International Standard

ISO 23337

# 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

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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 document 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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This document was prepared by Technical Committee ISO/TC 45, *Rubber and rubber products*, Subcommittee SC 2, *Testing and analysis.*

This third edition cancels and replaces the second edition (ISO 23337:2016), which has been technically revised.

The main changes are as follows:

— an optional test piece thickness has been added.

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

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[3] 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 for 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 [4].

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**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 determine the applicability of any other restrictions.**

**WARNING 2 — Certain procedures specified in this document might involve the use or generation of substances, or the generation of waste, that can 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 with 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 — Shape types, designation and marking*

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 terminology databases for use in standardization at the following addresses:

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