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Testing method for steel tyre cord —

Part 1: General requirements

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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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This document was prepared by Technical Committee ISO/TC17, *Steel*, Subcommittee SC 17, *Steel wire rod and wire products*.

A list of all parts in the ISO 23475 series can be found on the ISO website.

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Testing method for steel tyre cord —

Part 1: General requirements

1 Scope

This part of International standard specifies test methods of steel cords which are used for tyre reinforcement. Dimension, process properties, mechanical properties and coating test method are all included.

2 Normative references

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

ISO 17832, *Non-parallel steel wire and cords for tyre reinforcement*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 17832 apply.

4 Dimension

4.1 Cord diameter

4.1.1 Measure with micrometer

4.1.1.1 Principle

Hold the sample between two parallel circular faced anvils of a micrometer. Close the movable anvil gradually and gently until it is in contact with the specimen. Read the value on the micrometer.

4.1.1.2 Apparatus

4.1.1.2.1 Micrometer

A precision disk micrometer with non-rotate spindle is suggested. This micrometer may have a hole (maximum 8mm) in the center of the anvils. ([Figure 1](#))

Measuring range is from 0mm to 25mm. Resolution is 0,001mm

Anvil type: the diameter of the anvils shall be greater than one lay length (min. 20 mm in diameter).
Measuring force range: <10 N. It is suggested from 3N-5 N.

The anvils shall be plane within 0,002mm and parallel within 0,005mm.

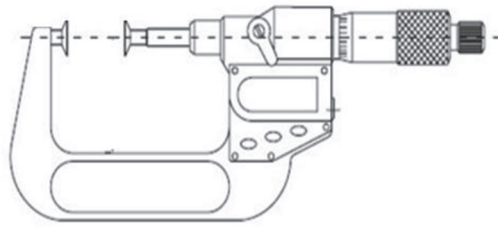


Figure 1 — Disk micrometer

4.1.1.2.2 Fusing machine

4.1.1.3 Procedure

- a) Clean the surface of the anvils with clean paper. Verify whether the micrometer reads 0,000 when the anvils are closed for each measurement.
- b) Fuse a specimen to a length about 150 mm and take care that cord end is well secured and no unraveling. Place the sample in the center of the anvils.
- c) Close the movable anvil gradually and gently until it is in contact with the specimen. For normal cords, stop rotating the spindle when 3 ‘click’ are heard and for HE, HI and OC constructions only 1 “click” is heard.
- d) Axially rotate the sample between repeated measurements in order to find the maximum diameter (D_1) and minimum diameter (D_2).

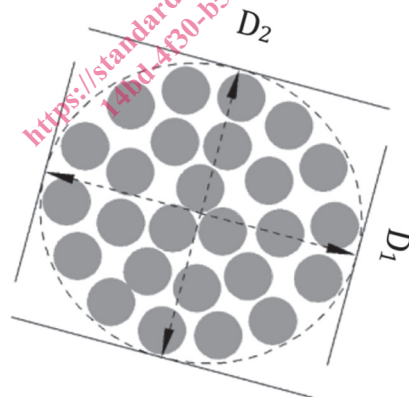


Figure 2 — Diameter test diagram

4.1.1.4 Expression of results

Calculate average diameter (D) with the formula below:

$$D = \frac{D_1 + D_2}{2} \tag{1}$$

where

D_1 is the maximum diameter, expressed in millimetre (mm)

D_2 is the minimum diameter, expressed in millimetre (mm)

D is the average diameter, expressed in millimetre (mm)

4.1.1.5 Test report

Report the average diameter to nearest 0,001mm

4.1.2 Measure with profile projector

4.1.2.1 Principle

Specimens of a cord sample are successively put on the optical microscope. A silhouette of the cord is projected on the screen. The thickness of the specimen is measured by moving the abscissa axis of the projector.

4.1.2.2 Apparatus

4.1.2.2.1 Profile projector, with

- Magnification possibility : x 10 or x 20
- Micrometer stage table: resolution 0,001 mm

4.1.2.2.2 Sample holder, A frame on which two magnets are fixed in order to position the test specimen

4.1.2.2.3 Fusing machine

4.1.2.3 Procedure

- a) Fuse a specimen to a length about 100mm, ensure that fuse is well done in order to prevent the cord ends from any unravelling. Put the specimen on the sample holder and ensure that is fixed by magnets.
- b) Bring the sample into sample holder and adjust the focal distance. Make the sample being projected on the screen.
- c) Rotate the sample until the maximum profile is being projected on the screen. Move the micrometer table until the horizontal reference line contacts two consecutive waves. ([figure3](#)).

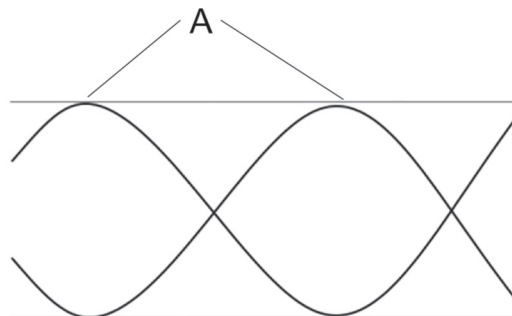


Figure 3 — X axis contacts the two consecutive waves

- d) Reset the micrometer. Move the stage until X axis contacts the opposite wave (Figure 4). Record the reading as maximum diameter (D_1). If there are two waves on the opposite side, measure the bigger one.

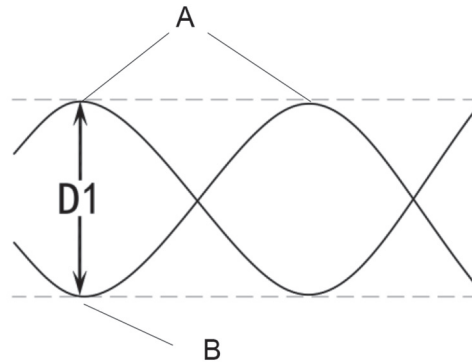


Figure 4 — X axis contacts the other side wave

- e) Turn the specimen through 90 degrees until a minimum diameter is obtained, record the minimum diameter D_2 . Repeat the step c and d and record the reading as minimum diameter (D_2). If there are two waves on the opposite side, measure the bigger one (Figure 5).

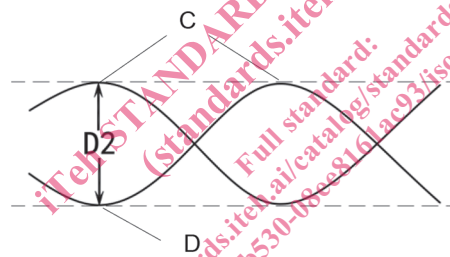


Figure 5 — the minimum diameter

4.1.2.4 Expression of results

Calculate average diameter (D) of the two readings with formula (1).

4.1.2.5 Test Report

Report the average diameter to the nearest 0,001mm.

NOTE This test method is generally used for open cords and HI cords or for other cord types that are sensitive to radial compression when using micrometer.

4.2 Unravalled Filament diameter

4.2.1 Principle

A sample is held between two parallel blade anvils of a micrometer. The movable anvil is closed gradually and gently until it is in contact with the specimen. Read the value on the micrometer.