



Designation: E1065/E1065M – 20

## Standard Practice for Evaluating Characteristics of Ultrasonic Search Units<sup>1</sup>

This standard is issued under the fixed designation E1065/E1065M; 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 covers measurement procedures for evaluating certain characteristics of ultrasonic search units (also known as “probes”) that are used with ultrasonic testing instrumentation. This practice describes means for obtaining performance data that may be used to define the acoustic and electric responses of ultrasonic search units.

1.2 The procedures are designed to measure search units as individual components (separate from the ultrasonic test instrument) using commercial search unit characterization systems or using laboratory instruments such as signal generators, pulsers, amplifiers, digitizers, oscilloscopes, and waveform analyzers.

1.3 The procedures are applicable to manufacturing acceptance and incoming inspection of new search units or to periodic performance evaluation of search units throughout their service life.

1.4 The procedures in **Annex A1 – Annex A6** are generally applicable to ultrasonic search units operating within the 0.4 to 10 MHz range. **Annex A7** is applicable to higher frequency immersion search unit evaluation. **Annex A8** describes a practice for measuring sound beam profiles in metals from contact straight-beam search units. Additional Annexes, such as sound beam profiling for angle-beam search units in metal and alternate means for search unit characterization, will be added when developed.

1.5 **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 are not necessarily exact equivalents; therefore, to ensure conformance with the standard, each system shall be used independently of the other, and values from the two systems shall not be combined.

1.6 *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 appro-*

*priate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.7 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

### 2. Referenced Documents

2.1 *ASTM Standards:*<sup>2</sup>

**E1316 Terminology for Nondestructive Examinations**

2.2 *ISO Standards:*<sup>3</sup>

**ISO 10375:1997 Non-destructive Testing—Ultrasonic Inspection—Characterization of Search Unit and Sound Field**

2.3 *Other Document:*<sup>4</sup>

**Standard Methods for Testing Single Element Pulse-Echo Ultrasonic Transducers**

### 3. Terminology

3.1 **Definitions**—For definitions of terms used in this practice, see Terminology **E1316**.

3.2 **Definitions of Terms Specific to This Standard:**

3.2.1 **aperture, *n***—the dimension(s) of the active area of the piezoelectric element of the search unit as established by experimentation.

3.2.2 **bandwidth (*BW*), *n***—that portion of the frequency response that falls within given limits.

3.2.2.1 **Discussion**—In this text, the limits used are the -6 dB level, as measured from the peak of the frequency response. The equation used for *BW* is:

$$BW = (f_u - f_l)/f_c \times 100 \quad (1)$$

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

<sup>3</sup> Available from International Organization for Standardization (ISO), ISO Central Secretariat, BIBC II, Chemin de Blandonnet 8, CP 401, 1214 Vernier, Geneva, Switzerland, <http://www.iso.org>.

<sup>4</sup> Available from the American Institute of Ultrasonics in Medicine, 14750 Sweitzer Lane, Suite 100, Laurel, MD 20707-5906.

<sup>1</sup> This practice is under the jurisdiction of ASTM Committee E07 on Nondestructive Testing and is the direct responsibility of Subcommittee E07.06 on Ultrasonic Method.

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