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# International Standard



# 4101

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## Drawn steel wire for elevator ropes — Specifications

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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 developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been authorized 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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 4101 was developed by Technical Committee ISO/TC 105, *Steel wire ropes*, and was circulated to the member bodies in October 1982.

It has been approved by the member bodies of the following countries :

Austria	India	Sweden
Canada	Israel	Switzerland
China	Italy	United Kingdom
Czechoslovakia	Korea, Rep. of	Thailand
Egypt, Arab Rep. of	Netherlands	USSR
France	Poland	
Germany, F. R.	Spain	

The member bodies of the following countries expressed disapproval of the document on technical grounds :

Australia  
Belgium  
South Africa, Rep. of

# Drawn steel wire for elevator ropes — Specifications

## 1 Scope

This International Standard gives the specifications for steel wire to be used for elevator ropes only.

It lays down :

- the dimensional tolerances;
- the mechanical characteristics.

## 2 Field of application

This International Standard applies to new steel wire of between 0,25 and 1,8 mm diameter, used solely for manufacture of elevator ropes. It does not apply to steel wires taken from a rope.

## 3 References

ISO 89, *Steel — Tensile testing of wire.*

ISO 136, *Steel — Simple torsion testing of wire.*

ISO 144, *Steel — Reverse bend testing of wire.*

ISO 2701, *Drawn wire for general purpose non-alloy steel wire ropes — Terms of acceptance.*

## 4 Diameters and ovality

### 4.1 Nominal diameter of the wire, $d$

The nominal diameter of the wire,  $d$ , is the diameter in millimetres specified by the ropemaker on the order. It shall be the basis on which the values of all characteristics are determined for acceptance of the wire.

### 4.2 Actual diameter of the wire

The actual diameter of the wire shall be the diameter given by the arithmetic mean of two measurements, one being perpendicular to the other in the same plane. The arithmetic mean shall be within the tolerance limits specified in table 1.

### 4.3 Ovality of the wire

The two measurements, taken as specified in 4.2, shall not differ by more than half the total tolerance given in table 1.

**Table 1 — Dimensional limits and tolerances**

Values in millimetres

Nominal diameter of wire <i>d</i>	Tolerance
0,25 < <i>d</i> < 0,40	± 0,010
0,40 < <i>d</i> < 0,50 0,50 < <i>d</i> < 0,60 0,60 < <i>d</i> < 0,70 0,70 < <i>d</i> < 0,80 0,80 < <i>d</i> < 1,00	± 0,015
1,00 < <i>d</i> < 1,20 1,20 < <i>d</i> < 1,30 1,30 < <i>d</i> < 1,50 1,50 < <i>d</i> < 1,60	± 0,020
1,60 < <i>d</i> < 1,80	± 0,025

## 5 Tensile strength

### 5.1 Wire tensile grades

The wire tensile grades are :

- 1 370 N/mm<sup>2</sup><sup>1)</sup>
- 1 570 N/mm<sup>2</sup>
- 1 770 N/mm<sup>2</sup>

These nominal values are the lower limits for strengths.

The upper limits are equal to the lower limits plus the tolerances given in table 2.

**Table 2 — Tensile tolerances**

Nominal diameter of wire <i>d</i> mm	Tensile tolerance N/mm <sup>2</sup>
0,25 < <i>d</i> < 0,40	300
0,40 < <i>d</i> < 0,50	300
0,50 < <i>d</i> < 1,00	280
1,00 < <i>d</i> < 1,50	260
1,50 < <i>d</i> < 1,80	230

### 5.2 Testing

The tensile test shall be carried out in accordance with the procedure given in ISO 89; however, in view of the number of tests on wire involved in the inspection of a batch, the speed of application of the load may be higher than that indicated in ISO 89 but never at such a speed as to produce a 25 % elongation between grips within 1 min. A 150 mm test piece should preferably be used.

1) 1 N/mm<sup>2</sup> = 1 MPa

2) Wire diameters smaller than 0,5 mm shall be tested only by means of the knotted wire tensile test.

In case of dispute, the tensile tests shall be performed strictly in accordance with ISO 89, particularly insofar as the speed of application of the load is concerned.

## 6 Simple torsion test

Depending on its diameter and tensile strength, the wire shall be capable of withstanding before fracture the minimum number of turns indicated in table 3.

The test relates only to wire with a diameter of 0,5 mm and over.<sup>2)</sup>

The test shall be carried out in accordance with the procedure given in ISO 136. A test piece length of 100 *d* between grips is preferable. When this length is impracticable, an alternative length shall be used at the discretion of the wire manufacturer. In this case, the minimum number of turns shall be proportional to the number specified in table 3, as the ratio of the alternative test length is to the standard test length of 100 *d*.

**Table 3 — Minimum number of turns**

Test length	Nominal diameter of wire <i>d</i> mm	Minimum number of turns		
		Tensile grade, N/mm <sup>2</sup>		
		1 370	1 570	1 770
100 <i>d</i>	0,50 < <i>d</i> < 0,60	34	30	28
	0,60 < <i>d</i> < 0,70			
	0,70 < <i>d</i> < 0,80			
	0,80 < <i>d</i> < 1,00			
	1,00 < <i>d</i> < 1,20	33	29	26
	1,20 < <i>d</i> < 1,30			
	1,30 < <i>d</i> < 1,50	33	28	25
	1,50 < <i>d</i> < 1,60			
	1,60 < <i>d</i> < 1,80			

## 7 Reverse bend test

The wire shall be capable of withstanding without fracture the minimum number of reverse bends indicated in table 4; the bending radii of the supports to be used, which vary with different wire diameters, are also given.

The test relates only to wire with a diameter of 0,5 mm and over.<sup>2)</sup>

The test shall be carried out in accordance with the procedure given in ISO 144.

Table 4 — Minimum number of reverse bends

Nominal diameter of wire <i>d</i> mm	Radius of curvature of supports mm	Minimum number of reverse bends		
		Tensile grade, N/mm <sup>2</sup>		
		1 370	1 570	1 770
0,50	1,25	9	7	6
0,55 0,60 0,65 0,70	1,75	15 13 11 10	13 11 9 8	12 10 8 7
0,75 0,80 0,85 0,90 0,95 1,00	2,50	17 15 13 12 11 10	15 14 13 12 11 10	14 13 12 11 10 9
1,10 1,20 1,30 1,40 1,50	3,75	18 15 13 11 10	17 15 13 11 10	16 14 12 10 9
1,60 1,70 1,80	5,00	15 13 12	13 12 11	12 11 10

NOTE — If the diameter lies between two consecutive diameters in the table, the number of bends and the bend radius corresponding to the next larger diameter shall be taken.

## 8 Tensile test on knotted wire

This test is limited to wire having a diameter of less than 0,5 mm and replaces the simple torsion test and the reverse bend test.

The length of wire with a single knot shall be capable of withstanding without breaking a load equal to not less than 50 % of that corresponding to the nominal strength.

The test shall be carried out in accordance with the procedure given in ISO 89, with the qualification that a simple knot should be made in the middle of the test piece.

## 9 Acceptance conditions

The method of sampling and acceptance shall be as given in ISO 2701.