



# Standard Practice for Determining the Scratch Hardness and Scrape Adhesion of Prints and Coatings<sup>1</sup>

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<sup>e1</sup> NOTE—Revised the units presentation and added a units statement editorially in October 2011.

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## 1. Scope

1.1 This practice describes procedures to obtain subjective, but comparative data for scratch hardness and scrape adhesion of coatings and color images produced by printers, copies and other reprographic devices.

1.2 This method simulates conditions where the surface of various substrates such as paper, film, cloth, and so forth may be subject to failure under mechanical force.

1.3 This test method covers the determination of the scratch hardness and scrape adhesion of coatings. Results are expressed in terms of force-to scratch coatings on substrates used in printing.

1.4 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.

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

## 2. Terminology

### 2.1 Definitions:

2.1.1 *scratch hardness*—the force necessary to cut through the coating to the substrate.

2.1.2 *scrape adhesion–scratch resistance*—the force required to scrape a path through the coating or print, when the stylus begins its motion. By moving a free edge of the test coating against a round stylus or loop under a variable load expressed in grams, scrape resistance is determined as the minimum load in grams required to cut through the film to the substrate.

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<sup>1</sup> This practice is under the jurisdiction of ASTM Committee F05 on Business Imaging Products and is the direct responsibility of Subcommittee F05.07 on Ink Jet Imaging Products.

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## 3. Summary of Practice

3.1 The scratch hardness and scrape adhesion is determined by pushing the substrate with coating beneath a rounded stylus or loop that is loaded in increasing amounts (weights) until the coating is scratched.

## 4. Significance and Use

4.1 The image life of printed media displayed in both typical office and outdoor environments is dependent on coating scratch resistance. While natural aging is the most reliable method of assessing coating scratch resistance, the length of the time required makes this method impractical for most materials.

4.2 Factors in the office and outdoor environments, such as heat, cold, thermal shock, ultraviolet/visible radiation and water vapor can have similar effect on the scratch resistance of coatings and prints as mechanical force.

4.3 Good scratch resistance is a prime consideration for coated media and prints. Highly absorptive coatings in digital printing have a tendency to dusting, flaking and cracking when folded.

4.4 This practice utilizing mechanical force allows comparative studies of coated and printed media. It is most useful in providing relative ratings for media which exhibit significant differences in performance.

## 5. Interferences

5.1 Since the scratch resistance adhesion is dependent on temperature and humidity, it is important that the effects of mechanical force be assessed under the conditions appropriate to the end use applications. While printed media may be handled and displayed under a variety of conditions, this test practice is intended to measure scratch resistance in typical indoor environments.

5.2 The adhesion is dependent on temperature and should be tested at the manufacturers recommended temperature for the best performance.

5.3 The scratch resistance of color images is dependent on the printing mode, the type of color and the amount of applied ink.