

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 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.

There are some types of mottling. These methods are described in the following W-leaflets:

- BACK TRAP MOTTLE (W57-AMS)**
 In back trap mottle paper is printed and the ink of the printed strip is set off 4 times to 4 clean printing forms with interval times of 10 s or 15 s.
- PRINT MOTTLE (W58-AMS)**
 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.
- WATER INTERFERENCE MOTTLE (W59-AMS)**
 Water interference mottle is the uneven printing result, caused by insufficient and uneven water absorption of the paper, followed by uneven ink absorption.
- INK TRAP MOTTLE (W92-AMS)**
 Ink trap mottle is the uneven printing result caused by a wrong trapping in tack and/or viscosity of the ink in wet-on-wet printing and is also influenced by an uneven absorption of the ink by the paper.

This information leaflet W57-AMS describes:

- Back trap mottle index**
 Paper is printed and the ink of the printed strip is set off 4 times to 4 clean printing forms with interval times of 10 s. After the last set off the test result is assessed by the IGT on-line analysing system or visually.
- Back trap mottle curve**
 Paper is printed and the ink of the printed strip is set off 4 times to 4 clean printing forms with interval times of 15 s. After printing and after every set off the test result is assessed by the IGT on-line analysing system or visually.

Principle

A paper is printed under standard conditions with the IGT printability tester. Thereafter the ink is set off 4 times from the printed strip to 4 clean printing forms.

Back trap mottle index: After the last set off the print result is assessed as a contrast value in the print by the IGT On-line Analysis Software for Mottling. If the on-line analysis software is not used, a visual appraisal can be made in comparison to a self-made scale or in comparison to other papers.

Back trap mottle curve: After every set off the print result is assessed as a contrast value in the print by the IGT On-line Analysis Software for Mottling. The visual appraisal is too inaccurate.

Materials and testing conditions		
1	IGT AMSTERDAM 1/2/5/6	
2	IGT High Speed Inking Unit 4	465.000.710
3	Top roller with 4 segments for conventional inks	466.003.003
4	IGT ink pipette	408.000.200
5	Printing disc, covered with rubber blanket, pin, 50 mm wide (5 x)	402.089.720
6	IGT mottle test ink	404.800.010
7	IGT On-line Analysis Software for Mottling	522.100
Strips of paper to be tested, preferable 55*340 mm ² , 3 strips per sample Lint free rags and cleaning naphtha		
	BTMottle Index	BTMottle Curve
Printing force	500 N	500 N
Printing speed	Cnst, 0,2 m/s	Cnst 0,2 m/s
Number of set offs	4	4
Interval times	10 s	15 s
Ink film thickness (volume)	8,0 µm (0,35 cm ³)	8,0 µm (0,35 cm ³)
Checkbox Scan	Activated	Activated
▶ The numbers 1 thru78 are available at IGT Testing Systems.		

Method of operation

- It is recommended to execute the test in the standard atmosphere; to most standards it is 23,0 ± 1,0 °C and 50 ± 2% rh.
- For the operation of the AMSTERDAM, Inking Unit and ink pipette follow the instructions of manuals, W100 and 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 strips and mark them with top and/or bottom side, machine and/or cross direction and a code for the type of paper.
- For back trap mottle index:
 - Select method **Mottle: Back Trap Index**.
 - If desired, touch the checkbox **Scan** to scan and save the test strip.
- For back trap mottle curve:
 - Select method **Mottle: Back Trap Curve**
 - Touch the checkbox **Scan** to scan and save the test strip.
- Remove the brush from the tester.
- Fill the ink pipette with the mottle test ink.
- Adjust the High Speed Inking Unit 4 with the following settings:
 - Water bath: 23,0 °C (73,4 °F)
 - 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



Execution for AMSTERDAM 1

1. Touch the button **PRINT** to rotate the shaft into the start position.
2. 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 a piece of tape.
3. 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 drying of the ink it is not advised to add some ink after a test.
4. Place a printing disc on the printing disc shaft of the inking unit and ink the disc during the preset or desired time.
5. Take the printing disc from the inking unit and place it on the printing disc shaft of the tester.
6. For Back trap mottle index
 - 6.1. Press both side buttons to make a print and to come into the waiting position for the 1st set off. At this moment release both side buttons.
 - 6.2. Directly take off the printing disc from the shaft and replace it by a clean disc.
 - 6.3. Before the waiting time has elapsed, press both side buttons to make a "print" in which the ink is set off from the printed paper to the blanket of the disc and to come into the waiting position for the 2nd set off. At this moment release both side buttons.
 - 6.4. Repeat the points 6.2 and 6.3 for the next three set offs. After the last set off, keep pressed both side buttons, if activated to move the camera downward, to make a scan of the test result and to come into the end position; then release both buttons.
7. For Back trap mottle curve:
 - 7.1. Press both side buttons to make a print, if activated to move the camera downward to make a scan of the test result and to come into the waiting position for the 1st set off; then release both side buttons.
 - 7.2. Directly take off the printing disc from the shaft and replace it by a clean disc.
 - 7.3. Before the waiting time has elapsed, press both side buttons to make a "print" in which the ink is set off from the printed paper to the blanket of the disc, to make a scan of the printing result and to come into the waiting position for the 2nd set off; then release the side buttons.
 - 7.4. Repeat the points 7.2 and 7.3 for the next three set offs and scans. After the last set off, keep pressed both side buttons to make a scan of the test result and to come into the end position; then release both buttons.
8. If the camera is activated:
 - 8.1. The test strip is assessed; if finished the camera moves upward.
 - 8.2. Save or discard the results.
9. Take the disc from the shaft, clean all discs with rags and naphtha and let them dry.
10. Take the sample from the tester.
11. For a next test start with point 2 or touch **BACK** and start with point 1. It is recommended to perform the test at least three times per sample.
12. After having finished the tests, touch **BACK** and clean and store all parts as described in the manuals.
13. Make an accurate record of the conditions and the results of the test and refer to method:
W57-AMS: Back Trap Mottle Index
W57-AMS: Back Trap Mottle Curve

Assessment for AMSTERDAM 1

1. Back trap mottle index:
 - 1.1. Image analyzing
The IGT On-line Analysis Software for Mottling has scanned and analyzed the printed strip after 4 set offs. The results are shown in the display as contrast. The higher this value the more mottling is present.
 - 1.2. Visually
If the IGT On-line Analysis Software for Mottling is not used, 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. Back trap mottle curve
 - 2.1. Image analyzing
The IGT On-line Analysis Software for Mottling has scanned and analyzed the printed strip after every print/set off. The results are shown in the display as contrast. The higher this value the more mottling is present.

Execution for AMSTERDAM 2

1. Touch the button **PRINT** to rotate the shafts into the start position.
2. 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 a piece of tape.
3. 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 drying of the ink it is not advised to add some ink after a test.
4. Place a printing disc on the printing disc shaft of the inking unit and ink the disc during the preset or desired time.
5. Place a clean printing disc on the 2nd printing disc shaft of the tester.
6. Take the printing disc from the inking unit and place it on the 1st printing disc shaft of the tester.
7. For Back trap mottle index:
 - 7.1. Press both side buttons to make a print of the first disc and to come into the waiting position for the 1st set off by the disc on the 2nd shaft. At this moment release both side buttons.
 - 7.2. Before the waiting time has elapsed, press both side buttons to make a "print" in which the ink is set off from the printed paper to the blanket of the disc on the 2nd shaft and to come into the waiting position for the 2nd set off. At this moment release both side buttons.
 - 7.3. Directly take off the printing disc from the 2nd shaft and replace it by a clean disc.
 - 7.4. Repeat the points 7.2 and 7.3 for the next three set offs. After the last set off, keep pressed both side buttons, if activated to move the camera downward, to make a scan of the test result and to come into the end position; then release both buttons.
8. For Back trap mottle curve:
 - 8.1. Press both side buttons to make a print of the first disc if activated to move the camera downward to make a scan of the test result and to come into the waiting position for the 1st set off; then release both side buttons.
 - 8.2. Before the waiting time has elapsed, press both side buttons to make a "print" in which the ink is set off from the printed paper to the blanket of the disc on the 2nd shaft, to make a scan of the printing result and to come into the waiting position for the 2nd set off; then release the side buttons.
 - 8.3. Directly take off the printing disc from the 2nd shaft and replace it by a clean disc.
 - 8.4. Repeat the points 8.2 and 8.3 for the next three set offs and scans. After the last set off, keep pressed both side buttons to make a scan of the test result and to come into the end position; then release both buttons.
9. If the camera is activated:
 - 9.1. The test strip is assessed; if finished the camera moves upward.
 - 9.2. Save or discard the results.
10. Take the discs from the shafts, clean all discs with rags and naphtha and let them dry.
11. Take the sample from the tester.
12. For a next test start with point 2 or touch **BACK** and start with point 1. It is recommended to perform the test at least three times per sample.
13. After having finished the tests, touch **BACK** to move the camera upward if activated and 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:
W57-AMS: Back Trap Mottle Index
W57-AMS: Back Trap Mottle Curve

Assessment for AMSTERDAM 2

1. Back trap mottle index:
 - 1.1. Image analyzing
The IGT On-line Analysis Software for Mottling has scanned and analyzed the printed strip after 4 set offs. The results are shown in the display as contrast. The higher this value the more mottling is present.
 - 1.2. Visually
If the IGT On-line Analysis Software for Mottling is not used, 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. Back trap mottle curve
 - 2.1. Image analyzing
The IGT On-line Analysis Software for Mottling has scanned and analyzed the printed strip after every print/set off. The results are shown in the display as contrast. The higher this value the more mottling is present.



Execution for AMSTERDAM 5 and 6

1. Touch the button **PRINT** to rotate the shafts into the start position.
2. 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 a piece of tape.
3. 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 times.
NOTE: Due to drying of the ink it is not advised to add some ink after a test.
4. Place a printing disc on the printing disc shaft of the inking unit and ink the disc during the preset or desired time.
5. Place 4 clean printing discs on the shafts 2, 3, 4 and 5 of the tester.
6. Take the printing disc from the inking unit and place the inked printing disc on the 1st printing disc shaft of the tester.
7. For Back trap mottle index:
 - 7.1. Press both side buttons to make a print of the first disc and to come into the waiting position for the 1st set off by the disc on the 2nd shaft. At this moment release both side buttons.
 - 7.2. Before the waiting time has elapsed, press both side buttons to make a "print" in which the ink is set off from the printed paper to the blanket of the disc on the 2nd shaft and to come into the waiting position for the 2nd set off by the disc on shaft 3. At this moment release both side buttons.
 - 7.3. Repeat point 7.2 for the next three set offs on the discs of the shafts 3, 4 and 5. After the last set off, keep pressed both the side buttons, if activated to move the camera downward to make a scan of the test result and to come into the end position; then release both buttons.
8. For Back trap mottle curve:
 - 8.1. Press both side buttons to make a print of the first disc, if activated to move the camera downward to make a scan of the printing result and to come into the waiting position for the 1st set off by the disc on the 2nd shaft. At this moment release both side buttons.
 - 8.2. Before the waiting time has elapsed, press both side buttons to make a "print" in which the ink is set off from the printed paper to the blanket of the disc on the 2nd shaft, to make a scan of the printing result and to come into the waiting position for the 2nd set off by the disc on shaft 3. At this moment release both side buttons.
 - 8.3. Repeat point 8.2 for the next three set offs and scans of the printing result of the shafts 3, 4 and 5. After the last set off, keep pressed both side buttons, to make a scan of the test result and to come into the end position; then release both buttons.
9. If the camera is activated:
 - 9.1. The test strip is assessed; if finished the camera moves upward.
 - 9.2. Save or discard the results.
10. Take the discs from the shafts, clean all discs with rags and naphtha and let them dry.
11. Take the sample from the tester.
12. For a next test start with point 2 or touch **BACK** and start with point 1. It is recommended to perform the test at least three times per sample.
13. After having finished the tests, touch **BACK** to move the camera upward and 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:
W57-AMS: Back Trap Mottle Index
W57-AMS: Back Trap Mottle Curve

Assessment for AMSTERDAM 5 and 6

1. Back trap mottle index:
 - 1.1. Image analyzing
The IGT On-line Analysis Software for Mottling has scanned and analyzed the printed strip after 4 set offs. The results are shown in the display as contrast. The higher this value the more mottling is present.
 - 1.2. Visually
If the IGT On-line Analysis Software for Mottling is not used, 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. Back trap mottle index High Speed:
 - 2.1. Image analyzing
The IGT On-line Analysis Software for Mottling has scanned and analyzed the printed strip after 4 set offs. The results are shown in the display as contrast. The higher this value the more mottling is present.
3. Back trap mottle curve:
 - 3.1. Image analyzing
The IGT On-line Analysis Software for Mottling has scanned and analyzed the printed strip after every print/set off. The results are shown in the display as contrast. The higher this value the more mottling is present.

Notes

1. Due to the quick altering of the rubber blanket of the printing disc and the sensitivity of the test, the maximum life time of the rubber blanket for this test is 1 month or even shorter after the first use.
2. The maximum storage life of the Mottle test ink in the original, closed packing is 1 year; in an opened packing 3 months.