INTERNATIONAL STANDARD

ISO 1890

Third edition
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Reinforcement yarns — Determination of twist

Fils de renfort — Détermination de la torsion

Reference number
ISO 1890:1997(E)

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 1890 was prepared by Technical Committee ISO/TC 61, *Plastics,* Subcommittee SC 13, *Composites and reinforcement fibres.*

This third edition cancels and replaces the second edition (ISO 1890:1986), which has been technically revised.

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Reinforcement yarns — Determination of twist

1 Scope

This International Standard specifies a method for the determination of twist in yarns made from textile glass, carbon or aramid filaments.

The method applies to single yarns (one twist) and to folded or cabled yarns (two or more twists). For folded and cabled yarns, the method is generally applied only to the final twist step.

This International Standard is applicable to package-wound yarns. If the measurement is carried out on yarns taken from a beam (or warp) or from a fabric, the result is of an indicative nature only.

The method is not applicable to products made from staple fibres.

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 2:1973, *Textiles - Designation of the direction of twist in yarns and related products.*

ISO 291:—[1)], *Plastics - Standard atmospheres for conditioning and testing.*

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

3 Definition

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

3.1 Z twist or **S twist**: The twist in a product if, when it is held in a vertical position, the spirals or helices formed by the fibres or filaments around its axis incline in the same direction as the central portion of the letter Z or S, respectively. (See ISO 2:1973, clause 2).

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1) To be published. (Revision of ISO 291:1977)

4 Principle

The twist in a specimen of known length is removed by untwisting, i.e. by turning one of the ends of the specimen with regard to the other, until all the elements (yarns, filaments) constituting the specimen are parallel.

The direction of twist in the yarn is noted and the value of the twist is expressed as the number of turns needed to eliminate the twist in 1 m of yarn.

The determination of the twist must allow for the fact that the take-off system may have an influence on the result.

Thus when the yarn is taken off tangentially, the degree of twist inserted by the twist frame is not changed. On the other hand, if the yarn is taken off over-end, the measured twist is modified depending on the circumference of the bobbin. It will increase or decrease depending whether the yarn is taken off from alternate sides of the package.

The method specified in this International Standard is based on the tangential take-off system.

If required, the over-end twist can be either measured or an approximate value calculated using the following equation:

$$T_{\text{over-end}} = T_{\text{tangential}} \pm \frac{1}{\pi D}$$

where

$\frac{1}{\pi D}$ corresponds to the twist induced by over-end take-off;

D is the diameter, in metres at the place on the bobbin where the specimen is taken.

5 Apparatus

5.1 Twist tester, i.e. an apparatus which has two clamps, one moving horizontally, the other rotating, mounted on a bar.

The twist tester shall satisfy the following conditions:

— It shall be capable of measuring the number of turns to the nearest turn.

— The clamps shall grip the yarn without slipping and shall not damage the yarn.

— The tester shall include a device capable of measuring the length of the yarn between the clamps to an accuracy of ±1 mm.

— It shall be possible to adjust the tension in the yarn between the clamps to a given value calculated as a function of the nominal linear density of the yarn. In practice however, this tension, particularly for single yarns (and the final twist step in folded or cabled yarns) does not affect the result. For routine checks and also when the measurement of the elongation of the yarn resulting from untwisting is not required, this adjustment tension can be omitted, making sure however that the specimen is clamped so that it is just taut.

— The initial distance between the clamps shall be of 500 mm ± 1 mm.

— For carbon-fibre yarn with no twist or with a twist of less than 20 turns per metre, the yarn specification or the person ordering the determination may stipulate that a stand with a fixed clamp be incorporated to make it possible to test a specimen of length L given by $4\ \text{m} \leqslant L \leqslant 5\ \text{m}$. For the calculation of the twist, the actual length shall be measured to an accuracy of 0,05 m.

5.2 **Dissection needle** or **thin blade.**

5.3 **Magnifying glass**, for examination of specimen, used to facilitate the separation of the yarn.

6 Test specimens

The determination is based on measurements carried out on three specimens taken consecutively from an elementary unit[2] or laboratory sample[3].

The yarn specification or the person requesting the determination may stipulate that the determination be performed on a (specified) higher number of specimens which are generally taken from adjacent positions in the elementary unit or laboratory sample.

Moreover, it may be stipulated that the determination be repeated at different places within the elementary unit or laboratory sample, either at given meterages or in the cylindrical part of the package if it is not all of this shape.

7 Conditioning and text atmosphere

No conditioning is required. However, in cases of dispute, the dertermination shall be carried out in a standard atmosphere as defined in ISO 291.

8 Procedure

8.1 Single yarns

8.1.1 If required, adjust the tension in the yarn to 0,25 cN/tex ± 0,1 cN/tex.

8.1.2 If the linear density of the yarn is not known, determine it by the method specified in ISO 1889.

8.1.3 Ensure that the elementary unit or laboratory sample to be examined is free of external damage. If necessary, remove yarn from the elementary unit or laboratory sample to obtain undamaged yarn.

8.1.4 Take off yarn tangentially (perpendicularly to the bobbin axis) and bring it directly, without cutting it, to the twist tester, fixing it first to the rotating clamp, then to the sliding clamp. Make sure that, during these clamping operations, the yarn is just taut, first between the elementary unit or laboratory sample and rotating clamp, then between the two clamps.

8.1.5 Set the twist tester counter to zero.

8.1.6 Turn the rotating clamp in the direction which eliminates the twist until it becomes possible to insert a dissection needle or thin blade between the filaments from the sliding clamp up to the rotating clamp. If necessary, use a magnifying glass to assist in inserting the needle and also to verify that all twist has been removed.

8.1.7 Record the number of turns on the counter and also the twist direction (Z or S, as per ISO 2).

8.1.8 Repeat the measurement on the two other specimens.

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2) The elementary unit (as defined in ISO 1886:1990, *Reinforcement fibres - Sampling plans applicable to received batches*) is the smallest normally commercially available entity of a given product.

3) A laboratory sample is a part of the elementary unit from which the specimen(s) will be selected for the test. A laboratory sample is taken when it is impractical to bring the elementary unit into the test laboratory.

8.2 Folded or cabled yarns

The procedure described in 8.1 is also designed for the final twist step of folded and cabled yarns. If, after measuring the final twist step, the determination is also to be performed on the previous twist steps, proceed as follows:

Immediately after measurement of the final twist step:

— cut out all the yarns constituting the specimen except one;

— reset the counter to zero and make sure that the specimen is under slight tension so as to keep it straight;

— determine the degree of twist, taking into account the actual length of the specimen;

— if necessary (for cabled yarns), repeat the operation on the previous twist step.

9 Expression of results

Calculate, for each specimen, the twist T, in turns per metre, using the equation

$$T = \frac{N}{L}$$

where

N is the number of turns necessary to untwist the specimen;

L is the length, in metres, under standard tension prior to untwisting.

Calculate, from the measurements made on the three specimens, the average of the twist, $\overline{T}$, in turns per metre. Report this value as the result of the determination.

If more than three specimens were taken for the determination (see clause 6), the results obtained for the various specimens in each determination shall be dealt with in accordance with the referring yarn specification or as specified by the person ordering the determination.

10 Precision

The precision of this test method is not known because interlaboratory data are not available. Interlaboratory data are being obtained and a precision statement will be added at the next revision.

11 Test report

The test report shall include the following information:

a) a reference to this International Standard;

b) all details necessary for identification of the yarn examined;

c) the sampling procedure used and the length of the specimens if not 0,5 m;