



Designation: E3169 – 18

Standard Guide for Digital Imaging and Communication in Nondestructive Evaluation (DICONDE)¹

This standard is issued under the fixed designation E3169; 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 The display, transfer and storage of digital nondestructive evaluation data in a common, open format is necessary for the effective interpretation and preservation of evaluation results. ASTM International has developed common open standards for Digital Imaging and Communication in Nondestructive Evaluation (DICONDE) based on the ubiquitous healthcare industry standard Digital Imaging and Communication in Medicine (DICOM). This guide provides an overview of the ASTM International standard practices that address DICONDE and assistance in identifying the correct standard practices for different use cases.

1.2 This document provides an overview of how to utilize the ASTM DICONDE standard practices found in paragraph 2.1.2 on ASTM DICONDE Test Methods Standards for the display, transfer and storage of digital nondestructive test data

1.3 This document provides an overview of how to utilize the DICOM standard found in paragraph 2.2 on Other Documents for the display, transfer and storage of digital nondestructive test data for test methods not explicitly addressed by a DICONDE standard practice but having an equivalent medical imaging modality.

1.4 This document provides recommendations for the display, transfer and storage of nondestructive digital test data not addressed in 1.2 or 1.3.

1.5 This document provides an overview of how to utilize the ASTM DICONDE standard practices found in paragraph 2.1.3 on ASTM DICONDE Interoperability Standards for validating a system that follows the ASTM DICONDE standard for the display, transfer and storage of digital nondestructive test data.

1.6 This document provides an overview of how to utilize the ASTM DICONDE standard practices found in 2.1.3 for validating that two or more systems that follow the ASTM

DICONDE standard for the transfer of digital nondestructive test data can successfully transfer data.

1.7 This document provides an overview of how to utilize the ASTM DICONDE standard practices found in 2.1.3 for validating that two or more systems that follow the ASTM DICONDE standard for the display of digital nondestructive test data display data consistently.

1.8 Although this guide contains no values that require units, it does describe methods to store and communicate data that do require units to be properly interpreted. The SI units required by this guide are to be regarded as standard. No other units of measurement are included in this guide.

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

1.10 *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:*²

2.1.1 General ASTM Standards:

[E1316 Terminology for Nondestructive Examinations](#)

2.1.2 ASTM DICONDE Test Method Standards:

[E2339 Practice for Digital Imaging and Communication in Nondestructive Evaluation \(DICONDE\)](#)

[E2663 Practice for Digital Imaging and Communication in Nondestructive Evaluation \(DICONDE\) for Ultrasonic Test Methods](#)

[E2699 Practice for Digital Imaging and Communication in Nondestructive Evaluation \(DICONDE\) for Digital Radiographic \(DR\) Test Methods](#)

¹ This test method is under the jurisdiction of ASTM Committee E07 on Nondestructive Testing and is the direct responsibility of Subcommittee E07.11 on Digital Imaging and Communication in Nondestructive Evaluation (DICONDE).

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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.

E2738 Practice for Digital Imaging and Communication Nondestructive Evaluation (DICONDE) for Computed Radiography (CR) Test Methods

E2767 Practice for Digital Imaging and Communication in Nondestructive Evaluation (DICONDE) for X-ray Computed Tomography (CT) Test Methods

E2934 Practice for Digital Imaging and Communication in Nondestructive Evaluation (DICONDE) for Eddy Current (EC) Test Methods

2.1.3 ASTM DICONDE Interoperability Standards:

E3147 Practice for Evaluating DICONDE Interoperability of Nondestructive Testing and Inspection Systems

2.2 Other Documentation:³

NEMA Standards Publication PS3, Version 3: Digital Imaging and Communications in Medicine (DICOM)

ACR-NEMA 300-1998 Digital Imaging and Communications in Medicine

3. Terminology

3.1 Definitions:

3.1.1 Nondestructive evaluation terms used in this practice can be found in Terminology E1316.

3.1.2 DICONDE terms used in this practice can be found in Terminology E2339 and E3147.

4. Summary of Guide

4.1 DICOM provides rich methods for managing the display, transfer and storage of a wide variety of digital test data. An explicit list of the digital data covered can be found in the DICOM standard. These modalities are referred to as Standard SOP Classes.

4.2 DICOM provides the flexibility to address the storage of digital data not expressly defined in a Standard SOP Class.

4.2.1 Standard Extended SOP Classes extend Standard SOP Classes with additional data that is user optional. Use of a Standard Extended SOP Class does not impact the interoperability of the SOP Class.

4.2.2 Specialized SOP Classes are derived from Standard SOP Class but include changes to the mandatory data associated with the SOP Class. Use of a Specialized SOP Class does impact interoperability and requires updates to the DICOM and DICONDE standards to ensure interoperability.

4.3 The DICONDE standard is comprised of both Standard Extended and Specialized SOP Classes.

4.3.1 Standard Extended SOP Classes are utilized when there is a medical imaging modality that closely aligns with a nondestructive test method. Examples of this are E2663 DICONDE for Ultrasonic Test Methods and E2699 DICONDE for Digital Radiographic Test Methods. The DICONDE standard practices that utilize Standard Extended SOP Classes maintain the most interoperability with DICOM compliant devices.

4.3.2 Specialized SOP Classes are utilized for test methods that do not have an equivalent medical imaging modality. An

example of this is E2934 DICONDE for Eddy Current Test Methods. In this case, the DICOM standard officially recognizes the existence of the DICONDE Specialized SOP Classes and will not create a future version of the DICOM standard that conflicts with the DICONDE Specialized SOP Classes. The DICONDE standard practices that are based on Specialized SOP Classes result in a low level of interoperability with DICOM compliant devices. In most cases, DICOM compliant devices will not accept the data since it is not a DICOM Standard SOP Class.

4.3.3 The purpose of DICONDE is to provide a standard way to universally access the NDT data and associated metadata produced by NDT systems. DICONDE facilitates the interoperability of NDE imaging and data acquisition equipment by specifying the image data in commonly accepted terms. It describes a standard protocol to display, transfer, and store the NDT data, utilizing the protocol established by DICOM, providing a means to automatically and transparently communicate between compliant equipment without loss of information. As such, it also provides a standard methodology to organize and retain the NDT data. The overall organization of ASTM's DICONDE standards and their relationship to DICOM is shown in Fig. 1.

4.4 NDT systems using DICONDE should do so in a manner that guarantees their ability to interoperate with other NDT systems that implement DICONDE. The inability to universally access the data and associated metadata produced by NDT systems defeats the purpose of DICONDE.

4.4.1 Vendors utilizing DICONDE are required to provide a conformance statement for each product claiming DICONDE conformance. The conformance statement is a technical document that outlines the relevant services for comparison with other systems to ensure communications work effectively.

4.4.2 In practice, it is impossible for vendors to ensure DICONDE systems interoperate in isolation. Specific test protocols are needed for vendors to be able to verify the ability of products claiming DICONDE conformance with similar products from other vendors.

4.4.3 For widespread adoption, systems claiming DICONDE conformance should be able to be verified for the end user. Specific test protocols are needed for verifying and documenting DICONDE conformance.

5. Significance and Use

5.1 Personnel responsible for the creation, display, transfer or storage of digital nondestructive evaluation results will use this guide.

5.2 Personnel responsible for the design and manufacture of NDT systems conforming to the DICONDE standard will use this guide.

5.3 Personnel responsible for the purchase and implementation of NDT systems conforming to the DICONDE standard will use this guide.

5.4 This guide will recommend courses of action for utilizing the DICONDE standard for the use cases described in 5.1, 5.2, and 5.3.

³ Available from National Electrical Manufacturers Association (NEMA), 1300 N. 17th St., Suite 900, Arlington, VA 22209, <http://www.nema.org>.