

Carbon fibre —

Part 1: Method for determination of density

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Plastics and Rubber Standards Policy Committee (PRM/-) to Technical Committee PRM/41, upon which the following bodies were represented:

- British Plastics Federation
- Department of Trade and Industry (National Physical Laboratory)
- Ministry of Defence
- Motor Industry Research Association

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National foreword

This Part of BS 7658 has been prepared under the direction of the Plastics and Rubber Standards Policy Committee and is identical with ISO 10119:1992 *Carbon fibre — Determination of density*, published by the International Organization for Standardization (ISO).

Cross-references

International Standard	Corresponding British Standard
ISO 291:1977	BS 2782 <i>Methods of testing plastics</i> Part 0:1992 <i>Introduction</i> (Appendix A is identical)
ISO 1675:1985	Method 620E:1980 <i>Determination of density of liquid resins by the pyknometer method</i> (Technically equivalent)

The Technical Committee has reviewed the provisions of ISO 1886, to which normative reference is made in the text, and has decided that they are acceptable for use in conjunction with this standard.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 8, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 Scope

This International Standard specifies three methods for the determination of the density of desized carbon fibre yarn:

- Method A: Liquid-displacement method
- Method B: Sink/float method
- Method C: Density-gradient column method

The determination of density may also be carried out on sized fibre by agreement between customer and supplier. At low levels of size (less than 1 %), the density obtained with sized fibre may be taken to be identical to that of unsized fibre.

Method C is the reference method.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 291:1977, *Plastics — Standard atmospheres for conditioning and testing*.

ISO 1675:1985, *Plastics — Liquid resins — Determination of density by the pyknometer method*.

ISO 1886:1990, *Reinforcement fibres — Sampling plans applicable to received batches*.

3 Definition

For the purposes of this International Standard, the following definition applies.

3.1

density

the mass per unit volume of a substance at a specified temperature. This property is expressed in kilograms per cubic metre or in grams per cubic centimetre at the specified temperature. The recommended temperature is 23 °C

4 Sampling

Sampling shall be carried out as specified by ISO 1886 in order to determine the number of elementary units (spools, etc.) to be sampled.

5 Conditioning and test conditions

Before testing, test specimens shall be conditioned in a standard test atmosphere as specified in ISO 291. During the test, the test apparatus and specimens shall be maintained at the same conditions as used for conditioning. The preferred conditions are 23 °C ± 2 °C and (50 ± 5) % RH.

6 Number of test specimens

Take at least three test specimens from each elementary unit.

7 Test methods

7.1 Method A: Liquid-displacement method

7.1.1 Principle

A specimen is weighed in air and then in a liquid which completely wets out the specimen and which has a known density at least 0,2 g/cm³ less than that of the specimen. The difference in mass of the specimen in the two media is due to the Archimedean upthrust. This difference in mass, divided by the density of the liquid, gives the volume of the specimen. The mass of the specimen in air, divided by its volume, gives the density of the specimen.

7.1.2 Apparatus and materials

Standard laboratory apparatus and the following:

7.1.2.1 *Analytical balance*, accurate to 0,1 mg.

7.1.2.2 *Suspension wire*, made of stainless steel, of diameter 0,4 mm or less, or a *specimen support* made of glass or stainless steel, with perforations so that it can be immersed easily in the immersion liquid (see Figure 1).

7.1.2.3 *Pyknometer or hydrometer*, accurate to 0,001 g/cm³.

7.1.2.4 *Beaker*, made of borosilicate glass.

7.1.2.5 *Support framework*, suitable for use with the balance (7.1.2.1) (see Figure 2).

7.1.2.6 *Vacuum pump* (optional).

7.1.2.7 *Ultrasonic device* (optional).

7.1.2.8 *Desiccator*

7.1.2.9 *Immersion liquids* (examples):

Ethanol	$\rho_{23} = 0,79 \text{ g/cm}^3$
Acetone	$\rho_{23} = 0,79 \text{ g/cm}^3$
Methanol	$\rho_{23} = 0,80 \text{ g/cm}^3$
Dichloroethane	$\rho_{23} = 1,25 \text{ g/cm}^3$
o-Dichlorobenzene	$\rho_{23} = 1,31 \text{ g/cm}^3$
Trichloroethane	$\rho_{23} = 1,35 \text{ g/cm}^3$
Trichloromethane	$\rho_{23} = 1,48 \text{ g/cm}^3$
Carbon tetrachloride	$\rho_{23} = 1,59 \text{ g/cm}^3$

WARNING — Take the necessary safety precautions when handling these liquids