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Graphic technology — Test method for the determination of the binding strength for perfect-bound products — Page-pull test working upwards

Technologie graphique — Méthodes d'essai pour la détermination de la force de fixation des produits à reliure collée — Essai de traction de page vers le haut

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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).

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For an explanation on 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 the following URL: www.iso.org/iso/foreword.html.

The committee responsible for this document is ISO/TC 130, *Graphic technology*.

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Introduction

Perfect binding is the most frequently used block-binding technique for brochures and books. The page-pull test, the only established method for the quality assessment of perfect bindings available today, plays an important role in the process control and quality verification.

The page-pull test has historically been performed using different procedures and devices. Test results[5] showed significant variations between devices. This document aims to harmonize the testing procedure, the testing equipment and the evaluation of the test results.

Within a research project, the following essential test parameters were identified as influencing the test results of page-pull tests[1]:

— test position (front, middle or rear part of the book block);

— specimen alignment in relation to the pull force direction;

— specimen opening and fixing during the page-pull test.

There are many products showing homogeneous test results independent of the test position. However, there are also products showing differences within the book block, even including sheet-to-sheet deviations. Therefore, it is recommended that there should be agreement on page-specific test positions and that these should be communicated with the particular results.

Book blocks show large differences in their opening behaviour. Products with a significant clamp usually show no differences of the test sheet alignment in different test positions. Products with a good lay-flat behaviour usually show significant bending of the test sheet in the area of the spine if tested in a non-centered test position. To avoid known measurement errors, a straight alignment of the test sheet is essential. A technical means to ensure this is the possibility to tilt the opened book block depending on the particular test position.

Non-specified loads on specimens need to be avoided to ensure the absence of preliminary stress on the binding. Therefore, the opening process of the specimen needs to be controlled. The opening angle of the specimen may be standardized by the shape of a book block opening device. The intensity of the opening is determined by the force applied during the opening process and the shape of the device. These settings influence the degree of freedom of movement of the specimen during the page-pull test procedure and thus the warping of the spine. A too low degree of freedom leads to an unrealistically frequent occurrence of paper ruptures, while the opposite may lead to a lifting of the whole book block. The provisions for the opening and fixing of the specimen are realized within this document by the definition of the shape and the force of a downholder. These settings have a significant influence on the test results.

The page-pull speed within a reasonable range, shows no significant influence on the test results. Therefore, in harmonization with ISO 1924-2, the page-pull speed was chosen to be 20 mm/min. This condition results in a non-linear force development during the test.

The test results need to be evaluated in a consistent manner. An evaluation schema that has been proven by long industry practice is given in Annex A.

Devices performing the page-pull test by pulling downwards create different measurement values from those pulling upwards. This results from the different block positioning due to gravity and the mass of the book block.

The pull test described in this document was developed to ensure a high level of reproducibility and comparability between laboratories. For internal quality assurance during production, devices with a lesser degree of comparability may be used.

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Graphic technology — Test method for the determination of the binding strength for perfect-bound products — Page-pull test working upwards

1 Scope

This document specifies a test method for the determination of the binding strength of perfect-bound products by pulling out single sheets from the book block in an upward direction.

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 186, *Paper and board — Sampling to determine average quality*

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

ISO 2859-1, *Sampling procedures for inspection by attributes — Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection*

3 Terms and definitions

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

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

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

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

3.1
binding strength
quality measure of the binding quality of a perfect-bound product

Note 1 to entry: Ratio between the pull-out force of a single sheet and the spine length.

3.2
book block
part of a case-bound book or brochure, consisting of a trimmed or untrimmed bound block of sheets, prior to the application of the book case or cover

3.3
glue penetration
uncontrolled and inhomogeneous penetration (several millimetres) of glue between the sheets of a *book block* (3.2)

3.4
special sheet
sheet of the book block with potentially different properties from those of the majority of the sheets of that *book block* (3.2)

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3.5
specimen
single test object, consisting either of a perfect-bound book (soft cover), a case-bound book (hard cover) or a perfect-bound *book block* (3.2) (intermediate product)

3.6
spine length
length of the spine of a *book block* (3.2), equal to the height of the book block

3.7
test fixture
apparatus to fix the *specimen* (3.5) on the test device during testing

3.8
test position
position of the *test sheet* (3.9) given as a percentage of the total number of pages

3.9
test sheet
sheet of the *book block* (3.2) chosen to be tested according to this document

4 Principle

The binding strength is evaluated by pulling out a single sheet from the book block using a material testing system and a specified test fixture. The test is performed in such a way that the test sheet is clamped on the complete fore edge while the opened book block is fixed at the specimen holder with a specified preload. The test sheet is pulled out upwards by a force acting perpendicular to the binding edge. The maximum force resulting from the pull-out procedure is measured. The binding strength of the specimen is calculated by dividing the maximum force by the spine length of the book block.

5 Apparatus

5.1 Material testing system

The material testing system shall be constructed as a twin-column device that shall be able to perform tensile testing and to apply a preload. It contains an upper moveable traverse, where the force transducer is located. The horizontal working space of the material testing system is determined by the maximum spine length of the products tested. A scheme of the material testing system, including the test fixture (see 5.2), is shown in Figure 1.

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