



Designation: F 757 – 01

Standard Test Method for Determining Energy Consumption of Copier and Copier-Duplicating Equipment¹

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1. Scope

1.1 This procedure provides a test method by which copiers, copier-duplicators, accessories, and similar office imaging devices may be rated for energy consumption.

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.*

2. Referenced Documents

2.1 *ASTM Standards:*

F 335 Terminology Relating to Electrostatic Copying²

F 995 Test Method for Estimating Toner Usage in Copiers Utilizing Dry Two-Component Developer²

3. Terminology

3.1 *Definitions*—For definitions of terms used in this test method, see Terminology F 335.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *accessories*—any device that expands the capability of the equipment beyond its normal operating mode. An accessory for purposes of energy tests shall be defined as one that is under the control of the operator.

3.2.2 *automatic shut-off mode*—variable energy state into which the machine can be programmed to place itself after a period of time of non-use or at a specified time.

3.2.3 *copier speed, first copy*—one of the convenient levels for which the copier's speed is measured. This is the amount of time the copier takes to make the first copy of a job.

3.2.4 *copier speed, multi copy*—one of the convenient levels for which the copier's speed is measured. This is the amount of time the copier takes to make multiple copies after the first copy of a job.

3.2.5 *copying*—the machine condition that exists from the beginning to the end of the cycle that produces a copy or copies.

3.2.6 *copying energy*—the amount of energy needed in excess of stand-by mode energy during a designated copying mode exclusive of plug-in and warm-up mode.

3.2.7 *copying time*—the amount of time that the nominal jobs are run when testing copying energy.

3.2.8 *cycle out*—the condition which exists when the machine has finished copying, and has returned to a stand-by mode.

3.2.9 *energy-saver recovery time*—the amount of time that the machine takes to come out of the energy-saver mode.

3.2.10 *energy-saver mode*—the condition that exists when the machine is not making copies and is consuming less power than when the machine is in stand-by mode. The machine goes into this mode a period of time after it finishes copying. Widely-used International Energy Star Program contributed to refer to this mode as low-power mode. It specifies that the machine starts passing to the energy-saver mode from the stand-by mode within 15 min. In compliance with the Energy Star Program, this document provides that the machine stays in the stand-by mode for 15 min until the start of passing to the energy-saver mode.

3.2.11 *energy-saver time*—the amount of time that the machine is in an energy-saver mode.

3.2.12 *job*—making copies from one or more originals without interruption or delay between originals.

3.2.13 *machine energy*—the energy consumed by a copier that is plugged-in 24 h/day and turned on 9 h but that is not making copies.

3.2.14 *nominal copies per day*—the number of nominal copies produced on a single machine during a nominal copying day.

3.2.15 *nominal volume*—one of the convenient levels into which the entire range of monthly volumes have been divided.

3.2.16 *plug-in mode*—the condition that exists when the machine is connected to an appropriate electrical source and is not turned on.

3.2.17 *recovery energy*—the amount of energy needed in excess of energy-saver mode energy to pass from the energy-saver mode to the stand-by mode.

3.2.18 *run mode*—a particular combination of originals per job and copies per original.

3.2.19 *standard copy*—a sheet imaged on one side that measures 8 ½ by 11 in. (216 by 280 mm).

¹ This test method is under the jurisdiction of ASTM Committee F05 on Business Copy Products and is the direct responsibility of Subcommittee F05.04 on Electrostatic Copy Products.

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



TABLE 1 Nominal Parameters for Each Nominal Volume

Nominal Monthly Volume, Copies/Month	Nominal Copies/Day	Nominal Jobs (1/8 day) ^a			
		Number of Jobs	Number of Originals	Number of Copies/Original	Job Interval, min
200	8	1	1	1	60.0
500	24	1	1	3	60.0
1 000	48	2	1	3	30.0
2 500	120	3	1	5	20.0
5 000	216	3	1	9	20.0
7 500	336	3	2	7	20.0
10 000	432	6	3	3	10.0
25 000	1 152	6	3	8	10.0
40 000	1 824	6	2	19	10.0
80 000	3 600	6	5	15	10.0
100 000	4 800	4	10	15	15.0
280 000	13 200	5	10	33	12.0
500 000	22 800	5	15	38	12.0
1 000 000	45 600	4	20	71	15.0

^a n = number of jobs $\times$ number of originals $\times$ number of copies per original.

3.2.20 *standard month*—thirty 24-h days.

3.2.21 *standard work day*—9 h.

3.2.21.1 *Discussion*—Since the International Energy Star Program is widely used nowadays, standard copiers have an automatic shut-off. The standard work day was changed from 10.5 to 9 h.

3.2.22 *standard work month*—22 standard work days.

3.2.23 *stand-by mode*—the condition that exists when the machine is not making copies, has reached operating conditions, but has not yet entered into energy-saver mode.

3.2.24 *warm-up mode*—the condition that exists when the machine is turned on from a plug-in mode and prior to reaching the stand-by mode.

4. Summary of Test Method

4.1 The standard energy consumption rating is determined (using a watt-hour meter) for a copier while the machine is in a simulated customer installation performing one eighth of a typical day's copying jobs. The typical day's jobs are based (size, number of originals, and copies per original) on the standard volume (see Table 1).

4.2 The simulated customer installation may be calculated with actual usage data (see 4.4), or based on the following assumptions, that the copier will typically:

4.2.1 Be connected to a live power line for thirty 24 h days (720 h) per month.

4.2.2 Be turned on or off or both each of 22 work days per month.

4.2.3 Go through a warm-up cycle once each of 22 work days each month, since the copier has an automatic shut off.

4.2.4 As a result of 4.2.2 and 3.2.22, be left on for an average of 9 h each of the 22 days, since the copier has an automatic shut-off.

4.2.5 As a result of 3.2.10, in the case where the number of jobs under the nominal jobs (1/8 day) is 4 or more from Table 1, the machine does not go into the energy-saver mode in the copying cycle (8 h a day), because the job interval is 15 min or less. Also as a result of 3.2.10, the machine is basically left in the energy-saver mode for 1 h during the lunch break out of the 9 h when the machine is on each standard work day.

4.2.5.1 *Discussion*—In actual use, the higher the monthly copying volume is, the larger the number of jobs is. Besides, it

is less likely to go into the energy-saver mode. Considering these, Table 1 was changed and the nominal monthly copying volume of 7500 was added on assumption that the monthly copying volume of 7500 or less results in the number of jobs of 3 or less under the nominal job (1/8 day); and the monthly copying volume of 10 000 or more results in the number of jobs of 4 or more under the nominal job (1/8 day).

4.2.6 Perform a typical day's copying jobs each of the 22 work days each month.

4.3 The energy consumption per copy or the typical month's energy consumption rating (kW/h per month) are determined using calculations based on the test data.

4.4 As an alternative you can use actual usage data for estimated hours of use in these formulas, and in Section 10. When making comparisons of like machines, it is recommended to use the same usage data.

5. Significance and Use

5.1 This test method provides a procedure for measuring the energy consumption of the product and associated accessories in various operating modes. It is intended to permit rating the energy requirements of products by a method that will permit accurate energy efficiency comparisons of each product with all other similar products.

6. Apparatus and Supplies

6.1 *Watt-Hour Meter*, one per phase, accurate to three figures.³

6.2 *Timer*, a timing device accurate to 1 s.

6.3 *Test Target*—A ten pitch, pica, 45 lines of lower case “k” character, 65 characters per line (2925 total characters), with a 1-in. (25-mm) clear border around the typed area, and on white paper. This target is prepared by the user. Alternately, the test target with 8 % coverage (PCN 12-609950-11) from Test Method F 995, can be used.

³ For certain low-volume copiers that consume little energy, the Duncan model EM-10 which reads to 0.1 watt hour per count, or equivalent, has been found suitable for use (12.2). Duncan models are available from Duncan Electric Co., Lafayette, IN, and the General Electric model is available from General Electric, Schenectady, NY.