



**International
Standard**

ISO 1817

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

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

**Eighth edition
2024-03**

This document is a preview generated by EMS



COPYRIGHT PROTECTED DOCUMENT

© ISO 2024

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

	Page
Foreword	iv
Introduction	v
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Apparatus	1
4.1 General.....	1
4.2 Apparatus for method A.....	2
4.3 Apparatus for method B.....	3
4.4 Apparatus for method C.....	3
4.4.1 General.....	3
4.4.2 With air contact.....	4
4.4.3 Without air contact.....	4
4.5 Apparatus for method D.....	5
4.6 Apparatus for method E.....	6
4.7 Additional equipment.....	7
5 Calibration	7
6 Test liquids	8
7 Test pieces	9
7.1 Preparation.....	9
7.2 Dimensions.....	9
7.3 Time interval between vulcanization and testing.....	9
7.4 Conditioning.....	9
8 Immersion in the test liquid	10
8.1 Temperature.....	10
8.2 Duration.....	10
9 Procedure	10
9.1 General.....	10
9.2 Replacement of test liquid.....	11
9.3 Change in mass.....	11
9.4 Change in volume.....	12
9.5 Change in dimensions.....	12
9.6 Change in surface area.....	13
9.7 Change in hardness.....	14
9.8 Change in tensile stress-strain properties.....	15
9.9 Testing with liquid on one surface only.....	15
9.10 Determination of extractable matter.....	16
9.10.1 General.....	16
9.10.2 By weighing the dried test piece.....	16
9.10.3 By evaporating the test liquid.....	16
10 Precision	16
11 Test report	16
Annex A (normative) Reference liquids	18
Annex B (normative) Calibration schedule	23
Annex C (informative) Precision	25
Bibliography	31

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 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).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents. ISO shall not be held responsible for identifying any or all such patent rights.

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, 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 www.iso.org/iso/foreword.html.

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

This eighth edition cancels and replaces the seventh edition (ISO 1817:2022), which has been technically revised.

The main changes are as follows:

- [Clause 4](#): examples for methods A and C added;
- [Clause 6](#): text added for metalworking fluids;
- [9.6](#): a method added to enable very short periods between taking the samples out of a liquid and registration of the surface change by the use of photography.

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

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 and drying of the rubber. This document describes the methods necessary for determining the following properties after immersion and after immersion and drying:

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

Although in some respects these tests can 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 can 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 document 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 can depend on the nature and magnitude of any stress within the rubber. In this document, test pieces are tested in an unstressed condition.

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

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

ISO 48-2, *Rubber, vulcanized or thermoplastic — Determination of hardness — Part 2: Hardness between 10 IRHD and 100 IRHD*

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

ISO 23529:2016, *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 Terms and definitions

No terms and definitions are listed in this document.

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>
- IEC Electropedia: available at <https://www.electropedia.org/>

4 Apparatus

4.1 General

Five different methods are defined, all with different equipment.