



Designation: F 1424 – 92 (Reapproved 2001)

Standard Test Method for Estimating Toner Usage in Full-Color Copiers Utilizing Dry Mono-or-Dual-Component Toners¹

This standard is issued under the fixed designation F 1424; 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 This test method describes a procedure for estimating the number of copies that can be produced for a given unit of toner in a full-color copier using dry mono- or dual-component development.

1.2 *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.* For specific hazards, see Section 9.

2. Referenced Documents

2.1 ASTM Standards:

D 5039 Test Method for Identification of Wire Side of Paper²

F 335 Terminology of Terms Relating to Electrostatic Copying³

F 875 Test Method for Evaluation of Large Area Density and Background on Office Copiers³

2.2 ASTM Adjuncts:

Density and Background Test Sheet (F 875)³

“k’s” with Graphic Elements (F 1424)⁴

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *dual-component development*—a mixture of dry toner and iron oxide developer that is used for developing electrostatic images in copiers (see Terminology F 335).

3.1.2 *full-color copiers*—copiers that can reproduce color originals containing gradations of color. Full-color copiers may have up to four individual color developing units containing four different color toners. These colors are frequently cyan, magenta, yellow, and black. The original is scanned by means of an analog system using a series of color filters or by means

of a digital scanning process. The full-color copier may require up to four scans to read the original. The copier individually applies one or more color toners to a transfer drum/belt or photoconductor, or both, which is in turn deposited on the paper.

3.1.3 *mono-component development*—a single component dry toner used for developing electrostatic images in copiers (see Terminology F 335).

3.1.4 *toner usage*—amount of toner (milligrams per copy) removed from the toner reservoir during the copy process.

4. Summary of Test Method

4.1 A full-color copier is set up to standard operating parameters and operated under a controlled job stream and environment for a length of time sufficient for stable performance (see Fig. 1). A known, or estimated quantity of toner is used over the length of the test and this result along with the total number of copies generated is used to estimate the number of copies produced per unit of toner.

4.2 A full-color copier may have up to four individual developing units containing up to four different color toners (usually cyan, magenta, yellow, and black). In some cases, the black developing unit may be dual-component while the color developing units may be mono-component (or vice versa). This test method is intended to address the toner yield of each type of development systems (mono- or dual-component).

5. Significance and Use

5.1 This test method can be used to evaluate the performance of different toners in a common machine. It can also be used to evaluate the economics of toner usage when making machine-to-machine cost-per-copy comparisons.

5.2 This test method provides only a point of estimate that is subject to a significant number of variables that are not easily measured. Toner-based imaging systems are not 100 % efficient. Some toner is lost to the surroundings (inside or outside of the copier). This loss may be significant enough to affect the total number of copies produced by a specific amount of toner. Anyone making a decision based on the results of this test method should carefully consider the accuracy of the results and other pertinent data.

¹ This test method 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.

Current edition approved Aug. 15, 1992. Published November 1992.

² *Annual Book of ASTM Standards*, Vol 15.09.

³ Available from ASTM International Headquarters. Order PCN 12-608750-11.

⁴ Available from ASTM International Headquarters. Order PCN 12-614240-52.

Weigh Toner-Added Data Sheet

Manufacturer of machine tested	_____
Model Number	_____
Rated number of copies per minute	_____
Copies/hour (copies/minute x 60)	_____
Test length (or developer life) (copies/hour x 50) [11.6]	_____
Copy counter reading at start (C_0) [11.8.1.2]	_____
Color of toner under test [11.6]	_____
Weight of initial toner unit added (T_1) [11.8.1.3]	_____ g
Weight of next toner unit added (T_2) [11.8.2.2]	_____ g
Copy counter reading at T_2 addition (C_2) [11.8.2.1]	_____
Weight of toner units added (T_i) [11.8.2.2]	_____ g
Copy counter reading at T_i addition (C_i) [11.8.2.1]	_____
Weight of toner units added (T_i as required) [11.8.2.2]	_____ g
Copy counter reading at T_i addition (C_i as required) [11.8.2.1]	_____
Weight of toner units added (T_{n-1}) [11.8.2.2]	_____ g
Copy counter reading at C_{n-1} [11.8.2.1]	_____
Copy counter reading at last toner addition (C_n) [11.8.2.2]	_____
Toner usage [11.8.2.3] $(1000 \times (T_2 + T_3 + \dots + T_{n-1}) / (C_n - C_2))$	_____ mg per copy

FIG. 1 Sample Data Sheet

5.3 Actual use of the copier in normal operating conditions will most likely result in toner usage values different from those generated in this test method.

6. Interferences

6.1 Variations in toner usage will occur for many reasons, such as the following:

- 6.1.1 Machine adjustments.
- 6.1.2 Operating environment.
- 6.1.3 Varying use of special copy products.
- 6.1.4 Number of copies on the photoconductor or developer, or both.
- 6.1.5 Variations in copy paper.
- 6.1.6 Operator variability.
- 6.1.7 Batch-to-batch toner and developer variability.
- 6.1.8 Machine-to-machine variability.
- 6.1.9 Variations in document area coverage.

7. Apparatus

- 7.1 Balance, reading to the nearest 1 g.
- 7.2 Reflection Densitometer or Reflectometer, capable of measuring a 6-mm solid circle.

8. Reagents and Materials

8.1 Sufficient quantities of paper, toner, developer (if required), and photoconductor to run the test (refer to 11.6).

8.2 Test Targets:

8.2.1 Density and Background Test Sheet, as shown in Fig. 1 of Test Method F 875.³

8.2.2 "k's" with Graphic Elements, as shown in Fig. 2.⁴

9. Hazards

9.1 Machine-to-machine comparisons should be made, if possible, with the same manufacturing lot of toner or developer, or both.

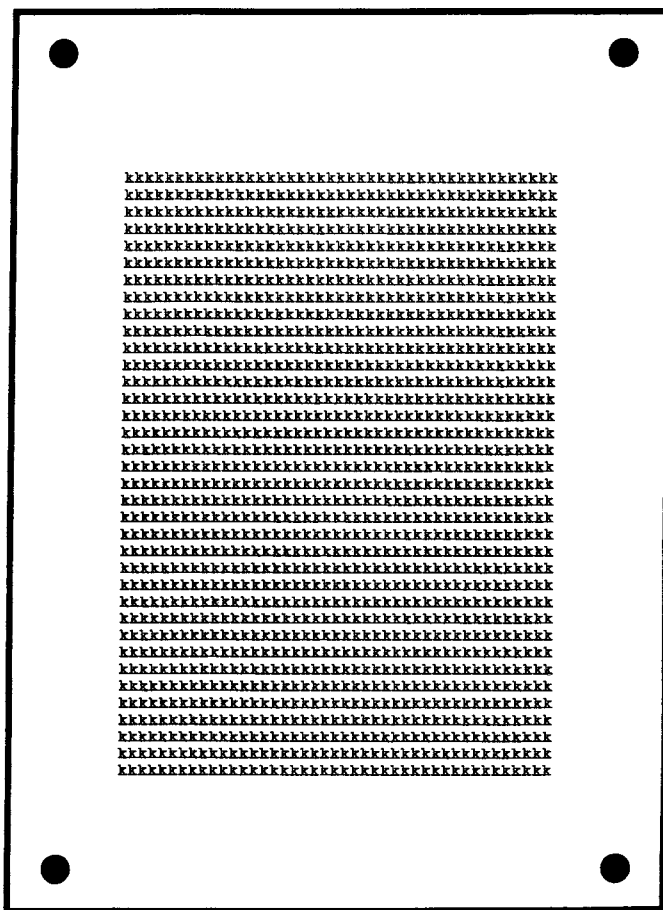


FIG. 2 "k's" with Graphic Elements

9.2 Any comparisons between machines or toners should carefully take into consideration the test conditions used and these conditions should be documented.

9.3 The test must be controlled as described in this test method. Casual use of the copier during the test will affect the results.

9.4 The toner usage estimated with this test method may not accurately predict actual field results. Actual results will depend not only on those interferences listed in Section 6, but also on a number of additional variables:

- 9.4.1 Type of originals used.
- 9.4.2 Machine and service variability.
- 9.4.3 The users image quality requirements.
- 9.4.4 The number of copies per original.
- 9.4.5 The use of secondary receivers.
- 9.4.6 Variations in copy papers.

9.4.7 A copier that produces a lower average print density may have a lower average toner usage than a similar copier producing a higher average print density. This is especially important to note when making copier-to-copier comparisons using the same toner.

10. Conditioning

10.1 Condition the paper (in wrapper), toner, developer, photoconductor, and copier in the test environment for 24 h prior to initiating the test.