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Steel wire ropes — Determination of the compliance characteristics of steel wire ropes subjected to lateral load

Câbles en acier — Détermination des caractéristiques de conformité des câbles en acier soumis à des charges latérales

ICS 77.140.65

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Foreword

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ISO 16839 was prepared by Technical Committee ISO/TC 105, *Steel wire rope*, Subcommittee SC , .

This second/third/... edition cancels and replaces the first/second/... edition (), [clause(s) / subclause(s) / table(s) / figure(s) / annex(es)] of which [has / have] been technically revised.

Introduction

In a multi layer spooling wire ropes are subjected to lateral pressure like shown in the following picture.

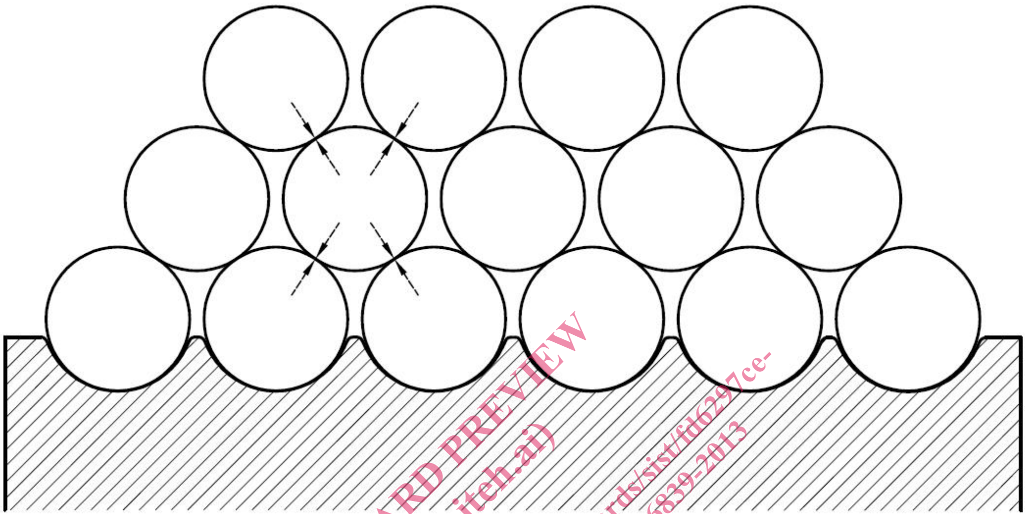

Figure 1: schematic presentation of the pyramidal form of layers in a multi layer spooling

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 setup that is subject to this particular standard.

This 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.

Steel wire ropes — Determination of the compliance characteristics of steel wire ropes subjected to lateral load

1 Scope

This test procedure 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 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 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*

ISO 17893, *Steel wire ropes — Vocabulary — designation and classification*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply / the terms and definitions given in … and the following apply.

3.1
notional rope diameter in the direction of the lateral force dy
the notional diameter of the rope in the Y axis as determined from the formula:

$$dy = d - \Delta dy_m$$

3.2
notional rope diameter perpendicular to the direction of the lateral force dx
the notional diameter of the rope in the X axis as determined from the formula:

$$dx = d + \Delta dx1_m + \Delta dx2_m$$

3.3
horizontal differential diameter value $\Delta dx1_m$, $\Delta dx2_m$
Readings of the dial gauges perpendicular to the direction of the lateral force. The zero position is the initial position when starting the test on the initial actual rope diameter.

3.4
Vertical differential jaw movement Δdy_m
Reading of the dial gauge in the direction of the lateral force. The zero position is the initial position when starting the test on the initial actual rope diameter.

3.5
lateral Force **FQ**
lateral force applied at the test in [kN]

3.6
maximum lateral Force **FQ-max**
maximum lateral force applied at the test in [kN]

3.7
degree of deformation **V**
compliance characteristics of steel wire ropes subjected to lateral load is expressed by the degree of deformation in [%]

3.8
final bedded condition
condition at which repeated readings of the dial gauges are consistent at both ends of the force range

3.9
partially bedded condition
condition when force cycles have been applied, but the dial gauge readings at both ends of the force range are not yet consistent

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 wiped clean thoroughly. Its length shall be such that the free length between end servings is at least equivalent to 3 lay length. The rope shall be served with a permanent serving. The material used for the permanent serving shall be tinned or galvanised soft wire or strand for zinc/ zinc alloy coated wire rope, and uncoated (bright), tinned or galvanised soft wire or strand for uncoated (bright) wire rope.

NOTE Fused and tapered ends may be used as an alternative to serving, but the sample length must be increased to avoid any effects e.g. shortening of the lay length associated with fused ends. Also the sample beyond the jaws must be supported to avoid any bending of the rope sample.

4.1 Cutting of 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 serving.

5 Jaws

A set of two jaws is necessary for the test method described in this particular procedure. The length of the jaws (A) 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 3 nominal rope diameters. For the case, that the jaws are fully supported by the interface of the compression testing machine, the thickness of the jaws (C) shall be at least equivalent to 1 nominal rope diameter. Otherwise the thickness has to be chosen in that way, that the deformation in either direction is smaller than 1%. The depth of the V-shaped groove (D) 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 advanced conditions than in a multi layer spooling, where the contact angle is between 116-117°.

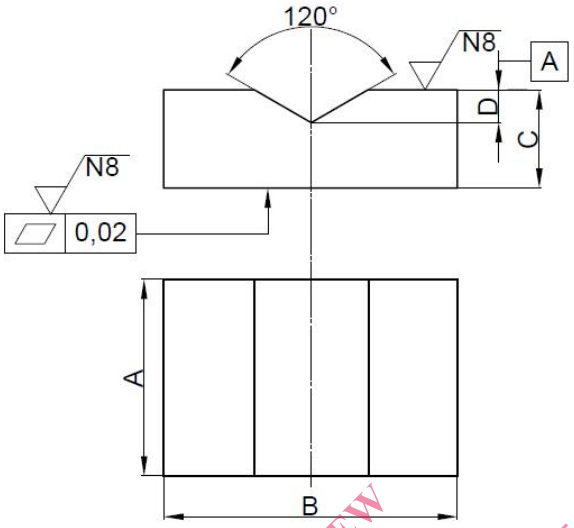

Figure 2: Jaw dimensions

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 or smaller than 1%.

7 Test method

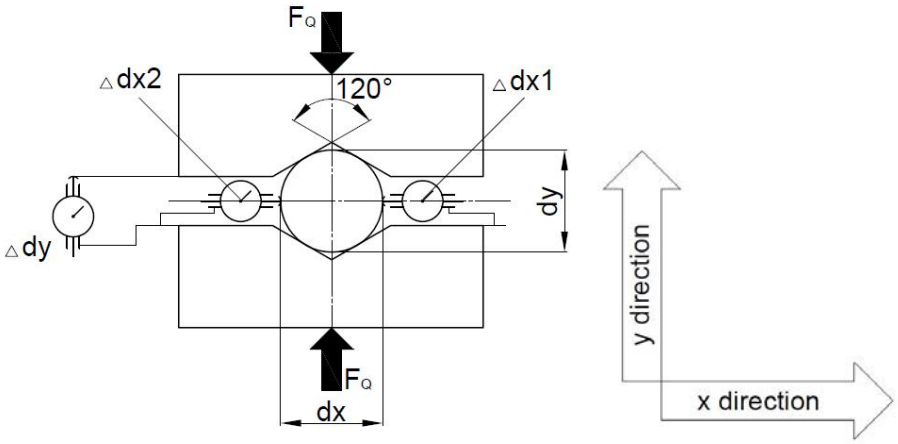

Figure 3: Test setup