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**Paints and varnishes — Determination  
of resistance to abrasion —**

Part 3:  
**Method with abrasive-paper covered  
wheel and linearly reciprocating test  
specimen**

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*Peintures et vernis — Détermination de la résistance à l'abrasion —  
Partie 3: Méthode utilisant une roue revêtue de papier abrasif et une  
éprouvette animée d'un mouvement de va-et-vient linéaire*

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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](http://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](http://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 on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword - Supplementary information](#)

The committee responsible for this document is ISO/TC 35, *Paints and varnishes*, Subcommittee SC 9, *General test methods for paints and varnishes*.

This second edition cancels and replaces the first edition (ISO 7784-3:2000), which has been technically revised with the following changes:

- a) the title has been changed;
- b) the terms and definitions clause has been amended;
- c) a figure explaining the principle of the method was amended;
- d) the supplementary test conditions previously in Annex A have been integrated in the test report;
- e) the calibration of the apparatus previously in Annex B has been deleted;
- f) the test procedure has been re-arranged;
- g) the text has been editorially revised and the normative references have been updated.

ISO 7784 consists of the following parts, under the general title *Paints and varnishes — Determination of resistance to abrasion*:

- *Part 1: Method with abrasive-paper covered wheels and rotating test specimen*
- *Part 2: Method with abrasive rubber wheels and rotating test specimen*
- *Part 3: Method with abrasive-paper covered wheel and linearly reciprocating test specimen*

## Introduction

This part of ISO 7784 is one of the three parts of ISO 7784 dealing with test methods for the determination of the resistance to abrasion of coatings using abrasive wheels. The characteristics and differences of these methods are summarized in [Table 1](#).

**Table 1 — Types of method**

Standard	Abrasive wheel		Test specimen movement
	Type	Degree of freedom	
ISO 7784-1	Abrasive paper on rubber wheel	Freely rotatable	Rotation
ISO 7784-2	Abrasive rubber wheel		
ISO 7784-3	Abrasive paper on metal wheel	Rigid – with stroke-dependent rotation <sup>a</sup>	Linear reciprocation

<sup>a</sup> A mechanism rotates the abrasive wheel by a small angle after each double stroke so that a new area of the abrasive paper is effective.

The methods using abrasive-paper covered wheels (ISO 7784-1 and ISO 7784-3) are preferably to be applied.

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# Paints and varnishes — Determination of resistance to abrasion —

## Part 3: Method with abrasive-paper covered wheel and linearly reciprocating test specimen

### 1 Scope

This part of ISO 7784 specifies a method for determining the resistance to abrasion of coatings, for which a loaded, rigid abrasive-paper covered wheel affects the coating of the linearly reciprocating test specimen.

### 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 1514, *Paints and varnishes — (Standard panels for testing)*

ISO 2808, *Paints and varnishes — Determination of film thickness*

ISO 3270, *Paints and varnishes and their raw materials — Temperatures and humidities for conditioning and testing*

ISO 4618, *Paints and varnishes — Terms and definitions*

ISO 7823-1, *Plastics — Poly(methyl methacrylate) sheets — Types, dimensions and characteristics — Part 1: Cast sheets*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 4618 and the following apply.

#### 3.1 test specimen

specimen on which the test is to be carried out

#### 3.2 double stroke ds

one complete reciprocal movement made by the abrasive wheel

#### 3.3 repeatability conditions

conditions where independent test results are obtained with the same method on identical test items in the same laboratory by the same operator using the same equipment within short intervals of time

[SOURCE: ISO 5725-1:1994, 3.14]

**3.4**  
**repeatability limit**

*r*  
value less than or equal to which the absolute difference between two test results obtained under *repeatability conditions* (3.3) may be expected to be with a probability of 95 %

[SOURCE: ISO 5725-1:1994, 3.16]

**3.5**  
**reproducibility conditions**

conditions where test results are obtained with the same method on identical test items in different laboratories with different operators using different equipment

[SOURCE: ISO 5725-1:1994, 3.18]

**3.6**  
**reproducibility limit**

*R*  
value less than or equal to which the absolute difference between two test results obtained under *reproducibility conditions* (3.5) may be expected to be with a probability of 95 %

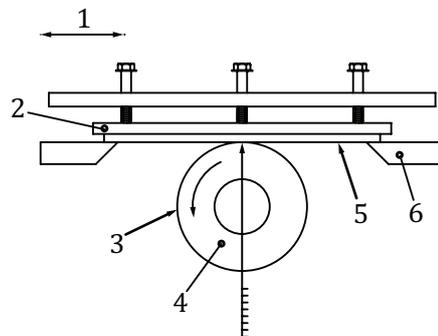
[SOURCE: ISO 5725-1:1994, 3.20]

**4 Principle**

A rigid abrasive wheel, covered with abrasive paper, is pressed onto the coating applying the test load. The test specimen is reciprocated with specified stroke length and double-stroke frequency. The abrasive wheel itself is rotated by a small angle after each double stroke, so that a new fresh portion of the abrasive paper is applied. The specimen is set with its testing surface facing downward, and the testing surface is abraded from underneath.

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Figure 1 illustrates the test principle.



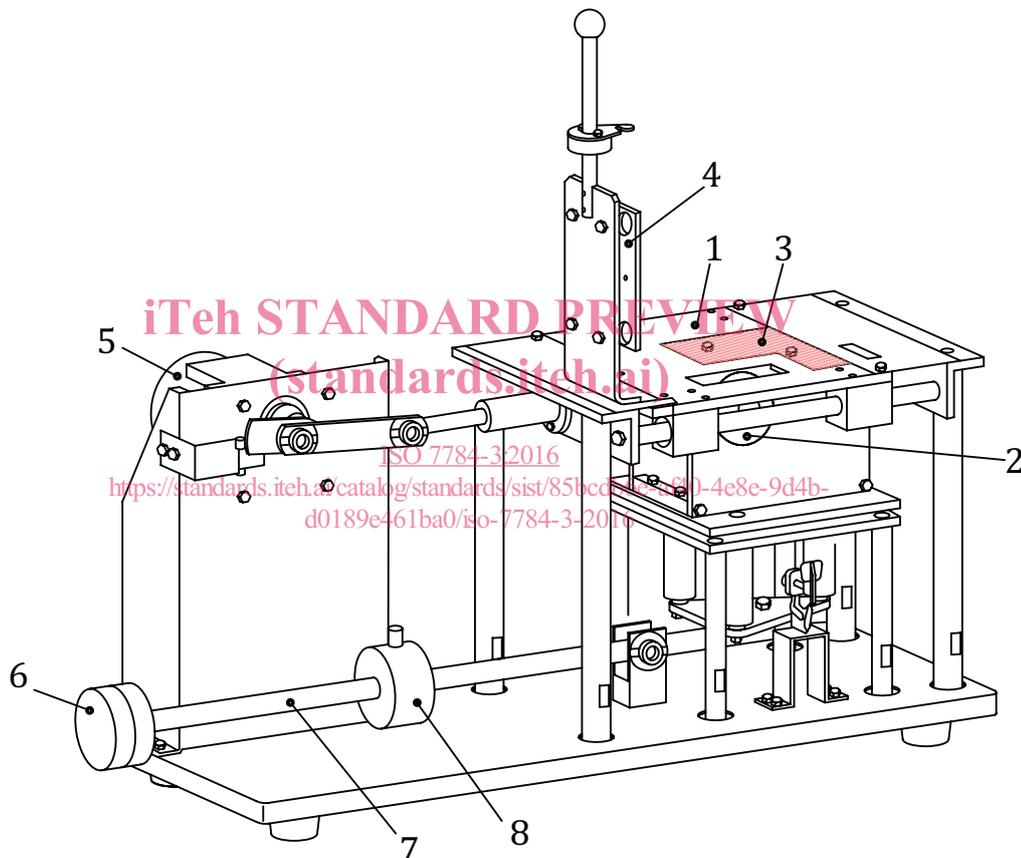
- Key**
- 1 reciprocating motion
  - 2 specimen press
  - 3 abrasive paper
  - 4 abrasive wheel
  - 5 specimen
  - 6 specimen stage

**Figure 1 — Principle of the abrasion test with linearly reciprocating test specimen**

## 5 Apparatus and materials

**5.1 Abrasive-wheel-wear test apparatus**, consisting of a clamping device with pressure plate for holding the test specimen level and rigid, and a 50 mm diameter wheel to the outer circumference of which is attached a 12 mm wide strip of the abrasive paper (5.2). The force between the wheel and the testing surface shall be capable of being varied from 0,98 N to at least 6,9 N with an accuracy of  $\pm 0,05$  N. The abrasive action is produced by the test specimen sliding to and fro in a horizontal plane in parallel contact with the testing surface over a 30 mm length over the abrasive wheel. Typical apparatus is illustrated in Figure 2.

After each double stroke, the wheel is advanced through a small angle to bring a new fresh portion of the abrasive paper into contact with the testing surface before making the next double stroke (400 ds in maximum). The relative speed of movement shall be  $(40 \pm 2)$  ds per minute. The testing surface shall be kept free from loose powder or abrasion debris during the test.



### Key

1	specimen stage	5	specimen reciprocating motor
2	abrasive wheel	6	load
3	specimen guide	7	load scale
4	specimen press	8	load adjust

Figure 2 — Abrasive-wheel-wear test apparatus (example)

**5.2 Abrasive paper.** The recommended abrasive paper is grain size P180 silicon carbide paper (ISO 6344-1). The strip shall be  $(12,0 \pm 0,2)$  mm wide. Its length shall be such that it covers the abrasive wheel without overlap or gap at the ends, a strip length of 158 mm is sufficient. In case the strips of