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Information technology — Office equipment — Method for measuring single photo printing time for digital printing devices

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Foreword

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

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Introduction

In recent years, photo printing devices have become widely available leading to widespread adoption of photo printing. Digital photo printing devices usually produce photoprints in short time.

The existing international standard (ISO/IEC 24734) for measuring printing productivity mainly addresses a method for measuring business documents. These documents may be multiple copies and consist of mixed content of text and graphics, on 8,5" × 11", A4, A3, and 11" × 17" paper typically used in offices. Another existing international standard (ISO/IEC 17629) for measuring first page out time addresses first page productivity of business documents at various states (ready, sleep, off) of devices.

This document provides a method and a procedure for measuring single photo printing time of digital photo printing devices. It allows manufacturers of digital photo printing devices to describe the single photo printing time and it allows buyers to compare various digital photo printing devices with respect to representative photo size and usage.

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Information technology — Office equipment — Method for measuring single photo printing time for digital printing devices

1 Scope

This document specifies a method for measuring single photo printing time of digital photo printing devices on a wide range of print technologies. This document is applicable to digital photo printing devices that can produce photo prints on either 2" × 3" (51 mm × 76 mm), L (89 mm × 127 mm), 4" × 6" (102 mm × 152 mm), A6 (105 mm × 148 mm), A4 (210 mm × 297 mm), 8,5" × 11" (215,9 mm × 279,4 mm), 11" × 17" (279,4 mm × 431,8 mm), A3 (297 mm × 420 mm) or A3+ size sheets. Devices can be connected to either the computer system, media card or mobile devices. This document includes test setup procedure, test runtime procedure and reporting requirements for the digital single photo printing time measurements. Instant photoprint systems, which do not complete image formation at the time of paper ejection from device, are out of the scope of this document.

NOTE Inkjet, thermal transfer, dye-sublimation, electro photo and colour or monochrome thermal activated systems (such as ZINK®[1)]) are typical technologies of the scope.

2 Normative references

ISO/IEC 24734, *Information technology — Office equipment — Method for measuring digital printing productivity*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 24734 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
A3+
sheet size similar to A3 but slightly larger than A3

Note 1 to entry: A3+ is slightly larger in each dimension than A3. Examples of A3+ are 329 mm × 483 mm and 320 mm × 450 mm (SRA3).

3.2
default driver
printing device driver that is selected as the default per the manufacturers' installation procedure

3.3
full detailed report
presentation of information including device setup and measured test results

Note 1 to entry: An example of full detailed report is shown in Annex A. Also refer to 7.4

1) ZINK is an example of a suitable product available commercially. This information is given for the convenience of users of this document and does not constitute an endorsement by ISO or IEC of this product.

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[SOURCE: ISO/IEC 24734: 2021, 3.11, modified – "machine" has been replaced by "device", the word "full" before "measured test results" has been removed and the Note 1 to entry has been modified to reference Annex A.]

3.4
single photo printing time
number of seconds between first movement of the media to the full ejection of the media or the number of seconds between the full ejection of a sheet of media and the full ejection of the next sheet of media

3.5
ready
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 operate

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

[SOURCE: ISO/IEC 17629: 2014, 2.8, modified – Term “ready” was added and "to print" was replaced by "to operate".]

3.6
test file
file used for testing as per the test method

[SOURCE: ISO/IEC 24734: 2021, 3.29, modified –"individual files" was replaced by "file" because only a single file is used for the test method in this document and the example was removed.]

4 Test parameters and conditions

4.1 Test platform test setup procedures

4.1.1 Initial platform setup

The test platform hardware shall be installed as per the manufacturer's instructions. The information of the test platform hardware shall be recorded as listed in the full detailed report; refer to Annex A for an example presentation. 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 shall be configured for the appropriate connection environment and the information shall be recorded as per full detailed report along with all settings and selections that differ from the installation default configuration.

It shall 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 report.

4.1.2 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. 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. Record the method used to establish the initial installation state.

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4.2 Printing device system setup

Place the printing device on a horizontal surface and setup the printing device according to the manufacturer's recommendation.

The standard test shall be conducted using the manufacturer's default setup for the given photo-printing device. All image, print quality, mode and speed modifiers shall be at their factory preset configuration for the photo-printing device and default installed condition. 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 tests. Other modes that may need to be modified for specific tests include photo mode, paper size, paper scaling, and collation. It is allowable to select photo paper. All changes to the default settings shall be recorded in the full detailed report.

If the content type of photo is available, it shall be set to photo. Print quality level for the photo printing shall be at factory preset configuration. Any user-selectable draft modes shall not be used.

Sheet selection shall be set to photo sheet. In case of multiple choices are available for photo paper setting, selection made for testing shall be included in the test report. If user-selectable automatic paper type detection is available on the device, it shall be disabled.

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.

4.3 Printing device connection

A printing device may be connected via a wired network connection (such as Ethernet), direct connection (such as USB) or wireless connection (such as Wi-Fi, Bluetooth) with which the printing device is equipped. The connected connection type and version shall be recorded and reported.

4.4 Printing device condition

All supplies used in the test(s), including sheet and printing device consumables, shall be only those specified as acceptable for use by the manufacturer (or otherwise noted). If available, 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. The device and all of its necessary supplies shall be acclimated in the test environment prior to conducting the test(s) at least 8 h.

4.5 Sample size

The test file shall be tested and measured at least twice for repeatability. All required tests shall be run using one device.

4.6 Sheet size and print mode

Size of sheet shall be chosen among 4” × 6”, A6 and L sized sheets that the device is capable of printing. If a device under testing is not capable of printing on 4” × 6”, A6 or L sized sheet, at least one of 2” × 3”, A4 and 8,5” × 11” sized sheet shall be chosen for the required tests.

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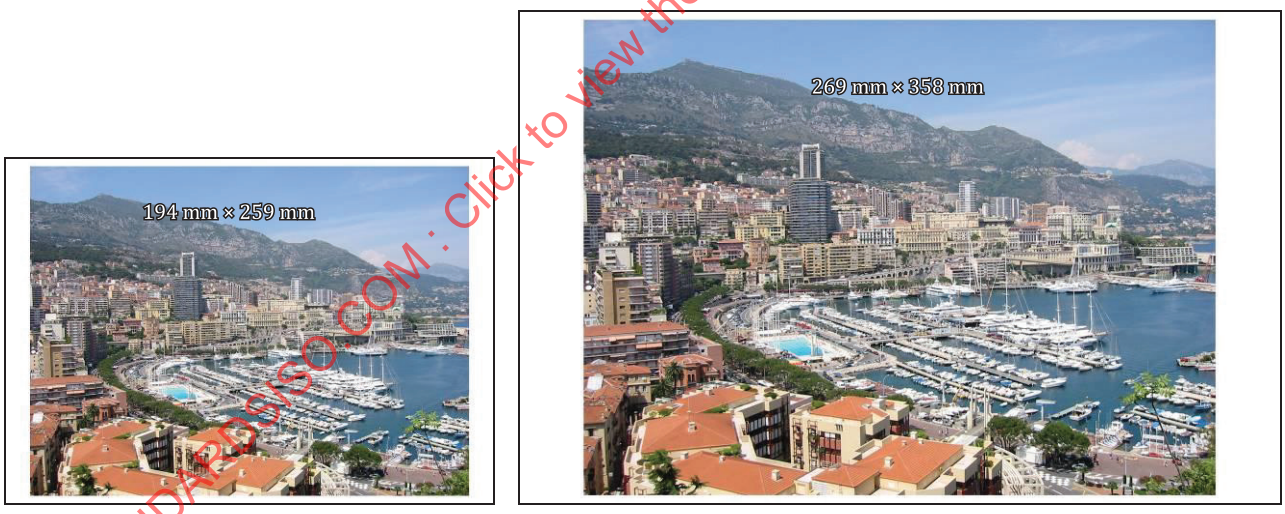
In all cases the sheet size used shall be indicated in the report as required in Table 2 and as shown in Table A.1. In the case of bordered printing, the printed image size shall be indicated in the report as required in Table 2 and as shown in Table A.1. The sheet feed orientation shall be noted in the full detailed report as shown in Table A.3. When a comparison is made between the single photo printing time of one device with that of other devices, the measurements shall be done with the same sheet sizes, the same sheet feed orientation, the same test method and the same testing conditions.

If a device has capability to print both borderless and bordered, the 2" × 3", 4" × 6", A6 or L sized sheet sizes that are supported for borderless printing on the device shall be printed borderless. Scaling for borderless printing shall be done with the smallest amount of cropping possible by the system and result in the minimum overspray supported by the device. If borderless printing is not allowed for a device under testing, 2" × 3", 4" × 6", A6 or L sized sheet that are not supported for borderless printing shall be printed with a border. Scaling for bordered printing shall be done with the smallest amount of cropping possible by the system and result in the minimum borders on all four sides supported by the device. If bordered printing is done, it shall be noted in the test report as described in 7.3.

A4, 8,5" × 11", 11" × 17", A3 and A3+ sized sheet shall be printed with border and the test image shall be printed without cropping and shall cover the full image of the test file. Scaling for bordered printing shall be done by the system. The dimension of the printed image shall be equal or larger than 194 mm × 259 mm for A4 and 8,5" × 11" sized sheet, and 269 mm × 358 mm or larger for 11" × 17", A3 and A3+ sized sheet. See Figure 1.

NOTE 1 When a 194 mm × 259 mm sized image is placed on the centre of an A4 sheet, the narrower margin (the long edge) becomes 8 mm for both sides.

NOTE 2 Examples of "system" are operation system of the host, the application, device driver, device, and the test procedure.



a) A4 (210 mm × 297 mm) b) 11" × 17" (279,4 mm × 431,8 mm)

Figure 1 — Minimum dimension of printed image

This document is not intended to be used for measuring single photo printing time on sheet sizes beyond A3/A3+ size.

4.7 Maintenance

Print engine maintenance shall be performed throughout testing per the manufacturer's recommendations on an as needed basis.

EXAMPLE Cleaning routines or consumables replacement.

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4.8 Test file

The tests shall be conducted using the standard official electronic test file as specified in Annex B as the input. Failure to use the exact file as specified shall invalidate test results.

4.9 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 %.

The temperature and humidity of the test environment shall be recorded in the full detailed report as described in 7.4.

4.10 Voltage

For a non-battery powered device, the printing device shall be connected to a voltage supply within the manufacturer-specified operating voltage range for the printing device under test. The line voltage shall be measured under no-load condition prior to each test and recorded in the full detailed report. For battery powered devices, the device shall use the manufacturer's recommended battery, and be charged with the manufacturer's recommend charger to full capacity prior to testing. Battery and charger used shall be recorded in the full detailed report as described in 7.4.

5 Test method

5.1 Overview

The test file, as specified in Annex B, shall be printed to measure single photo printing time.

Requirements of the "Test matrix" are shown in Table 1 below. Optional tests are shown as "O", required as "R".

Table 1 — "Test matrix"

Printer	Sheet size		
	4" × 6", A6 or L [a)]	2" × 3", A4 or 8,5" × 11"[a)]	11" × 17", A3 or A3+[a)]
Capable of printing on either 4" × 6", A6 or L	R	O	O
Capable of printing on neither 4" × 6", A6 nor L	not applicable	R	O
Capable of printing on neither A4 nor smaller than A4	not applicable	not applicable	R
Key Optional tests are shown as "O". Required test are shown as "R". [a)] At least one of these sheet sizes shall be selected. Additional sizes may be optionally tested.			

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5.2 Test measurement procedure

5.2.1 Test setup

Before testing, the following setup activities shall be completed.

a) Install the test platform into the initial installation state per 4.1.1.

b) Install the printing device following the user's manual and test setup requirements. The default required tests shall be run after the printing device has warmed-up. Use of warm-up printing (at least one page is printed just before testing) to ready the printing device is acceptable.

c) Set the system parameters (such as sheet selection, sheet size and feed orientation) for single photo printing time test. If user selectable automatic paper type detection is available on the device, it shall be disabled. Record the printing device model, configuration (options), default condition and any variant if selected.

d) Ensure the test file as described in 4.8 is available for testing. Ensure that a photo printing application is available on the computer or smart device or that the printing device is capable of direct printing of the test file that will be used in the test.

e) Printing mode control: configure the printing mode for manufacturer's recommended photo mode. Default printing modes require no changes in the driver of the printing device under test, other than to set the proper page scaling options, to turn collation OFF if it is ON by default, to select photo paper, to turn duplex OFF if it is ON by default. The test report shall include a record of the printing device modes that is selected and how it was selected.

5.2.2 Single photo printing time

5.2.2.1 General

There are two methods to measure single photo printing time ("one-sheet method" and "two-sheet method"). The one -sheet method measures time between the start of sheet transportation and the full ejection of the sheet from the device. The alternative two-sheet method measures time between the full ejection of the first sheet from the device and the full ejection of the second sheet from the device.

The one-sheet method shall be chosen when the start of sheet transportation can be recognized unless there is a specific reason to choose the two-sheet method. Sheet transportation start shall be measured from the first movement of the sheet after the print job has been started. If the start of sheet transportation cannot be recognized or there is specific reason not to use the one sheet method, the two-sheet method shall be chosen. The method chosen to measure single photo printing time shall be recorded and reported as required in Table 2 and as shown in Table A.1. If the two-sheet method is chosen, the reason shall be reported as required in Table 2 and as shown in Table A.1.

Single photo printing time for some devices is sensitive to the delay time from the full ejection of the last sheet of the previous print job to initiation of the next job. The delay time used shall be no shorter than 20 s and no longer than 50 s; however, care shall 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 C shall be used to establish a delay time to place the device in a stable condition. The delay time and whether a delay time found with Annex C was used shall be noted in the report as required in Table 2 and as shown in Table A.1.

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

NOTE The first noise made by the device after initiation of the print job can be recognized as a timing of the sheet transportation start.

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5.2.2.2 One sheet method

This method may be applied with a device that can hold at least one sheet in the input tray or in the handfed slot.

The procedure to measure single photo printing time by one sheet method is defined by the following steps.

a) Send a print job to the device using the test file, print mode controls and system parameters as the current test run.

b) When the last sheet has fully ejected from the device, start a timing device for the delay time.

c) Close the test file and associated software application or eject the direct connected memory device and return to the device home screen after the test file has been printed.

d) Open the test file with the photo printing application, or insert a memory device directly into the printing device, and configure the print mode and system settings to print a single copy of the test image.

e) Place one or more sheets into the sheet feeder or a single sheet into the handfed slot and initiate the print job. Some devices need to initiate the print job before the testing sheet is placed into the handfed slot.

f) [Start test run] At the time when the sheet starts moving from the sheet feeder or handfed slot, simultaneously start the timing device (stop watch or otherwise).

g) Record the time in seconds for completion of printing (the printed sheet has fully ejected from the device) to at least 2 decimal places.

h) [End test run] Close the test file and associated software application or eject the directly connected memory device and return to the printing device home screen.

i) Run the test steps a) – h) twice.

j) Determine whether third test run of steps a) – h) is required according to [5.3.2], and repeat test run for a total of three measurements if required.

k) Calculate the average single photo printing time.

5.2.2.3 Two sheet method

This method may be applied to a device with an input tray that can hold 2 or more sheets and can set number of copies of 2 or more.

The procedure to measure single photo printing time by two sheet method is defined by the following steps.

a) Send a print job to the device using the test file, print mode controls and system parameters as the current test run.

b) When the last sheet has fully ejected from the device, start a timing device for the delay time.

c) Close the test file and associated software application or eject the direct connected memory device and return to the device home screen after the test file has been printed.

d) Open the test file with the photo printing application, or insert a memory device directly into the printing device, and configure the print mode and system settings to print two copies of the test image.

e) Place two or more sheets into the sheet feeder and initiate the print job.

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f) [Start test run] At the time when the first sheet is fully ejected from the device, simultaneously start the timing device (stop watch or otherwise).

g) Record the time in seconds for completion of second sheet printing (the printed sheet has fully ejected from the device) to at least 2 decimal places.

h) [End test run] Close the test file and associated software application or eject the directly connected memory device and return to the printing device home screen.

i) Run the test steps a) – h) twice.

j) Determine whether third test run test of steps a) – h) is required according to [5.3.2], and repeat test run for a total of three measurements if required.

k) Calculate the average single photo printing time.

5.3 Test method process

5.3.1 Suggested flow chart

The suggested test execution flow is shown in Figure 2.

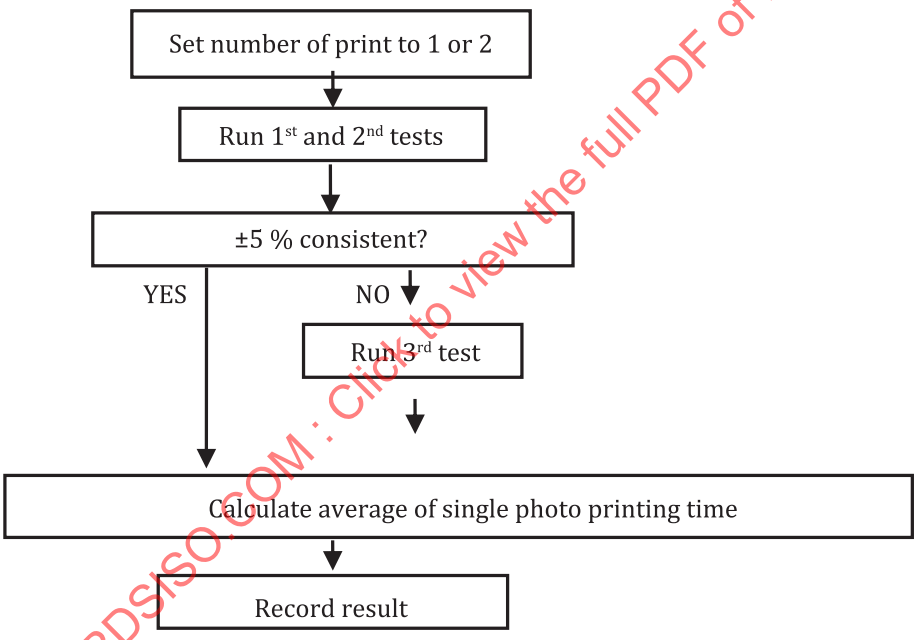

Figure 2 — Test method process flow chart

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5.3.2 ±5 % consistency criteria

If the first two test runs are not consistent within ±5 %, then a third test run is required, see Formula (1)

$$C = [2 \times T_1 / (T_1 + T_2)] - 1 \quad (1)$$

where

C is the consistency;

T_1 is the test result of 1st run;

T_2 is the test result of 2nd run.

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6 Calculations and 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 test 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 s may be rounded up to 13,8 or 14, but shall not be rounded down to 13,7 or 13.

Average of single photo printing time is calculated depending the given consistency criteria in 5.3.2.

$$T_s = (T_1 + T_2) / 2$$

(In case the number of test run is two.)

or

$$T_s = (T_1 + T_2 + T_3) / 3$$

(In case the number of test run is three.)

where

T_s is the average single photo printing time;

T_1 is the test result of 1st run;

T_2 is the test result of 2nd run;

T_3 is the test result of 3rd run.

7 Presentation of results

7.1 General

Three reporting formats are described in this clause.

a) The minimum declaration shall be the minimal requirement for presenting results, as described in 7.2.

b) The report to be presented should be the report format as described in 7.3, if requested.

c) The full detailed report to be presented should be the report format as described in 7.4, if requested.

7.2 Minimum declaration

The minimum requirement of "declaration" shall include the following items from the testing of one of the required sheet sizes:

a) description that single photo printing time has been determined in accordance with this document;

b) result of average single photo printing time test for the required size of sheet;

c) pointer to the full detailed report or contact information;

d) size of sheet tested;

e) border or borderless printing which was selected for the test, in case of bordered printing, the dimensions of the printed image;

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f) the test method which was used, one-sheet or two-sheet.

7.3 Report

The report shall include the contents displayed in Table 2.

NOTE The contents in Table 2 are requirement of this document, however, table formats displayed in this document are examples.

Table 2 — Report

Printer	Sheet size		
	4" × 6", A6 or L [a)]	2" × 3", A4 or 8.5" × 11"[a)]	11" × 17", A3 or A3+[a)]
Capable of printing on either 4" × 6", A6 or L	R	R*	R*
Capable of printing on neither 4" × 6", A6 nor L	not applicable	R	R*
Capable of printing on neither A4 nor smaller than A4	not applicable	not applicable	R
Key "R" is required to report for at least one of the sheet size in the column. "R*" is required to report when optional test is tested. a) At least one of these sheet size shall be selected. Additional sizes may be optionally tested. The following shall be reported. the size of sheet selected for the test and sheet feed orientation; whether the test was of bordered or borderless printing; in the case of bordered printing, the dimension of the printed image; test method which is used, one-sheet or two-sheet, for the single photo printing time; platform settings and selections that differ from default configuration; printing device settings and selections for photo printing mode; the delay time and whether a delay time found with Annex C was used; connection type; location to find full detailed report or contact information; The single photo printing time has been determined in accordance with **ISO/IEC 23385**			

7.4 Full detailed report

In a full detailed report, the average single photo printing time for each test shall be reported. The test system parameters shall be reported.

An example of the full detailed report is included in Annex A. A typical example of printing device settings that are recorded is shown in Annex A.

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Annex A
(informative)

Full detailed report example

This annex presents an example of a full detailed report, including the test setup information.

Table A.1 is an example of a report. Some details of tables A.2, A.3, A4 and A.5 may be different if instead of PC, and mobile device or direct connection was used for testing or if the device was battery powered.

Table A.1 — An example of a report

Measuring method	Sheet size		
	4" × 6"	A4	A3
single photo printing time	54 s borderless one-sheet method	141 s one-sheet method 200 mm x 266 mm Image	279 s one-sheet method 269 mm x 358 mm Image
— All settings and selections were default configuration — Manufacturer's recommended printing device settings and selections for photo printing mode — Paper feed orientation: long edge (4" × 6", A4), short edge(A3) — Connection type: USB 2.0 — Delay time: 50 second, Annex C used to determine — The single photo printing time has been determined in accordance with ISO/IEC 23385			

Table A.2 is an example of printing device information record.

Table A.2 — Example of printing device information record

Test start date and time	20/September/2019, 11:00 am
Tester	XXXXXX
Machine name/model:	PIXUS iP8730
Colour or B&W:	Colour printing device
Default output order:	Reverse order printing, correct order output stack
Configuration (options)	Default
Controller	XXXXXX
Printing device page count	850
Printing supplies page count	59
Temperature and humidity	23 °C / 45 %
Voltage	100 volts
Test end date and time	20/September/2019, 5:30 pm

Table A.3 is an example of test settings record.

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Table A.3 — Example of test settings record

	Item	Value
Modes and settings	Driver version	Default
	Print quality mode	Default for photo paper
	B&W settings	Not activated
	Setting N set count	application
	Collating function	Not activated
	In order output	Reverse order printing, correct order output stack
Paper	Paper feed orientation	long edge (4" × 6", A4), short edge(A3)
	Paper type setting	Photo paper
Paper-path	Paper feeding	Standard paper tray
	Paper exit	Standard exit tray
	Output orientation	face up
	Duplexing unit	Not activated

Table A.4 is an example of paper-specific information record

Table A.4 — Example of paper-specific information record

Paper	Manufacturer	Photo Paper Co.
	Grammage	60 g/m^2
	Size	4" × 6", A4, A3
	Paper type/name	Standard photo

Table A.5 is an example of test systems parameters

Table A.5 — Test system parameters

	Item	Value
Test system	Computer	Hp PRODESK
	Processor	Intel Core i5
	System chip set	Intel 945P Express
	System board	Intel D945PSN, Intel BIOS SN94510J.86A
	System memory	1 GB 533 MHz DDR2 Kingston p/n KVR533D2N4/1G
	Hard drive subsystem	Seagate Barracuda 7 200.9 250 GB, 7 200 RPM, 8 MB cache SATA/300, system board controller
	Video subsystem	Connect 3D Radeon X300, 256 MB, PCI Express
	Optical drive	Pioneer 16X DVD-RW DVR-R1A5PK
	I/O subsystem	PS/2 keyboard, mouse
	USB subsystem	System board controller, USB 2.0
Printing device connection	USB	USB 2.0
Software	Operating system	Microsoft Windows 10
	Printing applications	Adobe Photoshop CC 2019
	Print driver	PIXUS iP8730 MP Drivers Ver.1.02
	Test file and location	Original test file hard drive

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Annex B
(normative)

Test file

B.1 Overview

The tests shall be conducted using the official electronic test file provided or downloaded from the ISO website as the input. The most recent official file can be located at https://standards.iso.org/iso-iec/23385/ed-1/en/. Failure to use the exact file as specified shall invalidate test results.

B.2 Test file

The test file for this document consists of one image as JPEG (sRGB) file. The image of the JPEG (sRGB) file for the test is shown below (Figure B.1).

Figure B.1 — Image of the test file

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