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**Paper and board — Determination of  
grease resistance —**

**Part 1:  
Permeability test**

*Papier et carton — Détermination de l'imperméabilité aux graisses —*

*Partie 1: Essai de perméabilité*

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**Contents**

Page

<b>Foreword</b> .....	<b>iv</b>
<b>Introduction</b> .....	<b>v</b>
<b>1 Scope</b> .....	<b>1</b>
<b>2 Normative references</b> .....	<b>1</b>
<b>3 Terms and definitions</b> .....	<b>1</b>
<b>4 Principle</b> .....	<b>2</b>
<b>5 Reagents</b> .....	<b>2</b>
<b>6 Apparatus</b> .....	<b>2</b>
<b>7 Sampling</b> .....	<b>4</b>
<b>8 Conditioning</b> .....	<b>4</b>
<b>9 Preparation of test pieces</b> .....	<b>4</b>
<b>10 Procedure</b> .....	<b>4</b>
<b>10.1 General</b> .....	<b>4</b>
<b>10.2 Determination of show-through</b> .....	<b>4</b>
<b>10.3 Determination of break-through</b> .....	<b>5</b>
<b>10.4 Observation intervals</b> .....	<b>5</b>
<b>11 Precision</b> .....	<b>5</b>
<b>12 Expression of results</b> .....	<b>5</b>
<b>13 Test report</b> .....	<b>6</b>
<b>Annex A (normative) Creasing</b> .....	<b>7</b>
<b>Bibliography</b> .....	<b>8</b>

## 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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 16532-1 was prepared by Technical Committee ISO/TC 6, *Paper, board and pulps*, Subcommittee SC 2, *Test methods and quality specifications for paper and board*.

ISO 16532 consists of the following parts, under the general title *Paper and board — Determination of grease resistance*:

— *Part 1: Permeability test*

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— *Part 2: Surface repellency test*

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The following part is under preparation:

— *Part 3: Turpentine test for voids in glassine and greaseproof papers*

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## Introduction

The resistance of paper and board to penetration by fats, greases and oils is of particular importance for certain packaging purposes, for example the packaging of food. The packaging should not only provide an effective grease barrier, but should also deter the formation of aesthetically unacceptable grease spots on the packaging surfaces.

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# Paper and board — Determination of grease resistance —

## Part 1: Permeability test

### 1 Scope

This part of ISO 16532 specifies a method for the determination of the grease resistance of paper and board. The paper or board can be tested creased or uncreased. The test is primarily intended to establish a level of grease resistance by determining the time taken for a simulated “fat material” (palm kernel oil) to penetrate (break-through) the sheet for papers such as food board, and greaseproof and vegetable parchment. It is also applicable to paper and board which have been internally or surface sized with organophobic materials, or made grease resistant by a plastic extrusion coating.

### 2 Normative references

The following referenced documents are indispensable for the application 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*

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

ISO 4046-4, *Paper, board, pulps and related terms — Vocabulary — Part 4: Paper and board grades and converted products*

### 3 Terms and definitions

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

#### 3.1

##### **grease resistance**

ability of paper or board to resist the formation of surface spots or stains or the permeation of grease through the sheet

#### 3.2

##### **grease permeability**

ability of the paper or board to resist penetration of the grease through the sheet

NOTE Grease permeability is described by two characteristics: “break-through time” (actual penetration time) and “show-through time” (visual penetration time).

#### 3.3

##### **break-through time**

time elapsed between the application of the test grease, together with a weight, to one side of the test piece and the penetration of grease through to the other side of the test piece

**3.4 show-through time**  
time elapsed between the application of the test grease, together with a weight, to one side of the test piece and the first visual detection of grease stains (or a partial penetration of the grease through the sheet)

NOTE 1 The determination of break-through time is the primary purpose of this part of ISO 16532. However, show-through time may be of interest in special cases, for example, in the study of papers and boards internally or surface sized with organophobic materials, or of papers and boards which have been made grease resistant by plastic extrusion coating. The two tests may be combined, in which case show-through time is determined before break-through time.

NOTE 2 For many grades of paper and board, show-through times and break-through times are nearly identical.

## 4 Principle

The test pieces are placed on a glass plate, with or without a layer of cellulose wadding, and dyed palm kernel oil is applied, together with a weight, to the upper side of the test pieces. The time elapsed until an indication of partial or actual penetration of the grease through each test piece is noted, as described in the following paragraphs.

For determination of actual penetration (**break-through**) of grease through the test pieces, the end point is indicated by a visual observation of staining of the cellulose wadding in contact with the test pieces.

NOTE In practice, the time needed to penetrate the cellulose wadding (6.1) is included; this is very short and therefore negligible.

For determination of partial penetration (**show-through**) of grease, the end point is determined when the eye can detect spots or stains of grease without the aid of the cellulose wadding.

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## 5 Reagents

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**5.1 Standard grease** consisting of palm kernel oil<sup>1)</sup> or other oil with the following properties:

- temperature of liquefaction: 27 °C to 29 °C;
- dynamic viscosity at 35 °C: 33,5 mPa·s to 35,0 mPa·s;
- refractive index at 40 °C: 1,44 to 1,45;
- dyed with 0,25 % (mass fraction) Sudan red or a similar fat soluble dye.

If the grease is lumpy, it shall be homogenized before use with the aid of a spatula.

Greases other than the standardized material may be used, if they meet the specification outlined above, in which case this fact is to be stated in the test report.

## 6 Apparatus

**6.1 Cellulose wadding**, made of bleached chemical pulp (see ISO 4046-4).

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1) Dyed palm kernel oil suitable for this test is commercially available from ISEGA Forschungs- und Untersuchungsgesellschaft mbH, P.O. Box 10565, 63704 Ashaffenburg, Germany ([www.iseqa.de](http://www.iseqa.de)). This information is given for the convenience of users of this document and does not constitute an endorsement by ISO of the products from ISEGA Forschungs- und Untersuchungsgesellschaft mbH. Equivalent products may be used if they can be shown to lead to the same results.

The penetration time when measured with palm kernel oil shall be less than 15 s.

**6.2 Glass plate**, not smaller than 220 mm × 350 mm.

The plate shall be supported in such a way that the underside can be viewed in a mirror.

**6.3 Mirror**, placed beneath the glass plate (6.2) in such a way that the whole of the undersides of the test pieces can be viewed (see Figure 1). Ensure that the mirror has adequate lighting.



**Key**

- 1 glass plate
- 2 mirror

NOTE 1 In the test assembly shown, the horizontal glass plate is supported above bench height so that the mirror can be placed beneath.

NOTE 2 In the example shown, the sample on the right hand side is well past its end point.

**Figure 1 — Test assembly for the determination of break-through time**

**6.4 Creasing apparatus**, as described in Annex A.

**6.5 Metal template**, round or square (approximately 60 mm diameter or 60 mm × 60 mm square), and 2 mm to 3 mm thick, with a hole, of 30 mm diameter. The template is used to apply a controlled volume of grease.

**6.6 At least 10 test weights**, mass 50 g to 55 g, diameter 30 mm.