

## 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. 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 ( $73.4 \pm 1.8$  °F) and  $50 \pm 2\%$  rh.
- For the operation of the AIC2-5T2000 and Global Standard Tester follow the instructions of the manual, IGT information leaflets W28 and W100 and the display accurately.
- Handle the samples carefully.

## Preparation

1. Dilute the trypan blue solution with 25% isopropanol.
2. Condition the blankets, the paper, the test liquid and the equipment during > 6 hours in the standard atmosphere.
3. Cut the blanket strips (preferable 55 x 340 mm), 2 strips per type of rubber blanket in the machine direction and mark them with a code for the type of material. Also cut one extra strip of a rubber blanket for trials in the preparation.
4. Mount the extra rubber blanket strip on the sector. See W100.
5. Be sure the printing disc has the right diameter: 66.5 mm -/ thickness of blanket = xxx mm.
6. For AIC2-5T2000 only:
  - 6.1 Adjust the printing force of the upper printing disc shaft to 500 N and pay attention for the right backlash. See W100.
  - 6.2 Adjust the desired printing speed to 3 m/s in the increasing speed mode. (▲).
  - 6.3 Mount the syringe into the dispenser.
    - 6.3.1 Insert the needle of the syringe with the plunger downwards into the trypan blue solution and fill the syringe with the liquid by moving the plunger upwards, downwards and upwards for several times until no air is in the syringe; clean the needle with rags and ethanol.
7. For GST 1/1W only:
  - 7.1 Select the menu "Roughness blankets" in the display.
  - 7.2 Mount the roughness set:
    - 7.2.1 Move the mounting ring with the ring opening horizontal on the pin of the mounting plate.
    - 7.2.2 Place the syringe in the holder of the dispenser and fasten the plunger with the screw in the dispenser.
    - 7.2.3 Insert the needle of the syringe with the plunger downwards into the trypan blue solution and fill the syringe with the liquid by moving the plunger upwards, downwards and upwards for several times until no air is in the syringe; clean the needle with rags and ethanol.
    - 7.2.4 Place the dispenser with the syringe in the mounting ring and fasten it with the screw.
    - 7.2.5 Fix the white tube connection of the other side of the tube at the white dose air connection of the instrument by rotating.
8. Take off the blanket strip from the sector.
9. Check the functioning of the tester following the instructions in the chapter "Execution".

## Materials / testing conditions

1	IGT AIC2-5T2000 or IGT Global Standard Tester 1 or IGT Global Standard Tester 1-W *****	710.000.000 410.000.000 415.000.000
<u>For AIC2-5T2000 only:</u>		
2	Syringe 705N +	409.010.705.41
3	Dispenser BP.600/1 OR	409.006
4	Syringe 701N	
5	Printing disc, aluminium, 50 mm, ø xxx mm	409.010.701.41
6	Water with 1% trypan blue	4
7	Lacquer	402.120.xxx
8	Nomogram	409.004.000
9	Art paper, APCO II/II, IGT code Ka, 50 mm *****	409.005.000 409.007 404.009.025
<u>For GST 1/1W only:</u>		
10	Adaptor for micro syringe	
11	Micro syringe 705N 50 mm <sup>3</sup>	
12	Printing disc, aluminium, 50 mm, ø xxx mm	409.041
13	Water with 1% trypan blue	409.010.705.41
14	Lacquer	0
15	Nomogram	402.120.xxx
16	Art paper, APCO II/II, IGT code Ka, 50 mm *****	409.004.000 409.005.000
17	Strips of blankets to be tested, 55 x 340 mm, 3 strips per sample	409.007 404.009.025
18	Ruler	
19	Isopropanol	
20	Lint free rags	
21	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		Water with 1% trypan blue and 25% isopropanol
xxx = diameter of printing disc between 55.0 and 65.0 mm; the outer diameter after mounting the blanket must be 66 mm.		
▶ The numbers 1 thru 16 are available at IGT Testing Systems.		
▶ The numbers 2,3 and 5 thru 9 can be obtained as Roughness Set for AIC2-5T2000, article number 409.001.705.710.		
▶ The numbers 4 thru 9 can be obtained as Roughness Set for AIC2-5T2000, article number 409.001.701.710.		
▶ The numbers 10 thru 16 can be obtained as Roughness Set for Global Standard Tester 1/1W, article number 409.001.705.410.		
• This leaflet contains article numbers per January 1st, 2006 •		

## Execution

1. Place the printing disc on the printing disc shaft.
2. Mount a blanket strip on the sector. See W100.
3. Clean the blanket with lint free rags and petroleum ether and allow it to dry. NOTE: petroleum ether is very light flammable.
4. Set the printing force on the desired value: 200, 400, 600, 800 or 1000 N. NOTE: Start the tests with the lowest value.
5. Test the roughness of the paper Ka following the instructions of W28 with the following remarks:

- the testing liquid is the trypan blue solution with 25% isopropanol
- the printing force is the set force of point 4
- the packing is the rubber blanket to be tested



Fig. 1: Roughness set on

6. Test the roughness of the blanket:
  - 6.1 Attach one paper strip Ka with the testing side (printed side) facing to the blanket into the front clamp of the sector and move the paper strip over the printing disc.
  - 6.2 For AIC2-5T2000 only:
    - 6.2.1 Move the printing disc into printing position against the test strips .
    - 6.2.2 Apply a spot of lacquer with the brush onto the strip of paper on the printing disc at the place where the drop of test liquid will fall and allow the lacquer to dry. (This place will be at a distance of 100 - 105 mm from the beginning in the middle of the strip).
    - 6.2.3 Apply 1 to 6 mm<sup>3</sup> trypan blue solution on the lacquered spot by means of the micro syringe (see fig.1).
  - 6.3 For GST only:
    - 6.3.1 Select "Make print" in the display.
    - 6.3.2 Press the side buttons to move the sector into the starting position, to move the printing disc into printing position and to move the syringe downwards. After these movements release the side buttons.
    - 6.3.3 Press the button "Enter" to move the syringe upwards. Also the printing disc will release from the paper.
    - 6.3.4 Apply a spot of lacquer with the brush onto the strip of paper on the printing disc at the place where the drop of test liquid will fall on the paper and allow the lacquer to dry. (This place will be at a distance of 100 - 105 mm from the beginning in the middle of the strip).
    - 6.3.5 Select "Make print" in the display.
    - 6.3.6 Press the side buttons to move the printing disc into the printing position and to move the syringe downwards.
    - 6.3.7 Release the side buttons.
    - 6.3.8 Press button 1, 2, 3 or 4 to apply a drop of the test liquid of 1, 2, 3 or 4 mm<sup>3</sup> on the spot of lacquer of the paper strip. These buttons can be pressed more than once for bigger volumes. It is advised not to use more than 6 mm<sup>3</sup>.

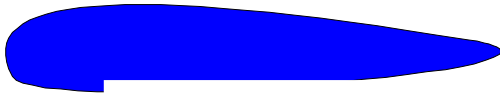


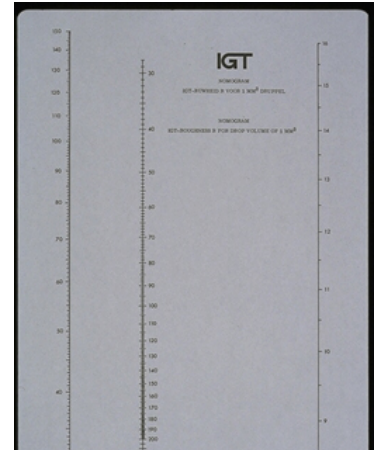
Fig. 2: test result

7. Make a "print".
8. Remove the test strips from the sector.
9. Calculate the roughness of the blanket as described in the chapter "Assessment".
10. Stretch the blanket on the sector again with a stretching force of 40 Nm.
11. Repeat the points 6 thru 10. It is recommended to perform the test at least 2 times per printing force.
12. Repeat the points 4 thru 11 for the next desired printing force (400, 600, 800 or 1000N) for the same strip of rubber blanket.
13. Take off the strip of rubber blanket from the sector.
14. Repeat the points 1 thru 12 for the next strip of rubber blanket. It is recommended to perform the test at least 3 times per sample.
15. After having finished the test clean and store all parts as described in the manual.
16. Make an accurate record of the conditions and the results of the test.

**Assessment**

1. Roughness of paper
  - 1.1 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.
2. Roughness of rubber blanket
  - Calculate the roughness of the rubber blanket (R<sub>R</sub>) for every printing force:
    - 2.1. Measure the length (l) of the stain on the paper strip to the

- nearest 0.5 mm.
- 2.2. Measure the width (b) in the centre of the length of the stain of the paper strip to the nearest 0.5 mm.
- 2.3. 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).
- 2.4. 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>).
- 2.5. Multiply this value with 2 to find the roughness as R<sub>p</sub> + R<sub>r</sub>.
- 2.6. 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>).
- 2.7. Repeat the points 2.1 thru 2.6 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.



Length mm      Roughness 0.01 cm<sup>3</sup>/m<sup>2</sup>      Width mm

Fig.3 : Nomogram

**Notes**

1. The test results of the AIC2-5T2000, AIC2-5 and GST1/1W compare well with one another, on the condition that they have been carried out under the same conditions.
2. Example of calculation for the use of nomogram.
  - 2.1 Roughness of paper:  
Assume the paper is tested (with the volume of 1 mm<sup>3</sup>) 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 mm<sup>3</sup> = 65 is found. The roughness of the paper is: R<sub>p</sub> = 65:100 = 0.65 cm<sup>3</sup>/m<sup>2</sup>.
  - 2.2 Roughness of rubber blanket:  
Assume the paper and rubber blanket are tested with a volume of 3 mm<sup>3</sup> 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 mm<sup>3</sup> = 65 is found. The 1/2 roughness of the paper and blanket is: 1/2 (R<sub>p</sub> + R<sub>r</sub>) = 65 : 100 = 0.65 cm<sup>3</sup>/m<sup>2</sup> for only 1 mm<sup>3</sup>. This value must be multiplied by 3 (volume was 3 mm<sup>3</sup>) to find the 1/2 roughness 1/2 (R<sub>p</sub> + R<sub>r</sub>) and with 2 to find the roughness (R<sub>p</sub> + R<sub>r</sub>).  
So: (R<sub>p</sub> + R<sub>r</sub>) = 0.65 \* 3 \* 2 = 3.9 cm<sup>3</sup>/m<sup>2</sup>.  
The roughness R<sub>r</sub> = 3.9 - 0.65 = 3.25 cm<sup>3</sup>/m<sup>2</sup>.
3. 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:  
 $(R_p + R_r) = 2(V * 1000) : A$   
Herein is:  
                            V = volume in mm<sup>3</sup> of trypan blue used  
                            A = area in mm<sup>2</sup> of stain

► 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.