Introduction

In general it is very difficult to carry out small-scale gravure printing tests. It is difficult to keep the ink with its volatile solvents constant during a test; this is valid for water based inks as well.

For laboratory trials it is necessary to have a system that uses only little ink and paper. A good solution is the IGT AMSTERDAM with the gravure attachment. This system is very flexible. The printing parameters as printing speed, printing force, number of pre-inking the printing form, the type of printing form (screen ruling, volume) and hardness/smoothness of impression cylinder can easily be changed. The adjustments are dependent to the combination of the type of ink and its viscosity, the type of substrate and the properties of ink and/or paper which will be tested.

Printing can be carried out in two different ways:

- W67-AMS: Gravure 180°. This method is the simplest method to make a print with the AMSTERDAM. The printing form is inked one or more times at choice and directly there after the print is made. The print cannot be scanned.
- W67-AMS: Gravure 180° 402.153. The printing form 402.153 (with 11 fields of different depth) is inked one or more times at choice and directly there after the print is made. The print can be scanned two times: in the 1st scan the left side of the print and in the 2nd scan the right side of the print. Besides the printing form mentioned there are many different types with other engravings available.
- W73-AMS: Gravure 360°. The printing form is inked one or more times at choice and directly there after two prints are made after each other. Dependent on the type of ink and substrate there can be a difference in the printing quality of the two prints. These differences can give information about the quality of the ink. To perform this test an impression cylinder of 360°, covered with a photopolymer of a certain hardness must be used.

The method in this leaflet W67-AMS describes the printing procedures according to "Gravure 180°" and "Gravure 180 402.153". The printing procedures can be used to make printed strips for testing the smoothness of the paper, checking the colour of the ink and other properties of the dried ink.

Principle

The gravure attachment consists of an engraved printing form (disc), a doctoring system and an impression cylinder. Some drops of the ink are put on the printing disc, the surplus of ink is wiped off and a print is made on the substrate, which has been attached to the impression cylinder. There is a wide range of different printing forms which can be used as well. The standard printing form 402.153.412 has 11 fields of 70 l/cm (175 l/inch) and depth from 11 to 33 µm.

To choose the right printing conditions the following advices can be given:

Property	Assessment	Testing conditions
Paper smoothness	Counting number of missing dots	100 N, 1 m/s, Heliotest ink, Astralon strip on rubber packing
Colour of ink	Measuring colour	500 N 0,2 – 1 m/s, reference paper C2846, rubber packing
General remarks:		
Low viscosity ink	1 m/s	
High viscosity ink	0,2 m/s	
For testing paper	Standard ink as Heliotest ink	
For testing ink	Reference paper IGT code C2846	
Pre inking printing disc	High degree of evaporation: 0 x Medium degree of evaporation: 2 x Low degree of evaporation (e.g. heliotest ink): 5 x	

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 follow the instructions of manuals, W100 and displays accurately.
- Handle the samples carefully.

Materials / Testing conditions		
1	IGT AMSTERDAM 1/2/5/6	
2	Engraved printing disc for "Gravure 180º " or Engraved disc for "180/402.153.412"	At choice 402.153.412
3	Doctor blade holder	435.031.412
4	Doctor blades	180.431.710.001
5	Packing, rubber, 55 mm	404.001.006
6	Astralon strip, 55 mm	404.009.013
7	Heliotest ink red (if desired)	404.003.006
8	Reference paper, 55 mm, IGT code C2846 (if desired)	404.009.029
Strips of paper to be tested, preferable 55*340 mm², 3 strips per sample Gravure ink to be tested (if desired) Densitometer (if desired) Spectrophotometer (if desired) (Disposable) ink pipettes Lint free rags Velvet Ethanol, ethyl acetate or other solvent of the ink		
Printing force	100 – 500 N	
Printing speed	0,2 - 1 m/s	
Pre inking gravure disc	At choice	
Checkbox Scan	Activated if desired for "Gravure 180 402.153"	
► The numbers 1 thru 8 are available at IGT Testing Systems.		

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. Select method one of the two methods:
   3.1. **Gravure 180°**
   3.2. **Gravure 180°, 402.153**
4. For gravure 180º, 402.153 only:
   4.1. If desired, touch the checkbox **Scan** to scan and save the test strip.
   4.2. If scanning is activated remove the brush to prevent damaging of the freshly printed strip.
5. Mount the rubber packing on the sector.
   NOTE: If the paper smoothness is tested it is advised to mount the rubber packing with the Astralon strip on it.
6. Mount the doctor blade into the blade holder.
7. Place the blade holder onto the two pins of the accessory holder with the blade pointing to the right and downward.
8. Clean the gravure disc with a cotton pad with ethanol.
9. Place the gravure disc on the 1st shaft.
10. Stir the bottle with ink well.
11. Fill a (disposable) pipette with the ink.

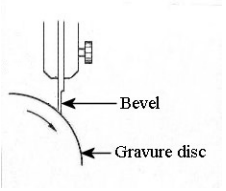

Fig. 1: doctor blade in holder

Execution

1. If desired, adjust the printing force, printing speed and number of pre-inkings.
2. Touch the button **PRINT** to rotate the printing disc shaft into a start position.
3. Mount a test strip on the sector by attaching the beginning of the test strip into the front clamp; if the printed sample will be scanned, fasten the end of the test strip on the sector with a piece of tape.
4. Press both side buttons to rotate the sector into the start position, to lower the doctor blade on the gravure disc and to rotate the disc to the 2nd start position; then release the buttons.
5. Apply a few drops of gravure ink on the printing disc just before the blade with the help of the (disposable) pipette.
6. For gravure 180°: Press both side buttons to (pre) ink the gravure disc, to make the print and to come into the end position, then release the side buttons.

►►

7. For gravure 180° 402.153:
   7.1. Press both side buttons to (pre) ink the gravure disc, to make the print, if activated to move the camera downward to make a scan of the left part and thereafter of the right part and to come into the end position; then release the side buttons.
   7.2. If the camera is activated:
      7.2.1 The test result is assessed; if finished the camera moves upward.
      7.2.2 Save or discard the results.
8. Take the sample from the tester.
9. For a next test with a very slow drying ink like Heliotest ink: start with point 3, otherwise continue with point 10.
10. Touch **BAC**K to lift the camera and doctor blade holder with blade.
11. Clean the disc, doctor blade and blade holder with rags with the right solvent for the ink used, let dry all ones and after cleaning place them on the right place on the tester.
12. Assess the print result on the desired properties as described in Assessment.
13. For a next test start with point 1 or 2. It is recommended to perform the test at least 3 times per sample.
14. After having finished the tests, touch the button **BAC**K to lift the camera and doctor blade holder with blade and clean and store all parts as described in the manuals.
15. Make an accurate record of the conditions and the results of the test and refer to:
    W67-AMS: Gravure 180°
    W67-AMS: Gravure 180°, 402.153

Assessment

1. For smoothness:
   1.1. Check the number of missing dots, if possible in comparison with a self-made scale of reference samples at the desired location of the print visually or with an imaging analyser for every test strip.
   1.2. Calculate the average and if required the standard deviation. In some cases it may be useful to mention the highest and lowest value as well.
2. For colour:
   2.1. Measure the colour with a spectrophotometer or compare visually with a (standard) sample.

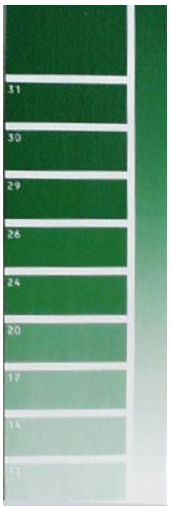

Fig. 2:
Gravure print

Notes:
No dried ink may remain in the cells of the disc. In the case there is dried ink in the cells clean the disc with velvet saturated with the solvent of the ink. Another method is to leave the disc overnight in ethyl acetate and afterwards cleaning with a velvet saturated with the solvent.