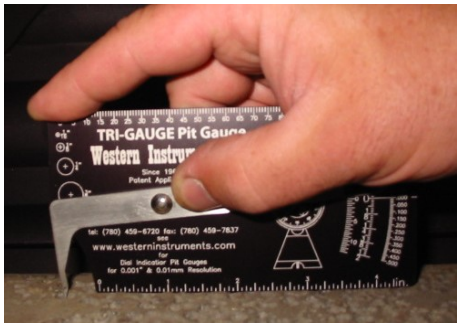
Western Instruments
Established 1965

Calibration of Pit Depth Gauges

Introduction



As the manufacturer of the World's only comprehensive product line of Pit Depth Gauges (Pit Gauges), we are often asked about calibration. The most common question is…."How often should I get my Pit Gauge Calibrated?", but before that question can be answered we must know what type of Pit Gauge we are talking about. There are advanced Bridging Pit Gauges, standard Dial Indicator Pit Gauges, down to a mechanical Lever Type (*Tri-Gauge*®) Pit Gauge illustrated in use here. Each of the various types of Pit Gauges are discussed below.

Lever Pit Gauges

Lever Type Pit Gauges have been available since the early 1960's, and while the Tri-Gauge® has the finest resolution (0.01" & 0.5mm) it would hardly be considered a precision instrument. With the accuracy of a Lever Pit Gauge being recognized, there are still end users who want such a device "calibrated", however it is just their terminology that is slightly off. These operator's are being diligent to ensure that their instrument, all be it a Lever Pit Gauge, is linear over its scale (standardized). Just because the unit can be accurately zeroed doesn't mean it will be reasonably accurate (linear) over the measurement range.

This "Standardization" is easily accomplished by obtaining a piece of 3/8" (or 9.5mm) Key Stock about 4" long. On a flat smooth surface (not a desk or table) place the Tri-Gauge® (Lever Pit Gauge) on top of the Key Stock. First check the zero on the Key Stock, and if it is OK, measure down to the flat surface below the Key Stock. If the measurement is within 0.01" or 0.02" (0.5mm) the depth scale is fine. To check the height component of the Tri-Gauge®, place the Gauge on the flat surface and measure the height of the Key Stock. Again, if the measurement is within 0.01" or 0.02" (0.5mm) this scale is fine. This demonstrates the Tri-Gauge® is Standardized (linier) over its range, but further the Tri-Gauge® Zero adjustment is covered in its manual.

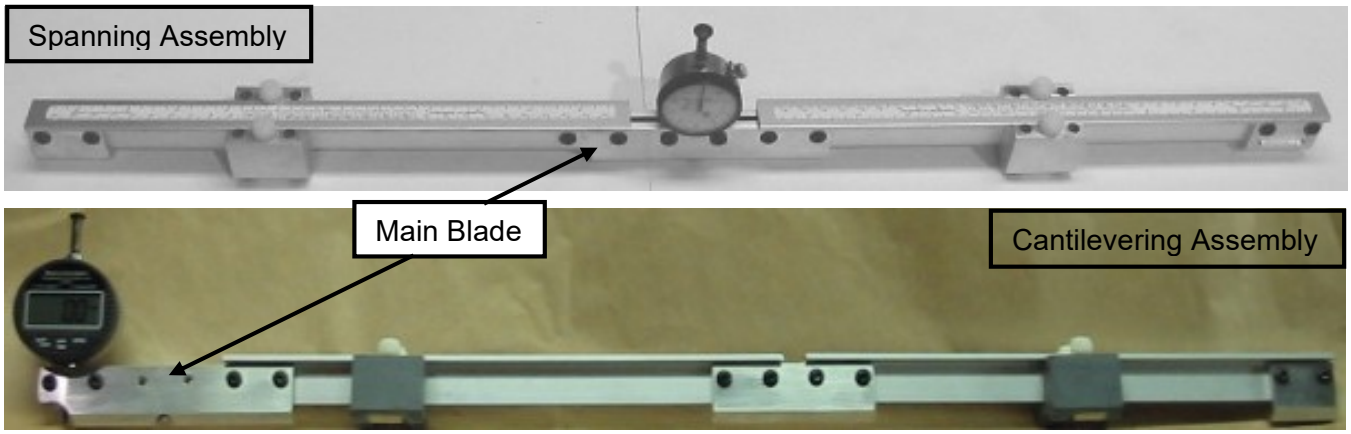
Dial Indicator Pit Gauges

Dial (or Digital) Indicators that are used on the Pit Gauge illustrated here (*Reaching Plus* Pit Gauge) are considered precision instruments, and should be Standardized as part of a Maintenance or Traceability Program. Any operator (or supervisor) who uses these popular Corrosion Pit Depth Gauges, on a regular basis, will have a good idea on the condition of this specialized tool. While not likely to loose their linearity, they are subject to damage due the harsh environments they are typically used in. Here again, the short piece of Key Stock can be used, to demonstrate to the operator that the Pit Gauge is working correctly. When the operator is employed by a contractor or the inspection is being done to comply with regulatory requirements a Traceable Calibration should be performed.

The Reference Block illustrated to the left is our N88-FBH and is manufactured and tested in accordance with ASTM and other applicable specifications. The N88-FBH is equipped with 4 (or more) Flat Bottom Holes at corner of the Block. The depth range of each Flat Bottom Hole is specified to a nominal depth. The holes are intentionally made not completely flat, as to simulate the irregular surface of corrosion or erosion, and allow the operator to "Scan" through the varying depths. The shallowest spot of the flat bottom hole is in the middle (center), and the deepest portion is toward the outside perimeter (edge) of the hole. This Calibration Block is one of several standards provided to our Authorized Agencies to certify our Pit Gauges, it can also be provided to operators to demonstrate their ability to accurately and reproducibly use a Pit Gauge.

Bridge Type Pit Gauges

The N88-FBH reference Block was developed for use on virtually any configuration of Pit Depth Gauge, including the Main Blades from any of our Bridge Type Pit Gauges. However, we still get questioned on the calibration for a "Bridge" assembly. This question assumes that the workpiece (Pipe, Vessel, Tank, Ship Hull, or Structural Steel) is perfectly flat and to our knowledge such a situation is virtually impossible. This demonstrates the necessity of a conformable or flexible Bridge Assembly.



The N88-FBH Calibration Sample, and the specifications employed for its manufacture, can only ensure a reasonable straightness and is certified to be within 0.002" (0.05mm) over its limited length. If a Bridge Assembly (Segmented or Fixed) were to be certified, its accuracy could only we warranted for a very short period of time as there are many variables (including temperature) that will affect its straightness. In our operation manual we state that when following procedures for assembly, "the *Bridge* will have a straightness of +/-0.015" (0.75mm) over its 28 ½" (725mm) length. If more accuracy is required assemble the unit on a flat surface". Therefore, to calibrate a Bridge (Segmented or Fixed) it would have to be assembled and tested on a Granite Surface Plate or using a specialized Planekator, neither of which is practical.

To look at the practical side of things, Bridge Type Pit Gauges are usually used to evaluate Pipeline Corrosion to meet PHMSA requirements (B31G and RP0502 for Integrity Management). As these specifications require a Bridge Assembly to follow the pipe's surface, we could assume that the pipe is of a similar straightness to the way it was laid and buried along the Right-of-Way. This would follow then that it was of similar straightness to the way it was shipped from the mill that produced it,

less any field bends. Therefore, we can assume the mill maintained the API 5L specification for straightness at less than 24mm/12 meter length. As an example then, our Bridging Pit Gauge assembled in its Cantilevering Configuration of 725mm long should be able to compensate for a variation in straightness of approximately 1.5mm (minimum).

Conclusion

There is certainly a need for both Standardization and Calibration for various configurations of Pit Gauges. Further, it is important for technicians to demonstrate their ability to use Pit Gauges both accurately and reproducibly. Until another group author's a similar document on the *Calibration of Pit Depth Gauges*, this one will stand.

*Note; Specifications are referred to above, but are not specified. When Pit Gauges are Calibrated by Western Instruments, or one of its authorized agencies, these are referenced. Dimensions or Specifications for the N88-FBH Calibration Block are also not provided. This particular document will eventually find it's way into the hands of competitive manufacturer's, however these companies do not have the necessary industry knowledge to find these specifications.

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