

## Introduction

There are many factors determining the final quality of the print. Among these the roughness of the rubber blanket or rather, the degree of smoothness of the blanket is one of them. In the printing process the rubber blanket has the contact with the substrate so this property is of big importance. The determination of the roughness described in this leaflet is a dynamic method, in which the printing force plays a very important role.

## Principle

On the IGT-printability tester the roughness of a standard paper is tested as described in IGT Information leaflet W28-AMS. The only difference to this method is the use of another type of testing liquid and several printing forces. In the same way the roughness of a combination of the standard paper and the rubber blanket is tested. The roughness of the paper is eliminated so the roughness of the rubber blanket is known.

Because the blankets are compressible, the test is carried out at different printing forces.

## 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 AMSTERDAM follow the instructions of the manuals, IGT information leaflet W100 and the displays accurately.
- Handle the samples carefully.

## Preparation

- Dilute the roughness solution with 25% isopropanol.
- Condition the blankets, the paper, the test liquid and the equipment during > 6 hours in the standard atmosphere.
- Cut the strips of rubber blanket in the machine direction and mark them with a code for the type of material.
- Cut the strips of reference paper which should be mounted on the printing disc to a length of 205 mm.
- Place a spot of lacquer on the side to be tested of the strips of paper of 205 mm at 60 mm from the beginning and let them dry.
- Select method **Roughness Rubber Blanket**.
- Mount the syringe into the dispenser/holder.
- Fill the syringe:
  - Insert the needle of the syringe with the plunger downwards into the test liquid and fill the syringe with the liquid by moving the plunger upward, downward and upward for several times.
  - Clean the outside of the needle with rags and ethanol.

## Execution

- Mount the strip of rubber blanket to be tested on the sector.
- Clean the blanket with lint free rags and petroleum ether and allow it to dry.  
**WARNING:** petroleum ether is very light flammable.
- Touch the button **PRINT** to rotate the 1<sup>st</sup> shaft into the start position.
- Set the printing force on the desired value: 200, 400, 600, 800 or 1000 N.  
**NOTE:** Start the tests with the lowest value.
- Test the roughness of the reference paper C2846 following the instructions of W28 with the following remarks:
  - The test liquid is the IGT roughness solution with 25% isopropanol.
  - The printing force is the set force of point 4 (200, 400, 600, 800 and 1000 N).
  - The packing is the rubber blanket to be tested.
- If the camera is activated, the test strip is assessed; if finished the camera moves upward.
- Test the roughness of the blanket:
  - Mount a reference paper strip C2846 of 205 mm on the printing disc with the side to be tested facing outward. The beginning of the strip must be at the location of the disc closest to the pin. To mount use a small piece of tape at the beginning and the end of the paper strip.
  - Place the printing disc on the 1<sup>st</sup> printing disc shaft.
  - Apply 1 mm<sup>3</sup> of the test solution on the lacquered spot of the paper by means of the micro syringe.
  - Press both side buttons to make a "print" during which the drop of testing liquid is spread into a spot between the paper strip and the rubber blanket, to move the camera downward to make a scan and to come into the end position; then release the side buttons.
- If the camera is activated:
  - The test strip is assessed; if finished the camera moves upward.
  - Save or discard the results.
- Take the paper sample from the disc.
- Calculate the roughness of the blanket as described in "Assessment".

## Materials / Testing conditions

|   |   |  |
|---|---|--|
| 1   | IGT AMSTERDAM 1/2/5/6                               |  |
| 2   | Micro syringe type 705N 50 mm <sup>3</sup>          | 409.010.705.414                                |
| 3   | Dispenser BP.600/1                                  | 409.006  |
| 4   | Printing disc, aluminum, 50 mm,                     | 402.331.720                                    |
| 5   | IGT roughness solution                              | 409.004.000                                    |
| 6   | Lacquer   | 409.005.000                                    |
| 7   | Nomogram  | 409.007  |
|   | Strips of reference paper, IGT code C2846,<br>50 mm | 404.009.029                                    |
| Strips of blankets to be tested, 55 * 340 mm <sup>2</sup> , 3 strips per sample |   |  |
| Ruler   |   |  |
| Isopropanol   |   |  |
| Lint free rags  |   |  |
| Petroleum ether   |   |  |
| Printing force  |   | 200, 400, 600, 800 and 1000 N                  |
| Printing speed  |   | Increasing, end speed 3 m/s                    |
| Quantity of test liquid   |   | 1 mm <sup>3</sup>                              |
| Test liquid   |   | IGT roughness solution with<br>25% isopropanol |
| ► The numbers 1 thru 7 are available at IGT Testing Systems.                    |   |  |

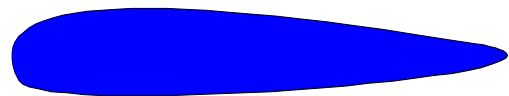


Fig. 1: Test result

- If necessary stretch the blanket on the sector again.
- For the next test: repeat the points 6 thru 11. It is recommended to perform the test at least 2 times per printing force.
- For the next desired printing force for the same strip of rubber blanket: repeat the points 4 thru 12.
- Take off the strip of rubber blanket from the sector.
- For the next strip of rubber blanket: repeat the points 1 thru 14. It is recommended to perform the test at least 3 times per type of sample.
- After having finished the test clean and store all parts as described in the manual.
- Make an accurate record of the conditions and the results of the test and refer to W62-AMS.

## Assessment

- If the camera is activated: the roughness of the combination of rubber blanket and reference paper is assessed as mm<sup>2</sup> of liquid per ½ m<sup>2</sup> of paper C2846 + ½ m<sup>2</sup> of rubber blanket; subtract this value with ½ the roughness of the reference paper and multiply with 2.
- Camera not activated:
  - Roughness of paper (R<sub>P</sub>).** Calculate the roughness of the paper (R<sub>P</sub>) for every printing force and for every type of rubber blanket as described in IGT Information leaflet W28.
  - Roughness of rubber blanket (R<sub>R</sub>).** Calculate the roughness of the rubber blanket (R<sub>R</sub>) for every printing force:
    - Measure the length (l) of the stain on the paper strip to the nearest 0,5 mm.
    - Measure the width (b) in the centre of the length of the stain of the paper strip to the nearest 0,5 mm.
    - Find the corresponding positions (l) and (b) in the nomogram and connect the two points with a straight line. The intersection with the R-axis gives the roughness as (1/2 R<sub>P</sub> + 1/2 R<sub>R</sub>) in 0,01 cm<sup>3</sup>/m<sup>2</sup> for the drop volume of 1 mm<sup>3</sup>. (R<sub>P</sub> = roughness of paper and R<sub>R</sub> = roughness of rubber blanket).
    - Multiply the value of the R-axis with the number of mm<sup>3</sup> of the drop volume used and divide this value by 100. The dimension is cm<sup>3</sup>/m<sup>2</sup> for only (1/2 R<sub>P</sub> + 1/2 R<sub>R</sub>).
    - Multiply this value with 2 to find the roughness as R<sub>P</sub> + R<sub>R</sub>.
    - Subtract this value (R<sub>P</sub> + R<sub>R</sub>) with the value of the paper R<sub>P</sub> of the corresponding test to have the roughness of the rubber blanket (R<sub>R</sub>).
- Repeat the point 1 or 2 for every printing force and type of rubber blanket and calculate the average of every test. In some cases it may be useful to mention the highest and lowest values as well.

**Notes:**

1. Example of calculation for the use of nomogram.

- Roughness of paper ( $R_p$ ):

Assume the paper is tested (with the volume of  $1 \text{ mm}^3$ ) and the resulting stain has a length ( $l$ ) = 70 mm, and a width, measured in the middle of the length, ( $b$ ) = 13 mm. From the nomogram the value for 100 R at  $1 \text{ mm}^3 = 65$  is found. The roughness of the paper is:

$$R_p = 65:100 = 0,65 \text{ cm}^3/\text{m}^2.$$

- Roughness of rubber blanket ( $R_R$ ):

Assume the paper and rubber blanket are tested with a volume of  $3 \text{ mm}^3$  and the resulting stain has a length ( $l$ ) = 70 mm, and a width, measured in the middle of the length ( $b$ ) = 13 mm.

From the nomogram the value for 100 R at  $1 \text{ mm}^3 = 65$  is found.

The  $\frac{1}{2}$  roughness of the paper and blanket is:  $\frac{1}{2} (R_p + R_r) = 65 : 100 = 0,65 \text{ cm}^3/\text{m}^2$  for only  $1 \text{ mm}^3$ . This value must be multiplied by 3 (volume was  $3 \text{ mm}^3$ ) to find the  $\frac{1}{2}$  roughness  $\frac{1}{2} (R_p + R_r)$  and with 2 to find the roughness ( $R_p + R_r$ ).

$$\text{So: } (R_p + R_r) = 0,65 * 3 * 2 = 3,9 \text{ cm}^3/\text{m}^2.$$

$$\text{The roughness } R_R = 3,9 - 0,65 = 3,25 \text{ cm}^3/\text{m}^2.$$

2. The area of the stain may be approximated using the formula:

$$A = 0,85 * l * b$$

Herein is: A = area of the stain

l = length of the stain, b = width of the stain

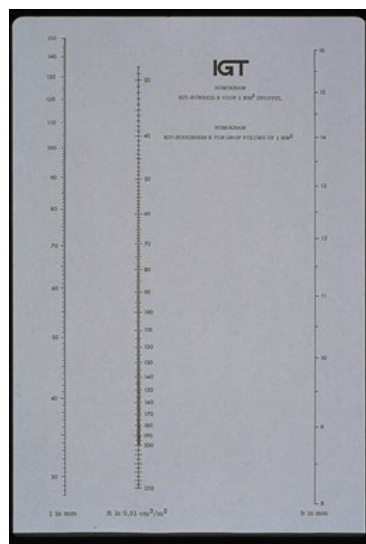
The roughness is calculated with the formula:

$$(R_p + R_R) = 2(V \times 1000) : A$$

Herein is:

V = volume in  $\text{mm}^3$  of trypan blue used

A = area in  $\text{mm}^2$  of stain



Length  
mm

Roughness  
0,01  $\text{cm}^3/\text{m}^2$

Width  
mm

Fig.2: Nomogram