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**Rubber, vulcanized — Determination of
tension fatigue**

Caoutchouc vulcanisé — Détermination de la fatigue en traction



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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.

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 6943 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 6943:2007), which has been revised primarily to include a calibration schedule for the apparatus used (see Annex B).

Rubber, vulcanized — Determination of tension fatigue

WARNING — Persons using this International Standard should be familiar with normal laboratory practice. This standard 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.

IMPORTANT — Certain procedures specified in this International Standard 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 International Standard describes a method for the determination of the resistance of vulcanized rubbers to fatigue under repeated tensile deformations, the test piece size and frequency of cycling being such that there is little or no temperature rise. Under these conditions, failure results from the growth of a crack that ultimately severs the test piece.

The method is restricted to repeated deformations in which the test piece is relaxed to zero strain for part of each cycle. Analogous fatigue processes can occur under repeated deformations which do not pass through zero strain and also, in certain rubbers, under static deformation, but this International Standard does not apply to these conditions.

The method is believed to be suitable for rubbers that have reasonably stable stress-strain properties, at least after a period of cycling, and that do not show undue stress softening or set, or highly viscous behaviour. Materials that do not meet these criteria might present considerable difficulties from the points of view of both experiment and interpretation. For example, for a rubber that develops a large amount of set during the fatigue test, the test strain will be ill-defined and the fatigue life is likely to differ markedly under constant maximum load and constant maximum extension conditions; how the results for such a rubber should be interpreted, or compared with those for other rubbers, has not been established by basic work. As a general guide, a rubber for which the set determined in accordance with 9.5 and 10.2 exceeds 10 % is likely to fall into this category. For this reason, the method is not considered suitable for most thermoplastic elastomers.

Similar considerations apply with regard to other changes in elasticity behaviour during testing.

A distinction should be made between this fatigue test and the flexometer tests described in the various parts of ISO 4666, where fatigue breakdown occurs under the simultaneous action of stress and temperature.

Advantages over the De Mattia flex cracking and cut growth test (see ISO 132) include the following. The test yields quantitative results which do not depend on operator interpretation and which can be recorded automatically. The initial deformation is clearly defined and can readily be varied to suit different applications.

Great caution is necessary in attempting to relate standard test results to service performance since the comparative fatigue resistance of different vulcanizates can vary according to the test conditions used and to the basis by which the results are compared. Guidance on the selection of test conditions and on the interpretation of results is given in Annex A.

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 18899:2004, *Rubber — Guide to the calibration of test equipment*

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