



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

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INTRODUCTION

Plane-strain fracture toughness testing of aluminum alloys is performed essentially in accordance with Test Method E 399. However, there is a need, in the application of Test Method E 399 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 E 399 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 inch-pound units are to be regarded as the standard. The values given in parentheses are provided for information only.

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:

B 646 Practice for Fracture Toughness Testing of Aluminum Alloys²

E 29 Practice for Using Significant Digits in Test Data to

Determine Conformance with Specifications³

E 399 Test Method for Plane-Strain Fracture Toughness of Metallic Materials⁴

E 1823 Terminology Relating to Fatigue and Fracture Testing⁴

3. Terminology

3.1 *General*—Terms, definitions, symbols, and orientation designations in Test Method E 399 and Terminology E 1823 are applicable herein.

3.2 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 E 399 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.

3.2.2 *meaningful plane-strain fracture toughness*—test result, designated K_{Qc} , that does not meet one or more of the validity requirements in Test Method E 399, but for which there is experimental or analytical evidence that the departure from validity is small enough that the value of K_{Qc} is expected to be within 5 or 10 % of the value of K_{Ic} that would have been obtained had all the validity criteria been met.

3.2.3 *valid plane-strain, fracture toughness*—test result meeting all the validity requirements in Test Method E 399, that is, a value of K_{Ic} .

4. Summary of Practice

4.1 This practice supplements Test Method E 399 and Practice B 646 in three main areas:

4.1.1 Specimen sampling,

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.

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² *Annual Book of ASTM Standards*, Vol 02.02.

³ *Annual Book of ASTM Standards*, Vol 14.02.

⁴ *Annual Book of ASTM Standards*, Vol 03.01.

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