

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Live working – Insulating ropes

Travaux sous tension – Cordes isolantes

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IEC 62192:2009

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**LIVE WORKING –
INSULATING ROPES**
FOREWORD

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International Standard IEC 62192 has been prepared by technical committee 78: Live working.

The text of this standard is based on the following documents:

FDIS	Report on voting
78/773/FDIS	78/787/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

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- withdrawn,
- replaced by a revised edition, or
- amended.

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INTRODUCTION

Insulating ropes designed and manufactured according to this standard contribute to the safety of the users, provided they are used by skilled persons, in accordance with safe methods of work and the instructions for use.

This International Standard defines the required electrical properties of insulating ropes which already meet other specifications relating to mechanical strength, physical and construction properties, for use in live working at the power frequency system voltages up to and including 800 kV r.m.s.

This standard does not propose to address all the safety factors associated with the use of the insulating rope. It is the responsibility of the user to establish appropriate safety practices.

Ropes which meet this standard can bridge two or more live phase conductors, or one phase conductor and earth as required during live working. Effects of the use of insulating ropes on the dielectric strength of the installation have to be evaluated. Depending on the configuration of an installation, the use of insulating ropes will have different effects on its dielectric strength.

Cotton, sisal and hemp ropes are unsuitable for this application, as are any other ropes that exhibit electrical conductivity. Examples of ropes which are able to meet the requirements of this standard are formed from fibres that have been treated with a wax or other chemical which causes the surface of the rope to become hydrophobic.

This document has been prepared according to the requirements of IEC 61477 where applicable.

The product covered by this standard may have an impact on the environment during some or all stages of its life cycle. These impacts can range from slight to significant, be of short-term or long-term, and occur at the global, regional or local level.

Except for a requirement for the selection of a testing dye and the disposal statement in the instructions for use, this standard does not include requirements and test provisions for the manufacturers of the product, or recommendations to the users of the product for environmental improvement. However, all parties intervening in its design, manufacture, packaging, distribution, use, maintenance, repair, reuse, recovery and disposal are invited to take account of environmental considerations.

LIVE WORKING – INSULATING ROPES

1 Scope

This International Standard covers insulating ropes that are utilized during live working procedures in contact with parts of installations operating at voltages up to and including 800 kV r.m.s.

Insulating ropes for live working procedure under rain and/or d.c. conditions are not covered by this standard.

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.

IEC 60060-1, *High-voltage test techniques – Part 1: General definitions and test requirements*

IEC 60212:1971, *Standard conditions for use prior to and during the testing of solid electrical insulating materials*

IEC 60417, *Graphical symbols for use on equipment*

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IEC 61318:2007, *Live working – Conformity assessment applicable to tools, devices and equipment*

IEC 61477, *Live working – Minimum requirements for the utilization of tools, devices and equipment*

ISO 2307, *Ropes – Determination of certain physical and mechanical properties*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 61318 and the following apply.

3.1

creep

dimensional change with time in a test section of the rope when subjected to continued working load

3.2

elongation

initial dimensional change in a test section of the rope subjected to rated working load for a short period of time

3.3

insulating rope

rope with electrical insulating properties suitable for use in contact with live parts

[IEV 651-09-01, modified]

3.4

rope

stout cord made from woven or twisted insulating or non-insulating material used for various handling operations

NOTE Ropes, which may come into contact with live conductors, should be insulating. Ropes used to move tools and other equipment into place, which are clear of live parts, may be non-insulating.

[IEC 60743, definition 10.1.1, modified]

4 Requirements

4.1 Physical and dimensional

4.1.1 Physical

Ropes shall be free of visual manufacturing defects such as incorrect impregnation or faulty stranding or cabling.

Ropes covered by this standard shall demonstrate low water absorption and capillary action.

4.1.2 Dimensional

Diameter and circumference of ropes shall comply with the manufacturer specifications with a tolerance of $\pm 10\%$.

NOTE National or regional standards could specify dimensioning where needed.

4.2 Electrical

Ropes covered by this standard shall have appropriate dielectric properties under dry conditions and when exposed to humid conditions.

Splicing of insulating ropes shall be possible, whilst keeping the ropes appropriate dielectric properties and in accordance with the manufacturer's instructions.

Insulating ropes to be used under rain condition, or d.c. stress are not covered by this standard.

4.3 Mechanical

In addition to other specifications related to mechanical strength and construction properties, ropes covered by this standard shall demonstrate limit elongation under normal loading conditions.

4.4 Marking

The insulating ropes shall be properly identified.

Ropes covered by this standard shall be marked with the following permanent items of marking:

- name of the manufacturer, or trade mark,
- year of manufacture, coded with a colour tracer or other means.

The following information shall also be supplied, either by a marking or other means on the rope or on each reel of rope or each smallest shipping container:

- symbol IEC 60417-5216 (2002-10) – Suitable for live working; double triangle (see Annex A),

NOTE The exact ratio of the height of the figure to the base of the triangle is 1,43. For the purpose of convenience, this ratio can be between the values of 1,4 and 1,5.

- number of the relevant IEC standard immediately adjacent to the symbol with year of publication (four digits) (IEC 62192:2009),
- batch number,
- details of diameter,
- type of lay,
- fibre material,
- minimum breaking force,
- creep,
- recommended working load.

The marking shall be durable, clearly visible and legible to a person with normal or corrected vision without additional magnification.

4.5 Instructions for use and care

Each reel of rope or each smallest shipping length shall be supplied with the manufacturer's written information and instructions for use and care. These instructions shall be prepared in accordance with the general provisions given in IEC 61477.

The information and instructions shall include as a minimum:

- any special treatment of the fibres which makes them specially suitable for this application,
- instructions for splicing,
- instructions for handling, cleaning, storage and transportation,
- instructions for periodic testing, repair, and disposal of the rope,
- period of years from the moment of production in which the mechanical characteristics can be guaranteed (storage life).

5 Tests

5.1 General

The present standard provides testing provisions to demonstrate compliance of the product to the requirements of Clause 4. These testing provisions are primarily intended to be used as type tests for validation of the design input. Where relevant, alternative means (calculation, examination, tests, etc.) are specified within the test subclauses, for the purpose of insulating ropes having completed the production phase.

Each type test shall be carried out on test pieces as specified below. If one or more test pieces fail during the type test, the product has not met the requirements of this standard.

The type tests shall be performed according to the chronological order specified in Annex B.

5.2 Atmospheric conditions

Unless otherwise stated, the lengths of insulating rope submitted to type tests shall be preconditioned for $4 \text{ h} \pm 0,5 \text{ h}$ and tested under the normal atmospheric conditions provided in Table I of IEC 60212, at a temperature of between $15 \text{ }^\circ\text{C}$ and $35 \text{ }^\circ\text{C}$, with a relative humidity between 25 % and 75 % (taking into account Note 5 of Table I of IEC 60212).

5.3 Visual verification and dimensional checking

5.3.1 Visual verification

Ropes shall be visually verified to check if the requirements of 4.1.1 and 4.4 are fulfilled.

When visual verification is specified, it shall be understood to be visual verification by a person with normal or corrected vision, without additional magnification.

5.3.2 Dimensional check

Nominal diameter and nominal circumference of ropes shall be measured to check for compliance with 4.1.2.

5.4 Electrical tests

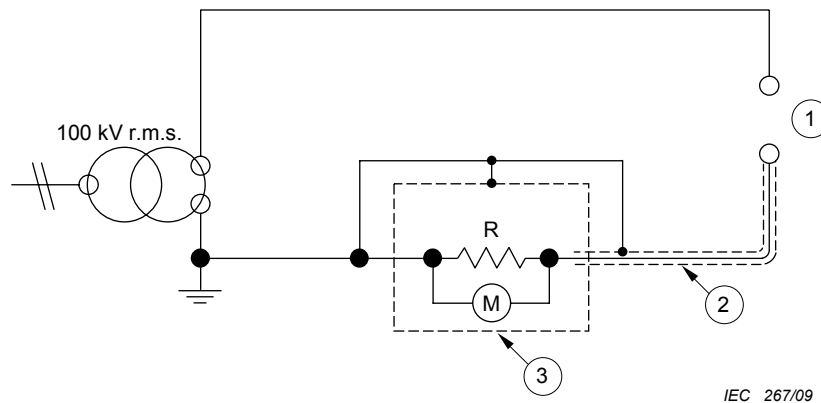
Unless otherwise specified, the electrical tests shall be carried out in accordance with IEC 60060-1.

A total of six test pieces are required for the electrical tests.

5.4.1 Leakage current under dry conditions

5.4.1.1 General

The test shall be performed on three test pieces with a length of 2 000 mm each. A voltage of 100 kV r.m.s. shall be applied, across a 300 mm length of rope for 1 min and the leakage current during this period shall be measured (see Figure 1 for example of a test set-up).



IEC 267/09

Key

- 1 Test piece
- 2 Shielded wire
- 3 Faraday box. A shielded container enclosing and guarding the resistor R and the voltmeter M. Both the screen and the shield of the measuring lead by-pass R and M, by providing a path for stray capacitive currents to ground.
- R A 100 Ω, 50 W wirewound non-inductive resistor is recommended. A 50 W resistor at a minimum is recommended because a hazardous condition would exist if the resistor should fail and create an open circuit.
- M Battery operated, true-RMS, solid state voltmeter

Figure 1 – Example of test set up to measure leakage current
(standards.iteh.ai)

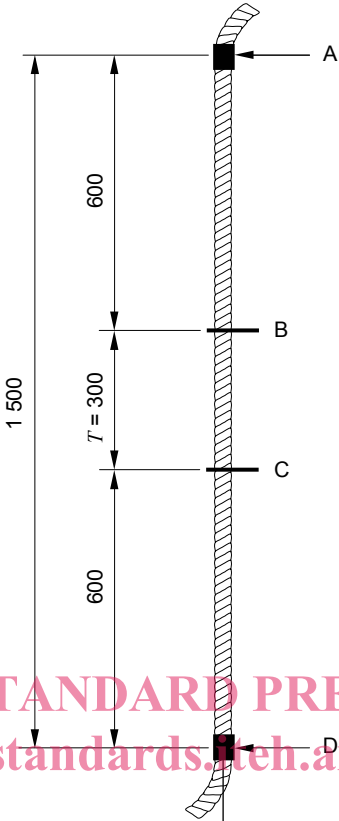
5.4.1.2 Test procedure

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The test piece shall be mounted in the vertical position with a distance of 1 500 mm between the attachment points, and tensioned at the lower attachment point with a 4,5 kg mass.

Two electrodes shall be formed by wrapping tinned copper wire of a diameter between 0,5 mm and 1 mm tightly around the test piece. The electrodes shall be centred in the test section with a clearance of 300 mm between the electrodes and mounted to provide a good electrical contact. Figure 2 illustrates the connection.

Dimensions in millimetres



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Figure 2a – Electrode arrangement for test before water conditioning