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Information technology — Office equipment — Method for the determination of ink cartridge photo yield for colour printing with inkjet printers and multi-function devices that contain inkjet printer components

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National foreword

This British Standard is the UK implementation of ISO/IEC 29102:2023. It supersedes BS ISO/IEC 29102:2015, which is withdrawn.

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A list of organizations represented on this committee can be obtained on request to its committee manager.

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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*.

This third edition cancels and replaces the second edition (ISO/IEC 29102:2015), which has been technically revised.

The main changes are as follows:

— the URL for test chart has been updated;

— the humidity requirement has been changed.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html and www.iec.ch/national-committees.

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Introduction

The scope of this document is limited to evaluation of ink cartridge yield of ink-containing cartridges (i.e. integrated ink cartridges and ink cartridges without integrated print heads) for colour photo printing with colour inkjet printers. This document can be applied to colour inkjet printers having an interface to a computer as well as colour inkjet printers that cannot be connected to a computer. This document can also be applied to the inkjet printer component of any multifunctional device that has a digital input printing path, including multi-function devices that contain inkjet printer components. Both liquid and solid ink products can be tested using this document.

The cartridge yields of primary cartridges are determined by an end of life judgment, or signalled with either of two phenomena: fade, caused by depletion of ink in the cartridge, or automatic printing stop, caused by an ink out detection function. The cartridge yields of supplemental cartridges are estimated. It is envisioned that one of the uses of this document will be for the calculation of cost per page (CPP). While this document measures a portion of this cost, it is not used as the sole component of CPP calculation. Additional factors need to be considered for accurate CPP calculations.

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Information technology — Office equipment — Method for the determination of ink cartridge yield for colour photo printing with inkjet printers and multi-function devices that contain inkjet printer components

1 Scope

The purpose of this document is to provide a method to determine the ink cartridge yield of ink-containing cartridges (i.e. integrated ink cartridges and ink cartridges without integrated print heads) for colour photo printing with colour inkjet printers and multifunction devices that contain inkjet printer components. In the case where a cartridge set can be used in multiple printer models, only one yield test is performed as long as the difference between printer models does not impact yield.

NOTE A cartridge supplier can choose to use more than one market identifier for a single physical cartridge. In this case only one yield test is required as long as there are no differences in the cartridges other than market identifiers.

This document prescribes the following:

— the test method that manufacturers, test laboratories, etc. use to determine ink cartridge yield;

— the method for determination of declared cartridge yield values for photo printing from the test results; and

— the appropriate method of describing the cartridge yield for photo printing in documentation supplied to the consumer by the manufacturer.

This document is only intended for the determination of ink cartridge yield. No other claims can be made from this testing regarding quality, reliability, etc.

This document can be used to determine the yield of any cartridge that is used during the printing of the photo test file defined in ISO/IEC 29103.

This document is not for use with printers whose minimum printable size is equal to or greater than A3. This document is not intended to measure the yield of photo printing on paper size larger than 4" × 6", L or A6. In addition, this document is not for use with industrial printers or point of sale printers. It only applies to desktop printing systems.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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/IEC 24711, *Information technology — Office equipment — Method for the determination of ink cartridge yield for colour inkjet printers and multi-function devices that contain printer components*

ISO/IEC 29103, *Information technology — Office equipment — Colour photo test pages for measurement of ink cartridge yield for colour photo printing*

3 Terms and definitions

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

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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
fade
phenomenon in which a significant colour change occurs due to ink depletion

Note 1 to entry: If a printer exhibits fade, a five minute pause is allowed to provide for recovery of the ink delivery system and printing can continue. If fade appears on the next page, then the cartridge is judged at *end of life* (3.7) and the additional page printed after the five minute pause is not counted in the yield calculation. If fade does not appear on the next page, then printing can continue until the next fade or *ink out* (3.6) is encountered.

Note 2 to entry: For examples of fade, please consult Annex A (Figure A.1).

Note 3 to entry: In some printer systems, fade can occur prematurely due to the way that ink is provided to the printing system.

Note 4 to entry: It can be helpful to use the first *photo test suite* (3.5) print samples from the first cartridge set for colour comparison.

Note 5 to entry: A blue light source (such as a blue LED) can be used to help in the detection of yellow fade.

3.2
streak
thin lines of colour that appear in test images

Note 1 to entry: Streaks differ from *fade* (3.1) in the width.

Note 2 to entry: If streaks occur in two or more out of four consecutive test pages, then a *streak-removal operation* (3.3) is required.

Note 3 to entry: Streaks can appear due to a number of reasons; thermal issues and clogged nozzles being two of the main causes. Comparisons are made using the phenomenon sample provided in Annex B (Figure B.1).

3.3
streak-removal operation
procedure used to restore the print performance by removing *streaks* (3.2)

Note 1 to entry: It is often called a nozzle-cleaning operation.

Note 2 to entry: If streaks are observed in two or more out of four consecutive test pages, first the printer can be left idle for five minutes. Then an additional four pages are printed. If the streaks are still observed, then a streak-removal operation is conducted according to the latest printer manufacturer documentation. Due to the significant amount of ink that is used for cleaning, the maximum permissible number of times that the streak-removal operation can be used on a given cartridge is prescribed in 5.2.2. All test pages printed during this process will be included in the page count for determining the yield.

3.4
print head alignment operation
function that aligns newly installed print heads

Note 1 to entry: If it is mandatory according to the latest printer manufacturer documentation, this operation is performed during testing. The pages used in the alignment procedure are not counted in the measurement of yield.

3.5
photo test suite
series of pages defined in ISO/IEC 29103 that are printed as separate jobs

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3.6
ink out
signal generated by the printing system when the usable ink in the system is depleted and the printer stops printing

3.7
end of life
condition determined by one of two mechanisms: *fade* (3.1) or *ink out* (3.6)

Note 1 to entry: For cartridges containing multiple colour inks, end of life is defined when the first colour exhibits fade or ink out. In the event that the printer can continue printing after ink out is reported, the cartridge will still be considered at end of life.

3.8
end of testing
point of time when all of *primary cartridges* (3.11) are consumed three times per printer under testing

3.9
individual cartridge yield
number of pages printed between cartridge installation and *end of life* (3.7)

3.10
declared cartridge yield
value at or below the lower 90 % confidence bound of the mean

Note 1 to entry: 90 % confidence bound of the mean is prescribed in 6.1 and 6.2.

3.11
primary cartridge
major contributing cartridge for ink consumption

Note 1 to entry: The minimum number of primary cartridges to be tested for different printing systems is prescribed in 4.2. Cartridges that reach *end of life* (3.7) first are classified as primary cartridges. They should be consumed at least three times per printer at *end of testing* (3.8).

Note 2 to entry: Colour inkjet printers commonly utilize a set of different colour inks to improve quality of photo images. The number of different colour inks ranges from three to more than 10. Ink usages of different colours are not designed to be uniform. In order to maintain testing time and cost at a reasonable level, the definition of primary cartridges is introduced in this document.

3.12
supplemental cartridge
cartridge that is not classified as *primary cartridge* (3.11)

Note 1 to entry: The determination of yield for supplemental cartridges is made according to the procedure prescribed in 6.2.

3.13
proxy cartridge
primary cartridge (3.11) to be utilized for estimating yield of *supplemental cartridges* (3.12)

Note 1 to entry: More information about proxy cartridges can be found in 6.2.1.

3.14
photo paper
coated paper for photo printing

3.15
content type selection
selection that specifies the content for printing

Note 1 to entry: Examples include photo and document. This can be selected by the user or in some cases by the printing system based on the automatic media detection.

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3.16
paper media selection
selection that specifies the type of media

Note 1 to entry: This can be selected by the user and/or by the automatic media detection.

3.17
print-quality level selection
user selection that specifies the various levels of printed image quality and enhancement

EXAMPLE Normal, best or highest.

Note 1 to entry: Some printers do not have a function of the selections specified in 3.15, 3.16 and 3.17.

4 Test parameters and conditions

4.1 Set up

Place the printer on a horizontal surface and set up the printer according to the installation guide provided in the printer user's manual. If a printer has the capability to use both PC connection and another method of data input for photo printing, the PC connection shall be used for testing. If a printer does not have PC connection capability, the method of delivering photo test page suite to printer and printing procedure shall be included in the test report. Use the most recent printer driver available from the manufacturer's website or the supplied driver with the printer. The driver version shall be specified on the test report. Cartridge installation shall be completed following the instructions in the cartridge installation guide. If there is a contradiction between the printer and cartridge manuals for the cartridge installation, the cartridge manual will take precedence except if changes are recommended for printer or driver settings.

At the start of the test, all printers shall be set up using a set of priming cartridges to ensure that the ink used in testing is primarily for printing, not for initial priming/cleaning. After the printer is set up according to the manufacturer’s instructions, the priming cartridges shall be used to print until consistent images are generated. The priming cartridges shall be removed and replaced with new cartridges that will be used for testing yield. The pages printed during priming operation will be included in the test report. However, those pages are not counted towards yield. Even if required by the printer, print head alignment does not have to be performed on the priming cartridges. The replacement of the priming cartridges with the first set of test cartridges may be done all at once or staggered individually. If done all at once, all test cartridges begin with photo test suite number 1 and continue until end of life. If the staggered start method is used, the test suite number shall be tracked separately for each cartridge. The test start method shall be included in the test report.

Print-quality level selection shall be at factory pre-set configuration for the printer and default installed condition for the driver and shall be included in the test report. Any user selectable ink conservation modes (for example, draft mode) shall be disabled during testing. If content-type selection to photo is available on the printer, it shall be set to photo and included in the test report.

Paper media selection shall be set to photo paper. 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 media detection is available on the printer, it shall be disabled to make sure the same ink amount to be consumed for different media. If automatic media detection is used, it shall be noted on the test report. If these settings cannot be verified, then testing shall occur with automatic media detection on. If the printer and driver settings differ, then the driver defaults shall be used.

Any scaling to ensure that the photo test suite is printed correctly shall be based on printer system or driver. To facilitate automated testing, the photo test suite may be pre-generated using the printer driver. This is often accomplished using a print to file command. This method is only valid if it does not affect the measured yield. If a pre-generated file is used, it shall be noted on the test report.

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