

# INTERNATIONAL STANDARD

**ISO**  
**3384**

Fourth edition  
1999-10-15

**AMENDMENT 1**  
2001-01-15

---

---

## **Rubber, vulcanized or thermoplastic — Determination of stress relaxation in compression at ambient and at elevated temperatures**

### **AMENDMENT 1: Precision data**

*Caoutchouc vulcanisé ou thermoplastique — Détermination de la  
relaxation de contrainte en compression à température ambiante et aux  
températures élevées*

*AMENDEMENT 1: Données concernant la fiabilité*



Reference number  
ISO 3384:1999/Amd.1:2001(E)

© ISO 2001

**PDF disclaimer**

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.

STANDARDSISO.COM : Click to view the full PDF of ISO 3384:1999/Amd 1:2001

© ISO 2001

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office  
Case postale 56 • CH-1211 Geneva 20  
Tel. + 41 22 749 01 11  
Fax + 41 22 749 09 47  
E-mail [copyright@iso.ch](mailto:copyright@iso.ch)  
Web [www.iso.ch](http://www.iso.ch)

Printed in Switzerland

## 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 3.

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 Amendment may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

Amendment 1 to International Standard ISO 3384:1999 was prepared by Technical Committee ISO/TC 45, *Rubber and rubber products*, Subcommittee SC 2, *Testing and analyses*.



# Rubber, vulcanized or thermoplastic — Determination of stress relaxation in compression at ambient and at elevated temperatures

## AMENDMENT 1: Precision data

Pages 6 and 7

Add a new clause 10 entitled "Precision" as given below, renumber the existing clause 10 to become clause 11 and add the informative annex also given below.

### 10 Precision

#### 10.1 General

An interlaboratory test programme (ITP) and the precision calculations to express the repeatability and reproducibility were performed in accordance with ISO/TR 9272:1986, *Rubber and rubber products — Determination of precision for test method standards*. Consult this for precision concepts and nomenclature. Annex A gives guidance on the use of repeatability and reproducibility results.

#### 10.2 Precision details

**10.2.1** The ITP was conducted in 1998. One material, an IR/SBR blend rubber compound, was used. Testing using method A was conducted at 23 °C and 100 °C and using method B at 100 °C. A test result is taken as the average value, for two test pieces, of the percent decrease in the initial counterforce after 168 h of relaxation. Twelve laboratories participated in the 23 °C testing using method A, eleven laboratories in the 100 °C testing using method A and seven laboratories in the 100 °C testing using method B.

**10.2.2** The precision determined is a Type 1 precision; fully prepared test pieces were submitted to the laboratories. The precision is also an intermediate-term precision with a span of 2 or 3 weeks between the two replications. This is required due to the relaxation-ageing period of 168 h for each replication of the test. This is in distinction to the more usual day 1/day 2 replication with a few days between replications.

**10.2.3** Analysis of the data from all the laboratories (all three tests) resulted in

- the results from three laboratories being declared outliers for method A at 23 °C;
- the results from two laboratories being declared outliers for method A at 100 °C;
- the result from one laboratory being declared an outlier for method B at 100 °C.

These results were rejected and the final analysis was conducted on the remaining data, viz:

- for method A at 23 °C: the results from nine laboratories;
- for method A at 100 °C: the results from nine laboratories;
- for method B at 100 °C: the results from six laboratories.

The revised database represents those laboratories that had good within-lab control of the testing (the results are in relatively good agreement).

### 10.3 Precision results

The precision data obtained from the final database are given in Table 1. The precision (both repeatability and reproducibility) of method B at 100 °C is substantially worse than that for method A. No relative precision, ( $r$ ) and ( $R$ ), is given for this International Standard.

The symbols used in Table 1 are as follows:

$s_r$  is the repeatability standard deviation, in measurement units;

$r$  is the repeatability, in measurement units (i.e. % relaxation);

$s_R$  is the reproducibility standard deviation, in measured units;

$R$  is the reproducibility, in measurement units (i.e. % relaxation).

**Table 1 — Precision results**

| <b>Method A, 168 h at 23 °C</b>  |                      |       |      |       |      |
|----------------------------------|----------------------|-------|------|-------|------|
| Material                         | Mean<br>% relaxation | $s_r$ | $r$  | $s_R$ | $R$  |
| A                                | 10,9                 | 0,795 | 2,22 | 1,21  | 3,40 |
| <b>Method A, 168 h at 100 °C</b> |                      |       |      |       |      |
| Material                         | Mean<br>% relaxation | $s_r$ | $r$  | $s_R$ | $R$  |
| A                                | 50,5                 | 0,845 | 2,37 | 2,15  | 6,03 |
| <b>Method B, 168 h at 100 °C</b> |                      |       |      |       |      |
| Material                         | Mean<br>% relaxation | $s_r$ | $r$  | $s_R$ | $R$  |
| A                                | 67,5                 | 2,07  | 5,8  | 8,66  | 24,3 |