



Standard Test Method for Measurement of Fatigue Crack Growth Rates¹

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1. Scope

1.1 This test method² covers the determination of fatigue crack growth rates from near-threshold to $K_{\max}$ controlled instability. Results are expressed in terms of the crack-tip stress-intensity factor range (ΔK), defined by the theory of linear elasticity.

1.2 Several different test procedures are provided, the optimum test procedure being primarily dependent on the magnitude of the fatigue crack growth rate to be measured.

1.3 Materials that can be tested by this test method are not limited by thickness or by strength so long as specimens are of sufficient thickness to preclude buckling and of sufficient planar size to remain predominantly elastic during testing.

1.4 A range of specimen sizes with proportional planar dimensions is provided, but size is variable to be adjusted for yield strength and applied force. Specimen thickness may be varied independent of planar size.

1.5 The details of the various specimens and test configurations are shown in Annex A1-Annex A3. Specimen configurations other than those contained in this method may be used provided that well-established stress-intensity factor calibrations are available and that specimens are of sufficient planar size to remain predominantly elastic during testing.

1.6 Residual stress/crack closure may significantly influence the fatigue crack growth rate data, particularly at low stress-intensity factors and low stress ratios, although such variables are not incorporated into the computation of ΔK .

1.7 Values stated in SI units are to be regarded as the standard. Values given in parentheses are for information only.

1.8 This test method is divided into two main parts. The first part gives general information concerning the recommendations and requirements for fatigue crack growth rate testing. The second part is composed of annexes that describe the special requirements for various specimen configurations, special requirements for testing in aqueous environments, and procedures for non-visual crack size determination. In addition, there are appendices that cover techniques for calculating

da/dN, determining fatigue crack opening force, and guidelines for measuring the growth of small fatigue cracks. General information and requirements common to all specimen types are listed as follows:

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1.9 Special requirements for the various specimen configurations appear in the following order:

The Compact Tension Specimen	Annex A1
The Middle Tension Specimen	Annex A2
The Eccentrically-Loaded Single Edge Crack Tension Specimen	Annex A3

1.10 *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:

- E 4 Practices for Force Verification of Testing Machines³
- E 6 Terminology Relating to Methods of Mechanical Testing³
- E 8 Test Methods for Tension Testing of Metallic Materials³
- E 337 Test Method for Measuring Humidity with a Psychrometer (the Measurement of Wet- and Dry-Bulb Temperatures)⁴
- E 338 Test Method for Sharp-Notch Tension Testing of

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² For additional information on this test method see RR: E 24 – 1001. Available from ASTM Headquarters, 100 Barr Harbor Drive, West Conshohocken, PA 19428.

³ Annual Book of ASTM Standards, Vol 03.01.

⁴ Annual Book of ASTM Standards, Vol 11.03.