INTERNATIONAL STANDARD

ISO 7619-1

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AMENDMENT 1
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Rubber, vulcanized or thermoplastic — Determination of indentation hardness —

Part 1: Durometer method (Shore hardness)

AMENDMENT 1: Precision data

Caoutchouc vulcanisé ou thermoplastique — Détermination de la dureté par pénétration —

Partie 1: Méthode au duromètre (dureté Shore)

AMENDEMENT 1: Données de fidélité

Reference number
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Foreword

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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.

Amendment 1 to ISO 7619-1:2004 was prepared by Technical Committee ISO/TC 45, *Rubber and rubber products*, Subcommittee SC 2, *Testing and analysis*.

This amendment concerns the addition of a precision statement in ISO 7619-1:2004.

Rubber, vulcanized or thermoplastic — Determination of indentation hardness —

Part 1: Durometer method (Shore hardness)

AMENDMENT 1: Precision data

Page 1, Clause 2

Replace the existing normative reference with the following.

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

Page 6, 8.1, Note

Replace the existing note with the following.

"NOTE For further information on calibration of hardness meters and durometers, see ISO 18898."

Page 6

Insert the following new Clause 9 immediately after 8.2.

9 Precision

9.1 Interlaboratory test

An interlaboratory test program (ITP) for precision evaluation for micro hardness tests was conducted in 2004 using the precision procedures and guidelines as described in the subsequently published ISO/TR 9272:2005.

See Tables A.1 and A.2 for precision results.

Precision for Type AM durometer hardness measurement was evaluated. Although Micro IRHD testing is not specified in this test method, the precision for Micro International Rubber Hardness Degrees (IRHD) was evaluated as a supplementary method for purposes of comparison. ISO 48 also has an additional set of precision results for IRHD.[1)]

1) This is to ensure that optimal use is made of the results on IRHD from the ITP for ISO 7619-1, given that these results might otherwise be discarded. Having precision in both locations (ISO 7619-1 and ISO 48) for IRHD expands the precision knowledge base for IRHD and provides more precision information on this method.

9.2 Precision results

The precision results for Type AM durometer measurement are given in Table A.1 with the materials listed in increasing hardness order. These results were obtained using the outlier replacement procedures as described in ISO/TR 9272:2005. General statements for the use of the precision results are cited below. These are given in terms of both absolute precision, r and R, and relative precision (r) and (R).

9.3 Repeatability

The repeatability, or local domain precision, for each of the hardness test methods was established for each material by the values found in Table A.1. Two individual test results (obtained by the proper use of this part of ISO 7619) that differ by more than the tabulated values for r (in measurement units) and (r) (in percent) shall be considered as suspect, i.e. as having come from different populations. Such a decision suggests that some appropriate investigative action be taken.

9.4 Reproducibility

The reproducibility, or global domain precision, for Type AM durometer hardness test method was established for each material by the values found in Table A.1. Two individual test results obtained in different laboratories (by the proper use of this part of ISO 7619) that differ by more than the tabulated values for R (in measurement units) and (R) (in percent) shall be considered as suspect, i.e. as having come from different populations. Such a decision suggests that some appropriate investigative action be taken.

Page 6

Renumber the existing Clause 9 as Clause 10.

Page 7

Insert the following new Annex A between the newly-numbered Clause 10 and the Bibliography.

Annex A
(informative)

Precision for Type AM durometer compared to Micro IRHD

A.1 A Type 1 precision was evaluated (for both tests) using cured test pieces prepared from four (4) different rubber compounds A, B, C and D (with a range of hardness values) supplied to each of the six (6) participating laboratories in the ITP. On each of two (2) test days, two weeks apart, the following test sequence was carried out. Three (3) test pieces for each compound were furnished and a median of five (5) hardness measurements on each of the three test pieces was obtained for each of two operators. For each operator, a median value was selected for the three test pieces. The two median values were then averaged to obtain a single value designated as a test result for that test day. Shore A measurements were made on one side of the test piece and IRHD measurements were made on the reverse side. The precision analysis was based on test result data, i.e. two (2) test result values per laboratory.

The ISO/TR 9272:2005 Option 2 outlier treatment procedure, outlier replacement, was adopted since the ITP has a minimum number (6) of participating laboratories. This Option 2 procedure replaces each outlier declared as significant, with a value that is consistent with the data value distribution for the non-outlier data for that material. See ISO/TR 9272:2005 for a rationale for this concept and for other details.

The precision results as determined by this ITP may not be applied to acceptance or rejection testing for any group of materials or products without documentation that the results of this precision evaluation actually apply to the products or materials tested.

A.2 The precision for Micro IRHD testing is found in Table A.2, with the materials listed in increasing hardness order. These results were obtained using the outlier replacement procedures as described in ISO/TR 9272:2005, as cited above. These are given in terms of both the absolute precision, r or R, and also for relative precision (r) and (R). The statements as given above for repeatability and reproducibility for type AM durometer may be used for any application to Micro IRHD testing, using Table A.2 for the precision parameters.

A.3 The results of the precision analysis in Tables A.1 and A.2 indicate that there is no pronounced trend for r or R versus hardness level over the 46 to 74 range. The repeatability parameters for Type AM durometer [$r = 0{,}88$, $(r) = 1{,}47$] and for Micro IRHD [$r = 1{,}14$, $(r) = 2{,}04$] are reasonably similar. However, the reproducibility for the two hardness measurement methods is substantially different: for Shore A, $R = 5{,}08$, $(R) = 8{,}98$, and for IRHD, $R = 2{,}20$, $(R) = 3{,}85$. The reproducibility parameters R and (R) for IRHD are 43 % of the value(s) for Shore A, indicating much better between laboratory agreement for the IRHD measurements.

A.4 Bias is the difference between a measured average test result and a reference or true value for the measurement in question. Reference values do not exist for this test method and therefore bias cannot be evaluated.

Table A.1 — Precision for ISO 7619-1, Hardness — Type AM durometer

Material	Mean level	Within laboratory			Between laboratory			Number of laboratories[d]
		Standard deviation s_r [a]	Repeatability (absolute) r [a]	Repeatability (relative) (r) [b]	Standard deviation s_R [c]	Reproducibility (absolute) R [a]	Reproducibility (relative) (R) [b]	
B (2)	47,9	0,276	0,772	1,61	2,32	6,5	13,57	6
C (3)	55,2	0,223	0,623	1,13	1,85	5,17	9,35	6 (1)
A (1)	62,8	0,404	1,13	1,8	1,95	5,45	8,68	6
D (4)	73,9	0,357	1	1,35	1,14	3,2	4,33	6 (1)
—	Group average	—	0,881 25	1,472 5	—	5,08	8,982 5	—

NOTE See Clause 9 for discussion of precision results of this table.

[a] In measurement units.

[b] In percent of mean level.

[c] For total between laboratory variation, in measurement units.

[d] Number of Option 2 outlier laboratory replacement values listed in parentheses ().

Table A.2 — Precision for ISO 48, Hardness - Micro IRHD

Material	Mean level	Within laboratory			Between laboratory			Number of laboratories[d]
		Standard deviation s_r [a]	Repeatability (absolute) r [a]	Repeatability (relative) (r) [b]	Standard deviation s_R [c]	Reproducibility (absolute) R [a]	Reproducibility (relative) (R) [b]	
B (2)	45,6	0,404	1,13	2,48	0,954	2,67	5,85	6
C (3)	53,9	0,469	1,31	2,43	0,583	1,63	3,03	6 (1)
A (1)	63,7	0,605	1,7	2,66	0,728	2,04	3,2	6
D (4)	74	0,149	0,416	0,57	0,875	2,45	3,31	6 (1)
—	Group average	—	1,139	2,035	—	2,197 5	3,847 5	—

NOTE See Clause 9 for discussion of precision results of this table.

[a] In measurement units.

[b] In percent of mean level.

[c] For total between laboratory variation, in measurement units.

[d] Number of Option 2 outlier laboratory replacement values listed in parentheses ().

Page 8, Bibliography

Delete the footnote (“Under preparation”) from bibliographical Reference [4].

Add the following to the list of bibliographical references.

[8] ISO/TR 9272:2005, *Rubber and rubber products — Determination of precision for test method standards*