

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, damping water and the most important one: the type of paper. Variations in the surface characteristics as absorption and smoothness play an important role in the mottle and are caused by the production process and the components in the paper.

There can be three kinds of mottle:

- Back trap (print) mottle: an uneven printing result, caused by uneven ink absorption of the paper. A testing method is described in this information leaflet. An alternative and easier, but sometimes less accurate method has been described in IGT information leaflet W58.
- Water interference mottle: an uneven printing result, caused by insufficient and uneven water absorption of the paper, followed by uneven ink absorption. This testing method has been described in IGT information leaflet W59.
- Ink trap mottle: an uneven printing result caused by a wrong trapping of the ink in tack and/or viscosity and is also influenced by an uneven absorption of the ink by the paper. This method has been described in IGT information leaflet W69 (rubber 65 Shore A) and W 46 (rubber 85 Shore A).

Principle:

A paper is printed under standard conditions with an IGT printability tester, after certain times the ink is set off from the printed paper to 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 analysing system.

NOTE: In this method the standard back trap mottle 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 ± 1.0 °C (73.4 ± 1.8 °F) and 50 ± 2% rh.
- For the operation of the AIC2-5T2000, Global Standard Tester, High Speed Inking Unit 4 and ink pipette follow the instructions of the manuals, IGT information leaflet W100 and the displays accurately.
- Handle the samples carefully.

Preparation:

1. Condition the papers, the ink and the equipment during >6 hours in the standard atmosphere.
2. Cut the paper strips (preferable 55 x 340 mm, 3 strips per sample) and mark them with top and/or bottom side, machine and/or cross direction and a code for the type of paper.
3. For AIC2-5T2000 only:



Fig.1: Damping unit AIC25T2000

- 3.1. Mount the top three layers of a paper packing on the sector. See W100.
- 3.2. Adjust the printing force of both printing disc shafts to 500 N and pay attention for the right backlash. See W100.
- 3.3. Adjust the printing speed to 0.2 m/s in the constant speed mode (□).
- 3.4. 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. Fasten the shaft with the screw at the left hand side of the tester.
- 3.5. Mount a doctor blade in the doctor blade holder. See W100.
- 3.6. Remove the screw from the mounting shaft.
- 3.7. 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

Materials / testing conditions

1	IGT AIC2-5T2000 or IGT Global Standard Tester 2	710.000.000 412.000.000
2	IGT High Speed Inking Unit 4	466.000.710
3	(Top roller with 4 segments for conventional inks)	(466.003.003)
4	IGT ink pipette *****	408.000.200
<u>For AIC2-5T2000 only:</u>		
5	Mounting shaft	450.054.710
6	Doctor blade holder	435.054.710
7	Doctor blades	180.431.710.001
8	Damping disc for 1 µm of water	
9	Printing disc, covered with rubber blanket, 50 mm, ø 66 mm (5 x)	402.354.010.710 402.089
10	Packing, paper, 55 mm	
11	Huber mottle test ink *****	404.001.005 404.800.010
<u>For GST2 only:</u>		
12	Doctor blade holder	435.031.412
13	Doctor blades	180.431.710.001
14	Damping disc for 1 µm of water	402.354.010.412
15	Printing disc, covered with rubber blanket, 50 mm wide, ø 66 mm (5 x)	402.089
16	Cartridge	160.200
17	Hoses and coupling	160.300
18	Packing, paper, 55 mm	404.001.005
19	Huber mottle test ink	404.800.010
20	Sector with clamps *****	361.000.000
21	DOMAS Analyzing System (if desired)	520.100
22	Strips of paper to be tested, preferable 55 x 340 mm, 3 strips per sample	
23	Damping fluid (water or water with additives)	
24	Reference mottle scale or mottle analysing system (if desired)	
25	Cotton pads	
26	Lint free rags	
27	Ethanol	
28	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.
- ▶ The numbers 5 thru 11 can be obtained as Mottle Test Set (water interference method) for AIC2-5T2000, article number 435.000.710.059.
- ▶ The numbers 12 thru 19 can be obtained as Mottle Test Set (water interference method) for GST2, article number 435.000.412.059.
- ▶ *This leaflet contains article numbers per January 1st, 2006* ◀.

screw in the shaft to prevent sliding off the blade holder device from the shaft.

- 3.8. Clean the damping disc with a towel with ethanol.
- 3.9. Place the damping disc on the top shaft.
- 3.10. Turn the blade holder device carefully clockwise to rest the doctor blade on the damping disc.
- 3.11. Cut a piece of cotton of about 5 x 50 mm, immerse it into the damping fluid and place it on the damping disc, turn the blade holder device carefully clockwise to rest the doctor blade on the damping disc and turn the damping disc clockwise. The damping disc must be wetted. NOTE: the cotton pad is resting on the disc at the left hand side behind the blade.
4. For GST2/3/3H only:
 - 4.1. If not present, mount the sector with clamps. See W100.
 - 4.2. Mount the top three layers of a paper packing on the sector. See W100.
 - 4.3. Select the menu "Water mottle" in the display.
 - 4.4. Fill a cartridge with the damping fluid and mount it on the tester. See W100.

- 4.5. Mount a doctor blade in the doctor blade holder. See W100.
- 4.6. Slide the doctor blade holder with the doctor blade downward and pointing to the right on the two pins of the mounting plate.
- 4.7. Clean the damping disc with a towel with ethanol.



Fig.2: Damping unit GST2

- 4.8. Place the damping disc on the top shaft of the tester.
- 4.9. Cut a piece of lint free cotton of about 0.5 x 50 mm, immerse it into the damping fluid and place it on the damping disc at the left hand side of the blade. NOTE: if the blade is downward on the disc, the cotton pad is resting on the disc at the left hand side behind the blade.
5. Take off the brush from the tester.
6. Check the functioning of the tester following the instructions in the chapter "Execution".
7. Fill the ink pipette with the mottle test ink.
8. Adjust the High Speed Inking Unit with the following settings:
 - Water bath: 23.0° C (73.4° F)
 - Top roller: 4-segmented, rubber for conventional inks
 - Mode: 2
 - Starting time: 5 s
 - Distribution time: 10 s
 - Distribution speed: 1.2 m/s
 - Inking time printing discs: 5 s
9. Check the functioning of the High Speed Inking Unit.

Execution:

1. Attach a test strip on the sector and fasten the end of the test strip on the sector with tape.
2. Apply 0.35 cm³ of ink to the inking unit and distribute the ink. NOTE: 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 time.
4. Take the printing disc from the inking unit and place it on the lower printing disc shaft of the tester and turn it into the position that the seam in the rubber blanket is toward the sector.
5. For AIC2-5T2000 only:
 - 5.1. Take care that the piece of cotton on the damping disc contains enough damping fluid to wet the damping disc. See point 20 in the chapter "Preparation".
 - 5.2. Turn the sector into starting position.
 - 5.3. Start the stopwatch.
 - 5.4. Press one of the side buttons to start the motor.
 - 5.5. Move the damping and printing disc into printing position against the test strip.
 - 5.6. At a certain time, e.g. 10 s after having started the stopwatch, make a print.
 - 5.7. Directly move the damping and printing disc out of printing position OR in the case the damping disc is already out of printing position, move the printing disc out of printing position.
 - 5.8. Directly move the sector into starting position.
 - 5.9. Directly replace the printing disc by a clean one and turn it into the position that the seam of the blanket is toward the sector.
 - 5.10. Directly press one of the side buttons to start the motor.
 - 5.11. Directly move the printing disc into printing position against the test strip.

- 5.12. After 10 s after having made the print, make a "print" to set off the ink from the printed strip to the clean printing disc.
- 5.13. Repeat the points 5.7 thru 5.12 for the next three clean printing discs.
6. For GST only:
 - 6.1. Select "Make print" in the display.
 - 6.2. Press the side buttons to move the sector into the starting position and to move the doctor blade holder downward.
 - 6.3. If necessary press one of the buttons 1- 4 to add a few drops of water to the cotton of the damping unit.
 - 6.4. Make a print, keep pressed both side buttons to move the sector into the starting position again and release the side buttons. NOTE: From the moment of printing the timer starts counting down from 10 s to 0 s.
 - 6.5. Directly replace the printing disc by a clean one and turn it into the position that the seam of the blanket is toward the sector.
 - 6.6. 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.
 - 6.7. Repeat the points 6.2 and 6.3 for three times.
 - 6.8. Press "Enter" to finish the test for this test sample.
7. Remove the test strip from the sector.
8. Measure the test result as described in the chapter "Assessment".
9. Take the printing disc from the shaft and clean all printing discs with rags and naphtha.
10. Clean the rollers of the inking unit or use the next segment for the following test.
11. Repeat points 1 thru 10 for every test strip.
12. After having finished the tests, clean and store all parts as described in the manuals.
13. Make an accurate record of the conditions and the results of the test.

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.
2. **IMAGE ANALYZING**
Measure the printing result with the PTS DOMAS Image Analyzing System, module Print Unevenness.

A = not damped, only printed for back trap mottle	1 st print
	A
B = damped and printed for water interference mottle	B

Fig. 3: Printed strips

Notes:

1. The test results of the AIC2-5T2000, AIC2-5 and Global Standard Tester 2 compare well with one another on the condition that the tests have been carried out under the same testing conditions.
2. The maximum storage life of the Mottle test ink in the original, closed packing is 1 year; in an opened packing 3 months.

► In comparison to older IGT leaflets, this leaflet is valid for the AIC2-5T2000 and Global Standard Testers as mentioned

This information leaflet has been compiled with the utmost care. However, may you find any inadequacies or if there are any comments, we kindly request you to send these to IGT Testing Systems, Sales Department.