. When the uncertainty in a measurement is evaluated and stated, you can properly evaluate the quality of the measurement.

Instron's calibration standards and processes in North America and Asia are accredited by the National Voluntary Laboratory Accreditation Program (NVLAP). NVLAP is a program administered by the National Institute of Standards and Technology (NIST), the National Metrology Institute (NMI) of the United States. NVLAP regularly assesses Instron's competence in performing accurate calibration and verification processes including the accuracy of the equipment used in those processes.



There are many different accreditation organizations worldwide, and several in the USA. To ensure that the different accreditation organizations harmonize their standards and processes so that they can accept each other's accreditations internationally, the International Laboratory Accreditation Cooperative (ILAC) was established and has now more than 70 accreditation bodies worldwide as signatories to their Mutual Recognition Arrangement (ILAC-MRA).

In 2010, ILAC published the ILAC Policy for Uncertainty in Calibration to harmonize the expression of uncertainty of measurement on calibration certificates and on scopes of accreditation of calibration laboratories. One of the major requirements of this policy is that each calibration verification measurement should be accompanied by the associated uncertainty measurement.

Take a look at your last calibration certificate. If you have a certificate issued from another calibration laboratory, you may see only a general statement relating to uncertainty of measurement.

However, if the Instron Calibration Laboratory has issued your certificate, you will see that each individual result is accompanied by an uncertainty measurement that has been calculated with that result.

Instron has long considered the reporting of uncertainty of measurement to be good metrological practice and has been reporting measurement uncertainties that are consistent with the new ILAC requirements for many years.

Instron's commitment to offering quality products and services shows in many ways. The accurate reporting of measurement uncertainty with every calibration result is one more reason why we say:

The Difference is Measurable.

Balancing the Load Cell

We are often asked how frequently an operator should balance the load cell during testing. Many lab managers require the operator to balance a load cell before the start of a new sample; others require balancing the load cell before testing every specimen. We believe that either procedure is acceptable, as long as you follow one major rule:

Never balance the load cell when there is a specimen clamped in both grips.

Instron load cells can detect a change in load as a result of simply gripping the specimen. If the load is balanced after a specimen is gripped, you risk zeroing out a real load. This real load will be subtracted from or added to reported results, thereby falsely increasing or decreasing actual values depending on whether or not there was a compressive or tensile load on the specimen before the load cell was balanced.

If you notice a change on the load channel display after gripping, you can remove the load using automated software features, such as preload or specimen protect, or by manually adjust the position of the crosshead.

Q. What is the difference between percentage of full-scale and percentage of reading?

A. The accuracy of a device describes how close a measurement is to the actual value. It is usually presented in one of two forms: percentage of full-scale or percentage of reading.

Percentage of full-scale, usually shown as %FS, is a fixed error, and therefore, has a greater influence at lower measurement values. For example, if a load cell has a 200 lbf capacity and an accuracy of 0.3%FS, the error is 0.6 lbf throughout the measurement range. Therefore, at a measurement of 20 lbf, the 0.6 lbf error is 3% of the reading. This is outside of the ASTM E4 requirement that measurements should be within 1% of reading.

Percentage of reading is usually shown as %RO. For example, if a load cell has a 200 lbf capacity and an accuracy of 1% RO, then at a measurement of 20 lbf the error is 0.2 lbf or 1% of the reading, and within ASTM E4 requirements. Devices that specify accuracy as a percentage of reading typically have a wider range of use, since this is a more difficult specification to meet.

Instron Worldwide Headquarters
825 University Ave
Norwood, MA 02062
www.instron.com