



# Standard Test Method for Measurement of Internal Stress of Metallic Coatings by Split Strip Evaluation (Deposit Stress Analyzer Method)<sup>1</sup>

This standard is issued under the fixed designation B975; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

## INTRODUCTION

The deposit stress analyzer method provides a rapid, accurate, and economical means for the determination of the internal tensile and compressive stress in metallic and nonmetallic coatings. Internal stress is expressed in pounds per square inch or megapascals. This procedure for measuring internal stress offers the advantages of test specimens that are pre-calibrated by the manufacturer, a small test specimen coating surface area, and rapid determination of the internal stress in the applied coating.

## 1. Scope

1.1 This test method for determining the internal tensile or compressive stress in applied coatings is quantitative. It is applicable to metallic layers that are applied by the processes of electroplating or chemical deposition that exhibit internal tensile or compressive stress values from 500 to 145 000 psi (3.45 to 1000 MPa).

1.2 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.3 *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:<sup>2</sup>

**B636** Test Method for Measurement of Internal Stress of Plated Metallic Coatings with the Spiral Contractometer  
**E177** Practice for Use of the Terms Precision and Bias in ASTM Test Methods

**E691** Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method

### 2.2 IEC Standard:<sup>3</sup>

**IEC 61010** Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use

## 3. Terminology

### 3.1 Definitions of Terms Specific to This Standard:

3.1.1 *average deposit thickness,  $n$* —average deposit thickness equals the deposit weight in grams divided by the specific gravity of the deposit in grams per cubic centimetre multiplied by the plated deposit surface area per test strip (see **Eq 3**).

3.1.2 *constant  $K$ ,  $n$* —this certifiable calibrated number is determined experimentally for each lot of test strips manufactured to enable simple mathematical calculation of the internal deposit stress while factoring the influence of percent elongation difference between the deposit and the substrate without the use of complicated bent strip formulas. See **Note 4**.

3.1.3 *helix,  $n$* —metal strip approximately 0.01 to 0.013 in. (0.025 to 0.033 cm) thick formed as a helix approximately 0.9 in. (2.3 cm) in diameter and 0.61 in. (15.5 cm) long with or without a polytetrafluoroethylene (PTFE) coating on the inside surface.

3.1.4 *internal stress,  $n$* —stress in a given layer of coating can result from foreign atoms or materials in the layer that stress the natural structure of the deposit as the coating is being formed from sources independent of foreign atoms such as misfit dislocations and the result of additional processing.

### 3.1.4.1 Discussion—Stress that develops in a given layer of

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<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 Electrotechnical Commission (IEC), 3, rue de Varembe, P.O. Box 131, 1211 Geneva 20, Switzerland, <http://www.iec.ch>.