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Stranded wire ropes for mine hoisting -- Fibre components -- Characteristics and tests

Câbles d'extraction toronnés utilisés dans les mines -- Composants textiles -- Caractéristiques et essais

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73.100.40	Oprema za vleko in dviganje	Haulage and hoisting equipment

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INTERNATIONAL STANDARD 3155

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Stranded wire ropes for mine hoisting — Fibre components — Characteristics and tests

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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 3155 was drawn up by Technical Committee ISO/TC 82, *Mining,* and 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	Netherlands	United Kingdom
Egypt, Arab Rep. of	Poland	Yugoslavia
France	Romania	

The Member Bodies of the following countries expressed disapproval of the document on technical grounds :

South Africa, Rep. of

Printed In Switzerland

Stranded wire ropes for mine hoisting — Fibre components — Characteristics and tests

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies the nature and properties of the fibre components for stranded wire ropes for mine hoisting, together with the corresponding test methods.

2 GENERAL REQUIREMENTS

Fibre cores, or steel cores with fibre inserts, or fibre covers shall be of a size sufficient to give the strands of the rope solid and adequate support and to prevent adjacent strands of a new rope in no-load condition from direct contact. Fibre cores shall be firmly stranded and shall consist of at least three strands. The lay of the strands in the fibre core shall be opposite to the lay of the yarns in the strand.

3 MATERIAL

Fibre cores, fibre covers and fibre inserts shall be made from long hard fibre of the following types :

Sisal (*Agava sisalana* Pervine) and

Manila (Abaca) (*Musa textilis* Nee)

Admixture of any other or of old fibres is prohibited.

Suitable synthetic fibre may be used by agreement between purchaser and supplier.

4 PROPERTIES OF FIBRE COMPONENTS

4.1 All yarns shall contain not more than 2 ml/100 g of water-soluble aggressive acids. This shall be checked in accordance with 5.1.

4.2 The yarns shall contain less than 0,3 % of chloride ions expressed as sodium chloride. This shall be checked in accordance with 5.2.

4.3 The following limit values for the content of extractable matter are applicable for natural fibre yarns.

a) In the case of yarns to which no lubricant has been added during the manufacturing process, the extractable matter content shall not exceed 5 %. In this case, the finished fibre core shall not contain more than 25 % of extractable matter.

b) In the case of yarns to which lubricants and impregnating compounds have already been added during the manufacturing process, the admissible upper limit is 18 %, the admissible lower limit 12 %.

This shall be checked in accordance with 5.3.

5 METHODS OF TEST

5.1 Determination of water-soluble acids

5.1.1 *Procedure*

Weigh, to the nearest 0,1 g, a sample of mass 20 to 30 g of the full cross-section to be tested. Unravel the sample and transfer it to a Soxhlet apparatus. Boil for 30 min with 100 ml of distilled water. Filter through a filter paper and wash the residue with three successive lots of hot distilled water. After washing, the total quantity of the water extract shall not exceed 175 ml.

Add a few drops of phenolphthalein to the extract and titrate with 0,1 N sodium or potassium hydroxide solution to a permanent colour.

5.1.2 *Expression of results*

The water-soluble acids Z, in millilitres per 100 g, is given by the formula :

$$Z = \frac{10 \times V}{m_0}$$

where

m_0 is the mass, in grams, of the sample;

V is the volume, in millilitres, of 0,1 N sodium or potassium hydroxide solution used in the titration.

Express the result to the nearest 0,1 ml/100 g.

5.2 Determination of salt content

5.2.1 *Procedure*

Place 10 g of the fibre moistened with 40 ml of 5 % sodium carbonate solution in a platinum or silica basin. The value of 40 ml is to be verified. Evaporate to dryness and ignite at

dull redness (or at a temperature just high enough to give a product sufficiently charred to yield a colourless filtrate on extraction with water). Extract the residue with hot water, filter and wash. Then return the residue to the platinum or silica basin and incinerate completely. Dissolve the ash in dilute nitric acid (20 % (*m/m*)), filter, wash the residue, and add this solution and washings to the aqueous extract.

To the combined extract, rendered acid with dilute nitric acid, add a known volume of 0,1 N silver nitrate solution in slight excess and stir well. Filter and wash the silver chloride precipitate.

To the combined filtrates and washings, add 5 ml of a saturated solution of ammonium iron(III) alum and titrate the excess silver nitrate with 0,1 N potassium thiocyanate solution until a permanent light brown colour develops.

5.2.2 *Expression of results*

Calculate the percentage of chloride from the amount of silver nitrate converted into silver chloride on the basis that 1 ml of 0,1 N silver nitrate solution is equivalent to 0,005 85 g of sodium chloride.

Express the result to the nearest 0,1 % of sodium chloride.

5.3 Determination of the extractable content

5.3.1 *Preparation of samples*

From the middle of a piece of wire rope core having a mass of at least 100 g, cut two samples representing the complete cross-sectional area, choosing their length in such a way that the mass m_1 of the sample to be used for the determination of the extractable matter content lies between 20 and 30 g and the mass m_2 of the sample to be used for the determination of the moisture content is about 50 g.

5.3.2 *Determination of the extractable matter content (dry extract)*

Unravel the first sample, of mass m_1, weighed to the nearest 0,1 g, and place in a new extraction sleeve of known mass, which does not contain any substances soluble in methylene chloride and which has not undergone any drying process. The sample shall not project over the edge of the sleeve.

Dry an extraction flask of nominal capacity 250 ml for at least 2 h in a cabinet at 105 °C. Cool the flask in a desiccator for 2 h and determine its mass to the nearest 0,001 g.

Pour 150 ml of methylene chloride into the flask and extract the contents of the sleeve in a Twisselmann or Soxhlet apparatus until such time as the extraction medium flows off in a colourless form or, when colourless impregnating compounds are used, a sample taken from the extract evaporates without residue.

After extraction, evaporate the solvent leaving a small quantity. Evaporate this residual quantity of the extraction agent in a drying cabinet at 105 °C until constant mass is attained. The drying process can be accelerated by placing the flask in an inclined position. Cool the flask for 2 h in a desiccator and weigh again, to the nearest 0,001 g, so as to determine by difference the mass m_3 of the extracted portion (moisture free).

5.3.3 *Determination of water content*

For this determination, use the sample of mass m_2. Distil the water contained in the sample after addition of xylene or an appropriate benzole fraction and condense in a graduated recipient.

For the mass of water m_4 obtained from the sample of mass m_2, calculate the mass of water m_5, present in the sample of mass m_1 using the formula :

$$m_5 = \frac{m_1}{m_2} \times m_4$$

Express the result to the nearest 0,001 g.

5.3.4 *Expression of results*

The extractable matter content M, expressed as a percentage by mass of the dry fibre material remaining after extraction, is given by the formula :

$$M = \frac{m_3}{m_1 - (m_3 + m_5)} \times 100$$

where

m_1 is the mass, in grams, of the sample used in the determination of extractable matter;

m_3 is the mass, in grams, of the matter extracted from that sample;

m_5 is the mass, in grams, of the water in that sample, as determined according to 5.3.3.

Express the result to the nearest 0,1 %.