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Textiles — Determination of twist in yarns — Direct counting method

Textiles — Détermination de la torsion des fils — Méthode par comptage direct

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Foreword

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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 on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 38, *Textiles*, Subcommittee SC 23, *Fibres and yarns*.

This fourth edition cancels and replaces the third edition (ISO 2061:2010), which has been technically revised.

Textiles — Determination of twist in yarns — Direct counting method

1 Scope

This International Standard specifies a method for the determination of the direction of twist in yarns, the amount of twist, in terms of turns per unit length, and the change in length on untwisting, by the direct counting method.

This International Standard is applicable to

a) single yarns (spun and filament),

b) plied yarns, and

c) cabled yarns.

Separate procedures are given for each type of yarn. The method is designed primarily for yarns in packages, but, with special precautions, the procedures can be used for yarns taken from fabrics. It is not suitable for the determination of twist in a monofilament.

NOTE See also ISO 1890, which was prepared especially for the needs of glass textile technology, and ISO 7211-4.

This International Standard covers the determination of twist in plied and cabled yarns as follows:

a) in plied yarns: the final twist of the plied yarns and the original twist of the single yarn before plying;

b) in cabled yarns:

   — the final cabling twist of the yarn;

   — the original twist of the plied yarn after plying, but prior to the last stage of processing;

   — the twist of the single yarn before plying.

If desired, the twist of single and plied yarn components, as they lie in the final structure, can be determined by the special procedure given in 10.5.7.

This International Standard is not applicable, except by agreement, to yarns which stretch more than 0,5 % when the tension increases from 0,5 cN to 1,0 cN per unit linear density of the yarn expressed in tex. Such yarns can be tested under special conditions of tension which are accepted by all parties interested in the test results.

This International Standard is not suitable for products of open-end spinning and intermingled (interlaced) multifilament yarns.

This International Standard is not applicable to yarns which are too large to permit their being placed in the clamps of the testing apparatus without crushing or distortion severe enough to affect the test results.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 2, *Textiles — Designation of the direction of twist in yarns and related products*

ISO 139, *Textiles — Standard atmospheres for conditioning and testing*

3 Terms and definitions

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

3.1
twist
number of turns about the axis of a yarn based on its nominal gauge length before untwisting

Note 1 to entry: Twist should preferably be expressed as turns per metre (turns/m), but it may be expressed as turns per centimetre (turns/cm).

3.2
gauge length
distance between two effective clamping points of the test specimen mounted in the testing equipment

3.3
initial length
length of a test specimen under a specified pretension at the beginning of a test

3.4
change in length on untwisting
increase or decrease in initial length observed when the specimen is untwisted

Note 1 to entry: Expressed as the percentage extension or contraction, based on the specimen's initial length.

3.5
moisture equilibrium for testing
state reached when the rate of increase in mass of a sample or specimen in a specified (test) atmosphere does not exceed the prescribed rate for the material being tested

Note 1 to entry: See ISO 139.

Note 2 to entry: A textile material is in moisture equilibrium with the ambient atmosphere when it does not exchange water with this atmosphere; its mass then remains constant as long as the experiment is carried out in an unchanged atmosphere. For test purposes, moisture equilibrium is reached by absorption, starting from a relatively low moisture content.

3.6
yarn package
length or lengths of yarn in a form suitable for use, handling, storing, or shipping

Note 1 to entry: Packages may be comprised of unsupported yarn, such as balls, or supported yarn, such as skeins, cakes, bobbins, cops, cones, pirns, spools, tubes, or beams.

3.7
twist factor
measure of the spiralling orientation of the fibres in a spun yarn or of the filaments in a filament yarn

Note 1 to entry: The twist factor is related to the angle which fibres on the surface of the yarn make with the axis of the yarn and is a measure of the hardness of the resulting yarn due to twist.

4 Principle

The twist in a known length of yarn is removed by rotating one end of the specimen with respect to the other until the components of the yarn being tested are parallel. The exact number of turns required to remove the twist is reported in terms of turns per unit length of yarn.

5 Apparatus

5.1 Twist counter, consisting of a pair of clamps, one of which is rotatable in either direction and positively connected to a revolution counter. The position of one or both clamps shall be adjustable to permit testing yarn lengths from 10 mm to 500 mm. There shall be no play in the clamp which might affect the gauge length.

5.1.1 Means shall be provided for applying tension to the specimen and for rapidly determining the specimen length with an accuracy of ±0,5 mm or ±2 %, whichever is smaller.

NOTE The limit of 2 % is consistent with the highest accuracy required in counting the number of turns in the specimen.

5.1.2 The counting device shall be capable of recording the number of revolutions of the rotatable clamp.

5.1.3 If the contraction or extension of the untwisted specimen is to be measured, the movable but non-rotatable clamp shall be capable of travelling with essentially no friction.

5.2 Dissecting needle.

5.3 Means for magnifying the specimen being tested.

5.4 Equipment for reeling laboratory sample skeins (optional).

6 Standard atmosphere

6.1 The standard atmospheres for preconditioning, conditioning, and testing shall be as specified in ISO 139.

The amount of twist is not affected directly by changes in relative humidity, but since wide changes in humidity cause changes in the length of some materials, all determinations should be made on samples in equilibrium with the appropriate standard atmosphere.

6.2 Generally, it is not necessary to precondition samples before conditioning for twist tests.

7 Sampling

7.1 Samples shall be taken in one of the following ways:

a) according to the directions, if any, given in the material specification;

b) according to procedures approved by ISO for textile products, if directions on sampling are not included in the material specification;

c) according to the method given in Annex A, if neither a) nor b) is applicable.

   1) Bulk samples shall be taken as directed in A.1.

   2) Laboratory-sample packages shall be taken from the bulk sample as directed in A.2.

8 Test specimens

8.1 Length

8.1.1 Single spun yarns

The initial length of the specimen shall be as great as possible, but shall be somewhat less than the average length of the staple fibre used to spin the yarn. The initial lengths of specimens listed in Table 1 are commonly used.

Table 1 — Specimen lengths

Type of yarn material	Specimen initial length mm
Cotton	10 and 25
Worsted	25 and 50
Woolen	25 and 50
Bast fibre	100 and 250

8.1.2 Single multifilament, plied, and cabled yarns

8.1.2.1 Take an initial length of 250 mm ± 0,5 mm if the nominal twist is >1 250 turns/m.

8.1.2.2 Take an initial length of 500 mm ± 0,5 mm if the nominal twist is <1 250 turns/m.

8.2 Selection

8.2.1 Test specimens shall be taken, at the lowest tension practicable, from the end of the package if this is the normal method of use; otherwise, take the yarn from the side of the package. Discard the few metres of yarn at the beginning and end of the package in order to avoid damaged sections.

8.2.1.1 If it is desired to reel laboratory sample skeins, the yarn specimens shall be taken as specified in 8.2.1 and shall be representative of the original package.

8.2.2 If two or more test specimens are taken from an individual yarn package, they shall be taken at random intervals of at least 1 m in order to minimize the effects of cyclic variation introduced during the manufacture. If more than two specimens are taken from an individual package, take groups of specimens, not more than five to a group, at intervals of several metres.

8.3 Number of test specimens

8.3.1 Take the number of specimens required in the material specification, when applicable.

8.3.2 In the absence of material specification, take a number of specimens designed to give the precision specified below, following the directions given in 8.3.3 or 8.3.4, depending on the information available on the variation of twist results in the material being tested.

8.3.3 If information on variation is available, take a number of specimens, *n*, calculated by the formula given in Table 2, to secure the precision specified at a probability of 95 %.

Table 2 — Formula for number of specimens, *n*, using information on variation

Type of yarn	Range of twist	Precision	Formula for n [a)]
Single multifilament	Less than 40 turns/m	±4,0 turns/m	$0{,}240\sigma^{2}$ [b)]
Single multifilament	40 turns/m to 100 turns/m	±5,0 turns/m	$0{,}154\sigma^{2}$ [b)]
All other yarns	—	±5,0 %	$0{,}154v^{2}$ [c)]

a) Where n is the number of tests.

b) Where σ is the standard deviation of individual results, determined from extensive past records on similar materials.

c) Where v is the coefficient of variation of individual test results, determined from extensive past records on similar materials.

8.3.4 If no information on variation is available or in the case of a dispute, determine the number of specimens as follows.

a) Take the number of specimens, n, specified in Table 3, which also indicates the variation assumed to calculate n.

b) Calculate the coefficient of variation, v, or the twist results by normal statistical methods. If the variation is such that the precision with 95 % confidence is greater than 5 %, increase the number of tests. The number of tests required can be calculated as follows:

$$n = \left(\frac{1{,}96v}{5} \right)^2 \quad (1)$$

where

n is the number of tests;

v is the coefficient of variation of individual test results, determined from extensive past records on similar materials.

Table 3 — Number of specimens, *n*, in the absence of information on variation

Type of yarn	Range of twist	*n*	Assumed variation [a]
Single, spun	All	50	v = 18 %
Single, multifilament	Less than 40 turns/m	20	σ = 8,0 turns/m
Single, multifilament	40 turns/m to 100 turns/m	20	σ = 10,0 turns/m
Single, multifilament	More than 100 turns/m	20	v = 10 %
Plied and cabled yarns	All	20	v = 10 %

a Where v and σ are as defined in Table 2, footnotes b and c.

9 Procedure 1 — Determination of the direction of twist

9.1 Hold one end of the yarn in such a position that a short length (at least 100 mm) is suspended in a vertical position. Examine the vertical section of the yarn and determine if the slope of the yarn elements (fibres, filaments, or component yarns) conforms to the slope of the central portion of the letters “S” or “Z”.

9.2 Designate the direction of twist as “S” or “Z” as observed, in accordance with ISO 2.

