
Carbon fibre — Determination of filament diameter and cross- sectional area

*Fibres de carbone — Détermination du diamètre et de l'aire de la
section transversale des filaments*

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

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Contents

Page

Foreword	iv
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Principle	1
5 Test specimens	2
5.1 General.....	2
5.2 Method A.....	2
5.3 Methods B and D.....	2
5.4 Method C.....	2
5.5 Method E.....	2
6 Method A: Determination of the diameter by calculation	2
7 Method B: Determination of filament diameter by optical microscopy	3
7.1 Principle.....	3
7.2 Apparatus.....	3
7.3 Calibration of the microscope.....	4
7.4 Preparation of the test specimen.....	4
7.5 Procedure.....	5
7.6 Expression of results.....	5
8 Method C: Determination of the diameter and cross-sectional area of transversely cut filaments by microscopy	5
8.1 Principle.....	5
8.2 Apparatus.....	5
8.3 Preparation of test specimen.....	6
8.4 Procedure.....	6
8.4.1 General.....	6
8.4.2 Optical microscopic examination.....	6
8.4.3 Scanning electron microscopy.....	6
8.5 Measurement of the diameter.....	7
8.5.1 Filaments of circular cross-section.....	7
8.5.2 Filaments of non-circular cross-section.....	7
9 Method D: Determination of the diameter by laser diffractometry	7
9.1 Principle.....	7
9.2 Apparatus.....	7
9.3 Preparation of test specimen.....	8
9.4 Procedure.....	8
9.5 Expression of results.....	8
10 Method E: Determination of filament diameter by scanning electron microscopy	8
10.1 Principle.....	8
10.2 Apparatus.....	8
10.3 Procedure.....	9
11 Precision	9
12 Test report	9
Annex A (informative) Suggested method for the preparation of test specimens for method C	10

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).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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For an explanation on 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 the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 13, *Composites and reinforcement fibres*.

This second edition cancels and replaces the first edition (ISO 11567:1995), which has been technically revised.

The main changes compared to the previous edition are as follows.

- a) Method E, Determination of the diameter by scanning electron microscopy, has been added.
- b) The number of the test specimens in method A, method B, method C and method D has been identified.

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 11567:2018 incorporates the following corrections:

- [Formula \(1\)](#) in [Clause 6](#) has been corrected.

Carbon fibre — Determination of filament diameter and cross-sectional area

1 Scope

This document specifies five test methods used for the determination of the diameter and cross-sectional area of single carbon fibre filaments.

The shape of the cross-section of the filaments from different suppliers can vary significantly. The term “diameter” used in this document applies to all cases, from a “true” diameter, where the filament is exactly circular in cross-section, to an “apparent” diameter where the filament is not circular.

The methods proposed are not necessarily directly applicable to all types of filament. The product specification determines the method to be used. If there is no specification, the selection of the appropriate method is a matter of judgement. The details given here are considered to be sufficiently precise to enable this choice to be made.

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 1888:2006, *Textile glass — Staple fibres or filaments — Determination of average diameter*

ISO 1889, *Reinforcement yarns — Determination of linear density*

ISO 10119, *Carbon fibre — Determination of density*

ISO 11566, *Carbon fibre — Determination of the tensile properties of single-filament specimens*

3 Terms and definitions

No terms and definitions are listed in this document.

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/>

4 Principle

Five methods are proposed for the determination of the diameter and cross-sectional area of carbon fibre filaments:

- Method A:

Determination of the diameter by calculation.

- Method B:

Determination of the diameter by optical microscopy.

- Method C:

Determination of the diameter and cross-sectional area of transversely cut filaments by microscopy.

— Method D:

Determination of the diameter by laser diffractometry.

— Method E:

Determination of the diameter by scanning electron microscopy.

NOTE Method A gives only an average value of the diameter, which can be sufficient in certain cases, while methods B, C, D and E, which are experimental methods, provide actual values.

5 Test specimens

5.1 General

Because of the intrinsic variability in filament diameter between filaments and along the length of a filament, it is recommended that the diameter or cross-sectional area of 20 filaments in the yarn sample be measured and a statistical analysis of these results carried out.

Test specimens shall be taken from each yarn sample.

5.2 Method A

Yarns are used as test specimens, the amount of yarn taken are specified in ISO 10119 and ISO 1889.

Prepare at least 2 test specimens.

5.3 Methods B and D

Filaments taken from the yarns are used as test specimens, the length of the filaments are approximately 50 mm.

Prepare at least 20 test specimens.

5.4 Method C

Yarns are used as test specimens, the length of yarn taken are approximately 30 mm.

Prepare one test specimen, which consists of at least 20 filaments.

5.5 Method E

Filaments taken from the yarns are used as test specimens, the length of the filaments are determined according to the stage size of the scanning electron microscope.

Prepare at least 20 test specimens.

6 Method A: Determination of the diameter by calculation

An average filament diameter is determined from the linear density of the unsized yarn determined in accordance with ISO 1889, the density determined in accordance with ISO 10119 and the number of filaments in the yarn. The number of filaments in the yarn shall be given by the carbon fibre manufacturer.