
**Rubber — Determination of viscosity
and stress relaxation using a rotorless
sealed shear rheometer**

*Caoutchouc — Détermination de la viscosité et de la relaxation de
contrainte au moyen d'un rhéomètre à cisaillement sans rotor étanche*



This document is a preview generated by EVIS



COPYRIGHT PROTECTED DOCUMENT

© ISO 2012

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.org
Web 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 Principle	2
5 Apparatus	3
5.1 General	3
5.2 Die cavity	3
5.3 Die closure	3
5.4 Movement	3
5.5 Heating and temperature control	4
5.6 Torque-measuring system	4
6 Calibration	6
7 Test piece	6
7.1 Preparation of the test piece	6
7.2 Protective films	6
8 Temperature	6
9 Procedure	7
9.1 Testing sequence	7
9.2 Preparation for the test	7
9.3 Rheometer loading	7
10 Reporting of results	7
10.1 Examples of reporting results	7
10.2 Basic expression of results	7
10.3 Additional results	8
10.4 Stress relaxation test results	8
11 Precision	8
12 Test report	8
Annex A (normative) Calibration schedule	10
Annex B (informative) Precision data	12
Bibliography	14

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 2.

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.

ISO 13145 was prepared by Technical Committee ISO/TC 45, *Rubber and rubber products*, Subcommittee SC 2, *Testing and analysis*.

Introduction

The rheological properties of rubbers are related to their structural characteristics and will influence the behaviour of the rubber during processing and the performance of the final product.

For these reasons, the industrial environment requires instruments that can quickly and easily evaluate the rheological properties.

As a consequence, this standard test method was formulated using a rotorless sealed shear rheometer for rheological evaluation under defined conditions.

This test could be an alternative to the Mooney viscometer, still used as standard in many parts of the rubber industry to measure Mooney viscosity (in accordance with ISO 289-1). The defined conditions have been selected to provide a shear rate range similar to that used for Mooney viscosity and a good repeatability level.

This new test procedure should be performed over a short time and preferably in the automatic mode to optimize test efficiency.

Rubber — Determination of viscosity and stress relaxation using a rotorless sealed shear rheometer

WARNING — Persons using this International Standard should be familiar with normal laboratory practice. This standard 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 ensure compliance with any national regulatory conditions.

1 Scope

This International Standard describes a method for the determination of the viscosity and stress relaxation of raw or compounded rubber under specified conditions.

The viscosity determination consists of a constant strain, temperature and frequency test in which the elastic and the loss components of the complex shear modulus can be determined.

The determination of stress relaxation consists of a constant static strain and temperature test in which the torque decrease can be determined.

2 Normative references

The following referenced documents are indispensable for the application 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 1382, *Rubber — Vocabulary*

ISO 18899:2004, *Rubber — Guide to the calibration of test equipment*

3 Terms and definitions

For the purpose of this document, the terms and definitions given in ISO 1382 and the following apply.

3.1

rotorless sealed shear rheometer

device consisting of two dies forming a temperature-controlled cavity, one of which is moved relative to the other to apply a stress or strain to the test piece

3.2

sinusoidal strain

$\gamma(t)$

strain produced by the oscillation of the die constituting the test cavity

NOTE It is given by the expression $\gamma(t) = \gamma_0 \sin(\omega t)$, where γ_0 is the maximum amplitude of the applied strain.

3.3

loss angle

δ

phase angle between the stress and the strain

NOTE This is a measure of the presence and extent of viscous behaviour in a material. For viscoelastic materials, the phase angle can assume a value between 0° and 90°. 90° is an ideal Newtonian liquid.