
INTERNATIONAL STANDARD



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Stranded wire ropes for mine hoisting — Impregnating compounds, lubricants and service dressings — Characteristics and tests

Câbles d'extraction toronnés utilisés dans les mines — Composés d'imprégnation et lubrifiants utilisés en cours de fabrication et en service — Caractéristiques et essais

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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 3156 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
Belgium
Bulgaria
Chile
Czechoslovakia
Egypt, Arab Rep. of
France

Germany
Hungary
India
Ireland
Netherlands
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South Africa, Rep. of
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Thailand
Turkey
United Kingdom
Yugoslavia

No Member Body expressed disapproval of the document.

Stranded wire ropes for mine hoisting — Impregnating compounds, lubricants and service dressings — Characteristics and tests

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1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies the nature and properties of impregnating compounds and lubricants for stranded wire ropes for mine hoisting, together with the corresponding test methods. In particular, it is concerned with

- a) impregnating compounds for fibre main cores, fibre covers, and fibre inserts;
- b) lubricants used in manufacture;
- c) service dressings.

The different requirements for the two basic types of winder (Koepe or drum) are recognized where significant.

2 GENERAL REQUIREMENTS

The lubricants and impregnating compounds used in the rope shall meet the following requirements :

- a) they shall contain a non-volatile base material, which may be dispersed in a petroleum solvent;
- b) they shall be homogeneous and shall, if heating is required for application, return to substantially the same state after heating as before heating, i.e. they shall be heat reversible;
- c) they shall be compatible with all other compounds used in the rope;
- d) they shall not contain grit, abrasive matter, deliberate weighting matter, water, chlorides or other similar impurities;

e) they shall be resistant to significant age embrittlement;

f) they shall not contain any additive or compound which, in combination with moisture in any of its forms, could form products inherently corrosive to steel or zinc, or detrimental to the fibres comprising the rope or to the pulley lining;

g) they shall not contain any additive or compound which, due to degradation by either heat or exposure to natural sunlight, could form products inherently corrosive to steel or zinc, or detrimental to the fibres comprising the rope or to the pulley linings;

h) if solvents are used, they shall not contain benzene or chlorinated hydrocarbons;

i) they shall not be injurious in any way to personnel using them if reasonable safety precautions and procedures are used.

Additionally, for Koepe winding ropes, the lubricant and lubricating systems shall meet the following requirements under normal operating conditions :

j) the tendency for exudation of lubricant to the surface of the rope shall be minimal;

k) the coefficient of friction between the rope and the pulley lining shall be sufficient to ensure adequate grip.

These requirements are normally achieved by using a combination of lubricants and appropriate lubrication methods. The choice of the lubricant shall be the subject of agreement between the rope manufacturer or supplier and the purchaser.

3 SPECIAL REQUIREMENTS

3.1 Impregnating compounds for fibre components

The impregnating compound shall meet the following requirements :

- a) it shall reduce friction between the individual fibres;
- b) it shall give protection against corrosion to any wires in contact with the fibre;
- c) it shall be of such a nature that, on heating or otherwise, it will, where necessary, thoroughly impregnate the fibre component;
- d) it shall not contain heavy fuel oils or coal tar.

Additionally, if the fibres comprising the component are natural fibres, the impregnating compound shall meet the following requirements :

- e) it shall protect the fibres from microbiological degradation;
- f) it shall minimize water absorption into the component;
- g) the impregnation temperature shall not exceed 110 °C if it is necessary to heat an impregnating compound in order to ensure thorough impregnation.

3.2 Rope manufacturing lubricants

The lubricant shall meet the following requirements :

- a) it shall have good covering properties;
- b) it shall reduce friction and fretting between the wires in the rope;
- c) it shall protect the wires in the rope against corrosion;
- d) it shall be water repellent and water resistant;
- e) it shall contain no components soluble or emulsifiable in water.

If necessary for application purposes, the viscosity of the lubricant may be reduced by heating. In these cases, care must be taken not to degrade the lubricant by heating at too high a temperature or for too long a time.

For Koepe winding ropes, attention must be paid to the requirements for minimum exudation, and to the coefficient of friction requirements (see 2j and 2k).

3.3 Service dressings

The service dressing shall meet the following requirements :

- a) it shall meet the requirements of 3.2.

b) it shall be capable of penetrating from the wire surface into a rope and/or displacing any internal moisture. In order to meet this requirement, the viscosity of the dressing may be reduced by either heating or, preferably, the use of a solvent;

c) chlorinated hydrocarbon solvents must not be used¹⁾;

d) the compounds used for the service dressing of Koepe winding ropes shall not reduce the coefficient of friction between the rope and the pulley lining substantially below the value previously agreed between the purchaser and the manufacturer.

4 QUALIFICATION TESTS

The rope lubricants and impregnating compounds supplied in accordance with the specifications of clauses 2 and 3 shall be products which have been subjected to, and have passed, those qualification tests agreed between the purchaser and manufacturer of the rope.

The service dressings supplied in accordance with the specifications of clauses 2 and 3 shall be products which have been subjected to, and have passed, the qualification tests agreed between the rope user and the lubricant manufacturer.

Any change in the formulation of a qualified product will require its qualification.

A qualification certificate shall be issued for each product.

5 QUALITY CONTROL

The material supplied for use shall be identical, within manufacturing tolerances, with the product receiving qualification. For the rope lubricants and impregnating compounds, the characteristics determined, the manufacturing tolerances allowable, and the test methods shall be agreed between the purchaser and manufacturer. For service dressings, any agreement shall be between the rope user and the dressing manufacturer.

Where qualification tests are agreed, the lubricant supplier shall supply a certificate stating that the compound complies with the agreed requirements.

Such a certificate cannot be regarded as valid if more than 3 years have passed between the date of the test and the manufacture of the consignment in question.

6 TYPE AND METHODS OF TEST

(See annexes A and B)

These are to be agreed in accordance with clauses 4 and 5.

1) For safety purposes, many countries have laws relating to the use of toxic and/or flammable solvents in mines. These legal requirements must be given full consideration when using solvent-based materials.

ANNEX A

SUGGESTED QUALIFICATION AND QUALITY CONTROL TESTS

No.	Test	Impregnating compounds		Manufacturing lubricants		Service dressings	
		Qualification	Quality control	Qualification	Quality control	Qualification	Quality control
1	Wetting characteristics	—	—	+	—	+	—
2	Corrosion protection	—	—	+	R	+	—
3	Corrosivity	+	—	+	—	+	—
4	Acidity	—	+	—	+	—	+
5.1	Melting point ¹⁾	+}	+}	+}	+}	—}	—}
5.2	Drop point ¹⁾						
5.3	Softening point ¹⁾						
6	Low temperature adhesion	—	—	+	—	+	—
7	Viscosity	+	+	+	+	+	+
8.1	Penetration : Worked	—	+	+	R	—	—
8.2	Penetration : Unworked	—	+	+	+	—	—
9	Ash (sulphated residue)	—	+	—	+	—	+
10	Water stability	—	—	+	+	—	—

KEY

- Test not relevant
+ Test relevant
R Test relevant on sampling basis

1) Depending upon the type of material.

ANNEX B

SUGGESTED TEST METHODS

B.1 WETTING CHARACTERISTICS

When prepared in accordance with section 4.6.8.1 of MIL-C-16173D¹⁾, the compounds shall readily wet the surface of the test piece. For non-solvent-dispersed compounds, the application temperature shall be adjusted to give the correct film thickness.

After standing for 30 days, the coating shall be continuous and free from cracking or crazing.

B.2 CORROSION PROTECTION

Test pieces prepared in accordance with section 4.6.8.1 of MIL-C-16173D¹⁾ shall show no evidence of corrosion when subjected to either of the following tests :

- DIN 21258²⁾, section 3.5;
- Standard humidity cabinet test, for 30 days.

B.3 CORROSIVITY

The compound shall be tested in accordance with section 4.6.5 of MIL-C-16173D¹⁾ using zinc and steel plates and an exposure period of 7 days. Upon completion of the test, the specimens shall show no evidence of serious etching or pitting, mass change or severe discoloration.

For non-solvent-based compounds of the solid film type, the test temperature shall be between 10 and 20 °C above the melting point.

B.4 LOW TEMPERATURE ADHESION

When tested in accordance with section 4.6.10 of MIL-C-16173D¹⁾, the compound film shall show no evidence of flaking. For Central Europe, a suitable temperature for this test is – 15 °C. The actual test temperature shall be related to the coldest temperature that the rope is likely to encounter under normal conditions.

B.5 WATER STABILITY

When tested in accordance with the procedure laid down in section 4.6.12 – except clause 4.6.12.5 – of MIL-C-16173D¹⁾, the lubricant shall give evidence of complete water stability.

B.6 ACIDITY, MELTING POINT, DROP POINT, SOFTENING POINT, VISCOSITY, PENETRATION AND ASH

The standard tests for these characteristics should be used. The acceptance and rejection values shall be agreed between the interested parties.

1) Military Specification, *Corrosion preventive compound, solvent cut back, cold-application*, U.S. Department of Defense, 1966, Washington D.C.

2) DIN 21 258 8.67 *Tränkungsmittel und Schmierstoffe für Treibscheiben-Förderseile*, DIN Deutsches Institut für Normung e.V., Berlin.

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