



Standard Practice for Linear-Elastic Plane-Strain Fracture Toughness Testing of Aluminum Alloys¹

This standard is issued under the fixed designation B645; 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.

This standard has been approved for use by agencies of the U.S. Department of Defense.

INTRODUCTION

Linear-elastic plane-strain fracture toughness testing of aluminum alloys is performed essentially in accordance with Test Method E399. However, there is a need, in the application of Test Method E399 for quality assurance testing, to deal with the interpretation of the results for material qualification and release in cases where all requirements for valid measurements of plane-strain fracture toughness cannot be met. It is the purpose of this practice to provide consistent methods of dealing with those situations.

1. Scope*

1.1 This practice is applicable to the fracture toughness testing of all aluminum alloys, tempers, and products, especially in cases where the tests are being made to establish whether or not individual lots meet the requirements of specifications and should be released to customers.

1.2 Test Method E399 is the basic test method to be used for plane-strain fracture toughness testing of aluminum alloys. The purpose of this practice is to provide supplementary information for plane-strain fracture toughness of aluminum alloys in three main areas:

- 1.2.1 Specimen sampling,
- 1.2.2 Specimen size selection, and
- 1.2.3 Interpretation of invalid test results.

1.3 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.3.1 *Exception*—Certain inch-pound values given in parentheses are provided for information only.

1.4 This standard is currently written to accommodate only C(T) specimens.

1.5 *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 and health practices and determine the applicability of regulatory limitations prior to use.

2. Referenced Documents

2.1 *ASTM Standards*:²

B646 Practice for Fracture Toughness Testing of Aluminum Alloys

E29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications

E399 Test Method for Linear-Elastic Plane-Strain Fracture Toughness K_{Ic} of Metallic Materials

E561 Test Method for $K-R$ Curve Determination

E1823 Terminology Relating to Fatigue and Fracture Testing

3. Terminology

3.1 *General*—Terms, definitions, symbols, and orientation designations in Test Method E399 and Terminology E1823 are applicable herein.

3.2 *Definitions*: The following additional definitions are applicable:

3.2.1 *invalid plane-strain fracture toughness*—test result, K_{Qc} , that does not meet one or more of the validity requirements in Test Method E399 and, where so characterized, is of no value in judging the true plain-strain fracture toughness of a material but may, under certain conditions, adequately guarantee the material's fracture toughness for lot release purposes.

¹ This practice is under the jurisdiction of ASTM Committee B07 on Light Metals and Alloys and is the direct responsibility of Subcommittee B07.05 on Testing.

Current edition approved Dec. 1, 2015. Published December 2015. Originally approved in 1978. Last previous edition approved in 2010 as B645 – 10. DOI: 10.1520/B0645-10R15.

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.