
INTERNATIONAL STANDARD



4648

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

Rubber, vulcanized – Determination of dimensions of test pieces and products for test purposes

Caoutchouc vulcanisé – Détermination des dimensions des éprouvettes et des produits en vue des essais

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UDC 678.4.063 : 620.115.8

Ref. No. ISO 4648-1978 (E)

Descriptors : rubber, vulcanized rubber, test specimens, rubber products, tests, dimensional measurement.

Price based on 3 pages

FOREWORD

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been set up 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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 4648 was developed by Technical Committee ISO/TC 45, *Rubber and rubber products*, and was circulated to the member bodies in July 1977.

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It has been approved by the member bodies of the following countries :

[ISO 4648:1978](https://standards.iteh.ai/catalog/standards/sist/6ca4ff17-71be-41ee-b99c-2c6f5ccb2161/iso-4648-1978)

Belgium	India	Spain
Brazil	Italy	Sri Lanka
Canada	Mexico	Sweden
Czechoslovakia	Netherlands	Switzerland
France	New Zealand	Thailand
Germany	Poland	Turkey
Greece	Romania	United Kingdom
Hungary	South Africa, Rep. of	U.S.S.R.

The member body of the following country expressed disapproval of the document on technical grounds :

U.S.A.



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AMENDMENT 1

Amendment 1 to ISO 4648 was developed by Technical Committee ISO/TC 45, *Rubber and rubber products*.

It was submitted directly to the ISO Council for acceptance, in accordance with clause 5.10.1 of Part 1 of the Directives for the technical work of ISO.

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2.1 Method A1

- In the third line of the third paragraph, delete " 20 ± 3 kPa" and substitute " 22 ± 5 kPa".
- In the second line of the note, delete " 20 ± 3 kPa" and substitute " 22 ± 5 kPa".
- Replace the table by the following :

Foot diameter, mm	2,0	3,0	4,0	5,0	6,0	8,0	10,0
Mass required, g	7	16	28	44	63	113	176

Page 2

Annex

In the third line of item c), delete "14,5 g" and substitute "16 g".

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0 INTRODUCTION

An accurate measurement of the dimensions is necessary for the accurate determination of the values of various properties of rubber in the form of test pieces or products, such as tensile strength, tear resistance, resistance to liquids and compression set.

Pressure applied by measuring instruments has a significant effect on the thickness of soft flexible materials, and it is therefore necessary to specify the pressure imposed by the instrument on the test piece or product for accurate comparative measurements of such materials.

NOTE – For the measurement of dimensions of products for control and inspection purposes, attention is drawn to ISO 3302, *Rubber – Dimensional tolerances of solid moulded and extruded products*.

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies five methods for the measurement of the dimensions of solid vulcanized rubber, the method chosen in any particular case being essentially dependent on the magnitude of the dimension to be measured. Three of the methods, designated A1, B and C, are of general use over their specified ranges of applicability. Method A2 is a non-contact procedure often necessary for test pieces taken from products such as "O" rings, conveyor belts and hose, and method A3 is essentially for the measurement of compression set test pieces.

Other measuring equipment may be used when special conditions arise, for example when the test piece or product has a curved surface or complex shape, or when there is a requirement for higher or lower accuracy. Such other equipment includes cone gauges, manual micrometers, plug gauges and calibrated spheres. In all cases the means of supporting the item to be measured shall not cause any distortion of the rubber, and the method of use of the equipment shall be such as to avoid any significant change in the dimension being determined.

2 METHODS A1, A2 AND A3 – FOR DIMENSIONS LESS THAN 30 mm

2.1 Method A1

This method is applicable where the dimension to be measured lies between two flat parallel surfaces and where the other dimensions of the test piece or product are such that the application of the loaded foot does not cause buckling. It is not to be used for the measurement of compression set test pieces (see 2.3).

The dimensions shall be measured by an apparatus in which the test piece rests on a flat solid base plate and in which a gauge having a circular foot not more than 10 mm in diameter is applied to the test piece or product (see annex). The gauge shall be capable of measuring the thickness with an error of not more than 1 % or 0,01 mm, whichever is the smaller.

The circular foot shall not extend over the edge of the area of the test piece or product and shall exert a pressure of 20 ± 3 kPa* for solid rubber of hardness equal to or greater than 35 IRHD or of 10 ± 2 kPa for solid rubber of hardness less than 35 IRHD (see annex).

At least three measurements shall be taken of each dimension to be determined, and the median reported.

NOTE – The nominal masses required to give the specified pressure of 20 ± 3 kPa for dead-weight gauges are given for reference as follows:

Foot diameter, mm	2,0	3,0	4,0	5,0	6,0	8,0	10,0
Mass required, g	6,25	14,5	25	40	58	100	160

* 1 kPa = 1 kN/m²

2.2 Method A2

For the measurement of dimensions for which methods A1 and A3 are not applicable, "non-contact" methods (for example travelling microscope, projection microscope or shadowgraph) shall be used. The method shall be capable of measuring the dimension with an error of not more than 1 % or 0,01 mm, whichever is the smaller.

At least three measurements shall be taken of each dimension to be determined, and the median reported.

2.3 Method A3 – Measurement of thickness of compression set test pieces

Thickness shall be measured by a micrometer dial-gauge having two contact members with domed surfaces of spherical radius $12,5 \pm 0,1$ mm formed on rods $10 \pm 0,01$ mm in diameter. The gauge shall be operated under a force of 850 ± 20 mN and shall have a scale graduated in unit divisions of 0,01 mm.

The thickness shall be measured at the central portion of the test piece.

3 METHOD B – FOR DIMENSIONS OF 30 mm AND UP TO AND INCLUDING 100 mm

The dimension shall be measured by means of vernier calipers capable of measuring the dimension with an error of not more than 1 %. Each measurement shall be taken along a line perpendicular to the opposing faces of the test piece or product defining the dimension to be measured.

The previously set calipers shall be presented to the test piece or product, which shall be supported so that the dimension to be measured is not strained. The calipers shall be adjusted so that the measuring faces contact the surfaces of the test piece or product without compressing it, and the reading noted.

At least three measurements shall be taken of each dimension to be determined, and the median reported.

4 METHOD C – FOR DIMENSIONS OVER 100 mm

The dimensions shall be measured by means of a rule, tape or calipers with an error of not more than 1 mm. Each measurement shall be taken along a line perpendicular to the opposing faces of the test piece or product defining the dimension to be measured.

At least three measurements shall be taken of each dimension to be determined, and the median reported.

5 TEST REPORT

The test report shall include the following particulars :

- a) reference to this International Standard;
- b) a description of the test sample;
- c) the method used (A1, A2, A3, B or C);
- d) the median result, except when using method A3, to the same precision as the individual readings.

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ANNEX

APPARATUS SUITABLE FOR METHOD A1

A suitable dial-gauge operated under the appropriate dead load is normally satisfactory for method A1. The figure shows a more elaborate apparatus complying with the requirements of method A1 and particularly suitable for measuring the dimensions of rubber materials having hardness lower than 35 IRHD.

It consists essentially of the following parts :

- a) **A flat rigid base plate** to which is attached a rigid frame.
- b) **A micrometer dial-gauge** reading to an accuracy of 0,01 mm.
- c) **A rigid rod** terminating at its lower end in a flat circular foot 3,0 mm in diameter and having at its upper end a flange for engagement with the yoke. It has a total mass of 7,2 g for measuring rubbers having a hardness of less than 35 IRHD, and a mass of 14,5 g for use with harder rubbers. To achieve this mass an additional weight is added if necessary.
- d) **A locking lever** for holding the rod in any vertical position when engaged and allowing completely free vertical movement when disengaged.
- e) **A yoke and operating lever** for moving it vertically, such that when fully raised it supports the rod and the stem of the dial-gauge and when lowered it successively releases first the rod and then the dial-gauge stem.

In use, the yoke is first moved to the raised position and the test piece inserted. The yoke is lowered until the rod is resting freely on the test piece but with the dial-gauge stem still supported. The clamp is locked and the yoke then lowered fully. The dial-gauge reading is noted. The procedure is repeated with the test piece removed, and the difference between readings is the thickness of the test piece.

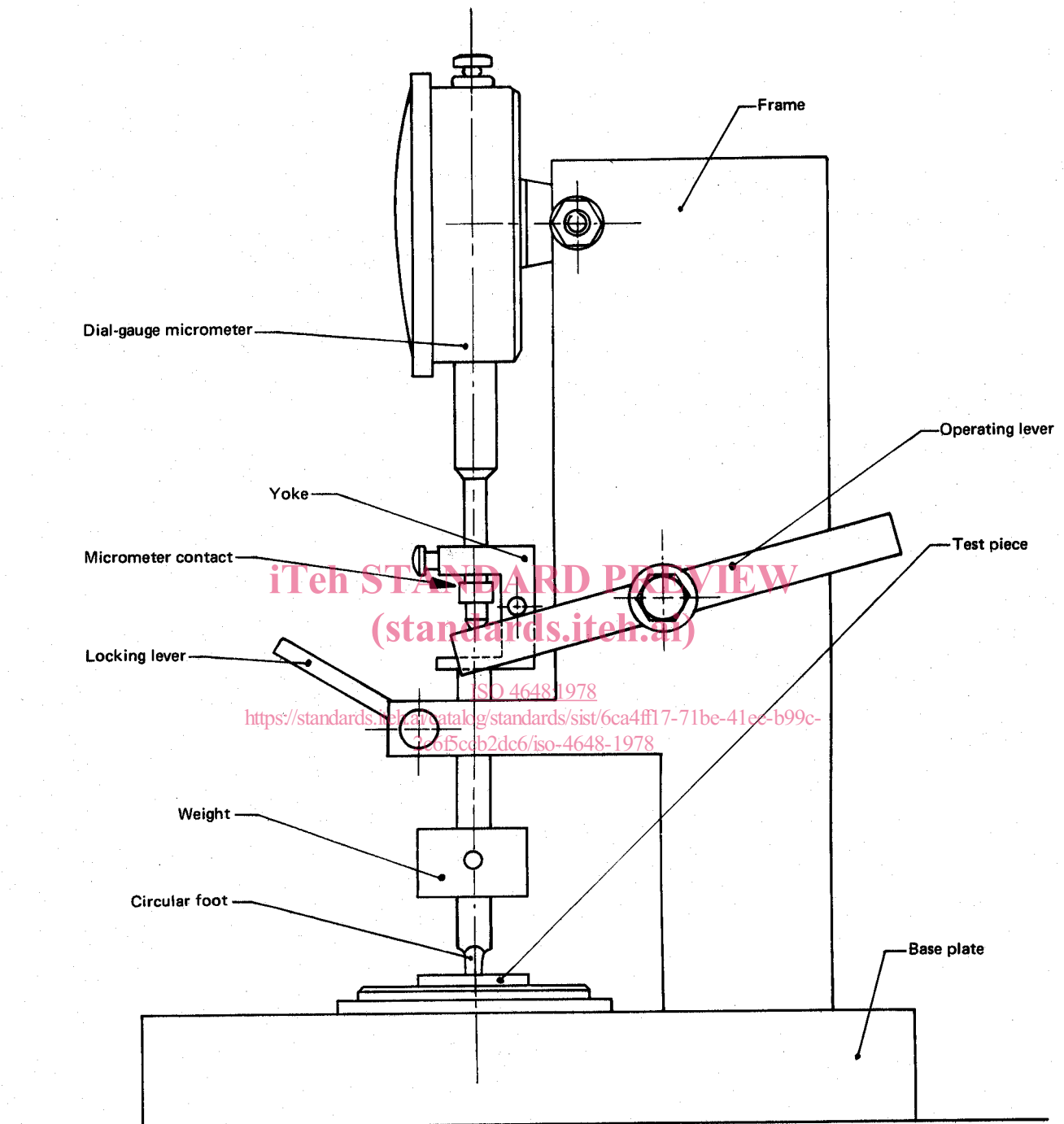


FIGURE – Diagram of apparatus suitable for method A1

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