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DIN 53504

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DIN 53504:1994-05

Testing of rubber – Determination of tensile strength at break, tensile stress at yield, elongation at break and stress values in a tensile test English translation of DIN 53504:2009-10

Prüfung von Kautschuk und Elastomeren –
Bestimmung von Reißfestigkeit, Zugfestigkeit, Reißdehnung und Spannungswerten im Zugversuch
Englische Übersetzung von DIN 53504:2009-10

Essai des élastomères –
Détermination de la résistance à la rupture, de la résistance à la traction, de l'allongement à la rupture et des valeurs de contraintes dans l'essai de traction
Traduction anglaise de DIN 53504:2009-10

Document comprises 18 pages

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Contents

Foreword

This standard has been prepared by Working Committee NA 062-04-34 AA *Prüfung der physikalischen Eigenschaften von Kautschuk und Elastomeren* of the *Normenausschuss Materialprüfung* (Materials Testing Standards Committee).

The contents of this standard has been largely harmonized with that of the International Standard ISO 37:2005, *Rubber, vulcanized or thermoplastic – Determination of tensile stress-strain properties*.

For the relationship with International Standard ISO 37:2005 issued by International Organization for Standardization (ISO), see Introduction.

Amendments

This standard differs from DIN 53504:1994-05 as follows:

a) in Subclause 5.1, reference has been made to DIN ISO 23529;

b) in subclause 5.3, reference has been made to DIN EN ISO 7500-1 and DIN EN ISO 9513;

c) the calculation of elongation for the determination of stress values for ring test pieces has been harmonized with that in International Standard ISO 37;

d) reference has been made to the circular gaskets in accordance with the specifications of the *Verband der Automobilindustrie e.V.* (VDA) (German Motor Vehicle Industries Association);

e) in 6.1, the type S 1A dumb-bell test piece has been introduced;

f) DIN ISO 23529 is now to be taken into account;

g) tolerances of (± 2,0 %) have been specified for the thickness of all test pieces;

h) tolerances have been specified for comparative measuring series;

i) in 6.3, the term “arbitration case” has been defined in detail.

Previous editions

DIN DVM 3504 = DIN 53504 Part 1: 1938-11
DIN DVM 3504 = DIN 53504 Part 2: 1940-12
DIN 53504: 1965-10, 1969-05, 1975-08, 1985-03, 1994-05

Introduction

DIN 53504 has been revised in order to harmonize it with ISO 37, while at the same time retaining the extensive possibilities and advantages that DIN 53504:1994-05 presented. Furthermore, practical information regarding testing is given.

Detailed information is provided in the relevant clauses.

Although type R 2 ring test pieces are not dealt with in ISO 37, they have been retained in this standard.

As regards the limits of error of extensometers used for measuring dumb-bells, reference is made to the possibility of adopting those given in ISO 5893 (2 %).

1 Scope

The test method specified in this standard serves to determine the tensile strength at break, tensile stress at yield, elongation at break and stress at a given strain of rubber test pieces of specified shape when these are stretched to rupture at a constant rate of traverse.

It is advisable that the full force-extension curve or at least part of it be plotted, since the behaviour of rubber when subjected to tensile stress cannot be adequately characterized by the tensile strength at break and elongation at break.

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.

DIN 53598-1, *Statistical evaluation based on random sampling with examples from rubber and plastics testing*

DIN EN ISO 7500-1, *Metallic materials — Verification of static uniaxial testing machines — Part 1: Tension/ compression testing machines — Verification and calibration of the force-measuring system*

DIN EN ISO 7500-1 Supplement 1, *Metallic materials — Verification of static uniaxial testing machines — Part 1: Tension/compression testing machines; verification and calibration of the force-measuring system; general for requirements, verification and calibration of tension, compression and flexion testing machines*

DIN EN ISO 9513, *Metallic materials — Calibration of extensometers used in uniaxial testing*

DIN ISO 5725-2, *Accuracy (trueness and precision) of measurement methods and results — Part 2: Basic method for the determination of repeatability and reproducibility of a standard measurement method*

DIN ISO 23529:2007-01, *Rubber — General procedures for preparing and conditioning test pieces for physical test methods (ISO 23529:2004)*

ISO 37:2005, *Rubber, vulcanized or thermoplastic — Determination of tensile stress-strain properties*

3 Terms and definitions

For the purposes of this standard the following terms and definitions apply.

3.1
tensile strength at break
σ_R

ratio of the force at break, F_R, to the initial cross-sectional area, A_0, of the test piece

3.2
tensile stress at yield
σ_{max}

ratio of the maximum measured force, F_{max}, to the initial cross-sectional area, A_0, of the test piece

NOTE If the tensile testing of rubber is carried out at or above ambient temperature, force F_R is generally equal to force F_{max}.