

KS

KOREAN INDUSTRIAL STANDARD

Testing methods for steel tire cords

KS D 0047 : 1997

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Testing methods for steel tire cords

1. Scope

This Korean Industrial Standard specifies the testing method for steel tire cords (herein after referred to as cords).

Remark The relative standards of this standard shall be as follows.

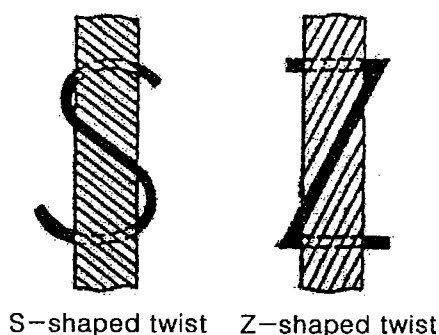
- KS A 0021 Rules for rounding of numerical values
- KS A 0105 Local units and the use of their multiples and of certain other units
- KS B 5202 Micrometer callipers
- KS B 5521 Tensile testing machines
- KS M 0001 General rules for chemical analysis
- KS M 0016 General rules for atomic absorption spectrochemical analysis
- KS M 0017 General rules for X-ray fluorescence spectrometric analysis

2. Definitions

For the purposes of this standard, the following definitions apply.

- (1) **element wire** Single wire composing a cord.
- (2) **strand** Small cord made of several-ply element wires.
- (3) **steel tire cords** Cord composed of one or plural strands.
- (4) **core** Element wire or strand to be used as the center in the cord.
- (5) **inner sheath** Layer of the element wires of the core and the surface layer, or of the element wires lying midway of the strand, or of the strand. This shows the midway layer of three layer construction of 3 + 9 + 15 and the like.
- (6) **outer sheath** Layer of the element wires or the strands, which lie on the surface of cord.
- (7) **lapping** Element wires wound on the cord spirally.
- (8) **cord diameter** Diameter of the circumscribed circle of cord. There are the case including the lapping and the case excluding it (mm).
- (9) **diameter of element wire (mm).**
- (10) **twisting direction** Direction in which the cord, strand or lapping is twisted. This direction is given by S or Z as shown in Fig. 1.

Fig. 1 Twisting Direction



- (11) **pitch of twist** Length which the cord, the strand or the lapping can be twisted by one time. (mm)
- (12) **cutting load** Maximum load required for cutting the cord. (N) {kgf}
- (13) **overall elongation at cutting time** Elongation percentage at the time when the cord is cut. (%)
- (14) **unitary mass** Mass per one meter in length of cord (g/m).
- (15) **composition of plating** Ratio of mass of the copper and zinc which have been plated on the surface part of element wire or cord. This is shown by percentage of copper usually (%).
- (16) **amount of plating** Mass of copper and zinc which have been plated on the surface part of the element wire or cord, per one kilogram in mass of the element wire or the cord (g/kg).
- (17) **flare** Longitudinal length of the loose part of the tip of cord at the time when cutting the cord by metallic cutter (mm).
- (18) **residual torsion** Number of revolutions per specified length that the cord itself has when one end of the cord has become free. Where the cord rotates in the direction in which the twist of the outer sheath begins, that direction shall be shown by "+" and the opposite direction shall be shown by "-".
- (19) **straightness** Degree of the flatness that the cord has when placing the cord freely.

3. Test Items

The test items shall be as follows.

- (1) Diameter of cord
- (2) Diameter of element wire
- (3) Pitch of twist
- (4) Cutting load and overall elongation at the cutting time
- (5) Unitary mass

(6) Composition of plating and amount of plating

(7) Film

(8) Residual torsion

(9) Straightness

4. Construction of Cord and Marking of Twist

4.1 Marking of Construction of Cord

The construction of the cord shall be marked according to the following construction describing formula.

$$N \times F \times D + N \times F \times D + N \times F \times D + F \times D$$

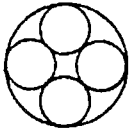
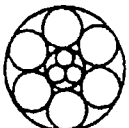
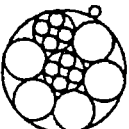
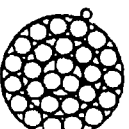
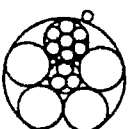
where N : number of strands.

F : number of element wires.

D : nominal diameter of element wires (mm).

- Remarks**
1. The above formula shall indicate each construction from the most inside layer toward the outside layer in the order of core, inner sheath, outer sheath and lapping and each layer shall be divided by the symbol "+"
 2. When N or F is 1, these 1 may be omitted
Example $1 \times 4 \times 0.25 \rightarrow 4 \times 0.25$
 3. When not less than two continuous layers are equal in element wire diameter, that element wire diameter may be written in only the last layer, too. Provided that the lapping shall be written separately.
Example $1 \times 3 \times 0.15 + 5 \times 7 \times 0.15 + 1 \times 0.15 \rightarrow 3 + 5 \times 7 \times 0.15 + 0.15$
 4. When the core and the layer adjacent to it are composed of the same strand, these may be marked in total sum.
Example $1 \times 4 \times 0.175 + 6 \times 4 \times 0.175 \rightarrow 7 \times 4 \times 0.175$

Table 1 Example of Marking of The Cord Construction

Construction	Marking	Construction	Marking
	4×0.25 or 1×4×0.25		3×0.20+6×0.38 or 1×3×0.20+6×0.38
	7×4×0.175+0.15 or 7×4×0.175+1×0.15 or 1×4+6×4×0.175+1×0.15		3+9+15×0.175+0.15 or 1×3+9+15×0.175+1×0.15
	3+5×7×0.15+0.15 or 1×3+5×7×0.15+1×0.15		

4.2 Marking of Twist

The twist direction and twist pitch shall be marked by in accordance with the order which moves from the core toward the outside layer.

Example 7×4×0.175+0.15 ----- Construction
S/Z/S ----- Twist direction
10/20/3.5 ----- Twist pitch
S10/Z20/S3.5 ----- Where the twist direction and the twist pitch are marked simultaneously.

5. Sampling Method

After removing the part likely to impair the intended test item from the cord wound on the reel, take the cord having the required length corresponding to the test item.

Take care sufficiently not to touch the sample directly with bare hand in this case.

Keep the sample in custody under the conditions free from corrosion or stains due to the outside air.

6. Testing Methods

6.1 Diameter of Cord

6.1.1 Micrometer Method

The micrometer method shall be as follow.

- (1) **Measuring Instrument** Use the micrometer with the minimum scale of 0.01 mm specified in **KS B 5202**. The diameter of the measuring plane of anvil and spindle shall be larger than one pitch of the cord.