



# Standard Guide for Ultrasonic C-Scan Bond Evaluation of Brazed or Welded Electrical Contact Assemblies<sup>1</sup>

This standard is issued under the fixed designation B 773; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

## INTRODUCTION

This guidance document is the result of an investigation by the ASTM Committee B04.04 Task Force on Ultrasonic Bond Testing of Electrical Contacts. Although ultrasonic interrogation is widely employed as a non-destructive evaluation method, its application to the testing of electrical contact bonds requires specific techniques.<sup>2,3</sup> The desire to study the variation of technique and its effect upon test results was responsible for a round-robin test program. The program was conducted in two phases in an attempt to standardize practices which would improve testing agreement. This study provided analysis and suggestions for reducing the variability of test results. The decision of the committee was to publish a summary of this information to serve as guidelines for writing specifications that will incorporate practices.

## 1. Scope

1.1 This guide describes ultrasonic testing procedures that can be used for evaluating the bond quality of electrical contact assemblies manufactured by brazing or welding.

1.2 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are for information only.

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.*

1.4 It is the responsibility of the user to become familiar with all hazards including those identified in the appropriate Material Safety Data Sheet for this product/material as provided by the manufacturer.

## 2. Referenced Documents

### 2.1 ASTM Standards:

E 214 Practice for Immersed Ultrasonic Examination by the Reflection Method Using Pulsed Longitudinal Waves<sup>4</sup>

E 500 Terminology Relating to Ultrasonic Examination<sup>4</sup>

E 1001 Practice for Detection and Evaluation of Discontinuities by the Immersed Pulse-Echo Ultrasonic Method using Longitudinal Waves<sup>4</sup>

2.2 *American Society for Nondestructive Testing Standard (ASNT):*

SNT-TC-1A Recommended Practice for Personnel Qualification and Certification in Nondestructive Testing<sup>5</sup>

## 3. Summary of Guide

3.1 *Pulse-echo Technique*—The pulse-echo technique is employed as an ultrasonic testing method which displays reflected energy pulses. A Piezoelectric transducer (typically 15–25 MHz frequency with 0.5- to 1.5-in. (12.7- to 38.1-mm) focal length in water) converts the original electrical pulse into a mechanical sound wave and then also acts as a receiver of the reflected mechanical energy, converting it back into useful electrical energy. The electrical instrumentation used with the transducer generates, receives, amplifies, and displays the controlled electrical pulses. (See Practices E 214 and E 1001.)

3.2 *C-Scan*—The amplified electrical signals as received from the transducer are gated for time/distance and establish the depth of analysis. When the transducer (coupled through a water medium) is made to traverse in the X-Y directions, the gated electrical signals are then used to describe a two-dimensional plan view of defects in the interior of the tested object(s). This plan view of defect information at a given depth of analysis (that is, the brazed or welded layer within the contact assembly) is called a C-scan. (See Terminology E 500.)

<sup>1</sup> This guide is under the jurisdiction of ASTM Committee B-4 on Materials for Thermostats, Electrical Heating and Resistance, Contacts and Connectors and is the direct responsibility of Subcommittee B04.02 on Electrical Contact Materials.

Current edition approved May 10, 1996. Published July 1996. Originally published as B 773 – 87. Last previous edition B 773 – 87 (1991)<sup>4</sup>.

<sup>2</sup> Buckley, R. I., Comney, R. R., Jr., and Popat, P. V., "Nondestructive Ultrasonic Inspection of Braze Bonds in High Current Electrical Contact Assemblies," Proceedings of the Holm Conference on Electrical Contacts, 1971, pp. 63–71.

<sup>3</sup> Jost, E., and Fontaine, G., "Ultrasonic In-line Inspection Technique for Contact Materials," Proceedings of the Holm Conference on Electrical Contacts, 1979, pp. 209–213.

<sup>4</sup> Annual Book of ASTM Standards, Vol 03.03.

<sup>5</sup> Available from ASNT, 1711 Arlingate Plaza, P.O. Box 28518, Columbus, OH 43228-0518.