INTERNATIONAL STANDARD

ISO/IEC 24735

Second edition
2012-06-15

Information technology — Office equipment — Method for measuring digital copying productivity

Technologie de l'information — Équipements de bureau — Méthode de mesure de la productivité d'un photocopieur numérique

Reference number
ISO/IEC 24735:2012(E)

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Published in Switzerland

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of the joint technical committee is to prepare International Standards. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

ISO/IEC 24735 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 28, *Office equipment.*

This second edition cancels and replaces the first edition (ISO/IEC 24735:2009), which has been technically revised. It also incorporates the Technical Corrigendum ISO/IEC 24735:2009/Cor.1:2009.

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Introduction

Many digital copying devices produce copied pages at a different rate than their nominal speed when running with different modes (simplex, duplex, copying quality modes), different substrate weight and collating and/or finishing options. The degree to which a reduction in productivity is experienced depends significantly on other parameters of the job stream. The most dominant of the parameters of the job stream are: the number of original pages in a set to be printed, whether ouput pages are single-sided or double-sided, image quality modes selected, B&W and colour reproduction job stream, number of print sets to be produced, substrate size used, run length and finishing options. The existing International Standard (ISO/IEC 14545) only addresses the productivity issues for light-lens B&W copying device/duplicators and does not take into account these important machine and job related factors for digital copying devices.

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Information technology — Office equipment — Method for measuring digital copying productivity

1 Scope

This International Standard specifies a method for measuring the “productivity” of digital copying devices and multifunctional devices with various copying modes. It is applicable to digital copying devices and multifunctional devices equipped with automatic document feeder and collating function. This International Standard is intended to be used for black and white (B&W) as well as colour digital copying devices and multifunctional devices of any underlying marking technology. It allows comparison of the throughput copying rates for a machine operated in various available operating modes (simplex, duplex, size of substrates, 2-up, etc) and various available digital image processing configurations. This International Standard includes test files, test setup procedures, test procedures, and reporting requirements for digital copying productivity measurements.

This International Standard is not intended to be used for devices which are not able to copy on a media size of A4/8.5"x11", devices that do not have an automatic document feeder (ADF), or devices which are not able to collate multiple copies of original prints from a test set.

This International Standard is not intended to replace manufacturer's rated speeds.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 2470-1:2009, *Paper, board and pulps — Measurement of diffuse blue reflectance factor — Part 1: Indoor daylight conditions (ISO brightness)*

ISO 536:1995, *Paper and board — Determination of grammage*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
duplex copying
use of a copying device to make a number of copies with the copying being done on both sides of the sheet

NOTE An equivalent term is “two-sided copying” and referred to as 1:2 mode or 2:2 mode.

3.2
effective throughput
EFTP
average speed at which a device produces pages measured from the initiation of the job through the complete exit of the last page of the last test set

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NOTE EFTP is expressed in images per minute (ipm). EFTP can be affected by the digital processing time of the test set as well as the run time of the test set.

3.3
estimated saturated throughput
ESAT
rate at which a device produces pages measured from the complete exit of the last page of the first test set through the complete exit of the last page of the last test set

NOTE ESAT is expressed in images per minute (ipm).

3.4
feature performance test
optional test used to evaluate productivity changes with various copying and finishing features enabled by providing FSOT and ESAT

NOTE The feature performance test suite is run with default copying system settings to establish a base line, and then with the selected feature (e.g. stapling) ON, for comparison.

3.5
first set out time
FSOT
number of seconds between the initiation of the job to the complete exit of the last page of the first test set

NOTE There is a different definition called “FCOT" (first copy out time). “FCOT” and “continuous copying speed” for EP (electrophotographic) copying machines are defined in ISO/IEC 21117. For reference, the extension of these definitions, also applied for out of scope copying devices, is shown in Annex D (informative).

3.6
full detailed report
presentation of information including machine setup and measured test results

3.7
full report
presentation of results including the FSOT, ESAT and EFTP values in general performance tests or the FSOT and ESAT values in feature performance tests as well as the calculated averages for each value

3.8
general performance test
test used to evaluate productivity by providing FSOT, ESAT and EFTP without using any special feature or mode, and which includes both the simplex copying mode and the duplex copying modes 1:2 and 2:2, if available

3.9
last set out time
LSOT
number of seconds between the initiation of the job to the complete exit of the last page of the last test set

3.10
nominal copying speed
copying rate, excluding time to first page copied, measured when producing pages in a continuous copying mode with a single static document using a nominal weight substrate

NOTE Nominal copying speed is expressed in copies per minute or images per minute.

3.11
simplex copying
use of a copying device when only a single side of a sheet is copied on

NOTE Other equivalent terms are “one-sided copying” or “simplex to simplex” referred to as 1:1 mode.

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3.12
summary report
presentation of results, including the average overall FSOT and ESAT in general performance tests or the ratio of the copying performance such as FSOT and ESAT with the subject feature ON versus the copying device default base line performance (without the subject feature ON) in feature performance tests

3.13
test file
digital file used for creating test targets

3.14
test set
all of the pages of a test target

3.15
test target
hard copy document used for testing per the test method, and created from a test file

NOTE An equivalent term is “test chart”.

4 Test Parameters and Conditions

4.1 Environment

The test environment, including temperature and humidity, shall be within the ranges recommended by the manufacturer for operating the device. If no recommendation is available, the following ranges shall apply.

Temperature: 18 °C to 25 °C
Relative humidity: 30% to 70%

NOTE The temperature and humidity of the test environment should be recorded in the full detailed report (Annex B).

4.2 Voltage

The copying device shall be connected to a voltage supply within the manufacturer specified operating voltage range for the copying device under test.

NOTE The measurement should be made under no-load condition prior to each test.

4.3 Copying Device Setup

Place the copying device on a horizontal surface and set up the copying device according to the manufacturer's recommendations.

The copying device shall be fully enclosed in its normal exterior cover. The machine and all of it's necessary supplies shall be acclimated in the test environment prior to conducting the test(s) at least 8 hours. All supplies used in the test(s), included copy paper, shall be those specified by the manufacturer. All image and copying modes should be at their factory pre-set configuration for the copying device. It is assumed that the settings listed in Table 1 are common to all copying devices. These listed settings shall be set to the manufacturer's default or pre-set condition for the device. If a device has settings not listed in Table 1, they too shall be set to default settings. For copying devices that have additional print quality and digital image processing features, those features must be set to match their normal default condition, and included in the result reporting. Disabling manufacturer default installed features, routines or applications, is not allowed. Examples include, but are not limited to the following: automatic cleaning or calibration cycles, and energy save settings. If the system has automatic media detect(automatic paper type selection), it can be disabled, and paper used in the test shall be selected manually. This must be noted in the full detailed report (Annex B). The following pre-set values in the test will be noted on this report format.

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If the copying device is setup with internal or external options such as memory, sorter, or finisher as default, then these options shall be noted on the full detailed report format in the configuration options as shown in Annex B, for example “Finisher as default” or “160GB HDD installed”.

Table 1 — Pre-set Settings

	Pre-set item	Pre-set value
Mode	Output resolution	default
	Output Quality	default
	Copying mode	default
	Auto density adjustment	default
	Collating function	Activated (if not activated in default mode.)
Paper	Paper sending direction	default
	Paper type setting	default
Paper-path	Paper feeding	Standard cassette
	Paper exit	Standard exit tray
	Face up exit	default
	Duplex copying unit	default (used in 1:2 mode and 2:2 mode).
Temporary stop	Fixing capability	default
	Image quality stability	default
	Capacity of paper	default
	Others	default

4.4 Paper

The output paper used in this test shall be within the range of, and/or not violate, specific written attribute guidelines and recommendations provided by the copying device manufacturer, which may include but are not be limited to: size, weight, composition, paper manufacturer(s), paper type, part number and other physical characteristics. Care must be taken to use a paper that conforms to the copying device manufacturers' paper specifications for the default copying device settings. The paper used for the general performance test [section 5.4] shall be cut-sheet, A4 and/or 8.5"x11" size. Optional paper sizes may be used in the feature performance tests such as 8.5"x14", A3, and/or 11"x17" size as appropriate for the test mode. The paper manufacturer, weight, size and paper type/name used in each test shall be noted on the full detailed report.

When sheets of paper of the size other than A4/A3 are used, the sizes shall be indicated in the places of A4 and A3 in the measurement results tables. When a comparison need to be made between the productivity of one machine with that of other machines the measurement shall be done with the same paper sizes. If the copying device employs “thick paper mode” for copying, then this optional mode shall be noted in the machine setup information of full detailed report specified in Annex B.

4.5 Maintenance

Copying device maintenance shall be performed throughout testing per the manufacturer's recommendations on an as needed basis. (For example, cleaning routines or consumables replacement).

4.6 Preparation of Test Targets (Test Charts)

The copying test file is outlined in Annex C (normative).

The test file consists of 4 single sided pages. When using the test file for the copying productivity test, the test targets must be created by printing the most recent electronic test file. If the intended machine does not have

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a printer function, then record the name of printer which is used to print out the actual test targets. The most recent official electronic file (ISO_IEC_24735_Test_Pages.pdf) can be located at http://standards.iso.org/ittf/PubliclyAvailableStandards/SC28_Test_Pages/.

The quality of test targets may affect the productivity measurement. You should create test targets according to the following notes.

1) The test targets shall be printed by the equipment to be tested itself in its default-printing mode.

2) The paper used for creating the test targets shall have a brightness of at least 80% to eliminate the influence of background.

3) The paper used for creating the test targets shall be 64 g/m^2 or above and sufficiently opaque to prevent copying of images on the backside.

4) The paper used for creating the test targets shall be free of wrinkles or other surface defects.

5) Confirm that the there are no defects such as unexpected dots or contaminations.

6) Page scaling shall not be used in general performance test. Typically, this is done by setting page scaling to “none”. Options such as “Fit to printable area” shall not be used in general performance test, either.

The brightness shall be measured according to ISO 2470-1:2009. The paper weight shall be measured according to ISO 536:1995.

5 Test Method

5.1 Test Setup

Before test, the machine under test shall be preconditioned as follows.

1) Install the copying device following the manufacturer's recommendations.

2) Clean the surface of the image scanning device if needed.

3) The default required tests shall be run after the copying device has warmed-up and entered a “ready” state. Use of warm-up copying (that means at least one page is copied just before testing) to ready the copying device is acceptable.

4) Set the system parameters (such as paper weight selection, paper size and feed orientation, quality mode) for test. Record the copying device model, configuration (options), default condition and any other variations if selected. If the system has automatic media detect (automatic paper type selection), it can be disabled, and paper used in the test shall be selected manually. This must be noted in the full detailed report.

Refer to Annex B for an example of settings to record. Refer to section 5.4 for information on required tests and 5.5 for information on running the optional feature performance tests. Refer to section 6 for information on the calculation and treatment of data. Refer to section 7 for information on data reporting.

NOTE Measurement of printing productivity in MFD should be measured according to ISO/IEC 24734 International Standard. Only copying productivity function can be measured according to this International Standard.

5.2 Test Measurement Procedure

A single set of each test target is copied and measured to determine $FSOT_{1set}$. Multiple, N sets, of each test target are measured for the 1 Set + 30 Seconds Test run to calculate $ESAT_{30sec}$ and $EFTP_{30sec}$, where N is the

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number of sets needed to meet $LSOT_{30sec}$–$FSOT_{30sec}$ ≥ 30 seconds. This method is used to provide varying tests for products across varying segments. This simple approach allows faster products to be tested with more sets and slower products to be tested with less sets without defining and categorizing products by segment. The 1 Set + 4 Minutes Test is a similar concept used to calculate $EFTP_{4min}$ and is intended to provide a test to illustrate that differences in productivity can occur for longer copying times compared to shorter copying times. It is understood and recognized that 4 minutes may be a long test for some devices, but a short test for other, higher end devices. The 4 minutes time is a compromise to meet the needs of the many products across many segments covered in the scope of this International Standard.

(1) Before test, the machine under test shall be preconditioned as described in section 5.1.

(2) Prepare and set the test targets (test charts) that will be used in the test, identified as described in Section 4.6.

(3) Refer to sections 5.4 and 5.5 to decide what tests are to be run.

1 Set Test Procedure to measure $FSOT_{1set}$ and $EFTP_{1set}$:

1) Enter Copy Set count = 1 required for this specific test run on the copying device operation panel.

2) [Start Test run] Press copy start button and simultaneously start the timing device (watch or otherwise).

3) Record the time for completion of one set to at least two decimal places.

4) [End Test run]

5) Run the 1 Set Test [steps 2 – 4] twice. Calculate the average $FSOT_{1set}$ and $EFTP_{1set}$ according to section 6.

6) Determine if the results are consistent within +/- 5% according to section 5.3.3, and perform a third Test run if required. (The data from the test is average of the individual runs. Three iterations are the max and the results from all iterations are averaged to get the required data.)

7) Calculate the average $FSOT_{1set}$ and $EFTP_{1set}$ according to section 6.

8) Repeat steps 2 – 7 for each required copying mode (1:1, 1:2, 2:2) that is available on the copying device under test.

NOTE The average $FSOT_{1set}$ for this test set is reported in the Summary Report, the Full Report and the Full Detailed Report as FSOT. For detail, see Annex A and Annex B for an example of report presentation.

1 Set + 30 Seconds Test Procedure to measure $ESAT_{30sec}$ and $EFTP_{30sec}$:

1) Enter Copy Set count = N required to for $LSOT_{30sec}$–$FSOT_{30sec}$ ≥ 30 Seconds. Select any necessary collate options to insure that multiple set runs copy the output in collated order (1234..., 1234 ...). For the second and third tests, use the same set count as used in the first test.

NOTE This $FSOT_{30sec}$ should not be confused with the $FSOT_{1set}$ from the 1 Set Test. The $FSOT_{30sec}$ measured is used to verify $LSOT_{30sec}$–$FSOT_{30sec}$ ≥ 30 seconds and to calculate $ESAT_{30sec}$.

2) [Start Test run] Press copy start button and simultaneously start the timing device (watch or otherwise).

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