



SLOVENSKI STANDARD
SIST EN 14621:2006

01-marec-2006

Tekstilije – Multifilamentne preje – Metode preskušanja teksturiranih in gladkih filamentnih prej

Textiles - Multifilament yarns - Methods of test for textured or non-textured filament yarns

Textilien - Multifilamentgarne - Prüfverfahren für texturierte und nicht texturierte Multifilamentgarne

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Textiles - Multifilaments - Méthodes d'essai des multifilaments texturés ou non texturés

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59.080.20 Preje

Yarns

SIST EN 14621:2006

en

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EUROPEAN STANDARD

EN 14621

NORME EUROPÉENNE

EUROPÄISCHE NORM

December 2005

ICS 59.080.20

English Version

Textiles - Multifilament yarns - Methods of test for textured or non-textured filament yarns

Textiles - Multifilaments - Méthodes d'essais pour la frisure des fils multifilaments texturés et le retrait thermique des fils plats et textures

Textilien - Multifilamentgarne - Prüfverfahren für texturierte und nicht texturierte Multifilamentgarne

This European Standard was approved by CEN on 26 October 2005.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

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Foreword

This European Standard (EN 14621:2005) has been prepared by the Technical Committee CEN /TC 248 "Textiles and Textile Products", the secretariat of which is held by BSI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by June 2006, and conflicting national standards shall be withdrawn at the latest by June 2006.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

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EN 14621:2005 (E)**1 Scope**

This European Standard specifies test methods for quality control of textured and non-textured multifilament synthetic yarns. It includes the following test methods:

- determination of the crimp contraction - textured multifilament yarn with linear density up to 500 dtex;
- determination of the hot air shrinkage - for non-textured and textured multifilament yarns;
- determination of the boiling water shrinkage - for non-textured and textured multifilament yarns.

2 Normative references

The following referenced documents are indispensable for the application of this European Standard. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN ISO 139, *Textiles — Standard atmospheres for conditioning and testing (ISO 139:2005)*

3 Terms and definitions

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

3.1**crimp contraction**

contraction of a textured filament yarn resulting from the development of crimp, expressed as a percentage of its original length, with the lengths of the contracted and straightened yarns measured under specified tensions

3.2**thermal shrinkage**

decrease in length of a textured or non-textured filament yarn as a result of a thermal treatment (boiling water or hot air), expressed as a percentage of its original length

3.3**linear density**

mass per unit length of a multifilament yarn as defined in EN ISO 2060

3.4**tension**

tensile force applied to the specimen, generally related to its linear density

3.5**pre-tension**

tension applied to a specimen at the beginning of certain tests

3.6**straightened length**

length of the specimen measured under a high tensile force, which straightens the skein without stretching

3.7**contracted length of textured yarn**

length of the specimen measured under a low tensile force after a specified recovery time has elapsed

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3.8**package**

form of presentation of the multifilament yarn, e.g. spool, cheese, cone, bobbin etc.

3.9**multifilament yarn**

yarn composed of several filaments

4 Test methods**4.1 Determination of the crimp contraction****4.1.1 Principle**

The crimp of a specimen of a textured filament yarn in the form of a skein of known nominal linear density is developed by treatment with hot air while the specimen is subjected to a low tensile force. After reconditioning, the straightened length of the skein is measured under a high tensile force. After a specified recovery time, the contracted length of the skein, shortened by the effect of the yarn crimp, is measured under the low tensile force.

Crimp contraction is calculated as the difference between the two length values related to the straightened length.

4.1.2 Apparatus

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4.1.2.1 Reel

A reel with a circumference of $(1\ 000 \pm 2,5)$ mm is used for winding the yarn skeins. The reel shall be fitted with a device to provide the specified tensile force per unit linear density to the material being wound on with the maximum possible accuracy and to maintain the separation between a number of skeins wound at the same time.

4.1.2.2 Automatic testing device

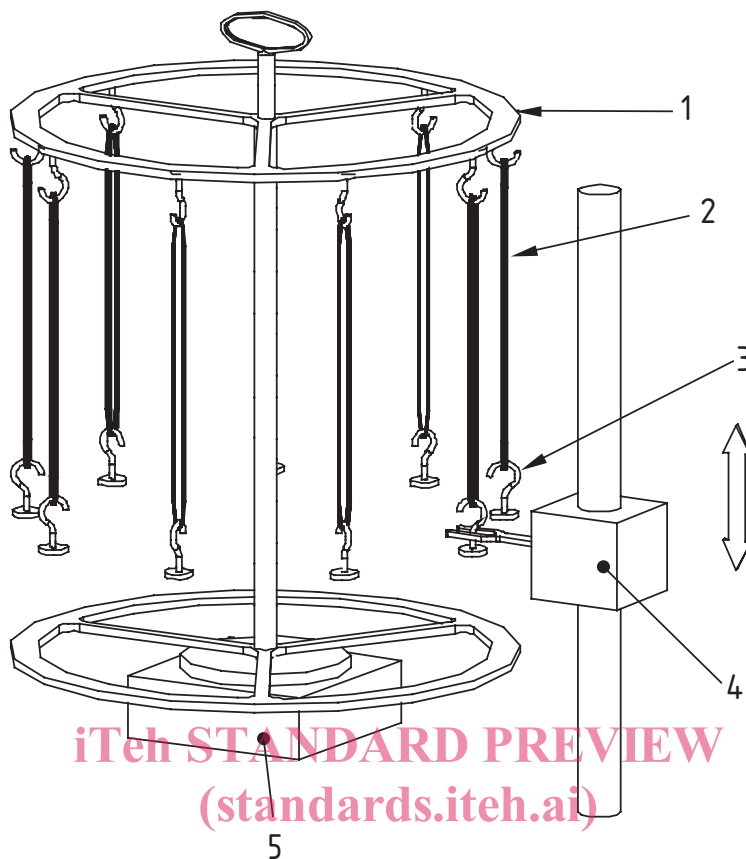
A suitable testing device (see Figure 1) uses a loading apparatus, which extends the skein at a speed of $(1\ 000 \pm 10)$ mm/min until the pre-set tensile force is reached at which the yarn crimp is pulled out, and which determines the straightened skein length related to that tensile force.

NOTE The speed of the loading apparatus may be reduced e.g. in case of less extensible textured yarns, for example to 250 mm/min, provided that this is clearly stated in the test report. Only test results obtained with identical speeds may be compared.

The same apparatus determines in a second measurement the contracted length of the skein under a low tensile force provided by a pre-tension weight attached to the skein or a hook-shaped pre-tension weight attached to the skein.

Resolution of the length measurement is 0,05 mm or better.

A number of skeins are arranged in a holder, with the skeins being tested in succession. The holder can be removed from the automatic testing device.



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Key

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- 1 Specimen holder
- 2 Specimen
- 3 Pre-tension weight (e.g. an S-shaped hook)
- 4 Loading apparatus and length measuring system
- 5 Force measuring system

Figure 1 — Automatic testing device**4.1.2.3 Oven with forced ventilation**

The oven shall be suitable for a heat treatment of the test specimens arranged in the holder of the automatic testing device at 120 °C. The temperature variation from the set value shall not exceed ± 4 °C in the immediate vicinity of the specimens.

The utilizable space shall have a height of at least 600 mm and suitable width and depth to accommodate the holder of the automatic testing device in an upright position, so that the skeins can hang perfectly.

The oven shall be operated with forced air circulation.

4.1.3 Conditioning and preparation of the test specimens

Take off at least 500 m from the packages representing the laboratory samples before preparing the test specimens.

Prior to testing, the specimens are exposed for at least 24 h to the standard atmosphere according to EN ISO 139.

To permit the use of the same linear density related tensile forces for yarns of different linear density, a skein is produced having a linear density of about 2 500 dtex (250 tex) by winding a corresponding length of yarn onto a reel. While the yarn is being reeled, a tensile force per unit linear density of $2 \text{ cN/tex} \pm 10 \%$ shall be maintained as uniformly as possible. (See Annex A for the calculation of the length of yarn to be reeled.)

The two yarn ends shall then be tied together, but in such a way that stretching of the yarn is avoided. When suspending the skeins from the specimen holder, the knots are placed at the suspension hooks.

Throughout the sampling and conditioning procedures, particular care should be taken that any stress applied to the specimens in the course of handling does not exceed the tensile force applied during reeling.

4.1.4 Procedure

After the skein is removed from the winding reel, it is suspended from the holder of the automatic testing device, and a tension weight of 2,5 cN (e.g. an S-shaped hook) is attached to the skein to produce the required tensile (force per unit linear density of 0,01 cN/tex) which remains on the skein throughout the whole testing procedure.

Following this, the holder with the skeins is placed into the oven preheated to a temperature of $(120 \pm 4) \text{ }^\circ\text{C}$, with its forced air circulation in operation, and is kept there for a period of $10 \text{ min} \pm 20 \text{ s}$ to develop the crimp.

Placing the holder into the oven shall be carried out within a time of 5 s to 10 s to minimize the temperature drop in the oven.

When the crimp development time has elapsed, the holder with the specimens is removed from the oven and exposed again to the standard atmosphere for 24 h for reconditioning and relaxation.

NOTE 1 The period of conditioning the specimens after reeling as well as after the heat treatment may be reduced, e.g. to 30 min, provided that this is clearly stated in the test report. Only test results obtained with identical conditioning periods may be compared.

NOTE 2 Polypropylene or polyethylene may be tested under different conditions of time and temperature, provided that this is clearly stated in the test report. Only test results obtained under identical test conditions may be compared.

To determine the straightened length L_0 , the holder with the specimens is placed into the automatic testing device tester. Thereafter, starting with the first specimen in the holder, the loading apparatus gradually extends the skein until a tensile force of 500 cN (i.e. $2 \text{ cN/tex} \pm 5 \%$) is reached. This force is maintained for $(10 \pm 1) \text{ s}$, and after this, the straightened length L_0 is measured.

Following the determination of the straightened length, the loading apparatus travels in the opposite direction to release the tensile force on the skein.

The specimen holder now turns to the next position, and the loading apparatus subjects the next skein to the same tensile force.

After all specimens in the holder have been tested, and after a relaxation period of $10 \text{ min} \pm 20 \text{ s}$ has elapsed, the contracted length L_1 of each skein under the pre-tension weight of 2,5 cN is measured by the same loading apparatus.

EN 14621:2005 (E)**4.1.5 Calculation and expression of the results**

The crimp contraction, CC, expressed in percent, is calculated from the following equation:

$$CC = 100 \times \frac{L_0 - L_1}{L_0} \quad (\%)$$

where

L_0 is the straightened length;

L_1 is the contracted length.

4.2 Determination of the hot air shrinkage**4.2.1 Principle**

Skeins of known nominal linear density are subjected to a low tensile force and treated with hot air at a specified temperature for a specified time. The skein length is measured under a specified tensile force suitable to straighten the skein before and after the heat treatment. Shrinkage is calculated as the difference between the two length values related to the length before the heat treatment.

4.2.2 Apparatus

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4.2.2.1 Reel

A reel with a circumference of $(1\,000 \pm 2,5)$ mm is used for winding the yarn skeins. The reel shall be fitted with a device to provide the specified tensile force per unit linear density to the material being wound on with the maximum possible accuracy and to maintain the separation between a number of skeins wound at the same time.

4.2.2.2 Automatic testing device

A suitable testing device uses a loading apparatus, which extends the skein with a speed of (1000 ± 10) mm/min for textured yarn or (250 ± 10) mm/min for non-textured yarn until the preset tensile force is reached at which the skein is straightened.

The device determines the initial length of the skein at this tensile force.

The same apparatus determines in a second measurement the length of the skein in the shrunken state (after treatment of the skein in the oven) under a low tensile force provided by a pre-tension weight attached to the skein.

Resolution of the length measurement is 0,05 mm or better.

A number of skeins are arranged in a holder, with the skeins being tested in succession. The holder can be removed from the automatic testing device.

4.2.2.3 Oven with forced ventilation

The utilizable space shall have:

- a height of at least 600 mm and suitable width and depth to accommodate the holder of the automatic testing device in an upright position, so that the skeins can hang perfectly;

- a thermometer (e.g. thermocouple) to measure and record the hot air temperature in the vicinity of the test specimens;
- an applied temperature accuracy of ± 3 °C.

Preferably, the oven has a temperature control to allow preheating the oven to a higher temperature level prior to placing the holder with the specimens into the oven, and to reduce the temperature to the required value: 190 °C, after the holder has been put in. In this manner a temperature drop below the required value can be avoided.

The temperature variation from the set value shall not exceed ± 4 °C in the immediate vicinity of the specimen.

NOTE Different polymers may require different temperatures. The heat temperature may be changed, provided that this is clearly stated in the test report. Only test results obtained with identical treatment temperatures may be compared.

The oven shall be operated with forced air circulation.

4.2.3 Conditioning and preparation of the test specimens

Take off at least 500 m from the packages representing the laboratory samples before preparing the test specimens.

Prior to testing, the packages are exposed for at least 24 h to the standard atmosphere according to EN ISO 139.

To permit the use of the same linear density related tensile forces for yarns of different linear density, a skein is produced having a linear density of about 2 500 dtex (250 tex) for yarns with linear density up to 1 000 dtex or about 10 000 dtex for yarns with linear density over 1 000 dtex by winding a corresponding length of yarn onto a reel 1 m in circumference. (See Annex A for the calculation of the length of yarn to be reeled.)

While the yarn is being reeled, the pre-tension, corresponding to an approximate force per unit linear density of 2 cN/tex ± 10 % for textured multifilament yarn and 0,5 cN/tex ± 10 % for non-textured multifilament yarn, shall be maintained as uniformly as possible.

The two yarn ends shall then be tied together, but in such a way that stretching of the yarn is avoided. When suspending the skeins from the specimen holder, the knots are placed at the suspension hooks.

Throughout the sampling and conditioning procedures, particular care should be taken that any stress applied to the specimens in the course of handling does not exceed the tensile force applied during reeling.

4.2.4 Procedure

After the skein is removed from the winding reel, it is suspended from the holder of the automatic testing device, and a tension weight of 2,5 cN (for skeins of 2 500 dtex, e.g. an S-shaped hook) or 10 cN (for skeins of 10 000 dtex) is attached to the skein to produce the required tensile (force per unit linear density of 0,01 cN/tex) which remains at the skein throughout the whole testing procedure.

To determine the straightened length L_0 (initial length), the holder with the specimens is placed into the automatic testing device. Thereafter, starting with the first specimen in the holder, the loading apparatus gradually extends the skein until an effective tensile force per unit linear density of 2 cN/tex ± 5 % for textured yarn or 0,5 cN/tex ± 5 % for non-textured yarn is reached. This force is maintained for (30 ± 1) s, and the straightened length L_0 is measured.

Following the determination of the straightened length, the loading apparatus travels in the opposite direction to release the tensile force on the skein.