Designation: F2498 – 05 (Reapproved 2011)

Standard Practice for Determining the Drying Time of Inkjet Media and Inks Using a Smudge Method[1]

This standard is issued under the fixed designation F2498; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This practice describes a procedure for assessing the drying time of black and white or color images produced by inkjet printers by smudging yellow, magenta cyan, red, green, blue, and black printed color bars.

1.2 This practice can be used to test different media with a given set of inks or it can be used to evaluate different inks with a given media.

1.3 This method is applicable to printed images, where the image may be contacted after printing.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Terminology

2.1 *Definitions:*

2.1.1 *ink jet media*—refer to recording elements used by ink jet printers to receive inks. The substrate may be paper, plastic, canvas, fabric, or other ink receptive material. The substrate may, or may not, be coated with an ink receptive layer(s).

3. Significance and Use

3.1 In addition to providing acceptable image quality, ink jet media have to dry in a reasonable time period so that the image is not perturbed by handling after imaging.

3.2 Good drying time is a prime consideration for inkjet inks and media. An inkjet print which does not dry in a reasonable time period has limited usefulness. This practice is used to obtain comparative data of drying times for inkjet inks and media.

4. Interferences

4.1 Since the drying time of inkjet inks and media is dependent on temperature and humidity, it is important that the measurements be made under the conditions appropriate to the end use applications. While printed media may be handled and displayed under a variety of conditions, this test practice is intended to determine drying time in indoor environments.

4.2 The drying time is dependent on temperature and humidity, and should be measured within the temperatures and humidities specified by the printer or media manufacturer.

4.3 The drying time is dependent on the printing mode, the type of color and the amount of applied inks.

4.4 This procedure is only applicable for determining dry time, when the drying time exceeds the actual print time.

5. Materials

5.1 Printer, media, stopwatch, PVC pre-powdered disposable gloves, test target, calculator.

6. Test Samples and Target

6.1 The method of printing, inks, inks laydown, and handling of printed samples shall be consistent with the anticipated end use.

6.2 The test image may be generated with personal computer word processing, drawing/graphics, or page layout software, saved as a print file for each printer/method of printing (contributing its unique inks and inks/receiver interactions that may impact drying time), trial-printed, and evaluated for appropriate ink letdown (purity and amount) and ease of printing and testing. Each print file should have its filename, type, and version identified in the image area and a place for experimental notes (for example, time, printer, environmental conditions, operator). The printer settings and a trial print of each print file version should be archived.

6.3 The test image should be constructed such that the bars consist of three primary colors (yellow, magenta, cyan), three secondary colors (red, green, blue), composite black (CMY) and pure black). They are ⅜ in. wide by 9 1⁄16 in. long, and the tick marks are spaced 15⁄16 in. apart. The sixth "X" tick mark will be at the lead edge of the print (first portion of image to exit the printer).

[1] This practice is under the jurisdiction of ASTM Committee F05 on Business Imaging Products and is the direct responsibility of Subcommittee F05.07 on Ink Jet Imaging Products.

Current edition approved Oct. 1, 2011. Published March 2012. Originally approved in 2005. Last previous edition approved in 2005 as F2498–05. DOI: 10.1520/F2498-05R11.

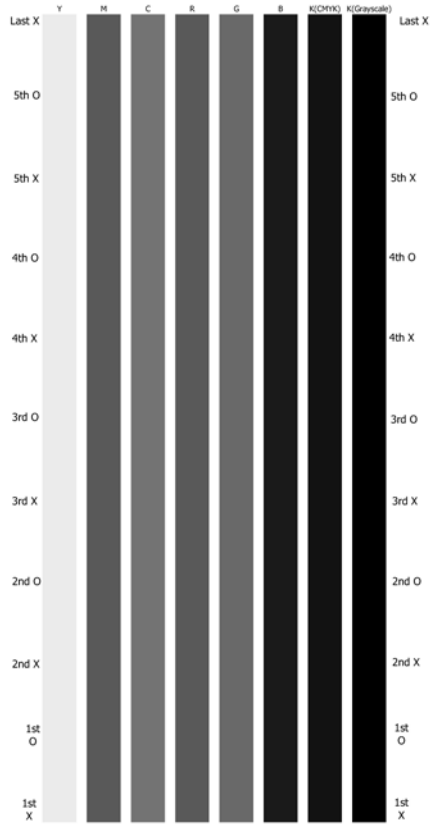

FIG. 1 Test Image

NOTE 1—Depending on the printer, it may not be possible to print both pure black and composite black bars.

7. Conditioning

7.1 It is recommended that samples be conditioned in the room where the test will be run for at least 24 h prior to printing. Samples should be placed individually so that maximum surface area of the media is exposed to the environment being tested. The conditioned samples should be visually inspected prior to printing for surface irregularities, which could adversely affect the measurements.

8. Smudge Procedure

8.1 Place PVC gloves on each hand.

8.2 Make 1 print of the test image using the specified printer and media at the predetermined room conditions.

8.3 As soon as the printer begins printing the color bars, begin timing using a stopwatch. End timing when the printing of the color bars is complete. This time is the total print time.

8.4 As soon as the print is released from the printer, start the stopwatch and place the printed image on a flat surface.

NOTE 2—For some printers, the print is not immediately released from the printer. In this case, do not end timing until the print is ejected.

8.5 Hold the print firmly in place on a flat horizontal surface with one hand, orienting the print horizontally so that the first "X" tick mark is on the left, with the black bar closest to you and with the other hand swipe the sample at the 1st tick mark labeled "1st X" using uniform pressure. Always swipe from the yellow bar to the black bar (100 % K).

8.6 After completing the swipe at the first "X" tick mark, proceed immediately to the subsequent "X" tick marks, skipping the "O" tick marks. Use a clean area of the gloved hand for each tick mark.

8.7 After the last "X" tick has been swiped, wait until the print time of the sample has elapsed, then using a clean area of the glove, swipe the "O" tick marks, starting at the first "O" and continue until all "O" tick marks have been swiped.

8.7.1 Using a black permanent marker, label the actual print time on the target, as well as the media, printer, and condition tested.

8.7.2 If smudging occurs on any of the color bars at the last "O" tick mark area, another print will need to be generated. Print the 2nd print, starting the stopwatch when the printing begins. When the sample has exited the printer, start the stop watch and wait until 3× the print time has passed (for example, print time = 4 minutes 36 seconds. For the second print, swiping of the "X" tick marks will be started at 12 minutes and 48 seconds). Follow steps 8.5 through 8.6. Again, wait the length of the print time (for example, an additional 4 minute 36 seconds) and then swipe the "O."

NOTE 3—If you know the approximate dry time, start the measurement at least 1 min before the print will dry. This will reduce the time of the testing procedure.

9. Evaluating Test Results

9.1 Record the actual time when smudging was no longer visible (for each color bar) and calculate the time by using the following procedure:

9.1.1 Total print time divided by 5 = increment time.

9.1.2 Place the increment time at the 2nd tick mark. Add the increment time to each subsequent "X" tick mark. The last "X" tick mark time should equal the actual total print time.

9.1.3 If smudging continues after the "X" tick marks, add the total print time plus ½ of the increment time. This total is place at the 1st "O" tick mark. Add the increment time to each subsequent "O" tick marks. The final "O" tick mark time should equal double the actual print time minus ½ the increment time (see Appendix X1 for an example of calculating increment times and smudging times).

10. Report

10.1 Report the following information:

10.1.1 Sample identification, including the printer, method of printing, and the media type.

10.1.2 Record the time when the sample no longer smudges for each color bar.

10.1.3 Record the temperature and humidity.

11. Precision and Bias

11.1 A statement of bias is not applicable in view of the unavailability of a standard reference for these properties.

11.2 To minimize variability when doing comparative testing, one operator should perform the smudge procedure.

12. Keywords

12.1 drying time; ink jet; media; printing; smudge

APPENDIX

(Nonmandatory Information)

X1. EXAMPLE OF CALCULATING INCREMENT TIMES AND SMUDGING TIMES

X1.1 Print Time = 4 minutes 36 seconds.

X1.1.1 Convert seconds to % minutes by dividing the number of seconds by 60 (36 divided by 60).

X1.1.2 This equals 0.6 minutes.

X1.1.3 Print time = 4.6 minutes.

X1.1.4 Divide 4.6 minutes by 5 (which equals 0.92 minutes; always round to 2 decimal places).

X1.1.5 0.92 = increment time.

X1.1.6 2nd "X" tick mark = 0.92 minutes.

X1.1.7 3rd "X" tick mark = 1.84 minutes.

X1.1.8 4th "X" tick mark = 2.76 minutes.

X1.1.9 5th "X" tick mark = 3.68 minutes.

X1.1.10 6th "X" tick mark = 4.60 minutes (which is the actual total print time).

X1.2 If smudging occurs after the last "X" tick mark, you must then calculate the "O" tick marks. This calculation is as follows:

X1.2.1 Add the total print time of 4.6 minutes plus ½ the increment time of 0.92 which equals 0.46 to arrive at the following: (add the 0.46 to #1; each subsequent time you add 0.92—the full increment time).

X1.2.2 1st "O" tick mark = 5.06 minutes.

X1.2.3 2nd "O" tick mark = 5.98 minutes.

X1.2.4 3rd "O" tick mark = 6.90 minutes.

X1.2.5 4th "O" tick mark = 7.82 minutes.

X1.2.6 5th "O" tick mark = 8.74 minutes.