
**Carbon-fibre-reinforced composites —
Determination of fibre weight content
by thermogravimetry (TG)**

*Composites renforcés de fibres de carbone — Détermination de la
teneur en masse de fibres par thermogravimétrie (TG)*



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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 documents 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 Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 13, *Composites and reinforcement fibres*.

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.

Introduction

Methods for the determination of fibre content of carbon fibre reinforced plastics has been established in ISO 14127. The fibre mass in the composite sample is derived by removing the plastic/polymer part in the sample by combustion using burner and the use of strong acid in ISO 14127. These methods are not recommended on the grounds of safety and reagent waste. The determination method of the content of carbon black in the rubber and rubber products is regulated by ISO 9924-3. A thermogravimeter is employed as the apparatus to remove the rubber part of the sample in ISO 9924-3. Currently, thermogravimeters are produced commercially with accuracy, repeatability and reproducibility sufficient for the determination of fibre content in carbon fibre reinforced plastics. In this document, a thermogravimeter is used as the apparatus to remove the plastic/polymer part of the composite sample.

Carbon-fibre-reinforced composites — Determination of fibre weight content by thermogravimetry (TG)

1 Scope

This document specifies a thermogravimetric method for the determination of fibre weight content by weight percent, of carbon fibre reinforced composites.

This method applies to pre-products, such as, prepregs, parts and products of carbon fibre reinforced composites.

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 291, *Plastics — Standard atmospheres for conditioning and testing*

3 Terms and definition

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

3.1

fibre weight content

w_f

<fibre based composites> ratio of fibre weight to total weight of composite, same as fibre content by weight; expressed as a percentage

4 Principle

A weighed test specimen is heated following a pre-set programme in a known atmosphere.

Initial pyrolysis in an inert atmosphere (nitrogen) is followed by combustion in an oxidizing atmosphere.

Generally, the reactions that generate mass variations are decompositions, oxidations, or reactions volatilizing a constituent.

Plotting the loss of mass as a function of temperature gives a quantitatively usable thermogram, which is characteristic of the material.

5 Reagents

5.1 Nitrogen gas, of minimal purity 99,995 % mass fraction, with an oxygen content of less than 10 mg/kg (ppm) and hydrocarbon content less than 1,5 mg/kg (ppm).