ASTM D 885 â€“ Tire Cords, Tire Cord Fabrics, and Industrial Filament Yarns Made from Manufactured Organic-Base Fibers/ Shrinkage of Conditioned Yarns and Cords at Elevated Temperature

Description

X2.4 Shrinkage of Conditioned Yarns and Cords at Elevated Temperature:

X2.4.1 Summary of Test Methodâ€”The initial length of a specimen of yarn or cord that has been permitted to relax in a conditioned atmosphere is determined while under a specified force. After exposure of the loaded specimen to a specified temperature until its length becomes constant, the final length is measured and the amount of shrinkage is calculated from the difference in observed specimen lengths.
X2.4.2 Apparatusâ€”A length-measuring device designed so that it can be exposed to an elevated temperature and upon which test specimens at least 250-mm (10-in.) long can be mounted with one end of each specimen in a fixed position. The device shall be equipped with a means for measuring the initial length and the final length of each specimen during the test period. This device shall be such that a tension weight can be attached to the free end of each specimen in such a manner that there shall be no change in twist.
X2.4.3 Preparation of Specimensâ€”Test five specimens. Wind a skein sample of yarn or cord from a package or remove a tabby sample of tire cord fabric from the board to which it may be attached. Permit the sample to condition while relaxed without kinking in the test atmosphere for a minimum of 16 h prior to testing.
X2.4.4 Procedureâ€”Secure one end of the specimen in the apparatus, and apply a tension of 5 +- 1 mN/tex (0.05 +- 0.01 gf/den) to the other end of the specimen in such a manner that there is no change in twist. Record the initial length of the specimen to the nearest 0.5 mm (0.02 in.). Place the apparatus with the specimen and weight in an oven at 177 +- 2Â°C (350 +- 3Â°F) (see Note X2.3). Expose the specimen until the rate of shrinkage of the specimen is less than 5 % of the shrinkage/ min. Record the final length of the loaded specimen to the nearest 0.5 mm (0.02 in.) before removing it from the oven.
X2.4.5 Calculation:
X2.4.5.1 Calculate the shrinkage at the specified temperature of each specimen to the nearest 0.1 % using Eq X2.1:

$$S = [(L_o - L_f)/L_o] \times 100 \qquad \text{(X2.1)}$$

where:
S = shrinkage, %,
L_o = initial length of specimen, mm (in.), and
L_f = final length of specimen, mm (in.).

X2.4.6 Report:

X2.4.6.1 State that the specimens were tested as directed in X2.4 of Test Methods D 885. Describe the material or product sampled and the method of sampling used. X2.4.6.2 Report the option or procedure

used, the number of specimens tested, and the shrinkage for the sample.

X2.5 Shrinkage Force of Conditioned Yarns and Cords at Elevated Temperature:
X2.5.1 Summary of Test Methodâ€"A specimen of yarn or cord is permitted to relax in a conditioned atmosphere. The conditioned specimen is mounted between fixed clamps under a specified pretension force and then exposed to a specified temperature. The maximum force developed during exposure is the shrinkage force of the specimen at the specified temperature (see X2.5.4.1).
X2.5.2 Apparatusâ€"A force-measuring device in which a test specimen can be secured with its ends in fixed clamps a minimum distance of 250-mm (10-in.) apart, and that can be exposed to an elevated temperature. The clamp at one end of the device shall be attached to a strain gage connected with a recorder that covers the range to be tested or a mechanical device that measures changes in force without a significant change in the length of the specimen. The strain gage or mechanical device shall permit less than 25-Âµm change in specimen length when used under the maximum tension developed. The device shall permit the attachment of a pretension force to the end of the specimen opposite the strain gage, without any change in twist, prior to tightening the clamp.
X2.5.3 Preparation of Specimensâ€"Test five specimens.
Wind a skein sample of yarn or cord from a package or remove a tabby sample of tire cord fabric from the board to which it may be attached. Permit the sample to condition while relaxed without kinking in the test atmosphere for a minimum of 16 h prior to testing.

X2.5.4 Procedureâ€"Secure one end of the specimen in the clamp attached to the strain gage or mechanical force measuring device and apply a pretension of 5 +- 1 mN/tex (0.05 +- 0.01 gf/den) to the other end of the specimen using care to avoid any change in twist. Secure the other end of the specimen in the other clamp while it is under the pretension. Remove the pretension and place the apparatus with the specimen in the oven at 177 +- 2Â°C (350 +- 3Â°F) (see Note X2.3). Expose the specimen until the rate of increase in force exerted by the specimen is less than 5 %/min. Record to the nearest 10 mN (0.002 lbf) the maximum force developed by the specimen while it is in the oven.
X2.5.4.1 If a strain gage with recorder is used, a complete force-time curve may be obtained.
X2.5.5 Calculation:
X2.5.5.1 Calculate the tenacity for each specimen using Eq X2.2:

$$ST = F_m/LD \qquad \text{(X2.2)}$$

where:
ST = shrinkage tenacity, mN/tex (gf/den),
F_m = maximum force developed by the specimen, mN (gf), and

LD = linear density of the specimen, tex (denier).

X2.5.5.2 Calculate the shrinkage tenacity for the sample, to the nearest 0.1 mn/tex (0.001 gf/den), as the average shrinkage tenacity of the specimens at the specified temperature.
X2.5.6 Report

X2.5.6.1 State that the specimens were tested as directed in X2.5 of Test Methods D 885. Describe the material or product sampled and the method of sampling used.
X2.5.6.2 Report the option or procedure used, the number of specimens tested, and the shrinkage

tenacity for the sample.

Shrinkage Tester for Kords, Tire Cord Fabrics, and Industrial Filament Yarns

- Digital PID temperature controller
- SS304 cabin
- Temperature up to 250C
- Digital force measurement device
- Station numbers as per customer request (Basic is single station for force measurement)
- Sample grips included (Basic machine has one station-two grips)
- Caliper for sample elongation measurement
- Loadcell for force measurement
- Digital timer included

Category

1. Equipment for Standards
2. Standards