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British Standard Methods for

Determination of crimp rigidity of textured nylon yarns

Méthodes de détermination de la résistance à la frisure des fils de nylon texturés

Verfahren zur Bestimmung der Kräuselfestigkeit von texturierten Nylongarnen

British Standards Institution

Foreword

This British Standard has been prepared under the direction of the Textiles and Clothing Standards Committee.

This method was included in the 1974 edition of BS Handbook No. 11 'Methods of test for textiles' as a recommended method. However, due to the wide usage of this method it has been decided to publish it as a British Standard.

The crimp rigidity test provides a method of measuring one important property that affects the dimensions and general characteristics of fabrics produced from crimped continuous filament yarn. It does not characterize the yarn completely but is a useful quality control check for throwsters and knitters.

In preparing this standard the original loadings at two levels, used to stress the yarn, have been retained but they have been converted from g/denier to mN/dtex. Thus the procedure and equipment are the same as in the method originally included in BS Handbook No. 11.

This standard applies only to textured nylon yarns. However, consideration is being given to preparing a method for textured polyester yarns.

At the time of publication of this British Standard, no corresponding international standard exists.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Contents

Methods

1 Scope

This British Standard describes two methods for determination of the crimp rigidity of textured nylon yarns. Method A (see **6.2**) is used for nylon yarns processed by conventional twist-detwist, false-twist and stuffer box methods. Method B (see **6.3**) is used for nylon yarns with latent crimp developed by relaxation, principally edge-crimped yarns.

2 Definition

For the purposes of this British Standard the following definition applies.

number of strands. The number of wraps in a hank of yarn multiplied by two.

3 Principle

A force equivalent to 0.900 mN/dtex is applied by two weights to the end of a hank of yarn immersed in water. After a fixed time the force is reduced to 0.0176* mN/dtex by removing one of the weights and after a further fixed time the reduction in length of the hank is measured. The crimp rigidity of the yarn is the reduction in length of the hank expressed as a percentage of the original length.

4 Apparatus

4.1 *Stopwatch* having an accuracy of 0.1 s.

4.2 *Measuring cylinder,* of 2 L capacity.

4.3 *Crimp rigidity apparatus,* as shown in figure 1, comprising the following:

(a) a yarn package stand;

(b) a small single-arm wrap reel with a yarn tensioner and an adjustable fork at one end and a detachable diabolo hank bar, with screws for trapping the yarn, at the other;

(c) an adjustable rubber scale, divided by scale marks into 100 equal divisions. It is mounted on a vertical support which can be hooked on to the rim of the measuring cylinder. A screw at the top for the support enables the length of the scale to be adjusted to that of the hank wound on the winder.

(d) a set of hooked 'heavy' weights of 150 g to 500 g and a set of 'light' weights of 3 g to 10 g in the form of S-shaped hooks. Both sets should be accurate to within ± 1 % of the stated value and shall be made of brass;

(e) a long handled grid to manipulate the heavy weights.

NOTE. The tensions specified are those developed in air, and are reduced by buoyancy. If materials other than brass are used, the tensions should be adjusted accordingly.

4.4 *Laboratory wrap reel.*

4.5 *Towel or blotting paper.*

4.6 *Swift or other suitable apparatus* to enable transference of wetted out yarn (method B) to the single-arm wrap reel (**4.3**(b)).

5 Test specimens

Two measurements on yarn from each package shall be made.

NOTE. Yarn from any type of package may be tested.

6 Procedure

6.1 Setting up the apparatus

Hook the clip of the support for the rubber scale (**4.3**(c)) over the rim of the measuring cylinder (**4.2**).

Attach the extra support to the diabolo hank bar (**4.3**(b)) and clip the supports onto the rim of the cylinder. With the bar in this position, check that the 100 % mark on the rubber scale coincides with the top of the 'V' of the diabolo. If necessary, adjust the scale using the screws on either side.

Replace the hank bar on the winder.

Position the two-pronged fork at the lower end of the arm of the winder so as to give an adequate hank length for normal operation with the rubber scale.

Fill the measuring cylinder with water (plus wetting agent) at 20 ± 2 °C and place the long-handled grid in the cylinder.

6.2 Method A

Place the package of yarn to be tested on the stud of the baseplate of the hank winder below the yarn guide (**4.3**(c)). Thread the yarn through the yarn tensioner (**4.3**(b)) and adjust the tension until, on pulling the yarn through the gate, it can be observed that the crimp is just removed.

Clamp the leading end of the yarn to the inner-side of the capstan of the diabolo by screwing the outer knurled knob on the hank bar. Wind a hank of yarn with a number of strands calculated so that forces of 0.900 mN/dtex and 0.0176 mN/dtex can be applied to each hank using the sets of hooked weights (**4.3**(d)).

NOTE 1. The forces and number of strands of yarns most commonly encountered are listed in tables 1 and 2.

Clamp the final strand to the outside of the capstan of the diabolo by tightening the inner knurled knob. Avoid backward movement of the hank bar during clamping and sever the clamped yarn so as to leave a tail of not more than 50 mm.

*A force of 0.0176 mN/dtex is approximately equivalent to 0.002 g/denier.

NOTE 2. Table 1 gives resultant hank dtex to enable the specified forces to be applied when the particular 'light' and 'heavy' weights are used.

NOTE 3. Table 2 shows the number of strands per hank to be used for yarns of specified nominal dtex.

Add the appropriate 'light' weight (see table 1) to the yarns forming the hank extending across the prongs of the fork at the lower end of the arm of the hank winder. Add the appropriate 'heavy' weight (see table 1) to the lower hook on the 'light' weight.

Remove the hank and the suspended weights by unscrewing the hank bar from the arm of the winder.

Attach the extra clip support to the hank bar and immerse the hank in the water in the measuring cylinder (4.2) by clipping the two supports over the rim of the cylinder.

Start the stopwatch (4.1).

Just prior to 2 min from immersing the hank, adjust the length of the rubber scale by turning the milled knob at th top of the scale support so that the 0 % mark is level with the bottom of the hank.

At 2 min from the time of immersion, remove the 'heavy' weight by raising the grid, causing the weight to tilt and releasing it from the S-shaped hook.

After a further 2 min, read the percentage contraction (crimp rigidity) directly from the rubber scale by sighting the lower end of the hank on the scale, taking care to avoid parallax errors.

Repeat the test on the second test specimen. If two values differ by more than 1 %, a further test shall be made and the mean of the three results obtained.

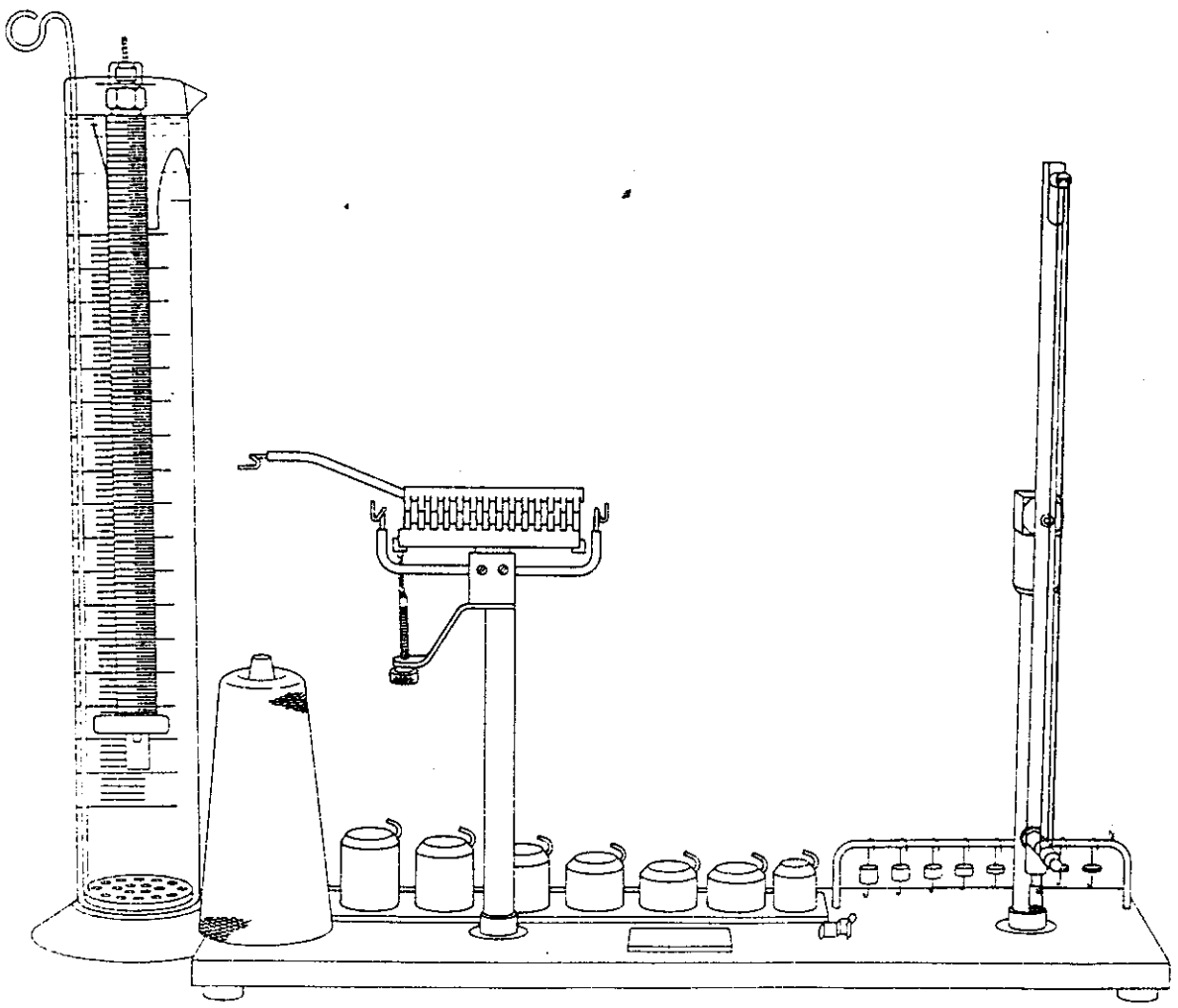

Figure 1. Crimp rigidity apparatus

6.3 Method B

NOTE. Yarns with latent crimp developed by relaxation should first be pre-bulked by the procedure described below.

Wind a hank on a normal wrap reel (4.4) so as to give sufficient yarn for all the required tests (approximately 30 m). Tie the hank loosely in six places and remove it from the reel.

Place the hank in water at room temperature and raise to 75 ± 4 °C over approximately 10 min. Agitate the yarn without causing the strands to tangle and maintain it at 75 ± 4 °C for 10 min. Cool slowly by allowing cold water to run into the vessel.

Wrap the yarn in a towel (4.5) or place it on blotting paper (4.5), and leave it to dry flat on the bench.

Place the relaxed hank on a swift (4.6) and then proceed as in 6.2.

7 Expression of results

Report the mean of duplicate tests (or triplicate tests, if necessary (see 6.2)) as the crimp rigidity of the yarn.

8 Comparison of results

The results obtained from yarns tested by method A are comparable only if the yarns have been produced by the same process. If yarns produced by different processes are to be compared, method B should be used but care should be exercised in interpreting the results since yarn properties other than crimp rigidity can influence subsequent behaviour in fabrics.

9 Test report

The test report shall contain the following details:

(a) the number and date of this British Standard, i.e. BS 6663 : 1986;

(b) the description of the sample tested;

(c) the test result expressed as in clause 7;

(d) the details of any deviation from the test procedures;

(e) the method used, i.e. A or B;

(f) the number of specimens tested.

Table 1. Total hank dtex to be used with specified 'light' and 'heavy' weights

Total hank	'Light' weight to be added to produce a force of 0.0176 mN/dtex*	'Heavy' weight to produce a force of 0.900 mN/dtex*
dtex	g	g
1667	3	150
2222	4	200
2778	5	250
3334	6	300
3889	7	350
4445	8	400
5000	9	450
5556	10	500

*1 gf = 9.806 65 mN.

Table 2. Number of strands per hank

Nominal	Total nominal	Strands per hank	Total hank	Light weight to be added (see table 1)
dtex	dtex		dtex	g
1/22	22	76	1672	3
1/33	33	50	1650	3
2/22	44	50	2200	4
1/50	50	44	2200	4
1/66	66	42	2772	5
1/78	78	36	2808	5
2/50	100	28	2800	5
1/110	110	20	2200	4
2/66	132	30	3960	7
2/66*	132	42	5544	10
2/78	156	18	2808	5
1/165	165	20	3300	6
2/110	220	20	4400	8
1/130	230	22	5060	9
3/78	234	24	5616	10
4/78	312	18	5616	10
2/230	460	12	5520	10

*An alternative hank size which gives a nearer approximation to a figure given in table 1.