

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. Good solutions are the IGT AIC2-5T2000 and Global Standard Testers 2 and 3H with the gravure attachment. These systems are very flexible. The printing parameters as printing speed, printing force, 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:

- **Method "gravure 180°".** In this method the printing form is inked only one time and directly after inking the print is made. This method is described in IGT information leaflet W67 for AIC2-5T2000 and GST 2/3H.
- **Method "gravure 360°".** In this method the printing form is inked twice and directly after each inking a print is made, so 2 prints are made after each other. In the second print of this method the cells are filled in a more optimal way so that there can be a difference between the first and second print. This method is described in IGT information leaflet W73 for Global Standard Tester 2 and 3H.

The method in this leaflet W67 describes the printing procedure according to "gravure 180°".

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. The standard printing form has 11 fields of 70 l/cm (175 l/inch) and depth from 11 to 33 µm. Other engravings are available.

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

Property	Assessment	Testing conditions
Smoothness of paper	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; paper Ka Rubber packing
General remarks:		
Low viscosity ink	1 m/s	
High viscosity ink	0.2 m/s	
Testing paper	Standard ink as Heliotest ink	
Testing ink	Standard paper as APCOII/II (IGT code Ka)	

Method of operation:

- It is recommended to execute the test in the standard atmosphere; to most standards it is 23.0 ± 1.0 °C (73.4 ± 1.8 °F) and 50 ± 2% rh.
- For the operation of the AIC2-5T2000 and Global Standard Tester follow the instructions of the manual, IGT information leaflet W100 and the display 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 (preferable 55 x 340 mm, 3 strips per sample) and mark them with top and/or bottom side, machine and/or cross direction and a code for the type of paper
3. For AIC2-5T2000 only:

Materials / testing conditions		
1	IGT AIC2-5T2000 or IGT Global Standard Tester 2 or IGT Global Standard Tester 3H *****	710.000.000 412.000.000 467.000.000
For AIC2-5T2000:		
2	Engraved printing disc	402.153.710*)
3	Mounting shaft	435.054.710
4	Doctor blade holder	450.054.710
5	Doctor blade	180.431.710.001
6	Packing, rubber, 55 mm	404.001.006
7	Astralon strip, 55 mm *****	404.009.013
For GST:		
8	Engraved printing disc	402.153.412*)
9	Cartridge empty	160.200
10	Hoses and coupling	160.300
11	Doctor blade holder	453.031.412
12	Doctor blade	180.431.710.001
13	Packing, rubber, 55 mm	404.001.006
14	Astralon strip, 55 mm	404.009.013
15	Sector with clamps (for GST 2) *****	361.000.000
16	Heliotest ink red (if desired)	404.003.006
17	DOMAS Analysing system (if desired)	520.300
18	Strips of paper to be tested, preferable 55 x 340 mm, 3 strips per sample	
19	Missing dot scale (if desired)	
20	Gravure ink (if desired)	
21	(Disposable) ink pipettes	
22	Lint free rags	
23	Velvet	
23	Ethanol, ethyl acetate or other solvent of the ink	
Printing force		100 - 500 N
Printing speed		0.2 - 1 m/s
► The numbers 1 thru 17 are available at IGT Testing Systems. ► The numbers 2 thru 7 can be obtained as Gravure Set for AIC2-5T2000, article number 402.153.710. ► The numbers 8 thru 14 can be obtained as Gravure Set 180° for GST 2/3H, article number 431.000.412. ► <i>This leaflet contains article numbers per January 1st, 2006</i> ◀.		
*) Other printing discs are available.		

- 3.1 Mount the rubber packing, if desired with the Astralon strip on it, on the sector. See W100.
- 3.2 Adjust the printing force of the upper printing disc shaft to the desired value and pay attention for the right backlash. See W100.
- 3.3 Adjust the printing speed to the desired value in the constant speed mode (□).
- 3.4 Place the adapting device (mounting shaft) with the thick shaft into the top accessory hole of the tester in such a way that the flat side in this shaft is pointing to the left.
- 3.5 Fasten the device with the screw at the left hand side of the tester.
- 3.6 Mount a doctor blade in the doctor blade holder. See W100.

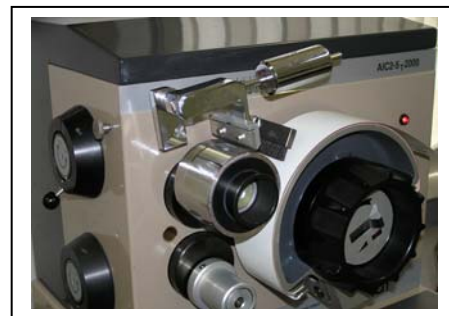


Fig. 1: Gravure accessory of AIC2-5T2000

- 3.7 Remove the screw from the adapting device.
 - 3.8 Slide the blade holder device with the blade downward and the weight pointing to the right on the adapting device, turn it anticlockwise until stop and replace the screw in the adapting device to prevent sliding off the blade holder device from the shaft.
 - 3.9 Shake the bottle or tin with ink well.
 - 3.10 Fill a (disposable) pipette.
4. For GST only:
- 4.1 If not present on the tester, mount the sector with clamps. See W100.
 - 4.2 Mount the rubber packing, if desired with the Astralon strip on it, on the sector. See W100.
 - 4.3 Select the menu "Gravure 180°" in the display.
 - 4.4 Adjust the printing force of the (upper) printing disc shaft to the desired value.
 - 4.5 Adjust the printing speed to the desired value.
 - 4.6 Shake the bottle or tin with ink well
 - 4.7 For continuous working:
 - 4.7.1 Fill the cartridge with ink (see W100).
 - 4.7.2 Mount the cartridge with ink on the Global Standard Tester (see W100).
 - 4.8 For some tests only: fill a (disposable) pipette.
 - 4.9 Mount the doctor blade in the doctor blade holder. See W100
 - 4.10 Slide the doctor blade holder with the blade downward and pointing to the right on the two pins of the mounting plate.



Fig. 2: Gravure accessory of GST

Execution:

1. Attach a test strip on the sector.
2. For AIC2-5T2000 only:
 - 2.1. Turn the sector into starting position.
 - 2.2. Rotate the disc clockwise into the position that the blade rests on the disc at the beginning of the design of the disc.
 - 2.3. Move the gravure disc into printing position against the test strip.
 - 2.4. Apply some drops of the ink into the nip of the blade on the disc.
 - 2.5. Make a print. See W100.
 - 2.6. Move the blade holder anti clockwise until stop.
3. For GST 2/3H only:
 - 3.1. Select "Make print" in the display.
 - 3.2. Press the side buttons to move the sector into the starting position, the doctor blade holder downward and the printing disc into starting position.
 - 3.3. For continuous working by the use of a cartridge: press one of the buttons 1 – 4 to apply a few drops of ink on the printing disc.

- 3.4. For some prints only by use of ink pipette: apply some drops of ink on the printing disc with a (disposable) pipette.
 - 3.5. Press the side buttons to distribute the ink on the printing disc and to make a print.
 - 3.6. Press "Enter" to lift the doctor blade from the printing disc.
4. Take off the printing disc from the shaft and clean it directly with velvet with ethanol.
 5. Place the printing disc back on the (top) printing disc shaft.
 6. Clean the doctor blade with rags and ethanol.
 7. Remove the test strip from the sector.
 8. Measure the test result as described in the chapter "Assessment".
 9. Repeat the points 1 through 9 for every strip. It is recommended to execute the test at least three times per combination of ink and substrate.
 10. After having finished the tests clean and store all parts as described in the manual.
 11. Make an accurate record of the conditions and the results of the test.

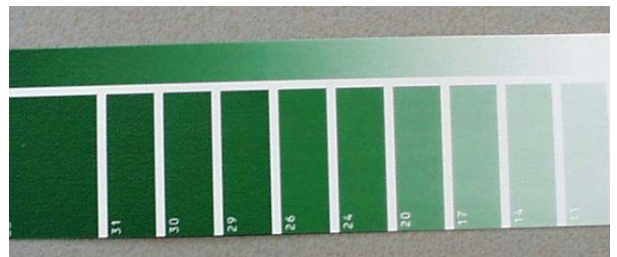


Fig. 3: gravure print

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 (DOMAS system) 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 sample.

Notes:

1. The test results of the AIC2-5T2000, AIC2-5 and Global Standard Testers 2 and 3H compare well with one another on the condition that the tests have been carried out under the same testing conditions. However, the test is very sensitive for very small variations in the equipment, printing discs and doctor blades.
2. 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.

► *In comparison to older IGT leaflets, this leaflet describes gravure printing for several tests.*

► *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.