Introduction

Absorption is the speed with which ink penetrates into paper after printing. For the offset process this property is very important. If the ink is absorbed too slowly or too fast, it may be the cause of problems. An absorption, which is too slow, may result in smearing because the ink does not dry fast enough. An absorption, which is too fast, may result in a reduction of the dry ink properties because too much binding agent has penetrated into the paper and mainly the pigments remain at the surface. Because of this, for instance, the abrasion resistance or gloss may be reduced. The varnish ability is influenced by the absorption as well. The test is important when using oxidative drying offset inks and varnishes. The absorption tests are usually carried out as comparative tests. The chosen absorption times may differ per type of paper.
This IGT information leaflet describes the following methods:

- W48 set off, 1, 2 or 4 fields, 0,7 m/s.
- W78 set off, 4 or 10 fields, 0,2 m/s.

Principle

A strip of the paper to be tested is printed with an IGT printability tester under standard conditions with a set off ink. After certain times the strip is brought into contact with a blank strip of a standard set off paper. Part of the ink, which is still present at the surface of the printed strip, will smear on the set off strip. The more ink is being absorbed into the printed strip, the less ink will smear on the set off strip. The density of the smeared ink will be a value for the absorption. Since smearing mainly concerns the ink, which is at the top of the surface of the paper, the test strip is printed with a hard (aluminum) printing form.
The complete range of recommended set off times is about 0,1, 3, 6, 10, 15, 30, 60 and 120 s. The short interval times < 10 s can be tested with the IGT AIC2-5T2000 and the Global Standard Tester 2; all other times (> 10 s) with the AIC2-5T2000, Global Standard Testers 2, 3 and 3H. For paper with little absorption, longer times may be of importance.
If the penetration of an ink has to be tested, a standard paper will be printed with the ink to be tested. Further, the test is carried out as described in this information leaflet.

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 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

1. Condition the papers, the ink and the equipment during >6 hours in the standard atmosphere.
2. 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.
3. Shorten the set off strips C2846 to a length of 200 mm.
4. Remove the brush from the tester.
5. Mount the paper packing on the sector. See W100.
6. For AIC2-5T2000 only:
   - 6.1. Adjust the printing force for both printing disc shafts to 1000 N and pay attention for the right backlash for both shafts. See W100.
   - 6.2. Adjust the printing speed to 0,7 m/s (W48) or 0,2 m/s (W78) in the constant speed mode (□).
7. For GST 2 only:
   - 7.1. Select the menu "Set off" in the display.
   - 7.2. Select the desired sub menu:
     - 7.2.1. "2 fields" for a test strip with 2 different interval times and the preset speed of 0,7 m/s.
     - 7.2.2. "4 fields" for a test strip with 4 different interval times and adjust the speed to 0,7 or 0,2 m/s.
     - 7.2.3. "10 fields" for a test strip with 10 different interval times and the pre set speed to 0,2 m/s.
8. For GST 3H only:
   - 8.1. Select the menu "Colour/density" in the display.
   - 8.2. Adjust the printing force to 1000N.
     NOTE: For adjusting the printing force, it is necessary to switch the "Fixed menus" in the "Options"-menu to OFF.
   - 8.3. Adjust the printing speed to 0,7 m/s.
     NOTE: For adjusting the printing speed, it is necessary to switch the "Fixed menus" in the "Options"-menu to OFF.
9. Fill the ink pipette with the set off ink.

Materials / Testing conditions		
1	IGT AIC2-5T2000	710.000.000
	or IGT Global Standard Tester 2	412.000.000
	or IGT Global Standard Tester 3H	467.000.000
	IGT High Speed Inking Unit 4	466.000.710
	or IGT inking unit AE FOUR	465.000.710
2	Top roller with 4 segments for conventional inks	466.003.003
3	IGT ink pipette, resolution 0,01 ml	408.000.200
4	Printing disc, aluminum, 50 mm (2x)	402.331
5	Packing, paper, 55 mm	404.001.005
6	IGT set off ink	404.520.068
7	Strips of reference paper, IGT code C2846, 55 mm	404.009.029
Strips of paper to be tested, preferable 55*340 mm², 3 strips per sample		
Densitometer (if required)		
Stopwatch (if required)		
Lint free rags and cleaning naphtha		
Printing- and set off force		1000 N
Printing and set off speed		Constant, 0,7 m/s (W48) or 0,2 m/s (W78)
Time between printing and set off		at choice
Ink film thickness (volume)		4,0 µm (0,17 cm³)
► The numbers 1 thru 7 are available at IGT Testing Systems.		

10. For High Speed Inking Unit 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
11. For inking unit AE FOUR only: see manual or 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 a piece of tape.
2. Mount a strip of the set off paper on a clean printing disc with a piece of tape at the beginning and the end of the strip.
3. Apply 0,17 cm³ of ink to a segment of the top roller of the inking unit and distribute the ink during the preset or desired inking time.
   NOTE: 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 printing disc during the preset or desired time.
5. Take the printing disc from the inking unit and place it on the top printing disc shaft of the tester.
6. For AIC2-5T2000 only:
   - 6.1. For 1 long interval time (>10 s):
     - 6.1.1. Set the interval timer on 0 s.
     - 6.1.2. Turn the sector into starting position.
     - 6.1.3. Start the stopwatch.
     - 6.1.4. Move the printing disc into printing position against the test strip.
     - 6.1.5. At a certain time, e.g. 10 s after having started the stopwatch make a print. See W100.
     - 6.1.6. Move the printing disc out of printing position.
     - 6.1.7. Take off the printing disc from the shaft.
     - 6.1.8. Place the disc with the set off paper onto the upper printing disc shaft.
     - 6.1.9. Turn the disc into the position that the beginning of the set off paper is pointing toward the sector.
     - 6.1.10. Turn the sector into starting position.
     - 6.1.11. Move the printing disc into printing position.
     - 6.1.12. After the desired time on the stopwatch, make a print during which the ink is set off from the printed strip to the unprinted paper. See W100.

►►

6.2. For 2 interval times:
- 6.2.1. Adjust the interval time. See W100.
- 6.2.2. Turn the sector into starting position.
- 6.2.3. Place the disc with the set off paper on it on the bottom shaft.
- 6.2.4. Turn the disc with the paper into the position that the beginning of the set off paper is pointing upwards.
- 6.2.5. Move the printing discs into printing position against the test strip.
- 6.2.6. Make a print during which the paper is printed and part of ink is set off from the printed paper to the unprinted paper. See W100.

7. For GST2 only:
   7.1. For 1 long interval time (>10 s):
   - 7.1.1. Set the interval timer on 0 s.
   - 7.1.2. Start the stopwatch.
   - 7.1.3. At a certain time (e.g. 10 s) make a print. See W100.
   - 7.1.4. Take off the printing disc from the shaft.
   - 7.1.5. Place the disc with the set off paper onto the top printing disc shaft.
   - 7.1.6. Turn the disc into the position that the beginning of the set off paper is pointing toward the sector.
   - 7.1.7. After the desired time on the stopwatch, make a print during which the ink is set off from the printed paper to the unprinted paper. See W100.

   7.2. For 2, 4 and 10 interval times:
   - 7.2.1. Adjust the interval time.
   - 7.2.2. Place the disc with the set off paper on it on the bottom printing disc shaft.
   - 7.2.3. Turn the disc into the position that the beginning of the set off paper is pointing upwards.
   - 7.2.4. Make a print in which the paper strip is printed and part of the ink is set off from the printed paper to the unprinted paper. See W100.

     NOTE: During the waiting positions of the long interval times the side buttons can be released. Before the elapsed time is 5 s the side buttons must be pressed again to continue setting off and then the buttons can be released again during next waiting time.

8. For GST 3H only:
   8.1. For 1 long interval time (>10 s):
   - 8.1.1. Start the stopwatch.
   - 8.1.2. At a certain time (e.g. 10 s) make a print. See W100.
   - 8.1.3. Take off the printing disc from the shaft.
   - 8.1.4. Place the disc with the set off paper onto the printing disc shaft.
   - 8.1.5. Turn the disc into the position that the beginning of the set off paper is pointing toward the sector.
   - 8.1.6. After the desired time on the stopwatch, make a print during which the ink is set off from the printed paper to the unprinted paper. See W100.

9. Take off the paper strip from the sector and the set off strip from the printing disc.
10. Mark the strips with the set off times.
11. Store the strips during > 5 hours in a safe and preferably to the standard atmosphere conditioned room.
12. Measure the test result as described in the chapter “Assessment”.
13. Take the printing disc and the set off disc from the shafts and clean them with rags and naphtha and let them dry.
14. Clean the rollers of the inking unit or use the next segment for the following test.
15. Repeat points 1 thru 14 for the next test strip. It is recommended to perform the test at least three times per sample.
16. After having finished the tests clean and store all parts as described in the manuals.
17. Make an accurate record of the conditions and the results of the test and refer to the testing method:
    17.1. W48: 2 fields, 0,7 m/s.
    17.2. W78: 4 or 10 fields, 0,2 m/s.

Assessment
1. After > 5 hours after making the print measure the contrast density of the set off strips.
2. Calculate the average of the measured densities per set off time per type of paper.
3. If desired calculate spreading and/or standard deviation. Sometimes it may be useful to note the highest and lowest values as well.
4. If desired make a table or graph.

Notes:
1. The maximum storage life of the Set off ink in the original, closed packing is 1 year; in an opened packing 3 months.

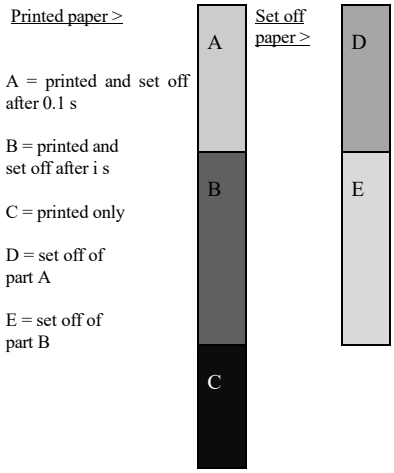

Fig. 1: Printed and set off strip (mode: 2 fields)

► *2006: In comparison to older IGT leaflets, this leaflet is valid for the AIC2-5T2000 and Global Standard Testers as mentioned.*
► *Printing disc (article number and width) and printing force have been changed.*
► *2012: This leaflet is valid for the AMSTERDAM and AE FOUR as well and contains some small text corrections.*
► *2017: The leaflet is valid for the AIC2-5T2000 and GST 2/3H only and contains some small text corrections.*