NOTICE: This standard has either been superseded and replaced by a new version or withdrawn.
Contact ASTM International (www.astm.org) for the latest information

Designation: F1721 – 04(Reapproved 2009)

Standard Practices for Determining Stability of Direct Thermal Imaging Products[1]

This standard is issued under the fixed designation F1721; 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.

1. Scope

1.1 These practices cover the evaluation of the effect of various solvents, light, heat, and humidity on direct thermal imaging products.

1.2 These practices may be used to evaluate the performance of thermal products coated on paper, film, or other substrate for specific applications.

1.3 These practices may be used for manufacturing control, development, and research.

1.4 The sections in these practices appear in the following sequence:

Scope	1
Referenced Documents	2
Terminology	3
Practices	
Solvent Resistance	4–11
Light Stability	12–18
Heat and Humidity Stability	19–25
Keywords	26

1.5 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.

1.6 *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:*[2]

D2244 Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates

F767 Test Method for Image Stability of Chemical Carbonless Paper to Light

F1320 Test Method for Evaluating Thermal Paper Employing a Facsimile Thermal Printer as a Test Instrument

F1405 Test Method for Determining the Dynamic Thermal Response of Direct Thermal Imaging Products—Atlantek Method

F1444 Test Method for Determining Dynamic Thermal Response of Direct Thermal Paper-Label Printer Method

2.2 *ANSI Standard:*

ANSI/CGATS 4-1993 Graphic Technology—Graphic Arts Reflection Densitometry Measurements—Terminology, Equations, Image Elements and Procedures[3]

3. Terminology

3.1 *Definitions:*

3.1.1 *direct thermal imaging product, n*—paper, film, or other substrate upon which a coating is applied; the imaging components consist of a color former (leuco dye), a developer, a sensitizer, and antioxidants which react to form an image when sufficiently heated from a thermal printhead.

SOLVENT RESISTANCE

4. Summary of Practice

4.1 Select one or more of the solvents appropriate to the application for which the product will be used.

4.2 Imaged samples including a control are measured for optical density then subjected to contact by various solvent materials for a specified time. Optionally, L* , a*, b* values can be measured for the background using a spectrodensitometer. After the test time is completed, the samples are again measured for optical density and L*, a*, b* and compared to a control. The L*, a*, b* measurements will indicate changes in image color.

4.2.1 Most units which measure L*, a*, b* can provide the difference values in the form of ΔL*, Δa*, Δb* and ΔE. Refer to the technical literature on color measurement for the interpretation of these results.

[1] These practices are under the jurisdiction of ASTM Committee F05 on Business Imaging Products and are the direct responsibility of Subcommittee F05.06 on Carbonless and Thermal Imaging Products.

Current edition approved Oct. 1, 2009. Published October 2009. Originally approved in 1996. Last previous edition approved in 2004 as F1721 – 04. DOI: 10.1520/F1721-04R09.

[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.

[3] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.

Copyright © ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959. United States

Documents
Document Sharing Hub
Full document details: ASTM F1721-04(2009)

5. Significance and Use

5.1 These procedures enable comparison of samples with a control under various solvent conditions to determine the stability of the image. The various solvents simulate conditions which may be encountered in the environment.

5.2 The test may be used to judge which materials are suitable for a specific situation and usage. The sensitivity of the products should match and the products should be for the same application.

5.3 The procedure may be used for the evaluation of direct imaging coatings on paper, film, or other substrate. The method of imaging should be with the type of imaging unit for which the product has been designed.

6. Interferences

6.1 Backing material will affect the reading taken with a spectrodensitometer. Specify which backing is used when taking a reading.

6.2 When reading L*, a*, b* values, also record observer, illuminator, and geometry of the instrument.

7. Apparatus and Materials

7.1 *Spectrodensitometer,* with an aperture smaller than the image area to be measured and meeting the requirements of ANSI/CGATS 4-1993, operating in visual density mode.

7.2 *Oven,* operated at 100 ± 4°F (38 ± 2°C).

7.3 *Printer or Alternative Imaging Device.*

7.4 *Weight*—2.5 lb/in.^{2} (0.176 kg/cm^2).

7.5 *PVC Film.*

7.6 *Cottonseed Oil.*

7.7 *Castor Oil.*

7.8 *Saturated Salt Solution.*

7.9 *Ethyl Alcohol,* 20 % v/v water, denatured.

7.10 *Isopropyl Alcohol.*

7.11 *Pipette.*

7.12 *Option*—Instrument for the measurement of L*, a*, b*.

8. Test Specimens

8.1 The test specimens and control shall be sheets or taken from a roll of direct thermal imaging product.

8.2 Cut samples into individual sheets approximately 8½ by 11 in. (216 by 279 mm). A maximum of six sheets per sample are required for testing.

8.3 Employ a control sample whose characteristics have been previously established or to which all results will be compared.

9. Calibration

9.1 *Spectrodensitometer*—Calibrate the densitometer in accordance with the manufacturer's recommendations.

9.2 *Option—L*, a*, b* Instrument*—Calibrate the unit in accordance with the manufacturer's recommendations.

10. Procedure

10.1 Image the samples and control with a printer to provide a series of images. Imaging may be achieved with a facsimile thermal printer employing a suitable test target (see Test Method F1320) or by imaging systems described in Test Methods F1405 or F1444. If possible, have some images be a solid block at least ¼ by ¼ in. (0.6 by 0.6 cm). Image all samples in the same manner.

10.2 Using the reflectance spectrodensitometer, measure the image density of the samples and control after full density development. Optionally, L*, a*, b* values may be measured for the background. A minimum of five measurements should be taken and averaged to improve accuracy. Measurements should be made in the same relative location on each sample.

10.3 Wrap each imaged sample and imaged control with three layers of PVC film, taking care to keep the samples flat and the film wrap wrinkle free. Place samples in an oven established at 100 ± 4°F (38± 2°C) under a weight of 2.5 lb/in.^{2} for 16 h.

10.4 Coat an imaged sample and imaged control with cottonseed oil or castor oil and place in an oven established at 100 ± 4°F (38 ± 2°C) for 16 h. Use a pipet or similar device to ensure that an equivalent amount of oil is applied to each sample.

10.5 Immerse imaged sample and imaged control in water for 16 h at room temperature. Upon removal, absorb excess water with paper toweling and allow samples and control to air dry at room temperature.

10.6 Immerse imaged sample and imaged control in a saturated sodium chloride salt solution for one hour at room temperature. Upon removal, absorb excess moisture with paper toweling and allow the samples to air dry at room temperature.

10.7 Immerse imaged sample and imaged control in ethyl alcohol (20 %, denatured) for 1 h at room temperature. Upon removal, blot excess solvent and allow the samples to air dry at room temperature.

10.8 Measure the optical density and L*, a*, b* of the imaged samples and the imaged control samples from 10.3 to 10.7. Measure the same locations as originally measured in 10.2. Most L*, a*, b* units will permit the measurement of the change in color (4.2.1).

10.9 Wipe an imaged sample and imaged control with a swab dampened with isopropyl alcohol. Visually compare the image of the sample to the control.

10.10 Compare the results of the samples to the control and establish a ranking order.

11. Report

11.1 Report the following information:

11.1.1 Dates that the test was conducted.

11.1.2 Sample and control identification.

11.1.3 Information regarding the equipment and materials employed in the tests.

11.1.4 Method used to image the samples.

AVA Documents
Document Sharing Hub

Full document details: ASTM F1721-04(2009)