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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 3916-2013

**Textiles -- Yarns from packages -- Determination of single-end
breaking force and elongation at break using constant rate of
extension (CRE) tester
(English Translation)**

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1 Scope

1.1

This Standard specifies the methods for the determination of breaking force and elongation at break of textile yarns from packages, i.e., the following four methods:

- A: manual: specimens are taken directly from conditioned packages;
- B: automatic: specimens are taken directly from conditioned packages;
- C: manual: relaxed test skeins are used after conditioning;
- D: manual: wetted specimens are used.

1.2

In cases of dispute regarding elongation at break of the yarns, method C is adopted.

NOTE: it is hoped that the three methods A, B and C can provide the same yarn stretching result, but the elongation value determined by method C is probably more accurate (or higher) than that determined by methods A and B. The results of breaking force and elongation at break determined by method D may not be exactly the same as the results determined by methods A, B and C.

1.3

This Standard specifies the application of a constant rate of extension (CRE) tester.

In view of the fact that the constant rate of travel (CRT) and constant rate of loading (CRL) instruments are still used, Appendix A lists the reference information for the application of the CRT and CRL instruments, which may be adopted in accordance with the agreement.

1.4

This Standard applies to all types of yarns, except glass yarn, high elastic yarn, high molecular polyethylene yarn (HMPE), ultra high molecular polyethylene yarn (UHMPE), ceramic yarn, carbon fiber yarn and polyolefin tape yarn.

1.5

This Standard is applicable to yarns taken from packages, but through the agreement of the relevant parties, it may also be used for the yarns taken from fabrics.

1.6

This Standard is applicable to single-end (single-strand) testing of yarns.

3.5 Clamp

Clamp is a constituent part of the tester, which clamps the specimen through suitable jaws.

3.6 Jaws

Jaws are a constituent part of the clamp, which are used to clamp the specimen.

3.7 Gauge Length

Gauge length refers to the distance between the clamping points on the test device,

NOTE: the gauge length of the bolt-type or winch-type clamp refers to the distance between the clamping points for the measurement along the yarns.

3.8 Initial Length

Initial length refers to the length of the specimen between the clamping points when the specified pre-tension is reached at the beginning of the test.

3.9 Package

Package refers to a packaging form suitable for the use, transportation and storage of the yarns.

NOTE: the package may be supported (such as: cones and bobbins), or unsupported (such as: skein and balls).

4 Principle

Use the constant rate of extension (CRE) tester to stretch the specimen, until it breaks; record the breaking force and elongation at break. Adopt 100% (relative to the initial length of the specimen) per minute of constant speed to stretch the specimen. In accordance with the agreement, the tester allows higher or lower stretching speeds.

Two gauge lengths are allowed, which are usually 500 mm (stretching speed is 500 mm/min) and in special cases: 250 mm (stretching speed is 250 mm/min).

5 Equipment and Reagents

5.1

The constant rate of extension (CRE) tester shall satisfy the following requirements:

- a) The tester shall be able to set the gauge length to 500 mm $\pm$ 2 mm or 250 mm $\pm$ 1 mm, or with two gauge lengths.
- b) The constant speed of the moving clamp shall be 500 mm/min $\pm$ 10 mm/min or 250 mm/min $\pm$ 5 mm/min, with an accuracy of $\pm$ 2%. In accordance with the

7 Pre-conditioning and Conditioning

7.1

The atmospheric conditions for pre-conditioning, conditioning and testing shall comply with the stipulations of GB/T 6529.

7.2

For methods A ~ C, the pre-conditioning of the package yarn sample or skein sample shall be no less than 4 h.

NOTE: if sample conditioning is conducted by direct moisture absorption from the dry state, the pre-conditioning may be omitted.

7.3

After pre-conditioning, the sample shall be placed under the atmospheric conditions used for conditioning for moisture absorption equilibrium. Generally speaking, the conditioning of skeins is no less than 8 h, but the tightly packaged yarns shall take at least 48 h.

7.4 The test of wet-state specimens does not require pre-conditioning or conditioning

(method D).

8.1 General Rules

8.1.1

If the agreement allows the use of multiple test conditions, then, the concerned parties shall conduct the tests under the same test conditions (i.e., gauge length, stretching speed, type of clamp, temperature, humidity and pre-tension).

8.1.2

Two gauge lengths are allowed, and usually, the length of 500 mm is adopted.

Under the following circumstances, the length of 250 mm shall be adopted:

- a) The stretching stroke of the instrument is not suitable for 500 mm specimens;
- b) Agreement between the concerned parties.

8.1.3

If it is necessary to calculate the breaking tenacity, then, in accordance with GB/T 4743, determine the linear density of the yarns.

8.1.4

For a gauge length of 500 mm, adopt the stretching speed of 500 mm/min. For a gauge length of 250 mm, then, the stretching speed of 250 mm/min shall be adopted.

In addition, merely for the automatic tester (method B), in accordance with the agreement, a higher stretching speed is allowed, and 2,000 mm/min or 5,000 mm/min is recommended; or in accordance with the agreement, a lower stretching speed may also be adopted, for example, 50%/min or 20%/min.

8.1.5

In accordance with the routine method, unwind the yarns from the package.

In accordance with the steps of 8.1.1 ~ 8.1.13, manually clamp the specimen into the clamp for the tensile test.

8.3 Method B - Automatic

The specimens are taken directly from the conditioned packages.

In accordance with the steps of 8.1.1 ~ 8.1.6 and 8.1.9 ~ 8.1.13, set the instrument to take specimens from 10 or 20 packages (see 6.3 and 6.6) and automatically conduct the test.

8.4 Method C - Manual, Conditioned Specimens

8.4.1

Use the reel (5.2) to take a strand of test skein from each package; the length of the skein shall satisfy the requirements of the number and length of specimens.

8.4.2

Under the atmospheric conditions of pre-conditioning and conditioning (see 7.1), merely use the swift (5.3) to relax the test skein under the minimum tension.