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Graphic technology — Laboratory preparation of test prints —

Part 2: Liquid printing inks

Technologie graphique — Préparation en laboratoire des impressions d'essai —

Partie 2: Encres d'impression liquides

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 130, *Graphic technology*.

This third edition cancels and replaces the second edition (ISO 2834-2:2015), which has been technically revised.

The main changes are as follows:

— parameters describing the preparation of printing forms and anilox cylinders are replaced by data (to be acquired by the user of this document) describing the ink transfer of particular settings of tester, printing forme, ink and substrate.

A list of all parts in the ISO 2834 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

This document describes the test print preparation of liquid inks (gravure and flexography). These test prints have a homogeneous distribution of ink on a substrate, a reproducible ink composition and relative ink coverage. Therefore, they are suitable for optical tests so that the measured reflectance can be assigned to a known ink coverage. If tests are done only for mechanical and chemical resistance, the user may apply less accurate methods. The preparation of test prints for paste inks (lithography) is described in ISO 2834-1, while screen inks are covered in ISO 2834-3.

In ISO 2834-1, specific operational settings for the “round-to-round” and the “round-to-flat” offset ink printability testers are provided. Laboratory proofers (printability testers) for liquid inks encompass a much wider array of operating processes and associated settings. Therefore, the guidelines included in ISO 2834-2 are more general and will, of necessity, result in more opportunities for operator error in making the test prints.

Graphic technology — Laboratory preparation of test prints —

Part 2: Liquid printing inks

1 Scope

This document specifies a test method for preparation of test prints produced with liquid printing inks, either water-based, solvent-based or radiation cured printing inks as used in flexography and gravure printing. Such test prints are intended to be used for reflection-based measurements, such as colorimetry and optical density as well as for testing light fastness, and the resistance of printing inks to mechanical and chemical attack regarding either printing ink and/or substrate. This document is not applicable to inks for ink jet printing.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 187, *Paper, board and pulps — Standard atmosphere for conditioning and testing and procedure for monitoring the atmosphere and conditioning of samples*

ISO 13655, *Graphic technology — Spectral measurement and colorimetric computation for graphic arts images*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
anilox roller
chromium plated or ceramic roller with evenly distributed small cells generally mounted on a flexographic printing press to control the quantity of ink transferred to the printing forme

3.2
extender
transparent material (varnish or polymer solution) used to reduce the colorant concentration while maintaining viscosity to adapt ink colour concentration to print substrates

3.3
laboratory proofer
printability tester
device for uniformly applying a reproducible amount of ink to a substrate under specified conditions

Note 1 to entry: Earlier editions of this document used the term "printability tester" which is still commonly used in the market.

3.4
flexographic printing forme
cylinder or sleeve covered with a relief type rubber or photopolymer plate for application of *printing ink* (3.6) to print substrate

3.5
gravure printing forme
mechanically engraved, laser-engraved or chemically etched cylinder, sleeve or plate for application of *printing ink* (3.6) to a print substrate

3.6
printing ink
composite material containing colorants, functional components, vehicle and additives

Note 1 to entry: In most cases, it is applied as a fluid to a substrate by a printing process and it is setting or drying by either physical (evaporation) and/or chemical (polymerizations, e.g. oxidation, radiation induced, or other) processes in order to form an image for decorative, informative or technical purposes.

3.7
retarder
additive to reduce the evaporation speed of the solvent in a liquid ink to prevent drying during the application of ink to the substrate

3.8
test-ready ink
printing ink (3.6) of the appropriate composition and viscosity for the purpose of the test

4 Test method

4.1 Principle

Using a laboratory proofer, the gravure or flexographic printing ink is applied consistently and uniformly on the chosen substrate. The ink transfer depends on many aspects of the proofer, the printing forme, the ink and the substrate. For each individual setting, the ink transfer shall be determined according to any method described in 4.4.4. As long as there are no changes in these settings and the printing forms are cleaned thoroughly, the ink transfer is constant.

NOTE 1 Test samples for mechanical and chemical resistance tests can be prepared using any technique resulting in a uniform ink film in a desired thickness range. Ink film thicknesses different from those used in practice will have a strong influence on the results of such tests. These methods are not covered by this document.

NOTE 2 Due to differences between a printing press and a laboratory proofer, prints produced on a laboratory proofer can be different in appearance and in ink film thickness from commercial prints. To reach the same colour strength or print density, different settings from the actual press settings are generally required.

4.2 Apparatus and quality requirements

4.2.1 Apparatus

Any laboratory proofer for liquid printing inks of the type to be tested, liquid printing ink (solvent, water or radiation cured), substrate and drying apparatus may be used as long as the resulting printed

ink film is uniform and at the required ink film thickness. Test conditions and variables associated with such equipment and materials shall be agreed upon between parties since variations in design and process have a strong influence on the test results and comparability of the properties of the test sample.

4.2.1.1 Laboratory proofer

To ensure repeatable operation, the laboratory proofer shall provide automated control of the ink transfer function. It is not practical to duplicate exactly a commercial production printing process in the laboratory. However, it is possible to duplicate results between two laboratories. The chosen laboratory proofer shall provide a consistent, uniform printed ink film at the required ink film thickness. To achieve this control, the printing speed and the pressure or impression (for flexography) between the printing forme and printing substrate shall be adjustable and shall be constant and uniform during the printing process.

For gravure, the Shore hardness of the pressure roller as well as the use of an electrostatic printing aid shall be agreed upon and specified. For flexography, the anilox roller (see also 4.2.1.3) and the type of blade or doctoring device shall be specified.

NOTE The Shore hardness, compressibility and smoothness of the impression roller depend on the purpose of the test. There are different pressure roller surfaces in the market. Often, these are harder plastic surfaces typically measured as Shore D and sometimes softer surfaces are used to be measured as Shore A. Guidance on the use of shore measurement can be found in corresponding ISO Standards. The determination of the Shore hardness requires a minimum thickness of the material to be tested. This sometimes is not present.

4.2.1.2 Printing formes

4.2.1.2.1 Gravure printing forme

These may be produced by electromechanical engraving, laser engraving or chemical etching. Printing formes can contain solid and tinted areas. The design of printing formes can either be of a standard layout with a designation of the supplier of the laboratory proofer or special with respect to customer needs. Printing forms containing half-tone images are not covered in this document. Printing formes shall have a designation. Printing forms should contain 100 % tone value patches with an area of at least 1 600 mm^2.

Gravure printing formes should be specified by the amount of ink transferred for each tone value present and shall be specified by the amount of ink transferred for the 100 % tone value. The transfer characteristic of the forme shall be characterized according to either method described in 4.4.4.

It is not practical to duplicate commercial production printing in the laboratory, and therefore, it is not necessary for the laboratory proofer to have the same gravure engraved cylinder as a commercial printing press. The ink transfer process of the laboratory proofer shall produce a printed ink film with a thickness that is representative of the industry. While the solid tone will be printed with the correct optical density, the tone scales will not necessarily be reproduced exactly. This can be evaluated by the use of a reflection densitometer or colourimeter using aim values that are agreed upon between parties. It is, in this way, possible to duplicate results between two laboratories.

NOTE 1 The cell volume can be approximately calculated using shape and dimensions of cells, measured directly by applying definite volumes of liquids or measured by optical means using, such as an interferometer. Gravure printing formes can be cylinders, sleeves or plates. The precise measurement of cell volumes of gravure printing formes is difficult. The cell volume can be determined: 1) approximately from calculation using shape and dimensions of cells; 2) measured directly by applying known volumes of liquids or 3) measured by optical means using, such as an interferometer. It can be useful to obtain a sufficient number of printing formes of a single lot to be shared between parties to ensure comparability of test prints.

NOTE 2 The relation between tone value, cell volumes and cell dimensions is complex and strongly substrate dependent.

NOTE 3 The typical thickness of dried ink films applied by the gravure process is 2,25 µm ± 1 µm.

4.2.1.2.2 Flexographic printing forme

Flexographic printing formes shall be relief type formes. The design of printing formes can either be of a standard layout with a designation of the supplier of the laboratory proofer or special with respect to customer needs. Printing forms containing half-tone images are not covered in this document. Printing formes shall have a designation. Printing forms should contain 100 % tone value patches with an area of at least 1 600 mm^2. Flexographic printing forms or print-ready printing forme cylinders may be prepared in different ways. This includes developed photopolymer or laser engraved rubber plate material and subsequent fixation on cylinders using, e.g. double sided (compressible) pressure sensitive tape, or direct laser engraving on a photopolymer or rubber covered printing forme cylinder.

It is not practical to exactly duplicate commercial production printing in the laboratory, and therefore, it is not necessary for the laboratory proofer to have the same relief plate as a commercial printing press. The ink transfer process of the laboratory proofer shall produce a printed ink film at a thickness that is representative of the industry. While the solid tone needs to be printed with the correct optical density, the tone scales will not necessarily be reproduced exactly. It is of primary concern to get the correct amount of ink on the substrate and not that the printing forme of the proofer matches the printing forme of the commercial printing press. In order to be able to duplicate results between two laboratories, it is necessary that the parameters of the printing forms are as close as possible.

NOTE 1 In flexographic printing, many different materials and manufacturing processes are used to make the printing forms. These parameters have a massive impact on the amount of ink, which is transferred and on the lay of the ink on the printed surface, which influences the optical density of the printed ink film. If standard conditions and print forms are used, it is possible to create a factor, in order to translate the results on the laboratory proofer to the production machines.

The following parameters are important to specify the printing forme and should be exchanged:

— brand name, type, hardness and thickness and general material (e.g. photopolymer, EPDM rubber) of the printing forme (plate or sleeve) specification according to the technical data sheet;

NOTE 2 The choice of the printing forme material determines solvent resistance, hardness, design limitations concerning dot shapes, line ruling, dot shoulder, capping, etc.

— brand name, type, compressibility and thickness of the cliché tape/sticky-back according to the technical data sheet;

— design of the forme (full tone, text, screen areas);

— for tone scale areas: screen frequency, screen type, screen angle of tone values and dot shape;

— for full tone areas: details of surface structuring if used;

— other information regarding printing forme production that influences the reproducibility of results (e.g. imaging and exposure technology, dot gain correction curves if used).

NOTE 3 The typical thickness of individual dried ink films applied by the flexographic process using water based, solvent based or radiation cured inks is 1,25 µm ± 0,5 µm.

Any distortion of image elements should be compensated.

4.2.1.3 Flexographic anilox roller

Anilox rollers may be produced by electromechanical engraving, laser engraving or chemical etching, the ratio of screen frequencies between anilox roller and printing forme shall be at least 2,5.