
**Rubber and rubber products —
Determination of the composition of
vulcanizates and uncured compounds
by thermogravimetry —**

Part 1:

**Butadiene, ethylene-propylene
copolymer and terpolymer, isobutene-
isoprene, isoprene and styrene-
butadiene rubbers**

*Caoutchouc et produits à base de caoutchouc — Détermination de
la composition des vulcanisats et des mélanges non vulcanisés par
thermogravimétrie —*

*Partie 1: Caoutchoucs butadiène, copolymères et terpolymères
éthylène-propylène, isobutène-isoprène, isoprène et butadiène-styrène*



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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 document 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).

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For an explanation of 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 www.iso.org/iso/foreword.html.

This document was prepared by ISO/TC 45, *Rubber and rubber products*, SC 2, *Testing and analysis*.

This fourth edition cancels and replaces the third edition (ISO 9924-1:2016), which has been technically revised:

The main changes are as follows:

- [Clause 3](#) is added;
- Added "If graphite is present" (see [4.3](#), [4.4](#)), to make the document more comprehensive;
- Modified the steps of heating rate (see [8.2.5](#) and [8.2.7](#)) to make the decomposition process of the sample more uniform;
- Modified the carbon black content part (see [9.2.3](#)). The modified expression is more reasonable and consistent with the "test procedure" clause;
- Modified the variables of formulae (see [9.1](#) and [9.3](#)) to be written using symbols instead of text.

A list of all parts in the ISO 9924 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

This corrected version of ISO 9924-1:2023 incorporates the following correction:

- In Formula 6, text describing the meaning of W_4 has been corrected.

Rubber and rubber products — Determination of the composition of vulcanizates and uncured compounds by thermogravimetry —

Part 1: Butadiene, ethylene-propylene copolymer and terpolymer, isobutene-isoprene, isoprene and styrene-butadiene rubbers

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 be informed of any national regulatory conditions.

1 Scope

This document specifies a thermogravimetric method for the determination of the total organic content, carbon black content and ash in vulcanizates and uncured compounds. The loss in mass at 300 °C is an approximate guide to the volatile-matter content of the compound.

The method is suitable for the analysis of rubber compounds and vulcanizates containing the following rubbers occurring alone or as mixtures:

- a) polyisoprene of natural or synthetic origin;
- b) polybutadiene;
- c) styrene-butadiene copolymers;
- d) isobutylene-isoprene copolymers;
- e) ethylene-propylene copolymers and related terpolymers.

NOTE The field of application of the method may be extended to the analysis of compounds containing rubbers different from those given in this subclause, provided that the applicability of the method is tested beforehand using known compounds or vulcanizates having a similar composition. Other compounds are covered in ISO 9924-2.

The method is not suitable for rubbers containing polymers which form a carbonaceous residue during pyrolysis, such as many chlorine- or nitrogen-containing rubbers.

The method is also not suitable for materials containing additives which cause the formation of carbonaceous residues during pyrolysis, such as cobalt and lead salts or phenolic resins.

The method is not suitable for compounds containing blowing agents and mineral fillers, such as carbonates, hydrated aluminium oxides, hydrated silicon oxides or silicates which decompose in the temperature range from 25 °C to 650 °C, unless suitable corrections based on prior knowledge of filler behaviour can be made.

The method is not suitable for the determination of the total polymer content of compounds or vulcanizates containing non-rubber organic ingredients that cannot be completely removed by solvent extraction carried out in accordance with ISO 1407.

2 Normative references

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 1407, *Rubber — Determination of solvent extract*