

Introduction

Mottling is the uneven appearance, mostly in solid areas: small dark and light areas appearing in the surface of paper (board) caused by ink, paper or press work.

As this definition says mottle is influenced by many parameters: type of ink, colour sequence, construction of printing press, speed, rubber blanket, dampening fluid and the most important one: the type of paper. Variations in the surface characteristics as absorption, smoothness and cloudiness play an important role in the mottle and are caused by the production process and the components in the paper.

In offset printing the (uneven) water absorption by the paper, followed by uneven ink absorption play an important role as well; this phenomenon is tested in the water interference mottling as described in this W-leaflet W59.

Other types of mottling are described in the following W-leaflets:

1. BACK TRAP MOTTLE (W57)

Back trap mottle is an uneven printing result, caused by uneven ink absorption of the paper. A print is made and set off against clean printing forms.

1. PRINT MOTTLE (W58)

Print mottle is an alternative and easier, but sometimes less accurate method than the back trap mottle. A paper strip is printed 4 times with the same printing disc.

2. INK TRAP MOTTLE (W46/W49)

Ink trap mottle is the uneven printing result caused by a wrong trapping in tack and/or viscosity of the ink and is also influenced by an uneven absorption of the ink by the paper.

Principle

A paper is dampened and printed under standard conditions with an IGT printability tester. Thereafter the ink is set off 3 times from the printed paper to 3 clean printing forms. The result is observed as a degree of unevenness in the print quality. This can be done visually in comparison with a self made scale or other papers and with an (off line) analysing system.

NOTE: In this method the standard back trap mottle as described in W57 is measured as well.

Method of operation

- It is recommended to execute the test in the standard atmosphere; to most standards it is $23,0 \pm 1,0$ °C and $50 \pm 2\%$ rh.
- For the operation of the AIC2-5T2000, Global Standard Tester, Inking Unit and ink pipette follow the instructions of the manuals, IGT information leaflet W100 and the displays accurately.
- Handle the samples carefully.

Preparation

- Condition the papers, the ink and the equipment during >6 hours in the standard atmosphere.
- Cut the paper and mark them with top and/or bottom side, machine and/or cross direction and a code for the type of paper.
- Remove the brush from the tester.

4. For AIC2-5T2000 only:

- Mount the top three layers of a paper packing on the sector. See W100.
- Adjust the printing force of both printing disc shafts to 500 N and pay attention for the right backlash. See W100.
- Adjust the printing speed to 0,2 m/s in the constant speed mode (□).
- Place the mounting shaft with the thick part into the top accessory hole of the tester in such a way that the flat side in this shaft is pointing to the left and fasten the shaft with the screw at the left hand side of the tester.
- Mount a doctor blade into the doctor blade holder. See W100.
- Remove the screw at the front side of the mounting shaft.
- Slide the blade holder device with the blade downward and the weight pointing to the right on the mounting shaft, turn it anticlockwise until stop and replace the screw into the shaft to prevent sliding off the blade holder device from the shaft.



Fig.1: Dampening unit

Materials / Testing conditions

1	IGT AIC2-5T2000	710.000.000
	or IGT Global Standard Tester 2	412.000.000
2	IGT High Speed Inking Unit 4	466.000.710
3	or IGT Inking Unit AE FOUR	465.000.710
4	Top roller with 4 segments for conventional inks	466.003.003
	IGT ink pipette	408.000.200

5	For AIC2-5T2000 only:	
6	Mounting shaft	450.054.710
7	Doctor blade holder	435.054.710
8	Doctor blades	180.431.710.001
9	Dampening disc for 1 µm of water	402.354.010.710
	or Dampening disc for 0,25 µm of water	402.354.002.710
10	or Dampening disc for 0,5 µm of water	402.354.005.710
	Printing disc with rubber blanket, 50 mm (5 x)	402.089
11	Packing, paper, 55 mm	404.001.005
12	Huber mottle test ink	404.800.010

	For GST2 only:	
13	Doctor blade holder	435.031.412
14	Doctor blades	180.431.710.001
15	Dampening disc for 1 µm of water	402.354.010.412
	or Dampening disc for 0,25 µm of water	402.354.002.412
	or Dampening disc for 0,5 µm of water	402.354.005.412
16	Printing disc with rubber blanket, 50 mm (5 x)	402.089
17	Cartridge	160.200
18	Hoses and coupling	160.300
19	Packing, paper, 55 mm	404.001.005
20	Huber mottle test ink	404.800.010

Reference mottle scale or mottle analyzing system (if desired)
Strips of paper to be tested, preferable 55 * 340 mm², 3 strips per sample
Dampening fluid (water or water with additives)
Cotton pads
Lint free rags, ethanol and cleaning naphtha

Printing force	500 N
Printing speed	Constant, 0,2 m/s
Time between printing and set off's	10 s
Number of set off's	4x
Ink film thickness (volume)	8,0 µm (0,35 cm ³)

► The numbers 1 thru 20 are available at IGT Testing Systems.

- Clean the dampening disc with a cotton pad with ethanol.
- Place the dampening disc on the top shaft.
- Cut a piece of cotton of about 5*50 mm².
 - Immerse it into the dampening fluid.
 - Place it on the dampening disc.
 - Turn the blade holder device carefully clockwise to rest the doctor blade on the dampening disc and note that the cotton pad will rest on the disc at the left hand side just behind the blade.
 - Turn the dampening disc clockwise; the dampening disc must be wetted.

5. For GST2 only:

- Mount the top three layers of a paper packing on the sector. See W100.
- Select the menu "Water mottle" in the display.
- Fill a cartridge with the dampening fluid and mount it on the tester. See W100.
- Mount a doctor blade into the doctor blade holder. See W100.
- Slide the doctor blade holder with the doctor blade downward and pointing to the right on the two pins of the mounting plate.
- Clean the dampening disc with a towel with ethanol.
- Place the dampening disc on the top shaft of the tester.



Fig.2: Dampening unit GST2

- 5.8. Cut a piece of cotton of about 5*50 mm²
 - 5.8.1. Immerse it into the dampening fluid.
 - 5.8.2. Place it on the dampening disc and note when the blade rests on the disc that the cotton pad is just at the left hand side behind the blade.
6. Fill the ink pipette with the mottle test ink.
7. For High Speed Inking Unit 4 only:
Adjust the unit with the following settings:
 - ☐ Water bath: 23,0 °C
 - ☐ Top roller: 4-segmented, rubber for conventional inks
 - ☐ Mode: 2
 - ☐ Startup time: 10 s
 - ☐ Distribution time: 20 s
 - ☐ Distribution speed: 0,5 m/s
 - ☐ Inking time printing discs: 15 s
8. For inking unit AE FOUR only: see manual and W100

Execution:

1. Mount a test strip on the sector by attaching the beginning of the test strip into the front clamp and fixing the end of the test strip on the sector with tape.
2. Apply 0,35 cm³ of ink to a segment of the top roller of the inking unit and distribute the ink during the preset or desired time.
NOTE: Due to the drying of the ink it is not advised to add some ink after a test.
3. Place a printing disc on the printing disc shaft of the inking unit and ink the printing disc during the preset or desired time.
4. Take the printing disc from the inking unit and place it on the bottom printing disc shaft of the tester.
5. Turn the disc into the position that the seam in the rubber blanket is toward the sector.
6. For AIC2-5T2000 only:
 - 6.1. Take care that the piece of cotton on the dampening disc contains enough dampening fluid to wet the dampening disc.
 - 6.2. Turn the sector into starting position.
 - 6.3. Start the stopwatch.
 - 6.4. Press one of the side buttons to start the motor.
 - 6.5. Move the dampening and printing disc into printing position against the test strip.
 - 6.6. At a certain time, e.g. 10 s after having started the stopwatch, make a print by pressing the other side button as well.
 - 6.7. As soon as the sector has stopped, release both buttons.
 - 6.8. Directly move the dampening and printing disc out of printing position OR in the case the dampening disc is already out of printing position, move the printing disc out of printing position.
 - 6.9. Directly move the sector into starting position.
 - 6.10. Directly replace the printing disc by a clean one.
 - 6.11. Directly turn the disc into the position that the seam of the blanket is toward the sector.
 - 6.12. Directly press one of the side buttons to start the motor.
 - 6.13. Directly move the printing disc into printing position against the test strip.
 - 6.14. After 10 s after having made the print, make a "print" by pressing the other side button as well to set off the ink from the printed strip to the clean printing disc.
 - 6.15. Repeat the points 6.7 thru 6.14 for the next three clean printing discs.
7. For GST only:
 - 7.1. Select "Make print" in the display.
 - 7.2. Press the side buttons to move the sector into the starting position and to move the doctor blade holder downward.
 - 7.3. If necessary press one of the buttons 1- 4 to add a few drops of water to the cotton pad on the of the dampening disc.
 - 7.4. Make a print by pressing both side buttons and keep pressed both buttons to move the sector into the starting position and thereafter release the side buttons.
NOTE: From the moment of printing the timer starts counting down from 10 s to 0 s.
 - 7.5. Directly replace the printing disc by a clean one.
 - 7.6. Directly turn the disc into the position that the seam of the blanket is toward the sector.
 - 7.7. Before the timer in the display has reached 0 s, press the side buttons. As soon as the timer has count down to 0, a "print" is made to set off the ink from the printed paper to the clean printing disc and the sector is moved into the starting position; at this moment release the side buttons.
NOTE: From the moment of printing the timer starts counting down from 10 s to 0 s.

- 7.8. Repeat the points 7.5 thru 7.7 for three times.
- 7.9. Press "Enter" to finish the test for this test sample.
8. Remove the test strip from the sector.
9. Measure the test result as described in the chapter "Assessment".
10. Take the printing disc from the shaft and clean all printing discs with rags and naphtha and let them dry.
11. Clean the rollers of the inking unit or use the next segment for the following test.
12. Repeat points 1 thru 11 for every test strip.
13. After having finished the tests, clean and store all parts as described in the manuals.
14. Make an accurate record of the conditions and the results of the test and refer to method W59.

Assessment:1. VISUALLY

Compare the printing results with a self made scale or compare with the results of other papers and give a number or description of the result.

A = not damped,
only printed for
back trap mottle

A

2. IMAGE ANALYZING

Measure the printing result with the Image Analyzing System.

B = damped and
printed for water
interference mottle

B

Notes:

1. The maximum storage life of the Mottle test ink in the original, closed packing is 1 year; in an opened packing 3 months.

Fig. 3: Printed strips

- 2006: In comparison to older IGT leaflets, this leaflet is valid for the AIC2-5T2000 and Global Standard Tester2.
- 2012: This leaflet is valid for the AE FOUR as well and the leaflet contains some small text corrections.
- 2017: This leaflet contains some small text corrections.