INTERNATIONAL STANDARD

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Edition 1.1
2002-06

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Live working –

Flexible conductor covers (line hoses) of insulating material

*This **English-language** version is derived from the original **bilingual** publication by leaving out all French-language pages. Missing page numbers correspond to the French-language pages.*

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

LIVE WORKING –

FLEXIBLE CONDUCTOR COVERS (LINE HOSES) OF INSULATING MATERIAL

FOREWORD

1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
2) The formal decisions or agreements of the IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested National Committees.
3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical specifications, technical reports or guides and they are accepted by the National Committees in that sense.
4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.
5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.
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International Standard IEC 61479 has been prepared by IEC technical committee 78: Live working.

This consolidated version of IEC 61479 consists of the first edition (2001) [documents 78/350/FDIS and 78/363/RVD] and its amendment 1 (2002) [documents 78/428/FDIS and 78/454/RVD].

The technical content is therefore identical to the base edition and its amendment and has been prepared for user convenience.

It bears the edition number 1.1.

A vertical line in the margin shows where the base publication has been modified by amendment 1.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 3.

Annexes A, B, C, and D form an integral part of this standard.

Annexes E, F and G are for information only.

The committee has decided that the contents of the base publication and its amendment will remain unchanged until 2005. At this date, the publication will be

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

LIVE WORKING –

FLEXIBLE CONDUCTOR COVERS (LINE HOSES) OF INSULATING MATERIAL

1 Scope

This International Standard is applicable to flexible insulating covers (line hoses) for the protection of workers from accidental contact with live or earthed electrical conductors and for the avoidance of short circuits during live working.

1.1 Classes

Five classes of conductor covers, differing in electrical characteristics, are provided and designated as class 0, class 1, class 2, class 3, and class 4.

1.2 Categories

Six categories of conductor covers differing in composition and properties are provided: category A – acid resistant, category H – oil resistant, category C – formulated for extreme low temperature environments, category W – formulated for extreme high temperature environments, category Z – ozone resistant, and category P – formulated for humid environment.

NOTE Types II and III material of ASTM D-1050 would be category Z.

1.3 Styles

Various styles of conductor covers, differing in construction characteristics are available and six of these are designated as style A, style B, style C, style D, style E, (see figure 1), and style F.

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 60050(151):1978, *International Electrotechnical Vocabulary (IEV) – Chapter 151: Electrical and magnetic devices*

IEC 60050(212):1990, *International Electrotechnical Vocabulary (IEV) – Chapter 212: Insulating solids, liquids and gases*

IEC 60050(601):1985, *International Electrotechnical Vocabulary (IEV) – Chapter 601: Generation, transmission and distribution of electricity – General*

IEC 60050(651):1999, *International Electrotechnical Vocabulary (IEV) – Chapter 651: Live working*

IEC 60060-1:1989, *High-voltage test techniques – Part 1: General definitions and test requirements*

IEC 60060-2:1994, *High-voltage test techniques – Part 2: Measuring systems*

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

IEC 60417 (all parts), *Graphical symbols for use on equipment*

IEC 61318:1994, *Live working – Guidelines for quality assurance plans*

ISO 472:1999, *Plastics – Vocabulary*

ISO 1817:1999, *Rubber, vulcanized – Determination of the effect of liquids*

ISO 2592:2000, *Determination of flash and fire points – Cleveland open cup method*

ISO 2859-1:1999, *Sampling procedures for inspection by attributes – Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection*

ISO 2977:1997, *Petroleum products and hydrocarbon solvents – Determination of aniline point and mixed aniline point*

ISO 3104:1994, *Petroleum products – Transparent and opaque liquids – Determination of kinematic viscosity and calculation of dynamic viscosity*

ISO 9001:1994, *Quality systems – Model for quality assurance in design, development, production, installation and servicing*

ISO 9002:1994, *Quality systems – Model for quality assurance in production, installation and servicing*

ISO 9003:1994, *Quality systems – Model for quality assurance in final inspection and test*

3 Definitions

For the purpose of this International Standard, the following definitions apply.

3.1
protective cover
rigid or flexible cover made of insulating material used to cover energized and/or dead parts and/or adjacent earthed (grounded) parts in order to prevent contact

NOTE A protective cover is generally designed to provide a required insulation level which makes it able to provide protection only when a worker inadvertently comes into contact with the protective cover and for only a short duration.

[IEV 651-04-01, modified]

3.2
conductor cover
protective cover made of insulating material and used to shroud the conductor

NOTE These covers can be either flexible or rigid. In general, they are commonly called "line hose" or "line guards".

[IEV 651-04-03]

3.3
elastomer
generic term that includes rubber, latex and elastomeric compounds that may be natural or synthetic or a mixture or a combination of both

3.4
plastic
material which contains as an essential ingredient a high polymer and which at some stage of its processing into finished products can be shaped by flow

[ISO 472 modified]

3.5
proof test voltage
the specified voltage that is applied to a device for the time defined under specific conditions to assure that the electrical strength of the insulation is above a specific value

3.6
flashover
breakdown between electrodes in a gas or a liquid or in vacuum, at least partly along the surface of solid insulation

[IEV 212-01-37]

3.7
puncture
path produced through a solid by a breakdown producing permanent damage. The term is also used as a synonym for electrical breakdown in solids

[IEV 212-01-38]

3.8
acceptance test
contractual test to prove to the customer that the device meets certain conditions of its specification

[IEV 151-04-20]

3.9
routine test
test to which each device is subjected during or after manufacture to ascertain whether it complies with certain criteria

[IEV 151-04-16]

3.10
sampling test
test on a number of devices taken at random from a batch

[IEV 151-04-17]

3.11
type test
test of one or more devices made to a certain design to show that the design meets certain specifications
[IEV 151-04-15]

3.12
nominal voltage of a system
a suitable approximate value of voltage used to designate or identify a system
[IEV 601-01-21]

3.13
inspection
term including visual inspection; a visual inspection by a person with normal or corrected vision and without additional magnification

4 Composition

The conductor cover shall be made of a flexible insulating material. This standard provides specific requirements and tests for conductor covers made of elastomer, plastic, or a blend of the two.

5 Classification

The conductor covers covered by this standard shall be designated as follows:

– by class, as class 0, class 1, class 2, class 3 and class 4;
– by category, by the addition of a suffix as shown in table 1;
– by style, as described, for example, in 6.1 (see figure 1).

Guidance as to use in relation to nominal voltage of a system is given in annex E.

Table 1 – Designation of special properties

Category	Resistant to
A	Acid
H	Oil
C	Extremely low temperature
W	Extremely high temperature
Z	Ozone
P	Humid condition
NOTE Any combination of categories may be used.	

6 Physical requirements

6.1 Shape

The shape of typical styles of conductor cover is indicated in figure 1 and designated by the following six styles with the following characteristics:

– style A: straight style with an essentially constant cross-section throughout its length;
– style B: connector-end style, similar to the straight style except that it shall have a moulded connector permanently affixed to one end;
– style C: extended-lip style;
– style D: extended-lip style with a moulded connector permanently affixed to one end;
– style E: interlocking style;
– style F: other shapes.

Other styles may be used and should be shaped so as to restrict inadvertent access to energized parts or earthed parts.

6.2 Dimensions

Recommended dimensions and tolerance are indicated in table 2.

Table 2 – Recommended dimensions and tolerances

Style	Inside diameter mm	Length[1)] mm
A, B, C and D	6, 16, 25, 32, 40, 50 and 63	915, 1 375, 1 820
E	22	As requested by the customer
F	Subject to design	Subject to design and customer request
Tolerances: inside diameter ±2 mm, length ±15,0 mm (additional ±15 mm connector end).		
[1)] Lengths other than those recommended may be requested.		

6.3 Thickness

The minimum wall thickness shall be determined only by the ability to pass the tests defined in clauses 7 and 8.

6.4 Workmanship and finish

Conductor covers shall be free on both inner and outer surfaces from harmful physical irregularities that can be detected by thorough test and inspection.

Harmful physical irregularities shall be defined as any feature that disrupts the uniform, smooth surface contour, such as pinholes, cracks, blisters, cuts, conductive imbedded foreign matter, creases, pinch marks, voids (entrapped air).

6.5 Marking

6.5.1 Each conductor cover which is claimed to comply with the requirements of this standard shall be marked with the following:

– symbol IEC-60417-5216 – Suitable for live working; double triangle (see annex A);
– number of the relevant IEC standard immediately adjacent to the symbol;
– name, trade mark, or identification of manufacturer;
– class;
– category, if applicable;
– month and year of manufacture;
– size (diameter).

In addition, each conductor cover shall have an area where a label or marking can be placed to identify when the conductor cover was put into service and the dates of any inspection and testing.

6.5.2 The marking shall be clearly visible, durable, and shall not impair the quality of the conductor cover.

6.5.3 Any additional marking shall be subject to agreement between the manufacturer and the customer. It shall not impair the quality of the cover.

6.5.4 In addition to the marking given in 6.5.1, the class of the conductor cover may be identified by coloring the symbol (double triangle) according to the following code:

– class 0: red;
– class 1: white;
– class 2: yellow;
– class 3: green;
– class 4: orange.

6.6 Packaging

The conductor covers shall be packaged in such a manner as to not be distorted mechanically while in transit. The outside of the container or package shall be marked with the name of the manufacturer or supplier, classification, category and size (diameter).

At the request of the customer, information contained in annex G and any additional or amended instructions shall be included in the package.

7 Tests on conductor covers

7.1 General

There are four categories of tests: type, routine, sampling, and acceptance. These are defined in clause 3.

The allotment of these conductor covers in various testing lots, the size of each lot, and the order in which these tests are carried out are given in annex B.

Each of the following subclauses defines whether type, routine, or sampling tests are required.