



Paper and board

Test printing

using an IGT-type printability tester

0 Introduction

This SCAN-test Method describes the procedure to be adopted when using an IGT-type printability tester to prepare prints on papers and boards with the exception of newsprint which is dealt with separately in SCAN-P 87. A parallel method (SCAN-P 78) describes the procedure to be adopted when a Prüfbau-type printability tester is used.

Test prints prepared in accordance with SCAN-P 86 can be evaluated according to SCAN-P 36.

1 Scope

This Method specifies a procedure for test printing using an IGT-type printability tester. It is applicable to all types of paper and boards (with the exception of newsprint).

Warning – Care must be taken when making a comparison between printing results from different laboratories or from different printability testers, see Clause 10 *Precision*.

2 References

- ISO 187 Paper, board and pulps – Standard atmosphere for conditioning and testing and procedure for monitoring the atmosphere and conditioning of samples (EN 20187)
- SCAN-P 9 Papers and boards – Identification of machine and cross directions
- SCAN-P 10 Papers and boards – Identification of wire side
- SCAN-P 36 Paper and board – Evaluation of test prints

Note – SCAN-test has withdrawn a number of test methods and refers instead to the corresponding ISO and/or EN Standards.

3 Definitions

For the purpose of this Method the following definitions apply:

3.1 *Print density, D* – The logarithm to base 10 of the ratio of the Y-value of the unprinted paper to the luminous reflectance factor of the print when it is placed over an opaque pad of the unprinted paper.

3.2 *Set off, SO* – The logarithm to base 10 of the ratio of the Y-value of the recipient surface to the luminous reflectance factor of the area stained by ink transfer when the stained paper is placed over an opaque pad of the recipient paper.

Note 1 – Set-off is a measure of the tendency for ink from a newly printed surface to be transferred to another surface (recipient surface) with which the test print is brought into contact under the action of a normal force without shear.

Note 2 – The recipient paper may be a standard paper or a sheet of the paper being tested.

Other print quality definitions are given in SCAN-P 36.

4 Principle

A cylindrical printing form consisting of a disc covered with plastic-coated rubber is inked in an inking unit. The paper or board to be printed is mounted on a cylindrical sector. Printing takes place under standardised conditions. The amount of ink transferred to the paper is calculated by weighing the printing disc before and after printing.

If set-off is to be determined, the fresh print is brought into contact with a clean recipient paper in a second printing nip under normal pressure without shear a short time after the printing.

5 Apparatus

5.1 *Printability tester* consisting of a printing unit with two adjustable printing nips.

5.1.1 *Printing unit* incorporating a motor-driven sector which rotates with constant and adjustable speed against a printing disc and, when measuring set-off, also against a second disc. The force between the printing disc and the sector is achieved by means of an adjustable spring. It is also possible to adjust the delay time used for set-off purposes.

Note 1 – It is important that the instrument is properly calibrated. Accessories for speed and force calibration are supplied by the manufacturer of the apparatus.

5.1.2 *Cylindrical printing discs* of aluminium, 68 mm in diameter and 32 mm or 50 mm wide, covered with plastic-coated (to avoid absorption of ink vehicle) rubber having a hardness of 85° Shore A. The width of the disc must match that of the sector. The disc must be light enough to be weighed on an analytical balance with a precision of 0,1 mg.

Note 2 – The rubber deteriorates with use and time, and the discs should therefore be kept in the dark at room temperature.

5.2 *Inking unit* to give a uniform ink film on the printing disc.

5.3 *Analytical balance* with an accuracy of at least 0,1 mg.

5.4 *Inking pipette*, or other suitable device for transferring an appropriate amount of ink to the inking device.

5.5 *Printing ink*. A black lithographic offset ink of a grade chosen by agreement between parties concerned or according to current laboratory practice.

Note 3 – The continuing development in ink technology means that it is impossible to standardise a single ink for use over a long period of time.

5.6 *Solvent for cleaning purposes*. Petroleum ether alone or white spirit followed by petroleum ether is suitable.

Note 4 – Cleaning liquids containing surfactants or non-volatile components should not be used.

5.7 *Set-off paper*, either a cast-coated paper or a further supply of the paper to be tested.

Note 5 – A suitable cast-coated "Chromolux" paper is manufactured by Zanders and is available through their agents.

6 Sampling and preparation of test pieces

The sampling procedure is not covered by this Method. Make sure that the test pieces taken are representative of the sample received.

Condition the samples as indicated in ISO 187 and keep them in the conditioned atmosphere throughout the test.

Note 1 – Because the viscosity of the ink is temperature-dependent, temperature control is as important for this test as humidity control.

Cut the test pieces to the dimensions suitable for the printability tester. Normally, the test pieces should be cut in the machine direction (see SCAN-P 9) to simulate web offset printing and in the cross direction to simulate sheet-fed offset. The direction of printing must be stated in the report. The pieces should be free from folds and wrinkles. Mark the side to be printed.

Note 2 – For subsequent evaluation according to SCAN-P 36, at least five pieces are required.

7 Procedure

7.1 Test conditions

7.1.1 *Temperature*. If the equipment has an internal temperature controller, make sure that the testing equipment, inking unit and printing disc and the test material are maintained at the correct temperature ($23 \pm 0,5$ °C).

7.1.2 *Printing disc*. Select a disc (5.1.2) having a width matching the width of the sector. If set-off is to be measured, use the same kind of discs as in printing.

7.1.3 *Inking the printing disc.* Introduce ink into the inking unit and ink the printing disc in accordance with the manufacturer's instructions.

7.1.4 *Printing pressure.* Set the printing force to 650 N for the 50 mm wide printing disc and to 415 N for the 32 mm wide printing disc to give a line load of (13 ± 1) kN/m. If set-off is to be measured, use the same line load in the second printing nip.

7.1.5 *Printing speed.* Adjust the printing speed to 1,0 m/s.

Note 1 – If there is a risk that picking will occur, a lower speed, e.g. 0,5 m/s, may be chosen. This must be stated in the report.

Note 2 – Another method can also be used to avoid picking: Attach a piece of plastic tape to the areas on the paper where the cylinder stops against the printing disc during printing, because in those places the risk of picking is the greatest. This must be stated in the report.

7.1.6 *Delay time.* If set-off is to be measured, adjust the delay time to a suitable level to provide meaningful data for the paper and ink concerned.

Note 3 – Different times may be necessary for different materials.

Note 4 – When using the printing speed of 1,0 m/s, two delay times for set-off can be used:

- 1) immediately following the printing (approx. 0,06 s),
- 2) the chosen delay time.

7.2 Test procedure

7.2.1 *Printing.* Fasten the front end of the test piece to the sector. Adjust the test piece so that it is flat on the sector and fasten the other end of the test piece. Weigh the inked printing disc and place it in position on the shaft. Bring the printing disc into contact with the sector and print the test piece. Remove the printing disc and weigh it immediately. Save the printed test piece for optical measurement as described in SCAN-P 36 (24 ± 2) h later.

Print a total of 5 test pieces with 5 different ink quantities. Print first with the lowest ink quantity and increase stepwise so that new ink is continually applied to the inking unit. Clean the printing disc after each printing. Clean the inking unit after each test series, i.e. after about 5 printings.

Note 5 – After cleaning the printing disc with solvent, wipe the surface dry and give the solvent sufficient time to evaporate.

Choose 5 ink quantities to cover a range of ink on paper from 0,7 g/m² to at least 2,0 g/m². The print properties are evaluated by determining the print density at a weight per unit area of 1,00 g/m² and 1,50 g/m² as described in SCAN-P 36.

7.2.2 *Set-off.* If set-off is to be measured, fasten a strip of set-off paper on the second printing disc and mount the disc to the second shaft. After ink transfer, press the print against the set-off paper after the chosen delay time. If the set-off paper is the same as that being tested, place it so that set-off takes place onto the reverse side. Save the strips for later measurement according to SCAN-P 36.

8 Calculation

Calculate the mass per unit area of ink transferred to each test piece according to:

$$W = \frac{(G_1 - G_2)}{A} \quad [1]$$

where

- W is the ink transferred, in grams per square metre;
 G_1 is the mass of the printing disc before printing, in grams to the nearest 0,1 gram;
 G_2 is the mass of the printing disc after printing, in grams to the nearest 0,1 gram;
 A is the area of the print, in square metre.

Note – The area of the print is normally considered to be the same as the surface area of the printing disc.

9 Report

The test report shall include reference to this SCAN-test Method and the following particulars:

- (a) time and place of testing;
- (b) identification of the test material, including the side and the direction of printing;
- (c) make and type of printing press;
- (d) type and name of printing ink used including the manufacturer, the date of manufacture and the batch number;
- (e) the amount of ink per unit area transferred to each test piece, to the nearest 0,01 g/m²;
- (f) the type and grammage of the set-off paper used;
- (g) the delay time before set-off;
- (h) for each test piece, the time at which the printing was made;
- (i) any departure from the procedure described in this Method and any other circumstances that may have affected the result.

10 Precision

Although this SCAN-test Method is concerned only with the transfer of ink under standardised conditions, in order to prepare test prints, the question of precision is essentially related not only to the precision with which the prints are prepared but also to the precision of the assessment of e.g. print density when these prints are evaluated. The data presented here combine both these aspects.

10.1 Repeatability

Results from repeated printings and measurements under normal laboratory conditions using test pieces from the same gross sample are shown in *Table 1*. The samples were printed with the same machine within a time period of 1½ months. Measurements were made in accordance with SCAN-P 36.

10.2 Reproducibility

Depending on the ink used and on the condition of the machines and materials, the results may vary and cannot be compared between laboratories.

Table 1. An example of print and set-off density and the coefficient of variation for repeated measurements. All measurements were made with a reflectometer. Tollenaar-Ernst equation was used for print density curve fitting and a second order equation for curve fitting for set-off density. The paper used was a coated woodfree paper and the ink was a commercially available printing ink.

Amount of ink on paper	Print density, <i>D</i>	CV, %	Set-off (0,06 s) density, <i>SO</i>	CV, %	Set-off (10 s) density, <i>SO</i>	CV, %
1,0 g/m ²	1,60	1,2	0,88	3,2	0,32	7,2
1,5 g/m ²	1,82	0,8	1,25	1,3	0,62	3,4

CV =coefficient of variation, i.e. the standard deviation × 100 divided by the mean.