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Standard Practice for Determination of Color Response of Electrostatic Copying System, Black and White Output[1]

This standard is issued under the fixed designation F974; 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.

ε[1] NOTE—Revised the units presentation and added a units statement editorially in October 2011.

1. Scope

1.1 This practice covers the determination of the color response of an electrostatic copy system, black and white output.

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 whoever uses this standard to consult and establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

E97 Method of Test for Directional Reflectance Factor, 45-Deg 0-Deg, of Opaque Specimens by Broad-Band Filter Reflectometry (Withdrawn 1991)[3]

F335 Terminology Relating to Electrostatic Imaging

F360 Practice for Image Evaluation of Electrostatic Business Copies

3. Significance and Use

3.1 This practice is for determining the color response of an electrostatic copy system by examining the black and white copies obtained from an electrostatic copier. This practice covers the capability of a copy system to reproduce various solid colors in varying shades of grey or black and white.

4. Interferences

4.1 This practice can be used to measure the color response for different copy system conditions (machine adjustments, machine configuration, supplies, environment, and so forth). These conditions should be noted so that comparison tests can be made.

4.2 In liquid developed copiers, the system color response is strongly dependent on the condition (that is, age, concentration, and so forth) of the toner bath. As a liquid toner is cycled through depletion and replenishment, color response may show wide fluctuations even though fluctuations in other copy quality criteria (for example, background, edge effect, resolution, and density) may not be altered. (See Terminology F335.)

4.3 In dry toned copiers, the system color response is strongly dependent on the age and condition of the photoconductor and developer and may also show wide fluctuations in color response even though some of the copy quality criteria listed in 4.2 may not be altered.

4.4 Copy systems that circulate the original to be copied through the copier may not be capable of handling a consumer prepared test target.

5. Apparatus

5.1 *Reflectometer,* operated and standardized according to the manufacturer's instructions and in accordance with Test Method E97. Spectral response shall be for measuring the daylight luminous reflectance factor, as described under the Terminology section of Test Method E97.

6. Materials

6.1 Copy paper, toning supplies, photoreceptor, and so forth should be approved materials currently used by the evaluator. Any change of supplies from one manufacturer to those of another may alter the test results.

7. Procedure

7.1 Prepare a test target in accordance with the Test Original section described in Practice F360. Select Munsell Color Chips appropriate to their copying needs and adhere by any suitable

[1] This practice is under the jurisdiction of ASTM Committee F05 on Business Imaging Products and is the direct responsibility of Subcommittee F05.04 on Electrostatic Imaging Products.

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[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] The last approved version of this historical standard is referenced on www.astm.org.

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method those selected chips on a suitable paper substrate (starting in the center of the substrate) allowing spatial intervals between the chips of at least 1½ in. (3.8 cm).

7.1.1 Alternate commercially available color composite targets can be selected and used as a target.

7.1.2 If the customer's color is not on the target, the results may be misleading results, particularly if saturated inks are used.

7.2 Use test target in accordance with the Procedure section described in Practice F360.

7.3 Adjust the exposure dial or controls of the copying machine to optimize color reproduction for the selected target. This can affect other imaging functions.

7.4 When comparative tests are being made by the user (equipment, supplies, test conditions, etc.), use the same target, paper, etc. in each case.

7.5 The user can also include a run-up and run-down of the exposure setting as a test for grey scale response.

8. Results and Calculations

8.1 *Method A*—Observe the imaged copies under normal illumination. Identify the colors that have been clearly reproduced (and separated if appropriate). Record all pertinent information regarding the test structure, that is, copier system model number, supplies lot number (if one is present), supplier by name of each supply item, environmental conditions, etc. Record all data on the imaged copy.

8.2 *Alternate Method B:*

8.2.1 Using the reflectometer (in accordance with the manufacturer's instructions), determine the reflectance for each imaged color patch, taking a minimum of three separate readings near the center of the color patch. Record the reflectance readings adjacent to each reproduced color patch on the imaged copy.

8.2.2 Calculate the average image reflectance value, R_n, for each color patch as follows:

$$R_n = \frac{T}{N} \tag{1}$$

where:

T = the total sum of the reflectance units recorded, and
N = the total number of readings.

8.2.3 For every color under consideration, there is an Index of Color Reproduction (IC) defined by the following equation (optional calculation):

$$\text{IC} = 100 - \frac{100\,(R_n - B_n)}{B_b - B_n} \tag{2}$$

where:

B_n = reflectance of the copied image of a solid black patch.
B_b = reflectance of the copied image of a solid white patch.
R_n = reflectance of the copied image of the solid color patch under test (this is the same as expressed in 8.2.2).

9. Keywords

9.1 color copiers; copiers; electrostatic imaging

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