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Standard Practice for Acoustic Emission Monitoring During Resistance Spot- Welding¹

This standard is issued under the fixed designation E751/E751M; 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 procedures for the measurement, processing, and interpretation of the acoustic emission (AE) response associated with selected stages of the resistance spot-welding process.

1.2 This practice also provides guidelines for feedback control by utilizing the measured AE response signals during the spot-welding process.

1.3

1.3 *Units*—The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

1.4 *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

E543 Specification for Agencies Performing Nondestructive Testing

E1316 Terminology for Nondestructive Examinations

2.2 *ASNT Standards:*³

SNT-TC-1A Recommended Practice for Nondestructive Testing Personnel Qualification and Certification

ANSI/ASNT CP-189 Standard for Qualification and Certification of Nondestructive Testing Personnel

2.3 *AIA Standard:*⁴

NAS-410 Certification and Qualification of Nondestructive Personnel (Quality Assurance Committee)

3. Terminology

3.1 *Definitions*—For definitions of terms relating to acoustic emission testing, see Section B of Terminology E1316.

4. Significance and Use

4.1 The AE produced during the production of a spot-weld can be related to weld quality parameters such as the strength and size of the nugget, the amount of expulsion, and the amount of cracking. Therefore, in-process AE monitoring can be used both as an examination method, and as a means for providing feedback control. Summary of Practice

4.1 The resistance spot-welding process consists of several stages. These are the set-down of the electrodes, squeeze, current flow, forging, hold time, and lift-off. Various types of acoustic emission signals are produced during each of these stages. Often, these signals can be identified with respect to the nature of their source. The individual signal elements may be greatly different, or totally absent, in various materials, thicknesses, and so forth. Fig. 1 is a schematic representation showing typical signal elements which may be present in the AE signature from a given spot-weld.

4.2 Most of the depicted AE signal features can be related to factors of weld quality. The AE occurring during set-down and squeeze can often be related to the condition of the electrodes and the surface of the parts. The large, often brief, signal at current

¹ This practice is under the jurisdiction of ASTM Committee E07 on Nondestructive Testing and is the direct responsibility of Subcommittee E07.04 on Acoustic Emission Method.

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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 American Society for Nondestructive Testing (ASNT), P.O. Box 28518, 1711 Arlingate Ln., Columbus, OH 43228-0518, <http://www.asnt.org>.

⁴ Available from Aerospace Industries Association of America, Inc. (AIA), 1000 Wilson Blvd., Suite 1700, Arlington, VA 22209-3928, <http://www.aia-aerospace.org>.

*A Summary of Changes section appears at the end of this standard.