INTERNATIONAL STANDARD

ISO 13002

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Carbon fibre — Designation system for filament yarns

Fibres de carbone — Système de désignation des fils continus

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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 13002 was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 13, *Composites and reinforcement fibres*.

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Carbon fibre — Designation system for filament yarns

1 Scope

1.1 This International Standard establishes a system of designation for filament yarns of carbon fibre which may be used as the basis for specifications.

1.2 This designation system is applicable to filament yarns used for the reinforcement of polymer composites.

It does not apply to discontinuous fibre products pyrolized in the form of staple yarns, woven fabrics, braids, knits, mats, etc.

1.3 The types of filament yarns are differentiated from each other by a classification system based on appropriate levels of the designatory properties:

a) tensile modulus of elasticity;

b) tensile strength;

c) linear density.

1.4 It is not intended to imply that materials having the same designation give the same performance. This International Standard does not provide engineering data, performance data or data on processing conditions which may be required to specify a material for a particular application and/or method of processing.

1.5 In order to specify a filament yarn for a particular application or to ensure reproducible processing, additional requirements may be given in data block 3 (see clause 3).

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 1889:1997, *Reinforcement yarns — Determination of linear density.*

ISO 10618:—[1)], *Carbon fibre — Determination of tensile properties of resin-impregnated yarns.*

1) To be published.

3 Designation system

The designation system for filament yarns is based on the following standardized pattern:

Designation				
Description block (optional)	Identity block			
	International Standard number block	Individual-item block		
		Data block 1	Data block 2	Data block 3

The designation consists of an optional description block, reading “Reinforcing fibre”, and an identity block comprising the International Standard number and an individual-item block. For unambiguous designation, the individual-item block is subdivided into three data blocks comprising the following information:

— Data block 1: Identification of the carbon fibres by information about the precursor yarn and product form (see 3.1).

— Data block 2: Designatory properties (see 3.2).

— Data block 3: For the purpose of specifications, a third data block may be containing additional information (see 3.3).

The first character of the individual-item block shall be a hyphen. The data blocks shall be separated from each other by commas.

If a data block is not used, this shall be indicated by doubling the separation sign, i.e. by two commas (,,).

3.1 Data block 1

In this data block, after the hyphen, filament yarns are identified by the symbol “CF” for carbon fibres, followed by a hyphen and two code-letters giving information on the precursor yarns (A, V and P) and product form of filament yarns (C) as specified in table 1.

Table 1 — Code-letters used for additional information in data block 1

Code-letters	Precursor yarn	Product form
AC	Acrylic fibre	Filament yarn
VC	Viscose fibre	Filament yarn
PC	Pitch fibre	Filament yarn

3.2 Data block 2

In this data block, the range of the tensile modulus of elasticity is represented by a three-figure code-number (see 3.2.1), the range of the tensile strength by a two-figure code-number (see 3.2.2) and the range of the linear density by a four-figure code-number (see 3.2.3).

The code-numbers are separated from each other by hyphens.

If a property value falls on or near a range limit value, the manufacturer shall state which range will designate the material. If subsequent individual test values lie on, or on either side of, the limit because of manufacturing tolerances, the designation is not affected.

3.2.1 Tensile modulus of elasticity

Tensile modulus of elasticity shall be determined in accordance with ISO 10618:—, Method B, which is the reference method for the calculation of the tensile modulus of carbon fibre.

The possible values of tensile modulus of elasticity are represented by a three-figure code-number which corresponds to the actual value, in gigapascals (GPa) rounded as shown in table 2.

Table 2 — Examples of ranges of tensile modulus of elasticity in data block 2

Code-number	Range of nominal tensile modulus of elasticity GPa
200	> 187 but ⩽ 213
225	> 213 but ⩽ 237
250	> 237 but ⩽ 263
275	> 263 but ⩽ 287
300	> 287 but ⩽ 313
400	> 387 but ⩽ 413
425	> 413 but ⩽ 437
450	> 437 but ⩽ 463
475	> 463 but ⩽ 487
500	> 487 but ⩽ 513
700	> 687 but ⩽ 713
725	> 713 but ⩽ 737
750	> 737 but ⩽ 763
775	> 763 but ⩽ 787
800	> 787 but ⩽ 813

3.2.2 Tensile strength

The possible values of tensile strength are represented by a two-figure code-number which corresponds to the thousands and hundreds digits of the actual value in megapascals (MPa) rounded to multiples of five as shown in table 3.

Table 3 — Examples of ranges of tensile strength in data block 2

Code-number	Range of nominal tensile strength MPa
20	> 1 750 but ⩽ 2 250
25	> 2 250 but ⩽ 2 750
30	> 2 750 but ⩽ 3 250
35	> 3 250 but ⩽ 3 750
40	> 3 750 but ⩽ 4 250
45	> 4 250 but ⩽ 4 750
50	> 4 750 but ⩽ 5 250
55	> 5 250 but ⩽ 5 750
60	> 5 750 but ⩽ 6 250

3.2.3 Linear density

Linear density shall be determined in accordance with ISO 1889.

The possible values of linear density are represented by a four-figure code-number which corresponds to the actual value in tex rounded to two significant figures as shown in table 4.

In cases where the code numbers are smaller than 1 000, zero (0) or double zero (00) can be omitted as shown in the examples in table 4.

Table 4 — Examples of ranges of linear density in data block 2

Code-number	Range of nominal linear density tex
0060 or **60**	> 55 but ⩽ 65
0070 or **70**	> 65 but ⩽ 75
0190 or **190**	> 185 but ⩽ 195
0200 or **200**	> 195 but ⩽ 205
0210 or **210**	> 205 but ⩽ 215
1400	> 1 350 but ⩽ 1 450
1500	> 1 450 but ⩽ 1 550
1600	> 1 550 but ⩽ 1 650
9 551 tex or higher is represented by **10k**, etc.	
10k	> 9 550 but ⩽ 10 500
11k	> 10 500 but ⩽ 11 500

3.3 Data block 3

Indication of additional requirements in this optional data block is a way of transforming the designation of a material into a specification for a particular application. This shall be done for example by reference to a suitable national standard or to a standard-like, generally established specification.

Examples of additional information are as follows:

— diameter or cross-sectional area of single filaments;

— number of single filaments per yarn;

— number and direction of twist in yarn;

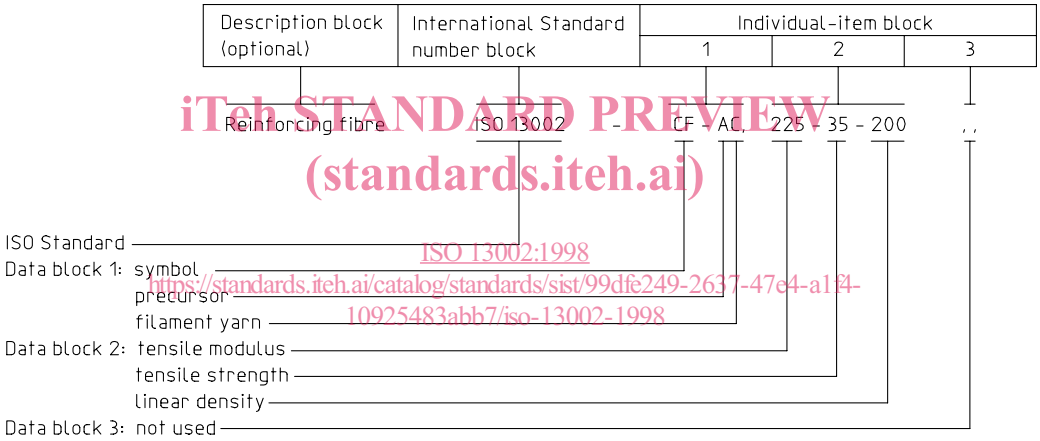
— surface-treated or not;

— size-treated or not, size content, compatibility with matrix resin;

— thermal oxidation stability of carbon fibre.

4 Example of a designation

For a carbon fibre in the form of filament yarn, which is made from an acrylic precursor, having a tensile modulus of elasticity of 233 GPa (225) and a tensile strength 3 540 MPa (35) and a linear density 198 tex (0200 or 200), would be designated:



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