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**Steel wire ropes — Determination of
the transverse rigidity of steel wire
ropes under no axial load condition**

*Câbles en acier — Détermination de la rigidité transversale des câbles
en acier sans charge axiale*

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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. www.iso.org/directives

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received. www.iso.org/patents

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

The committee responsible for this document is ISO/TC 105, *Steel wire ropes*.

This corrected version of ISO 16839:2013 incorporates the modification of Formula (1) in 7.2.

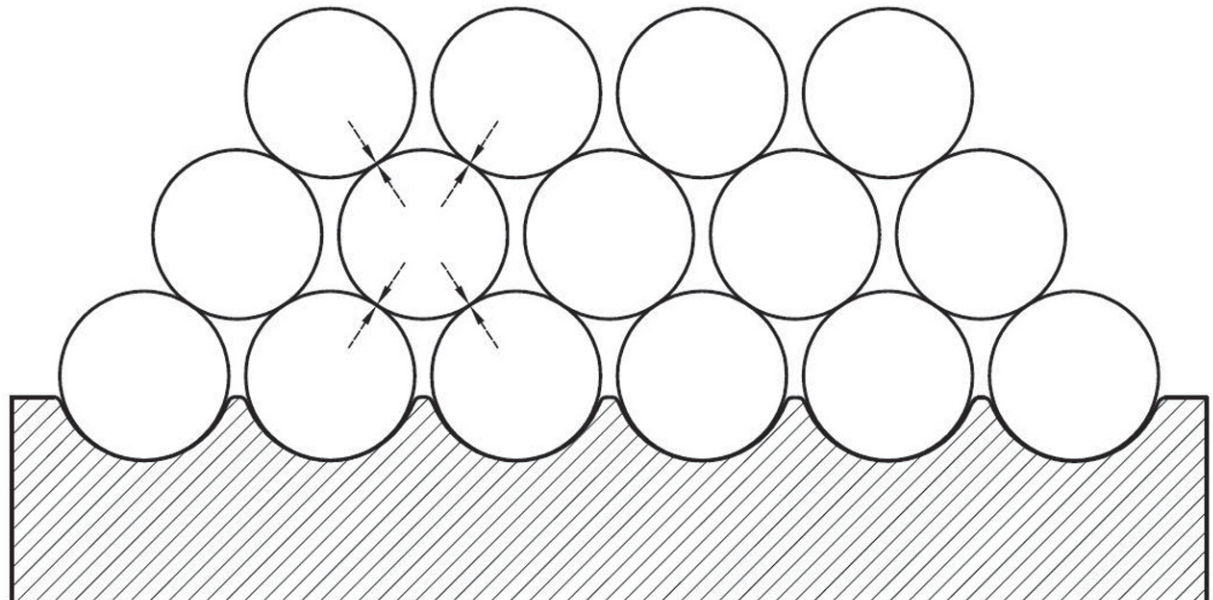
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Introduction

In a multilayer spooling, wire ropes are subjected to lateral pressure as shown in [Figure 1](#).



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Figure 1 — Schematic presentation of the pyramidal form of layers in a multilayer spooling

The cross-section shows the pyramidal form of layers (parallel sections) with the contact points of the rope to its surrounding turns. The lateral pressure is induced to the rope at four contact points. These working and stress conditions can be simulated with the test set-up shown in this International Standard.

This International Standard is intended to provide manufacturers, suppliers and independent testing bodies with a uniform testing method for determining the resistance against lateral deformation of steel wire rope without axial load.

Lateral deformation values depend on the condition of the rope, and it is thus necessary to know the actual condition under which the deformation is to be, or has been, determined.

The three usual conditions are

- initial (as manufactured),
- partially bedded, or
- final bedded.

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Steel wire ropes — Determination of the transverse rigidity of steel wire ropes under no axial load condition

1 Scope

This International Standard specifies a method for determining, by test and calculation, the resistance against lateral deformation of steel wire ropes without axial load. It provides a system of testing in order to qualify wire ropes.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable to its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 7500-1, *Metallic materials — Verification of static uniaxial testing machines — Part 1: Tension/compression testing machines — Verification and calibration of the force-measuring system*

ISO 463, *Geometrical Product Specifications (GPS) — Dimensional measuring equipment — Design and metrological characteristics of mechanical dial gauges*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1

notional rope diameter in the direction of the lateral force

d_y

notional diameter of the rope in the Y-axis as determined from the following:

$$d_y = d - \Delta d_{y_m}$$

3.2

notional rope diameter perpendicular to the direction of the lateral force

d_x

notional diameter of the rope in the X-axis as determined from the following:

$$d_x = d + \Delta d_{x_{1m}} + \Delta d_{x_{2m}}$$

3.3

horizontal differential diameter value

$\Delta d_{x_{1m}}, \Delta d_{x_{2m}}$

reading of the dial gauges perpendicular to the direction of the lateral force

Note 1 to entry: The zero position is the initial position when starting the test on the initial actual rope diameter.

3.4

vertical differential jaw movement

Δd_{y_m}

reading of the dial gauge in the direction of the lateral force

Note 1 to entry: The zero position is the initial position when starting the test on the initial actual rope diameter.

3.5
lateral force

F_Q
force applied laterally during the test

Note 1 to entry: It is expressed in kilo newton (kN).

3.6
maximum lateral force

$F_{Q,max}$
most concentrated lateral force applied during the test

Note 1 to entry: It is expressed in kilo newton (kN).

3.7
degree of deformation

V
compliance characteristics of steel wire ropes subjected to lateral load, expressed by the degree of deformation

Note 1 to entry: The degree of deformation is expressed in per cent (%).

3.8
final bedded condition

condition in which repeated readings of the dial gauges are consistent at both ends of the force range

3.9
partially bedded condition

condition where force cycles have been applied, but the dial gauge readings at both ends of the force range are not yet consistent

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4 Test piece

The test piece shall be representative of the rope as a whole and be free from defects. The surfaces of the rope sections shall be thoroughly wiped clean. Its length shall be such that the free length between end servings is at least equivalent to three lay lengths. The rope shall be served with a permanent serving. The material used for the permanent serving shall be tinned or galvanized soft wire or strand for zinc/zinc alloy coated wire rope, and uncoated (bright), tinned or galvanized soft wire or strand for uncoated (bright) wire rope. The wire rope shall be cut by abrasive wheel, percussive or shearing methods, paying particular attention not to disturb the position of wires and/or strands below and between the permanent servings.

Fused and tapered ends may be used as an alternative to serving, but the sample length shall be increased to avoid any effects, e.g. shortening of the lay length associated with fused ends.

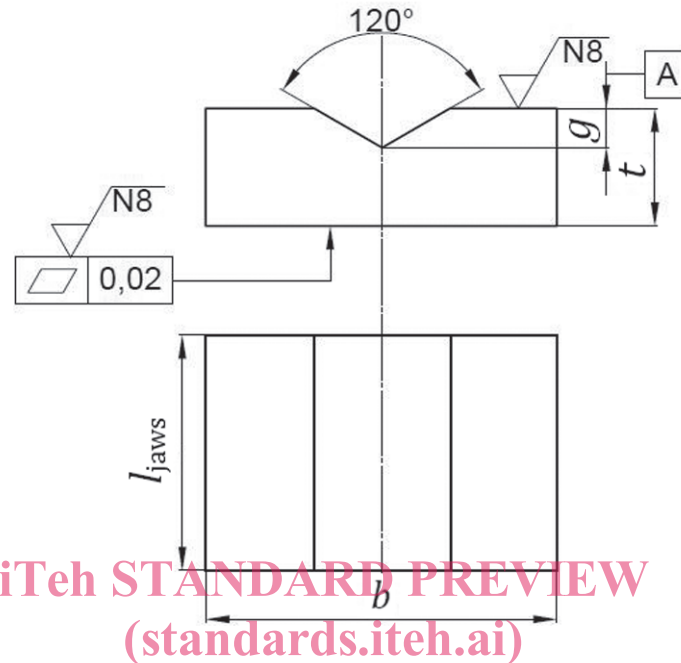
The sample beyond the jaws shall be supported to avoid any bending of the rope sample.

5 Jaws

A set of two jaws is necessary for the test method described in this particular procedure. The length of the jaws, l_{jaws} , shall be at least as long as one lay length of the rope. The width of the jaws, b , shall be at least equivalent to three nominal rope diameters. For the case in which the jaws are fully supported by the interface of the compression testing machine, the thickness of the jaws, t , shall be at least equivalent to one nominal rope diameter. Otherwise, the thickness shall be chosen in such a way that the deformation in either direction is smaller than 1 %. The depth of the V-shaped groove, g , with angle of aperture of

120° shall be equivalent as a minimum to 0,34 nominal rope diameter. The jaws shall be made out of hardened steel and the groove shall have a minimum hardness of 60 HRC.

NOTE An angle of 120° provides more advanced conditions than in a multilayer spooling, where the contact angle is between 116° and 117°.



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Figure 2 — Jaw dimensions

6 Test equipment

The compression testing machine shall be in accordance with ISO 7500-1 class 1.

The dial gauges shall be in accordance with ISO 463. The accuracy of the dial gauges shall be equal to or less than 1 %.

7 Test method

7.1 General

See [Figure 3](#).