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# INTERNATIONAL STANDARD



# 3154

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INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

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## Stranded wire ropes for mine hoisting — Technical delivery requirements

*Câbles d'extraction toronnés utilisés dans les mines — Conditions techniques de réception*

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## FOREWORD

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (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 set up 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 3154 was drawn up by Technical Committee ISO/TC 82, *Mining*, and was circulated to the Member Bodies in August 1973.

It has been approved by the Member Bodies of the following countries :

Austria	Germany	Spain
Belgium	Hungary	Sweden
Bulgaria	India	Thailand
Chile	Ireland	Turkey
Czechoslovakia	Poland	United Kingdom
Egypt, Arab Rep. of	Romania	U.S.S.R.
France	South Africa, Rep. of	Yugoslavia

No Member Body expressed disapproval of the document.

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# Stranded wire ropes for mine hoisting – Technical delivery requirements

## iTeh STANDARD PREVIEW (standards.iteh.ai)

### 1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies those properties which form a basis for acceptance of stranded wire ropes for mine hoisting and of their component parts. Full-lock coil ropes, balance ropes and flat ropes used in mines are not covered by this International Standard.

### 2 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 2232, *Drawn wire for general purpose non-alloy steel wire ropes – Specifications.*<sup>1)</sup>

ISO 2532, *Steel wire ropes – Vocabulary.*

ISO 3155, *Stranded wire ropes for mine hoisting – Fibre components – Characteristics and tests.*

ISO 3156, *Stranded wire ropes for mine hoisting – Impregnating compounds and lubricants – Characteristics and tests.*

### 3 COMPONENTS OF THE ROPE

#### 3.1 Wires

Stranded wire ropes for hoisting purposes shall be made from round wires<sup>2)</sup>. These shall be either bright or galvanized.

The requirements for wires after manufacture are given in clause 4.

The characteristics of the wire to be used for the manufacture of these ropes are not covered by this International Standard.

#### 3.2 Fibres

Fibre cores, fibre covers and fibre inserts used in the manufacture of these ropes shall comply with the requirements laid down in ISO 3155.

#### 3.3 Lubricants

The impregnating compounds and lubricants used during the manufacture and service dressing of these ropes shall comply with the requirements laid down in ISO 3156.

1) Only : Annex A – Determination of mass of zinc deposited per unit of surface.  
Annex B – Test for continuity and uniformity of coating.

2) In ropes of triangular strand or flattened strand construction, shaped wires may be used as core members.

## 4 REQUIREMENTS

### 4.1 Requirements on the completed rope

#### 4.1.1 Rope diameter

##### 4.1.1.1 NOMINAL ROPE DIAMETER

The nominal rope diameter shall be agreed between the manufacturer or supplier and the purchaser when the rope is ordered.

##### 4.1.1.2 ACTUAL ROPE DIAMETER

The actual rope diameter measured on the new, completed rope in the unloaded state shall be not less than the agreed nominal rope diameter and shall not exceed it by more than 5 %.

The actual rope diameter shall be measured by the method laid down in 5.1.1.

#### 4.1.2 Rope length

##### 4.1.2.1 NOMINAL LENGTH

The nominal rope length shall be agreed between the manufacturer or supplier and the purchaser when the rope is ordered. Any test pieces shall be included in the ordered length.

##### 4.1.2.2 ACTUAL ROPE LENGTH

The actual rope length measured on the new completed rope in the unloaded state shall be subject to the following tolerances on the ordered length :

up to and including 400 m :  $\begin{matrix} + 5 \\ 0 \end{matrix} \%$

over 400 m :  $\begin{matrix} + 20 \\ 0 \end{matrix} \text{ m}$  for each 1 000 m or part thereof.

The actual rope length shall be determined by the method agreed according to 5.1.2.

#### 4.1.3 Rope mass per metre

##### 4.1.3.1 NOMINAL ROPE MASS

The nominal rope mass per metre shall be agreed between the manufacturer or supplier and the purchaser when the rope is ordered.

##### 4.1.3.2 ACTUAL ROPE MASS

The actual rope mass measured on the new completed rope in the unloaded state shall not differ from the agreed nominal rope mass by less than - 2 % or more than + 5 % and shall be determined according to the method laid down in 5.1.3.

#### 4.1.4 Breaking loads

Two methods of assessment are recognized. Compliance with one or the other shall be agreed between the manufacturer or supplier and the purchaser. The definitions of breaking load shall be those given in ISO 2532.

##### 4.1.4.1 METHOD I

In this method the terms used are "nominal aggregate breaking load" and "measured aggregate breaking load".<sup>1)</sup>

###### a) Nominal aggregate breaking load

The nominal aggregate breaking load shall be agreed between the purchaser and the manufacturer or supplier when the rope is ordered.<sup>2)</sup>

###### b) Measured aggregate breaking load

The measured aggregate breaking load shall be not less than the nominal aggregate breaking load<sup>3)</sup>. It shall be determined by the method laid down in 5.1.4.1.

##### 4.1.4.2 METHOD II

In this method the terms used are "minimum breaking load" and "measured breaking load".

###### a) Minimum breaking load

The minimum breaking load shall be agreed between the purchaser and the manufacturer or supplier when the rope is ordered.

###### b) Measured breaking load

The measured breaking load shall be not less than the minimum breaking load<sup>3)</sup>. It shall be determined by a tensile test to destruction on a sample of the rope carried out in the manner specified in 5.1.4.2.

1) It is the practice in some countries to disregard certain components of the rope when assessing the nominal aggregate and the measured aggregate breaking loads. The value determined in this way is called a "reduced aggregate" (nominal or measured) breaking load of the rope. National standards and regulations may specify those components which have to be disregarded.

The reduced nominal and the reduced measured aggregate breaking loads may form a basis for acceptance of the rope.

2) The minimum breaking load may also be agreed between the purchaser and the manufacturer or supplier; in this case, the minimum breaking load is calculated from the nominal aggregate breaking load and an agreed spinning loss factor.

3) In special cases, if may be necessary for the upper limit of breaking load to be the subject of agreement between the manufacturer or supplier and the purchaser.

4.2 Requirements on round wires from rope

4.2.1 Wire diameter

4.2.1.1 NOMINAL DIAMETERS

The intervals separating successive nominal diameters for bright and galvanized wires are given in table 1. The diameter of galvanized wires shall be measured over the galvanized coating.

TABLE 1  
Dimensions in millimetres

Nominal diameter <i>d</i>	Intervals
≤ 2,0	0,05
> 2,0	0,1

If, for technical reasons, the nominal diameters of the wires differ from these values, the nominal diameters of the stranded wires shall be indicated by the manufacturer or supplier in the confirmation of the order to the rope purchaser and in the Full Works Certificate.

4.2.1.2 TOLERANCES

For bright and galvanized wires, the tolerances on the diameter shall be as given in table 2.

TABLE 2  
Dimensions in millimetres

Nominal diameter of wire <i>d</i>	Tolerance	
	Bright and Quality B* galvanized wire	Quality A* galvanized wire
0,8 ≤ <i>d</i> < 1,0	± 0,02	+ 0,03
1,0 ≤ <i>d</i> < 1,6	± 0,02	+ 0,04
1,6 ≤ <i>d</i> < 2,4	± 0,03	+ 0,05
2,4 ≤ <i>d</i> < 3,5	± 0,03	+ 0,06

\* See 4.2.5.1.

Galvanized wires may, owing to local irregularities, exceed the tolerances laid down in table 2 over a short length, provided that the use of the wires is not affected.

4.2.2 Tensile strength

4.2.2.1 NOMINAL TENSILE STRENGTH

The nominal tensile strength values (tensile grades) for wires shall be as given in table 3. They shall be agreed between the manufacturer or supplier and the purchaser when the rope is ordered.

TABLE 3

Nominal tensile strength (Tensile grade)	
N/mm <sup>2</sup>	kgf/mm <sup>2</sup>
1 570*	160
1 770*	180
1 960	200

\* These tensile grades should be preferred.

These nominal values are the lower limits for tensile strengths.

The upper limits are equal to the lower limits plus the tolerances given in 4.2.2.2.

If, in exceptional cases, other nominal tensile strengths are necessary, these and the relevant technical requirements shall be agreed between the manufacturer or supplier and the purchaser.

4.2.2.2 TOLERANCES

TABLE 4

Nominal diameter of wire <i>d</i>	Tolerance for nominal tensile strength	
	N/mm <sup>2</sup>	kgf/mm <sup>2</sup>
mm		
0,8 ≤ <i>d</i> < 1,0	350	36
1,0 ≤ <i>d</i> < 1,5	320	33
1,5 ≤ <i>d</i> < 2,0	290	30
<i>d</i> ≥ 2,0	260	27

4.2.3 Number of reverse bends

The minimum numbers of reverse bends shall be in accordance with table 5.<sup>1)</sup>

TABLE 5

Nominal diameter of wire <i>d</i>	Radius of cylindrical formers	Minimum number of reverse bends when Acceptance Method I is used					Reduction applicable on bending numbers when Acceptance Method II is used
		Bright and Quality B galvanized wire			Galvanized wire Quality A		
		Nominal tensile strength, N/mm <sup>2</sup> (kgf/mm <sup>2</sup> )					
mm	mm	1570 (160)	1770 (180)	1960 (200)	1570 (160)	1770 (180)	
0,8	2,5	14	13	12	12	10	3
0,9		12	11	10	10	8	3
1,0		10	9	8	8	6	3
1,1	3,75*	18	17	16	14	13	4
1,2		16	15	14	13	11	4
1,3		14	13	12	11	9	4
1,4		12	11	10	9	8	4
1,5		10	9	8	8	7	3
1,6	5	15	14	12	11	10	3
1,7		13	12	11	10	9	2
1,8		12	11	10	9	8	2
1,9		11	10	9	8	7	2
2,0		10	9	8	7	6	2
2,1		7,5	16	15	14	14	12
2,2	15		14	13	13	11	3
2,3	14		13	12	12	10	3
2,4	13		12	11	11	9	3
2,5	12		11	10	10	8	3
2,6	11		10	9	9	7	2
2,7	10		9	8	8	6	2
2,8	9		8	7	7	5	2
2,9	8		7	6	7	5	2
3,0	8		7	6	6	4	2
3,1	10	13	12	11	10	8	2
3,2		12	11	10	9	7	2
3,3		11	10	9	9	7	2
3,4		10	9	8	8	6	2
3,5		9	8	7	7	5	2

\* The bending radius of 3,75 mm has been adopted only recently and until further experience is gained, some discretion should be used in applying the numbers relating to this radius.

Values falling between the nominal diameter values listed in table 5 shall comply with the reverse bend numbers of the next higher nominal diameter.

1) Table 5 will be reconsidered after a period of 3 years.



4.2.4 Number of turns

The minimum number of turns shall be in accordance with the values specified in table 6.<sup>1)</sup>

4.2.5 Zinc coating

4.2.5.1 QUALITIES

Two grades of galvanizing shall be recognized. These are Quality A (heavy galvanizing) and Quality B (normal galvanizing).

4.2.5.2 ASSESSMENT

The quality of the galvanized coating shall be assessed :

- a) by the mean mass of zinc deposited per unit area of surface, in grams per square metre;

- b) by the continuity and the uniformity of the zinc coating (Preece test)<sup>2)</sup>.

The zinc coating shall comply with the values given in table 7.

The values given in the column for Quality A are not applicable for tensile grades exceeding 1 770 N/mm<sup>2</sup> (180 kgf/mm<sup>2</sup>). For higher tensile grades, values shall be agreed between the purchaser and the manufacturer or supplier.

4.3 Requirements on shaped wires from rope

If shaped wires from strand cores contribute an essential part of the breaking strength of the rope, the extent of the tests, the requirements, and the methods of testing shall be agreed between the purchaser and the manufacturer or supplier of the rope.

TABLE 6

Test length	Nominal diameter of wire <i>d</i>	Minimum number of turns				
		Bright and Quality B galvanized wire			Quality A galvanized wire	
		Nominal tensile strength, N/mm <sup>2</sup> (kgf/mm <sup>2</sup> )				
mm	mm	1570 (160)	1770 (180)	1960 (200)	1570 (160)	1770 (180)
100 × <i>d</i>	0,8 ≤ <i>d</i> < 1,0	33	31	25	21	19
	1,0 ≤ <i>d</i> < 1,3	31	29	24	19	17
	1,3 ≤ <i>d</i> < 1,8	30	27	23	18	16
	1,8 ≤ <i>d</i> < 2,3	28	26	21	17	14
	2,3 ≤ <i>d</i> < 3,0	26	23	19	14	11
	3,0 ≤ <i>d</i> < 3,4	24	21	18	9	7
	3,4 ≤ <i>d</i> < 3,5	22	19	16	8	6

TABLE 7

Nominal diameter of wire <i>d</i>	Quality B		Quality A	
	Minimum mass of zinc	Minimum number of immersions	Minimum mass of zinc	Minimum number of immersions
mm	g/m <sup>2</sup>		g/m <sup>2</sup>	
0,8 ≤ <i>d</i> < 1,0	70	0,5	130	1
1,0 ≤ <i>d</i> < 1,2	80	1	150	1,5
1,2 ≤ <i>d</i> < 1,5	90	1	165	1,5
1,5 ≤ <i>d</i> < 1,9	100	1	180	2
1,9 ≤ <i>d</i> < 2,5	110	1,5	205	2
2,5 ≤ <i>d</i> < 3,2	125	1,5	230	2,5
3,2 ≤ <i>d</i> < 3,5	135	2	250	3

1) Table 6 will be reconsidered after a period of 3 years.

2) See annex B of ISO 2232.