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**Rubber, vulcanized or  
thermoplastic — Determination  
of abrasion resistance using the  
Improved Lambourn test machine**

*Caoutchouc vulcanisé ou thermoplastique — Détermination de  
la résistance à l'abrasion à l'aide d'une machine de Lambourn  
perfectionnée*



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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 World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

The committee responsible for this document is ISO/TC 45, *Rubber and rubber products*, Subcommittee SC 2, *Testing and analysis*.

This second edition cancels and replaces the first edition (ISO 23337:2007), which has been technically revised to include a calibration schedule as [Annex B](#).

## Introduction

Various types of laboratory test equipment for determining the wear resistance of rubber compounds have been developed, depending on the products to which rubber compounds have been applied in the past. One such piece of equipment, called the “Improved Lambourn” abrasion test machine, is briefly introduced with other types in ISO 23794[2] and the test method for using it is described in detail in this document.

The main features of the Improved Lambourn machine are as follows:

- a) The slip rate is adjustable by virtue of the fact that the abrasive wheel and test piece are driven separately. A servo-mechanism is used for driving both the abrasive wheel and the test piece to ensure accurate speed control. In older types of equipment, both the abrasive wheel and the test piece were driven by the same drive system, with the speeds of rotation controlled by braking systems, which could result in an inaccurately controlled slip rate.
- b) A controlled feed of carborundum grit to the nip between the rubber test piece and the abrasive wheel ensures that abraded particles are prevented from adhering to the surface of the test piece or abrasive wheel, which is important in obtaining reproducible test results.

A previous wear study for rubber compounds using the Improved Lambourn machine showed that, at higher slip rates, wear resistance decreased in the order: butadiene rubber (BR) base compound, natural rubber (NR) base, styrene-butadiene rubber (SBR) base. However, at low slip rates, the order was reversed. This is interesting since the tread compound in truck and bus tyres generally uses NR or a blend of NR and BR base compound, while SBR base compound is used in car tyres. More details can be found in Reference [3].



# Rubber, vulcanized or thermoplastic — Determination of abrasion resistance using the Improved Lambourn test machine

**WARNING 1** — Persons using this document should be familiar with normal laboratory practice. This document does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user to establish appropriate safety and health practices and to ensure compliance with any national regulatory conditions.

**WARNING 2** — Certain procedures specified in this document might involve the use or generation of substances, or the generation of waste, that could constitute a local environmental hazard. Reference should be made to appropriate documentation on safe handling and disposal after use.

## 1 Scope

This document specifies a method for the determination of the resistance of rubber to abrasion using the Improved Lambourn test machine.

The abrasion loss resulting from the slip caused by the difference in circumferential speed between a disc-shaped rubber test piece and an abrasive wheel, which are driven to rotate independently with their circumferences pressed against each other by a specified load, is determined. The test result can be reported as a volume loss per abrasion test time or running distance, and/or as an abrasion resistance index compared to a reference compound.

As the Improved Lambourn test machine is capable of setting various abrasive conditions, such as slip rate, sliding speed and load, independently, this method is suitable for the evaluation of compounds for a range of rubber products, especially tyres, under a wide range of severity conditions. An example of the testing of tyre tread rubber is given in [Annex A](#).

## 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 525, *Bonded abrasive products — General requirements*

ISO 2781, *Rubber, vulcanized or thermoplastic — Determination of density*

ISO 8486-1, *Bonded abrasives — Determination and designation of grain size distribution — Part 1: Macrogrits F4 to F220*

ISO 18899:2013, *Rubber — Guide to the calibration of test equipment*

ISO 23529, *Rubber — General procedures for preparing and conditioning test pieces for physical test methods*

## 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/>