
**Information technology — Office
equipment — Method for measuring
first print out time for digital printing
devices**

*Technologies de l'information — Équipements de bureau — Méthode
de mesure de la première page hors délai d'un dispositif d'impression
numérique*

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/IEC JTC 1, *Information technology*, Subcommittee SC 28, *Office equipment*.

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Introduction

Many digital printing devices produce the first printed page at a different rate from subsequent pages. Due to this behaviour, nominal print speeds specified in pages per minute do not generally reflect the time to produce the first page. The degree to which a change in productivity is experienced depends significantly on many parameters of the job stream. The most dominant of the parameters of the job stream are: image quality modes selected, job content, B&W and colour reproduction, host computer, and connection type.

This International Standard provides a general method for measuring first print out time when the above mentioned job stream parameters for digital printing devices are taken into consideration. It allows manufacturers and buyers of digital printing devices to describe the first print out time of various digital printing devices with respect to representative office usage.

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Information technology — Office equipment — Method for measuring first print out time for digital printing devices

1 Scope

This International Standard specifies a method for measuring first print out time of digital printing devices. The International Standard is applicable to digital printing devices and multifunctional devices. The International Standard is intended to be used for black and white (B&W) as well as colour digital printing devices and multifunctional devices of any underlying marking technology. The International Standard includes instructions for test charts, test setup procedure, test procedure, and the reporting requirements for the digital printing measurements.

2 Terms and definitions

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

2.1

duplex printing

term used to describe uses in which a printing device prints on both sides of a sheet

Note 1 to entry: Another equivalent term is “two sided printing”.

2.2

first print out time

FPOT

number of seconds between the initiation of the job until the complete exit of the first sheet

Note 1 to entry: Other equivalent terms are “first page out time”, “first print out”, “time to first print”, and “time to first page”. Other similar terms have been used in industry as well.

2.3

full detailed report

presentation of information including host computer setup and measured test results

2.4

full report

presentation of measured test results

2.5

off state

state from which a device is not capable of receiving and printing a print job without user intervention on the device

Note 1 to entry: A device may enter Off state due to a user turning the device off, or device may enter Off state automatically after a delay.

2.6

paper feed orientation

whether the long or short edge of the paper is leading in the paper transport mechanism

Note 1 to entry: Typical devices with a maximum paper size of A4 have a paper feed orientation of short edge. Devices with a maximum paper size of A3 could print with A4 paper loaded in either long edge or short edge orientation. Typical devices with a maximum paper size of 8,5” × 11” have a paper feed orientation of short edge. Devices with a maximum paper size of 11” × 17” could print with 8,5” × 11” paper loaded in either long edge or short edge orientation.

2.7
power management delay time
time that a device waits between the last print job and going into a lower power state such as sleep state or off state

Note 1 to entry: The power management delay time corresponding to the setting as shipped is referred to as “default power management delay time” or “default delay time”.

2.8
ready state
state which a device typically enters after completing a print job where the printing engine is in a stable condition, but fully warmed up and prepared to print

Note 1 to entry: While in ready state, systems not directly involved with marking the media may be still in motion. For example, fans may still be spinning.

2.9
recovery time
time required by a device to recover from sleep state given by the difference in FPOT between sleep state and ready state

Note 1 to entry: Other related terms are “resume time” and “return time”. Other similar terms have been used in industry as well.

2.10
simplex printing
term used to describe uses in which a printing device prints on only one side of a sheet

Note 1 to entry: Another equivalent term is “one sided printing”.

2.11
sleep state
low power state from which a device is capable of receiving and printing a print job without user intervention on the device

Note 1 to entry: Some devices may have multiple low power states. This International Standard focuses only on the lowest power sleep state.

Note 2 to entry: Other equivalent terms are “power save”, “low power mode”, and “energy save”. Other similar terms have been used in industry as well.

2.12
summary report
presentation of results including only average FPOT from ready results

2.13
test file
refers to the digital test file used for testing

2.14
test page
first page or first two pages from a test file

Note 1 to entry: Duplex testing requires using the first two pages from a test file to print on both sides of the first sheet. Simplex testing only requires using the first page from a test file to print on one side of the first sheet.

2.15
test platform
set of hardware and software system components configured to perform the collection of digital printing FPOT tests, including, but not limited to a computer installed with an operating system and applicable application software, installed printing device software, hardware and software interfaces, and timing devices (stopwatch or automated)

2.16**test run**

refers to the operation of printing a test page or multiple test pages, in a particular system configuration

Note 1 to entry: Print times are recorded for each test run.

2.17**test suite**

refers to the combination of test files used to measure FPOT

2.18**warm-up time**

time required by a device to recover from off state given by the difference in FPOT between off state and ready state

Note 1 to entry: Other similar terms, such as “wait time”, have been used in industry as well.

3 Test Parameters and Conditions**3.1 Test Platform**

Due to the rapid change of computer technology, a common test platform (hardware and software) that can be used for FPOT testing over time is considered to be not practical. Instead, when a test platform is used, the test platform system parameters that may affect digital printing productivity measurements (see [Annex A](#)) shall be recorded.

3.2 Test Platform Test Setup Procedures**3.2.1 Initial Platform Setup**

The test platform hardware should be installed as per the manufacturer’s instructions. The test platform hardware information shall be recorded as listed in [Annex A](#). The test platform operating system and applications should be installed as per the manufacturer’s instructions. The test platform operating system and application information shall be recorded as per [Annex A](#). All settings or selections made during installation that differ from the application’s default settings or operating system’s default settings shall be recorded.

- The test platform should be configured for the appropriate connection environment, such as direct USB connection or network Ethernet connection, and the information shall be recorded as per [Annex A](#) along with all settings and selections that differ from the installation default configuration.
- It should be verified that the test platform is configured for optimal performance by evaluating system parameters such as hard disk fragmentation and compression, swap memory size, etc. Any settings, changes or optimizations made that differ from the installation default condition shall be recorded.
- The test platform is now in the Initial Installation State. All recorded settings shall be included in the Full Detailed Test report.

3.2.2 Creation of Disk Image of Test Platform (optional)

Disk imaging software may be used to enable the system to be restored to the Initial Installation State. Create the disk image after the test platform has been configured and before the print driver for the printing device is installed. Record the disk imaging software used and all settings that differ from the imaging software’s installation default condition.

3.2.3 Initial Test State

The test platform shall be restored to the Initial Installation State before beginning the sequence of tests for each new printing device. Each printing device product bundle or printing device hardware configuration that might be expected to result in a difference in performance should be considered a 'different printing device'. Record the method used to establish the Initial Installation State.

3.3 Printing Device System Setup

Place the printing device on a horizontal surface and setup the printing device according to the manufacturer's recommendation. Install the software (driver, port, etc.) recommended by the manufacturer. Use the most recent print driver available from the manufacturer. The driver and driver version shall be recorded on the test report.

The standard test shall be conducted using the manufacturer's default driver for the given printing device. If a default driver is not installed/selected automatically by the manufacturer's installation procedure, consult the manufacturer's documentation and use the recommended driver. All image, print quality, mode and speed modifiers shall be at their factory pre-set configuration for the printing device and default installed condition for the driver. If the printing device and driver differ, then the driver defaults shall be used. 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, bi-directional communications and energy save settings.

Testing shall be carried out in the specified modes, regardless of whether they are default settings or not. For example, if the default driver setting is duplex, the setting shall be changed to simplex for the simplex tests. Other modes that may need to be modified for specific tests include B&W mode on colour devices, paper size, paper scaling, and collation. It is allowable to disable automatic media detect and select plain paper. All changes to the default settings shall be recorded in the Full Detailed Report.

The file shall be rendered on the page in a size corresponding to the dimensions in the test page description. For example, when testing an A4 sized document, the media settings shall be set to A4, and when testing a 8,5" × 11" size document, set to 8,5" × 11", and so forth. Verify the printing device and print driver default page margin settings are not larger than 12,7 mm (0,5 inches). Adjust the settings as necessary to ensure the test page printable area is rendered correctly. Adjust the settings as necessary to ensure the test pages printable area is rendered to cover the paper page area as shown in the softcopy display of the test file. Any modifications to the printing device or print driver settings shall be recorded. Page placement modifiers such as page centering and auto-rotation can be used to place the image properly on the page. Any change from the printing device defaults shall be recorded in the Full Detailed Report.

Adjust the settings such as turning off 'page scaling' setting to ensure the test page printable area is rendered correctly.

For colour and B&W printing devices, printing the three files in the 'Office Category' test suite is required. The output of the three files on a colour device shall be in colour, whereas the output of the three files on a B&W device shall be B&W. For colour printing devices, an optional B&W result may be reported by using the same three colour files, changing the printing device or driver to produce B&W output, but maintaining the default quality or resolution setting.

Procedurally, the optional B&W output on a colour device test shall be done as follows: Select the printing device or driver options which are intended to produce B&W only output. Follow the manufacturer's instructions on how to change the printing device or driver for the result of producing B&W output utilizing only the black cartridge. If other settings change automatically as a result of changing to B&W mode, such as quality mode, this shall be noted on the test report. If B/W printing is performed by composite black, it shall be reported

NOTE Common means of setting a printing device in B&W include, but are not limited to, selecting a B&W option in the driver. In the driver, this might appear as: "print in B&W", "print in grayscale" or "print in black only". The selection of B&W printing can occur in several places in the driver and printing device. When the best method to set the printing device to print in B&W only is in question, it is best to contact the manufacturer regarding the best method to change this setting.

The device and all of its necessary supplies shall be acclimated in the test environment prior to conducting the test for at least eight hours.

Additional tests may be conducted using other, non-default, drivers or printing device description languages provided by the manufacturer for the printing device. Additional tests may also be conducted using other settings available with the device. Such settings may be, but are not limited to, print quality and speed modifier choices available in the driver. The results of such additional tests will be documented as having system parameters that differ from the factory defaults and shown in comparison to the default system parameter results.

3.4 Printing Device Connection

Connection to the test platform should be determined by the manufacturer's targeted usage. A printing device intended to be shared by several users should be connected via the network connection with which the printing device is equipped from the manufacturer. A printing device intended to be personal or desktop should be connected direct to the test computer (such as USB). The connection type, version shall be recorded and reported. In addition, all settings that differ from the system or printing device defaults shall be recorded and reported.

3.5 Printing Device Condition

All supplies used in the test(s), including paper and printing device consumables, shall be only those specified as acceptable for use by the manufacturer (or otherwise noted). If possible, the number of pages printed on the engine and printed on the consumables prior to the start of the test shall be recorded and reported.

3.6 Sample Size

For FPOT measurement, one device shall be tested. Each file shall be tested and measured at least twice for repeatability.

3.7 Paper

The paper used in this test shall be within the range of, and/or not violate, specific written attribute guidelines and recommendations provided by the printing device manufacturer, which may include but are not 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 printing device manufacturers' paper specifications for the default printing devices settings. The paper used shall be cut-sheet, A4 and/or 8,5" × 11" size. The paper manufacturer, weight, size and paper type/name used in each test shall be noted on the report.

In all cases the paper size used shall be indicated in the measurement results tables, and the paper feed orientation shall be noted in the test report. When a comparison is made between the productivity of one device with that of other devices the measurement shall be done with the same paper sizes and paper feed orientation.

3.8 Maintenance

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

3.9 Test Files, Test Suites and Software Applications

The ISO/IEC 24734 'Office Category' test suite and test files are specified in [Annex B](#). The tests shall be conducted using the standard official electronic test files as the input. The most recent official files can be located at http://standards.iso.org/ittf/PubliclyAvailableStandards/SC28_Test_Pages/. The 'Office Category' test files are part of the ISO/IEC 24734 test pages, and may be found inside the 'Office_Final.

zip' archive. Failure to use the exact files as specified shall invalidate test results. The versions of the test files and application software used shall be included in the test report.

The 'Office Category' test suite consists of three test files with 4 pages per file. The three test files are in the following file formats: Microsoft® Word®¹⁾ file, Microsoft® Excel®²⁾ file, Adobe® Reader®³⁾ file. Each test file is used and measured to determine FPOT. Equivalent applications may be used to open and print the test files if they can be shown to lead to the same results.

3.10 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 or the temperature and humidity range of the test environment should be recorded in the Full Detailed Report.

3.11 Voltage

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

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

4 Test Method

4.1 Test Measurement Procedure

A single test page, page 1 as shown in [Annex B](#), of the relevant test file is printed in order to measure FPOT for simplex printing. Two test pages, page 1 and page 2 as shown in [Annex B](#), of the relevant test file is printed in order to measure FPOT for duplex printing.

In order to ensure clarity between the results of each tests and to avoid test result confusion that can be caused by back to back job spooling effect or by jobs stuck in the print spooler, the print spooler must be empty before each test run.

4.1.1 Before Testing

- a) Install the test computer and a clean code image per the test setup requirements.
- b) Install the printing device, driver and application software following the user's manual and test setup requirements.
- c) Set the system parameters (such as paper weight selection, paper size and feed orientation, quality mode) for test. If the system has automatic media detect, it should be disabled and the paper to be

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2) Microsoft Excel is the trade name of a product supplied by Microsoft Corporation. This information is given for the convenience of users of this document and does not constitute an endorsement by ISO/IEC of the product named.

3) Adobe Reader is the trade name of a product supplied by Adobe Corporation. This information is given for the convenience of users of this document and does not constitute an endorsement by ISO/IEC of the product named.

used in the test shall be selected. Record the printing device model, configuration (options), default condition and any variant if selected.

- d) Assemble the files that will be used in the test, identified as described in [3.9](#). Ensure that the necessary applications are available on the computer that will be used in the test. In order to streamline testing, if the results are unaffected, the tester may optionally create and use special versions of the test files containing only page 1 for simplex testing or only page 1 and 2 for duplex testing. If special versions of the files are used, it shall be noted in the summary, full, and full detailed reports.

- e) Printing Mode Control:

Determine the Printing Mode for the current portion of the test. Required testing must use no changes in the driver of the printing device under test. However, the following change from default setting shall be taken, as applicable;

- turn off page scaling
- select plain paper
- select simplex or duplex
- for a colour printing device, set the mode of the print driver to produce colour or B&W output.

Some devices support multiple duplex options (for example, book versus tablet, long edge vs. short edge). The default duplex option shall be used and orientation recorded.

NOTE 1 The manner in which B&W is selected can affect performance test results. Preliminary evaluation of the settings and their impact on performance throughput is recommended. Refer to the product's operator manual for additional information regarding recommended settings.

NOTE 2 If the measured results are the same, the print mode controls for a given test run may be set by overriding the driver defaults in the control panel or similar. This may make testing easier by eliminating needed to select the proper settings before each test run.

- f) Refer to [4.3](#) to decide what tests are to be run. Refer to [Annex D](#) for an example of how to record test settings.

4.1.2 FPOT from Ready

The FPOT from Ready for some devices is sensitive to the delay time from the exit of the last page of the previous print job to the initiation of the next job. The delay time used shall be no shorter than 20 seconds and no longer than 50 seconds; however care must be taken to select a delay time that places the device in a stable condition. If the tester is unsure of what delay time will place the device in a stable condition, the procedure in [Annex F](#) shall be used to establish a delay time to place the device in a stable condition. The delay time used may be different from what [Annex F](#) would indicate as long as the average FPOT result is equivalent to the average FPOT at the delay time that [Annex F](#) would have selected. The delay time and whether a delay time found with [Annex F](#) was used shall be noted in the Full Report.

NOTE In general electro-photographic devices are in a stable condition at 50 seconds, although many devices may be in a stable condition in less than 50 seconds. With inkjet devices special care must be taken to avoid using a delay time that results in the print job arriving during a print head capping or servicing routine.

Procedure:

- a) Send a print job to the device using the same test file, print mode controls, and system parameters as the current test run.
- b) When the last page has fully exited from the device, start a timing device for the delay time.
- c) Close the test file and associated software application after the test file has been printed.
- d) Open an application and the corresponding test file for that application on the test computer.

- e) Select Print from the application.
- f) Configure the proper print mode controls and system parameters for the current test run.
- g) Set driver to print only page 1 (simplex) or pages 1 and 2 (duplex).
- h) Wait the delay time for Ready.
- i) When the delay time has elapsed, select "OK" and simultaneously start a timing device (watch or otherwise). The time measurement is started when the "OK" button in the printing application window is selected. In the case that the measured results are the same, the printer icon, quick print, or similar features may be used to initiate the print job.
- j) Record the time in seconds for completion of the page (the test page has fully exited from the device) to at least two decimal places, and optionally start a timing device for the delay time for the next test run.
- k)
 - If the timing device for the delay time was started in step 10, Run steps 3 – 10 once more for a total of 2 measurements before continuing to step 12.
 - If the timing device for the delay time was not started in step 10, Run steps 1 – 10 once more for a total of 2 measurements before continuing to step 12.
- l) Determine if the results are consistent according to [section 4.2.2](#), and perform a third test run of steps 1-10 if required.
- m) Calculate the average FPOT.
- n) Repeat 1-13 for each Test file.
- o) Calculate the average FPOT of the three files.

4.1.3 FPOT from Sleep

Before Testing:

Determine the default power management delay time to the lowest power Sleep state. This may be done through examining device settings, timing how long until a device user interface switches from Ready to the lowest power Sleep state, or by consulting device documentation or the device manufacturer. If no information can be found on the default power management delay time to the lowest power Sleep state, a delay of 60 minutes shall be used.

An additional wait is added after the power management delay time to Sleep determined above. The additional wait is 60 minutes. If the device under test is an inkjet device, and the recovery time is known to be independent from the length of time elapsed after entering Sleep, instead of waiting an additional 60 minutes, an additional wait of 10 minutes is allowed. If 60 minutes is not used as the additional wait time, the additional wait time and reason 60 minutes was not used shall be noted in the full report.

The total delay time is the sum of the power management delay time and the additional delay time.

The total delay time from the complete exit of the last page of the previous job to the initiation of the next job shall be noted in the Full Detailed Report.

If the device enters Off state automatically during the FPOT from Sleep test, the device shall be turned on manually, and noted as such in the full report. The result of the test shall still be reported as FPOT from Sleep.

Procedure:

- a) Send a print job to the device using the same test file, print mode controls, and system parameters as the current test run.
- b) When the page has fully exited from the device, start a timing device for the total delay time.
- c) Close the test file and associated software application after the test file has been printed.
- d) Wait until no earlier than 5 minutes before the total delay time has elapsed before continuing.
- e) Open the Adobe® Reader® ⁴⁾ Test file on the test computer.
- f) Select Print from the application.
- g) Configure the proper print mode controls and system parameters for the current test run.
- h) Set driver to print only page 1.
- i)
 - If the device is in Sleep State: When the total delay time has elapsed, select “OK” and simultaneously start the timing device (watch or otherwise). The time measurement is started when the “OK” button in the printing application window is selected. In the case that the measured results are the same, the printer icon, quick print, or similar features may be used to initiate the print job.
 - If the device is in Off State: When the total delay time has elapsed, turn the printing device on using the power button and simultaneously start the timing device. The time measurement is started when turning on the device. Select “OK” in the print dialog on test computer. In the case that the measured results are the same, the printer icon, quick print, or similar features may be used to initiate the print job. Some print systems may require some amount of delay between turning on the printing device and selecting “OK” in the print dialog on the test computer for the print job to successfully print. For such systems, the delay used shall be noted in the full report.
- j) Record the time in seconds for completion of the page (the test page has fully ejected from the device) to at least two decimal places, and optionally start a timing device for the delay time for the next test run.
- k)
 - If the timing device for the delay time was started in step j, Run steps c – j once more for a total of 2 measurements before continuing to step 12.
 - If the timing device for the delay time was not started in step j, Run steps a – j once more for a total of 2 measurements before continuing to step 1.
- l) Determine if the results are consistent according to [4.2.2](#), and perform a third test run of steps a-j if required.
- m) Calculate the average FPOT.

4.1.4 FPOT from Off

The delay time shall be 60 minutes.

4) Adobe Reader is the trade name of a product supplied by Adobe Corporation. This information is given for the convenience of users of this document and does not constitute an endorsement by ISO/IEC of the product named.

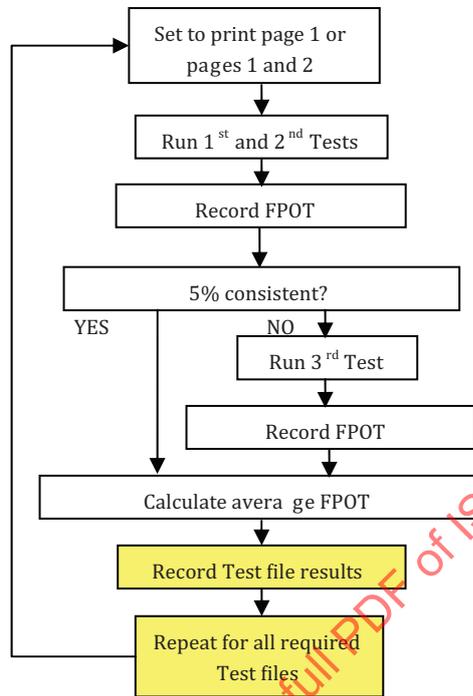
Procedure:

- a) Send a print job to the device using the same test file, print mode controls, and system parameters as the current test run, wait until the corresponding output sheet has exited the device, and close the test file and associated software.
- b) Place the device in Off state by turning the device off using the power button on the device, and start a timing device for the delay time.
- c) Wait until no earlier than 5 minutes before the delay time has elapsed before continuing.
- d) Open the Adobe® Reader ⁵⁾ Test file on the test computer.
- e) Select Print from the application.
- f) Configure the proper print mode controls and system parameters for the current test run.
- g) Set driver to print only page 1.
- h) When the delay time has elapsed, turn the printing device on using the power button and simultaneously start the timing device. The time measurement is started when turning on the device.
- i) Select "OK" in the print dialog on test computer. In the case that the measured results are the same, the printer icon, quick print, or similar features may be used to initiate the print job. Some print systems may require some amount of delay between turning on the printing device and selecting "OK" in the print dialog on the test computer for the print job to successfully print. For such systems, the delay used shall be noted in the full report.
- j) Record the time in seconds for completion of the page (the test page has fully ejected from the device) to at least two decimal places.
- k) Close the test file and associated software application after the test file has been printed.
- l) Run steps b – k twice.
- m) Determine if the results are consistent according to [4.2.2](#), and perform a third test run of steps b-k if required.
- n) Calculate the average FPOT.

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4.2 Test Method Process

4.2.1 Suggested Test Method Process Flow Chart



4.2.2 5% Consistency Criteria

If the first two test runs are not consistent within +/-5%, then a third test run is required.

$$Consistency = \frac{2 \times FPOT_1}{FPOT_1 + FPOT_2} - 1$$

4.3 Required Tests

4.3.1 Table Nomenclature

In the tables below, files marked “R” are required, and files marked “O” are optional. Files marked “X” are not used or tested. If one optional file in a row of a table is tested, then all optional files in that row must be tested.

A4 or 8.5” × 11” paper size shall be used for all tests.

4.3.2 FPOT from Ready

Table 1a — Colour Device

Printing Modes	Application Test files		
	Word File	Adobe Reader File	Excel File
Colour, Simplex	R	R	R
B&W, Simplex	O	O	O
Colour, Duplex	O	O	O
B&W, Duplex	O	O	O

Table 1b — Monochrome Device

Printing Modes	Application Test files		
	Word File	Adobe Reader File	Excel File
B&W, Simplex	R	R	R
B&W, Duplex	O	O	O

4.3.3 FPOT from Sleep

Table 2a — Colour Device

Printing Modes	Application Test files		
	Word File	Adobe Reader File	Excel File
Colour, Simplex	X	R	X
B&W, Simplex	X	O	X

Table 2b — Monochrome Device

Printing Modes	Application Test files		
	Word File	Adobe Reader File	Excel File
B&W, Simplex	X	R	X

4.3.4 FPOT from Off

Table 3a — Colour Device

Printing Modes	Application Test files		
	Word File	Adobe Reader File	Excel File
Colour, Simplex	X	O	X
B&W, Simplex	X	O	X

Table 3b — Monochrome Device

Printing Modes	Application Test files		
	Word File	Adobe Reader File	Excel File
B&W, Simplex	X	O	X

4.4 Optional Special Tests

Additional tests may be conducted using other, non-default, drivers or printing device description languages provided by the manufacturer for the printing device. Additional tests may also be conducted using other settings available with the device. Such settings may be, but are not limited to, print quality and speed modifier choices available in the driver. The results of such additional tests will be documented as having system parameters that differ from the factory defaults and shown in comparison to the default system parameter results.

5 Calculations and Treatment of Data

5.1 Treatment of Data

The time intervals for each test run are recorded during the test operation. A spreadsheet format that records the time for the tests run is useful for this purpose but is not required.

The measured intervals of time in seconds should be recorded to 2 decimal places. Average results are rounded up to 2 decimal places. Rounding up further is allowed, but rounding down is not allowed. For example, 13,76 seconds maybe be rounded up to 13,8 or 14, but shall not be rounded down to 13,5.

The average FPOT for any given file tested is

$$FPOT_{file} = \frac{\sum_N FPOT_N}{N}$$

Where N= the number of test runs for a given file tested in a given configuration

5.2 FPOT from Ready

FPOT from Ready is calculated by averaging the average times for each file. The average time for each file is the average of all test runs performed using that file. Averaging the average of each file is different than simply averaging all test runs in the case where some files had 2 test runs and some files had 3 test runs. Averaging the average FPOT for each file ensures that each test time counts equally in the final result. Data from all three files must be used when calculating FPOT from Ready.

$$FPOT_{Ready} = \frac{FPOT_{word} + FPOT_{excel} + FPOT_{reader}}{3}$$

5.3 FPOT from Sleep

The recovery time when starting from Sleep is estimated by using the difference in FPOT of the Reader file between Sleep and Ready for simplex printing.

$$Recovery_Time = FPOT_{reader_sleep} - FPOT_{reader_ready}$$

If the recovery time is less than zero, zero shall be reported for the recovery time.

5.4 FPOT from Off

The warm-up time when starting from Off is estimated by using the difference in FPOT of the Reader file between Off and Ready for simplex printing.

$$Warmup_Time = FPOT_{reader_off} - FPOT_{reader_ready}$$

If the warm-up time is less than zero, zero shall be reported for the warm-up time.

6 Presentation of Results

Products that are of the same distinct print system can share testing and reports. Two or more products or bundles may be part of a distinct print system when they use the same print mechanism and operating points, and there are no differences that might be expected to affect performance. Devices with differences that could affect performance are not part of the same distinct print system, and are different print systems, even if they use the same print mechanism, and shall not share testing and reports. For example, two devices may share the same base print engine but use a different default paper source. The different paper source may create a difference in paper path length, and a difference in

measurements. Two such devices shall not share testing reports. Another example is two multifunction devices with the same base print engine but one that includes an automatic document feeder and one that does not. The presence of an automatic document feeder is not expected to affect first print out time. Two such devices could share testing and reports.

The minimum required presentation of results shall include a Summary Report as displayed in Table 4. A Summary Report includes the average FPOT for all required and optional print modes tested. The system setting for the printing modes shall be identified (default and all non-default and optional test mode settings identified). For a colour printing device, include a description of the printing device settings used for the B&W print mode data. In a Full Report, the FPOT numbers for each of the individual test files shall be reported as displayed in Table 5.

If a required test file was not tested, or failed to print, reporting per this International Standard is not allowed.

The Summary Report should be the "Declaration" used in marketing materials or packaging. Declaration of the whole Summary Report is recommended. Abbreviated test reporting is allowed, including the reporting of the results from individual application testing as long as the reporting includes the corresponding averages of FPOT, a pointer to the full detailed report or contact information, and statement that the first page out time has been determined in accordance with ISO/IEC 17629.

However, the minimum requirement of "Declaration" shall include the following three items.

- a) Description that the FPOT has been determined in accordance with ISO/IEC 17629.
- b) The average of FPOT from Ready for default simplex mode.
- c) Pointer to the Full Detailed Report or contact information.

All reporting including Summary and Full Report tables shall include a pointer to the Full Detailed Report. An example of a Summary Report and Full Report are shown below.

Since FPOT from Sleep is measured on only the Adobe® Reader®⁶⁾ file, FPOT from Sleep of the Adobe® Reader® file shall not be presented or compared with the average FPOT From Ready. FPOT from Sleep may be presented and compared only with the FPOT from Ready of the Adobe® Reader® file.

An example Full Detailed Report is shown in [Annex E](#).

When appropriate, rows may be deleted from the Summary Report. Specifically, if a device does not have the ability to duplex, the duplex rows may be deleted or NA may be used when no data are available. Similarly, a monochrome only printing device does not need to report data for a colour printing mode. Rows for optional test that were not run can also be deleted.

Rounding up is allowed, but rounding down to a faster time is not allowed. Recorded and reported numbers shall never be better than actual averages.

In the tables below, tests marked "R" are required, and tests marked "O" are optional. It is required to report a complete set of results for any optional tests performed. For example, if an optional test was run, it must be reported in its entirety. Further example, if optional B&W simplex testing is run on a colour device, the data for all files must be presented, as well as the average FPOT of all of the files.

6) Adobe Reader is the trade name of a product supplied by Adobe Corporation. This information is given for the convenience of users of this document and does not constitute an endorsement by ISO/IEC of the product named.

Table 4 — Summary Report

		FPOT from Ready (Seconds)
Colour for colour device, B&W for monochrome device	Simplex	R
	Duplex	0
B&W mode (optional for colour device)	Simplex	0
	Duplex	0
NOTE 1 Record printing device and driver settings		
NOTE 2 Record printing device settings used for B&W output mode on colour device		
NOTE 3 Record location to find Full Detailed Report or contact information		

Table 5 — Full Report

		Word (seconds)	Excel (seconds)	Adobe Reader (seconds)	Average (seconds)	Delay Time
Colour for colour device, B&W for mono- chrome device	FPOT from Ready - Simplex	R	R	R	R	R
	FPOT from Ready - Duplex	0	0	0	0	0
	FPOT from Sleep - Simplex			R		R
	Recovery Time			R		
	FPOT from Off - Simplex			0		
	Warm-up Time			0		
B&W mode (optional for col- our device)	FPOT from Ready - Simplex	0	0	0	0	0
	FPOT from Ready - Duplex	0	0	0	0	0
	FPOT from Sleep - Simplex			0		0
	Recovery Time			0		
	FPOT from Off -Simplex			0		
	Warm-up Time			0		
NOTE 1 Record Printing Device and Driver Settings.						
NOTE 2 Record printing device settings used for B&W output mode on colour device						
NOTE 3 Record location to find Full Detailed Report or contact information						
NOTE 4 Record If Annex F was used						

Annex A (normative)

Test platform system parameters that may affect digital printing productivity measurements

The purpose of [Annex A](#) is two-fold. The first is to provide a general awareness of the contribution of the test platform to the overall digital printing device productivity measurement. The second is to provide a list of those test platform parameters that can be easily identified and subsequently recorded, which will help to reduce inter-testing variability.

Test Platform Parameter List

A1.0 Hardware

a. Testing platform hardware shall be comprised solely of a dedicated Computer system (Computer, monitor, keyboard, mouse) with direct connectivity to the printing device being tested.

b. Record the following attributes:

b.1. COMPUTER

- manufacturer
- model

b.2. Processor

- manufacturer
- name
- family
- model number

b.3. System chip set

- manufacturer
- model number

b.4. System board

- manufacturer
- model number
- BIOS with revision level

b.5. System memory

- manufacturer
- type
- total size
- speed

- part number

b.6. Hard drive and subsystem

- manufacturer
- model number
- total disk size
- total number of disks
- rotational speed

— if controller is an adapter card, then record manufacturer and model

b.7. Video controller

- manufacturer
- model
- memory size (identify: shared or dedicated)

b.8. Optical drive

- manufacturer
- model
- interface

b.9. Keyboard / Mouse connection

A2.0 Software

a. Testing platform software shall be limited to the operating system, required printing applications for the Productivity Test Suite (ISO 24734 [Annex B.1](#)), and printing device driver of the device being tested.

b. Record the following attributes

b.1. Operating system

- manufacturer
- name and version number
- service pack or patch level

b.2. For each printing application installed

- manufacturer
- name and version number
- service pack or patch level

b.3. For each printing driver installed

- manufacturer
- name and version number
- service pack or patch level

b.4. **Location of test files** (e.g., hard drive or optical drive)

A3.0 Connectivity of Test Platform to Printing Device

a. There shall be no other printing devices or devices connected to the testing platform via the interface type used (e.g. USB, Ethernet, or Wireless).

b. Record the following attributes

b.1. **Interface type**

b.2. **Identify if connectivity is through system board or adapter card**

— (if adapter card, record manufacturer and model)

b.3. **If USB**, record:

- USB level (e.g., 1.1 or 2.0)
- other devices on the same USB channel

b.4. **If Ethernet**, record:

- speed and topology
- MTU setting
- hub (manufacturer, model, and configuration)
- TCP/IP parameters (connection protocol and TCP receive window size)

A4.0 Example Documentation

a. USB attached printing device

Computer: white box system (no model number)

Processor: Intel Pentium 4 540

System Chip Set: Intel 945P Express

System Board: Intel D945PSN, Intel BIOS SN 94510J.86A

System Memory: 1 GB 533 MHz DDR2 Kingston p/n KVR533D2N4/1G

Hard Drive & Subsystem: Seagate Barracuda 7200.9, 250 MB,
7200 RPM, 8MB cache, SATA/300
(system board controller)

Video Processor: Connect 3D Radeon X300, 256 MB, PCI Express
(dedicated controller / memory)

Optical Drive: Pioneer 16x DVDRW DVR-R1A5PK

Keyboard / Mouse Connection: PS/2

USB: System board USB controller, USB 2.0, no other USB devices

b. Ethernet attached printing device

Computer: white box system (no model number)

Processor: Intel Pentium 4 540

System Chip Set: Intel 945P Express

System Board: Intel D945PSN, Intel BIOS SN 94510J.86A

System Memory: 1 GB 533 MHz DDR2 Kingston p/n KVR533D2N4/1G

Hard Drive & Subsystem: Seagate Barracuda 7200.9, 250 MB,
7200 RPM, 8MB cache, SATA/300
(system board controller)

Video Processor: Connect 3D Radeon X300, 256 MB, PCI Express
(dedicated controller / memory)

Optical Drive: Pioneer 16x DVDRW DVR-R1A5PK

Keyboard / Mouse Connection: PS/2

Ethernet: System board Ethernet controller, 100BaseTX, MTU=1500

Network Topology: 3Com SuperStack 3 Switch 4226T, full duplex,
TCP Port 9100, receive window size = 128

c. Software

Operating System: Microsoft Windows XP SP2
(all performance settings at default)

Printing Applications:

Microsoft Office Word 2003 SP2

Microsoft Office Excel 2003 SP2

Microsoft Office PowerPoint 2003 SP2

Adobe Reader 7.0.1

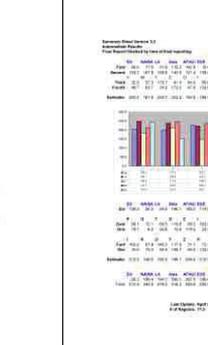
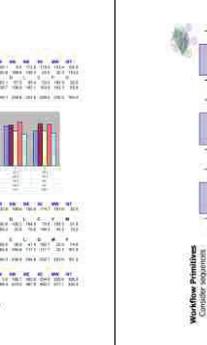
Printing device Drivers: PCL XT-6200 v8.3.1

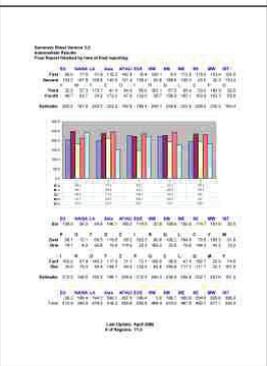
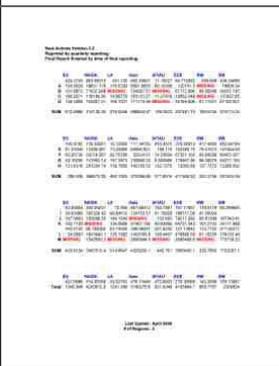
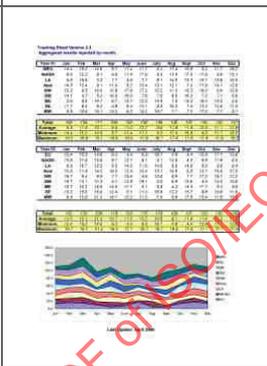
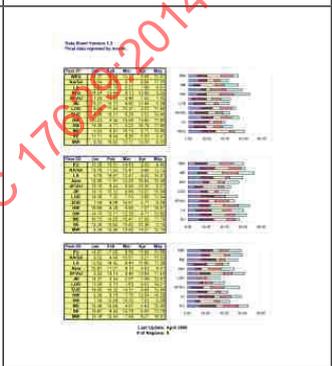
Test Files Location: Hard drive

Annex B (normative)

Test Suite

- The most recent official files can be located at http://standards.iso.org/ittf/PubliclyAvailableStandards/SC28_Test_Pages/
- Applications include Microsoft Office and similar (Word, Excel) as well as Adobe Reader
- Files have a mix of text, images and graphics and reflect common applications in the office environment. Files may include application clip art, embedded charts, imported images, large or multi-coloured gradient files and text wrapped around graphics or images.
- Files shall not include transparent objects or high resolution images/photos.
- Each file within the Office test suite has four A4/8,5" × 11" sized pages. The image size (with printable information) for each of A4/8,5" × 11" size page is ≤ 254 mm × 184,4 mm (10 inches × 7,26 inches) in order to print similar sized images on A4 or 8,5" × 11" sized paper (without being cropped). In the printing device setup, care need to be taken to ensure that the margin setting should not be set too large to crop the printable images.
- The test suite consists of 2 sets of files, one set suitable for A4 size paper and one set suitable for 8,5" × 11" size paper.
- The three files within the ISO/IEC 24734 'Office Category' test suite are
 - 4 page Word file (colour + B&W input)
 - 4 page Excel file (colour + B&W input), included graphs set to 600dpi
 - 4 page Adobe Reader file (colour + B&W input)

	Used for Simplex and Duplex FPOT	Used for Duplex FPOT	Not used for FPOT testing	Not used for FPOT testing
	Page 1	Page 2	Page 3	Page 4
Adobe Reader File				

	Used for Simplex and Duplex FPOT	Used for Duplex FPOT	Not used for FPOT testing	Not used for FPOT testing
Word File				
Excel file				

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Annex C (informative)

Report Presentation

Summary Report Examples

		FPOT from Ready (seconds)
Colour	Simplex	15,4
	Duplex	30,2
B&W	Simplex	12,7
	Duplex	25,2
NOTE 1 All printing device and driver settings were default mode.		
NOTE 2 For the B&W results, the print driver was set to "print in B&W"		
NOTE 3 The Full Detailed Test Report may be found at URL: xxxx.xxxx		

Some manufacturers may choose to advertise fewer items on boxes and spec sheets than are required to provide in the Summary Report. However, the minimum requirements of "declaration" as described in [Clause 6](#) still apply.

Full Report Example

		Word (seconds)	Excel (seconds)	Adobe Reader (seconds)	Average (seconds)	Delay Time
Colour for colour device, B&W for monochrome device	FPOT from Ready - Simplex	18,6	12,7	14,7	15,4	50 seconds
	FPOT from Ready - Duplex	31,1	29,7	29,6	30,2	50 seconds
	FPOT from Sleep - Simplex			23,8		75 minutes
	Recovery Time			9,1		
	FPOT from Off - Simplex			40,7		
	Warm-up Time			26,0		

NOTE 1 All printing device and driver settings were default mode.
 NOTE 2 For the B&W results, the print driver was set to "print in B&W"
 NOTE 3 The Full Detailed Test Report may be found at URL: xxxx.xxxx
 NOTE 4 [Annex F](#) used to determine delay time for FPOT from Ready

		Word (seconds)	Excel (seconds)	Adobe Reader (seconds)	Average (seconds)	Delay Time
B&W mode (optional for colour device)	FPOT from Ready - Simplex	14,5	12,7	10,8	12,7	50 seconds
	FPOT from Ready - Duplex	23,8	26,1	25,6	25,2	50 seconds
	FPOT from Sleep - Simplex			20,1		75 minutes
	Recovery Time			9,3		
	FPOT from Off -Simplex			37,2		
	Warm-up Time			26,4		
NOTE 1 All printing device and driver settings were default mode.						
NOTE 2 For the B&W results, the print driver was set to "print in B&W"						
NOTE 3 The Full Detailed Test Report may be found at URL: xxxx.xxxx						
NOTE 4 Annex F used to determine delay time for FPOT from Ready						

Annex D (informative)

An example of printing device and test settings to record

This ANNEX presents an example of how to record and report printing device and test settings. Such recordings shall be included with the Full Detailed Report.

Test Start Date and Time	20/July/2007, 11:00 am
Tester	XXXXXX
Machine name/model:	XT-6200
Colour or B&W:	Colour Printing device
Configuration (options)	Duplexer, HCI
Controller	XXXXXX
Printing device page count	8500
Printing supplies page count	295
Temperature and humidity	23 °C / 45%
Voltage	123 volts
Test End Date and Time	20/July/2007, 5:30 pm

	Item	Value
	PDL and driver version	default
Modes and Settings	Print Quality mode	default
	B&W settings	Activated (where, what – e.g. driver, select “print in b/w”
	Paper feed orientation	Short Edge
Paper	Paper type setting	default
	Paper feeding	Standard cassette
	Paper exit	Standard exit tray
Paper-path	Output orientation	default (face up or face down)
	Duplexing unit	default (short or long edge).

Paper	manufacturer	Office Paper Co.
	weight	60 g/m ²
	size	A4
	paper type/name	A44FG48A