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Standard Practice for Use of a Calibration Device to Demonstrate the Inspection Capability of an Interferometric Laser Imaging Nondestructive Tire Inspection System[1]

This standard is issued under the fixed designation F1364; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This practice describes the construction and use of a calibration device for demonstrating the anomaly detection capability of interferometric laser imaging nondestructive tire inspection system. A common practice within the industry is to refer to these systems as shearographic/holographic (S/H) systems.

1.2 This standard practice applies to S/H systems that are used for evaluating the structural integrity of pneumatic tires, (for example, presence or absence of anomalies within the tire).

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

F538 Terminology Relating to the Characteristics and Performance of Tires

2.2 *ASTM Adjuncts:*

Straining Block Drawings[3]

3. Terminology

3.1 *Definitions:*

3.1.1 *analysis, n*—an act of inspecting the S/H image and associating this image with a known calibration reference. **F538**

3.1.2 *shearogram/hologram, n*—the common term for an interferometric image provided by S/H systems. **F538**

3.1.3 *shearographic or holographic (S/H) systems, n*—a shearographic or holographic system using interferometric laser imaging to nondestructively inspect tires. **F538**

3.1.4 *straining block, n*—a test block containing a number of anomalies, that is capable of simulating an anomaly in a tire. **F538**

3.1.5 *straining block anomoly, n*—a change in the strain pattern of the deformable surface of a straining block as a result of applied stress brought about through a change in atmospheric pressure on the deformable surface.

3.1.5.1 *Discussion*—A distinction is made between an anomaly in the straining block and an anomaly in the a tire. **F538**

3.1.6 *straining block holding fixture, n*—a device for holding one or more straining blocks in the S/H system during the inspection process (see Fig. 1). **F538**

4. Summary of Practice

4.1 The straining block is designed to create an image of a known anomaly against which the performance of the S/H system may be evaluated. The block is constructed by securing a flexible membrane over a rigid block that contains a series of holes of various sizes and shapes. The membrane should be made of a material that retains its physical properties over time with minimal aging effects. The interior holes in the block are either vented to atmospheric pressure or sealed at a nominal pressure, allowing a differential pressure to exist on the membrane when the block is subjected to a vacuum. It is the deflection of the surface under this differential pressure that is measured by the S/H system. The thickness of material must be selected to give deflections that are representative of those associated with anomalies found in a tire.

4.2 The size of the holes in a straining block can be used to determine the sensitivity of the S/H system. Generally, larger holes are more readily detectable. However, it is possible for a poorly calibrated S/H system to detect some small holes and miss very large ones. Therefore, a calibration block should contain holes of varying diameter and depth, consistent with

[1] This practice is under the jurisdiction of ASTM Committee F09 on Tires and is the direct responsibility of Subcommittee F09.10 on Equipment, Facilities and Calibration.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] Available from ASTM International Headquarters. Order Adjunct No. ADJF1364. Original adjunct produced in 1992.