

---

---

**Rubber, vulcanized or  
thermoplastic — Determination of  
hardness —**

Part 3:  
**Dead-load hardness using the very low  
rubber hardness (VLRH) scale**

iTeh STANDARD PREVIEW  
(standards.iteh.ai)

*Caoutchouc vulcanisé ou thermoplastique — Détermination de la  
dureté —*

*Partie 3: Dureté sous charge constante au moyen de l'échelle de très  
faible dureté (VLRH)*

<https://standards.iteh.ai/catalog/standards/sis/72170d60-61d7-4267-88a5-c59282bd875a/iso-48-3-2018>



**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

ISO 48-3:2018

<https://standards.iteh.ai/catalog/standards/sist/72170d60-61d7-4267-88a5-c59282bd875a/iso-48-3-2018>



**COPYRIGHT PROTECTED DOCUMENT**

© ISO 2018

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  
Fax: +41 22 749 09 47  
Email: [copyright@iso.org](mailto:copyright@iso.org)  
Website: [www.iso.org](http://www.iso.org)

Published in Switzerland

# Contents

	Page
Foreword .....	iv
Introduction .....	v
<b>1 Scope .....</b>	<b>1</b>
<b>2 Normative references .....</b>	<b>1</b>
<b>3 Terms and definitions .....</b>	<b>1</b>
<b>4 Principle .....</b>	<b>1</b>
<b>5 Apparatus .....</b>	<b>2</b>
<b>6 Calibration .....</b>	<b>2</b>
<b>7 Test pieces .....</b>	<b>2</b>
<b>8 Time interval between forming the test pieces and testing .....</b>	<b>3</b>
<b>9 Conditioning .....</b>	<b>3</b>
<b>10 Temperature of test .....</b>	<b>3</b>
<b>11 Procedure .....</b>	<b>3</b>
<b>12 Test report .....</b>	<b>3</b>
<b>Annex A (normative) Relationship between indentation depth and hardness, and derivation of the VLRH scale .....</b>	<b>5</b>
<b>Annex B (normative) Calibration schedule .....</b>	<b>8</b>
<b>Bibliography .....</b>	<b>10</b>

[ISO 48-3:2018](https://standards.iteh.ai/catalog/standards/sist/72170d60-61d7-4267-88a5-c59282bd875a/iso-48-3-2018)

<https://standards.iteh.ai/catalog/standards/sist/72170d60-61d7-4267-88a5-c59282bd875a/iso-48-3-2018>

## 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 documents 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](http://www.iso.org/directives)).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

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

For an explanation on 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 the following URL: [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html). (standards.itech.ai)

This document was prepared by Technical Committee ISO/TC 45, *Rubber and rubber products*, Subcommittee SC 2, *Testing and analysis*. ISO 48-3:2018

[https://standards.itech.ai/catalog/standards/sist/72170d60-61d7-4267-](https://standards.itech.ai/catalog/standards/sist/72170d60-61d7-4267-88a5-e51283d1ca27/iso-48-3:2018)

This first edition of ISO 48-3 cancels and replaces ISO 27588:2012, of which it constitutes a minor revision. The changes compared to the previous edition are as follows:

- a new standard number has been given.
- in the Introduction, an explanation of the purpose of the grouping work has been added.

A list of all parts in the ISO 48 series can be found on the ISO website.

## Introduction

ISO/TC 45/SC 2 established a principle that it would be helpful for users if standards on the same subject but covering different aspects or methods were grouped together, preferably with an introductory guidance standard, rather than being scattered throughout the numbering system. This has been achieved for some subjects, for example curemeters (ISO 6502) and dynamic properties (ISO 4664).

In 2017, it was decided to group standards for hardness and, subsequently, it was agreed that they would be grouped under the ISO 48 number. The new standards together with the previously numbered standards are listed below.

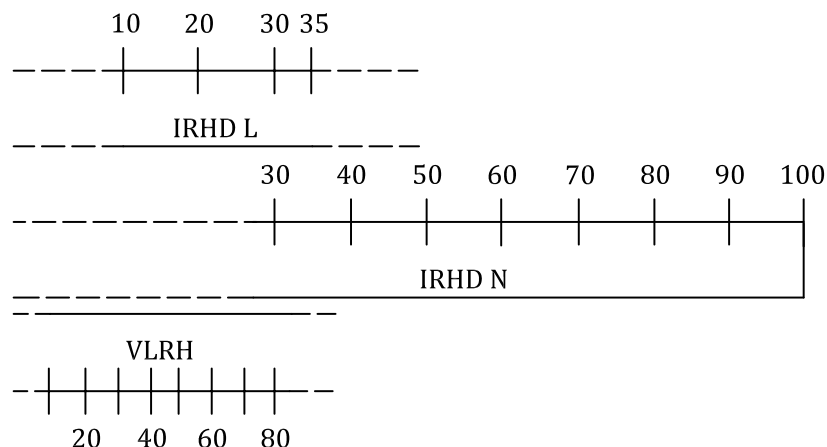
- ISO 48-1: former ISO 18517
- ISO 48-2: former ISO 48
- ISO 48-3: former ISO 27588
- ISO 48-4: former ISO 7619-1
- ISO 48-5: former ISO 7619-2
- ISO 48-6: former ISO 7267-1
- ISO 48-7: former ISO 7267-2
- ISO 48-8: former ISO 7267-3
- ISO 48-9: former ISO 18898

STANDARD PREVIEW  
(standards.iteh.ai)

The hardness test specified in this document is intended as a more discriminating alternative to the international rubber hardness degrees scale (ISO 48-2) for rubbers below 35 IRHD. A durometer method for soft rubbers is described in ISO 48-4 as the A0 scale. Examples of applications are low-modulus bearings, soft roller coverings and printing rubbers.

[Figure 1](#) shows a comparison of the ranges of the IRHD N and IRHD L methods in ISO 48-2 with the VLRH scale of this document.

The methods differ primarily in the diameter of the indenting ball and the magnitude of the indenting force, these being chosen to suit the particular application.



**Figure 1 — Comparison of the ranges of hardness measurement methods for rubber**

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

ISO 48-3:2018

<https://standards.iteh.ai/catalog/standards/sist/72170d60-61d7-4267-88a5-c59282bd875a/iso-48-3-2018>

# Rubber, vulcanized or thermoplastic — Determination of hardness —

## Part 3:

## Dead-load hardness using the very low rubber hardness (VLRH) scale

**WARNING** — 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.

### 1 Scope

This document specifies a dead-load method for the determination of the hardness of very soft vulcanized or thermoplastic rubbers using the very low rubber hardness (VLRH) scale.

The relation between the depth of penetration and the VLRH scale is linear.

iTeh STANDARD PREVIEW

### 2 Normative references (standards.iteh.ai)

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 48-9:2018, *Rubber, vulcanized or thermoplastic — Determination of hardness — Part 9: Calibration and verification of hardness testers*

ISO 18899, *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

No terms and definitions are listed in this document.

ISO and IEC maintain terminological 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 Principle

The hardness test consists of measuring the difference between the depths of indentation of a ball into the rubber under a small contact force and a large total force. From this difference, the hardness in “very low rubber hardness degrees” (VLRH) is obtained using [Table A.1](#) (see [Annex A](#)) or graphs based on this table or a scale, reading directly in very low rubber hardness degrees, calculated from the tables and fitted to the indentation-measuring instrument.

## 5 Apparatus

The essential parts of the apparatus are as follows, the appropriate dimensions and forces being shown in [Table 1](#). Detailed information can be found in References [3] and [4].

**5.1 Vertically guided plunger**, having a ball or spherical surface on the lower end, and **means for supporting the plunger** so that the spherical tip is kept slightly above the surface of the annular foot prior to applying the contact force.

**5.2 Means for applying a contact force and an additional indenting force to the plunger**, making allowance for the mass of the plunger, including any fittings attached to it, and for the force of any spring acting on it, so that the forces actually transmitted through the spherical end of the plunger are as specified.

**5.3 Means for measuring the increase in depth of indentation of the plunger caused by the indenting force**, either in millimetres with a maximum uncertainty of 0,001 mm, or reading directly in VLRH with a resolution such that a reading to at least 0,5 VLRH is possible.

**5.4 Flat annular foot**, normal to the axis of the plunger and having a central hole for the passage of the plunger. The foot rests on the test piece and shall be rigidly connected to the indentation measurement device so that a measurement is made of the movement of the plunger relative to the foot (i.e. the top surface of the test piece), not relative to the surface supporting the test piece.

If it is required that measurements be made on test pieces with a curved surface, a calibration has to be carried out. Tests need to be made on test pieces of the material with both flat and curved surfaces. The hardness difference ( $H_{\text{curved}} - H_{\text{flat}}$ ) which is found for the flat and the curved test pieces is used with opposite sign as correction of the hardness values obtained on test pieces of a similar material with a curved surface.

ISO 48-3:2018

[https://standards.iteh.ai/catalog/standards/sist/72170d60-61d7-4267-](https://standards.iteh.ai/catalog/standards/sist/72170d60-61d7-4267-88e1-2c0b0c0a0000)

**5.5 Measuring table**, as support for the test piece. The measuring table shall be flat and normal to the axis of the plunger.

**Table 1 — Nominal values and tolerances of forces and diameters**

Contact mN	Force on ball		Force on foot mN
	Indenting mN	Total mN	
8,3 ± 0,5	91,7 ± 0,5	100,0 ± 1,0	235 ± 30
Diameter mm			
Ball	Foot	Hole	
2,50 ± 0,01	6,0 ± 0,5	3,0 ± 0,1	

## 6 Calibration

The requirements for calibration of the test apparatus are given in [Annex B](#).

## 7 Test pieces

The test pieces shall be prepared in accordance with ISO 23529.

The test pieces shall have their upper and lower surfaces flat, smooth and parallel to one another.

The standard test piece shall be a minimum of 6 mm thick and shall be made up of one, two or three layers of rubber, the thinnest of which shall not be less than 2 mm. The lateral dimensions of the test



piece shall be such that three or more measurements can be made at least 10 mm from each other and at least 3 mm from the edges of the test piece.

Test pieces of other dimensions or from finished products may be used but will usually produce results which differ from those obtained with standard test pieces.

## 8 Time interval between forming the test pieces and testing

The time interval between forming the test pieces and testing shall be in accordance with ISO 23529.

## 9 Conditioning

The test pieces shall be maintained at a standard laboratory temperature (see ISO 23529) for a minimum of 3 h immediately before testing.

## 10 Temperature of test

The test shall be carried out at the same standard laboratory temperature as was used for the conditioning.

## 11 Procedure

Place a test piece on the horizontal measuring table. Bring the foot into contact with the surface of the test piece. Press the plunger and indenting ball onto the rubber for 5 s, the force on the ball being the contact force.

If the gauge is graduated in VLRH degrees, adjust it to read 100 at the end of the 5 s period. Then apply the additional indenting force and maintain it for 30 s, when a direct reading of hardness in VLRH degrees is obtained.

If the gauge is graduated in millimetres, note the differential indentation of the plunger caused by the additional indenting force, applied for 30 s. Convert this to VLRH degrees by using [Table A.1](#) or a graph constructed therefrom.

Repeat the test to obtain measurements at three different locations on the test piece, observing the requirements for separation distances given in [Clause 7](#). Take the median of the three results as the result of the test.

## 12 Test report

The test report shall include the following information:

- a) sample and test piece details:
  - 1) a full description of the sample and its origin;
  - 2) compound details and cure details, where appropriate;
  - 3) the dimensions of the test piece;
  - 4) the number of layers in the test piece and the thickness of the thinnest layer;
  - 5) in the case of curved or irregularly shaped test pieces, a description of the test piece;