
**Rubber, vulcanized or thermoplastic —
Determination of the effect of liquids**

*Caoutchouc vulcanisé ou thermoplastique — Détermination de l'action
des liquides*



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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 1817 was prepared by Technical Committee ISO/TC 45, *Rubber and rubber products*, Subcommittee SC 2, *Testing and analysis*.

This fifth edition cancels and replaces the fourth edition (ISO 1817:2005), which has been technically revised principally to update the clause on reference oils (Clause A.2) and to include a calibration schedule for the apparatus used (see Annex B).

Introduction

The action of a liquid on vulcanized or thermoplastic rubber can generally result in:

- a) absorption of the liquid by the rubber;
- b) extraction of soluble constituents from the rubber;
- c) a chemical reaction with the rubber.

The amount of absorption [a)] is usually larger than that of extraction [b)] so that the net result is an increase in volume, commonly termed “swelling”. The absorption of liquid can profoundly alter physical and chemical properties and hence change tensile strength, extensibility and hardness of the rubber, so it is important to measure these properties after treatment of the rubber. The extraction of soluble constituents, especially plasticizers and antidegradants, can likewise alter the rubber's physical properties and chemical resistance after drying (assuming the liquid to be volatile). Therefore, it is necessary to test these properties following immersion or drying of the rubber. This International Standard describes the methods necessary for determining the changes in the following properties:

- change in mass, volume and dimensions;
- extractable matter;
- change in hardness and tensile stress-strain properties after immersion and after immersion and drying.

Although in some respects these tests might simulate service conditions, no direct correlation with service behaviour is implied. Thus, the rubber giving the lowest change in volume is not necessarily the best one in service. The thickness of the rubber needs to be taken into account since the rate of penetration of liquid is time-dependent and the bulk of a very thick rubber product might remain unaffected for the whole of the projected service life, especially with viscous liquids. Moreover, it is known that the action of a liquid on rubber, especially at high temperatures, can be affected by the presence of atmospheric oxygen. The tests described in this International Standard can, however, provide valuable information on the suitability of a rubber for use with a given liquid and, in particular, constitute a useful control when used for developing rubbers resistant to oils, fuels, or other service liquids.

The effect of a liquid might depend on the nature and magnitude of any stress within the rubber. In this International Standard, test pieces are tested in an unstressed condition.

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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 methods of evaluating the resistance of vulcanized and thermoplastic rubbers to the action of liquids by measurement of properties of the rubbers before and after immersion in test liquids. The liquids concerned include current service liquids, such as petroleum derivatives, organic solvents and chemical reagents, as well as reference test liquids.

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 37, *Rubber, vulcanized or thermoplastic — Determination of tensile stress-strain properties*

ISO 48, *Rubber, vulcanized or thermoplastic — Determination of hardness (hardness between 10 IRHD and 100 IRHD)*

ISO 175, *Plastics — Methods of test for the determination of the effects of immersion in liquid chemicals*

ISO 7619-1, *Rubber, vulcanized or thermoplastic — Determination of indentation hardness — Part 1: Durometer method (Shore hardness)*

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

ISO 23529:2010, *Rubber — General procedures for preparing and conditioning test pieces for physical test methods*

ASTM D5964, *Standard Practice for Rubber IRM 901, IRM 902, and IRM 903 Replacement Oils for ASTM No. 1, ASTM No. 2, and ASTM No. 3 Oils*

3 Apparatus

3.1 Total immersion apparatus, designed to take account of the volatility of the test liquid and of the immersion temperature in order to prevent and minimize evaporation of the test liquid and the ingress of air.