# SLOVENSKI STANDARD
# SIST EN 61479:2002

**01-september-2002**

---

**Delo pod napetostjo - Zvijava pokrivala vodnikov (cevi vodnikov) iz izolacijskega materiala (IEC 61479:2001)**

Live working - Flexible conductor covers (line hoses) of insulating material

Arbeiten unter Spannung - Flexible Leiterseilabdeckungen aus isolierendem Material

Travaux sous tension - Protecteurs de conducteurs flexibles en matériau isolant



**Ta slovenski standard je istoveten z:** **EN 61479:2001**



---

**ICS:**

| | | |
|---|---|---|
| 13.260 | Varstvo pred električnim udarom. Delo pod napetostjo | Protection against electric shock. Live working |

**SIST EN 61479:2002** **en**

EUROPEAN STANDARD **EN 61479**

NORME EUROPÉENNE

EUROPÄISCHE NORM June 2001

ICS 13.260; 29.240.20; 29.260.99

English version

# Live working - Flexible conductor covers (line hoses) of insulating material
(IEC 61479:2001)

Travaux sous tension - Protecteurs de conducteurs flexibles en matériau isolant (CEI 61479:2001)

Arbeiten unter Spannung - Flexible Leiterseilabdeckungen aus isolierendem Material (IEC 61479:2001)



This European Standard was approved by CENELEC on 2001-05-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.



This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CENELEC
European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

**Central Secretariat: rue de Stassart 35, B - 1050 Brussels**



Ref. No. EN 61479:2001 E

## Foreword

The text of document 78/350/FDIS, future edition 1 of IEC 61479, prepared by IEC TC 78, Live working, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61479 on 2001-05-01.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2002-02-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2004-05-01

Annexes designated "normative" are part of the body of the standard.
Annexes designated "informative" are given for information only.
In this standard, annexes A, B, C, D and ZA are normative and annexes E, F and G are informative.
Annex ZA has been added by CENELEC.

---

## Endorsement notice

The text of the International Standard IEC 61479:2001 was approved by CENELEC as a European Standard without any modification.

# Annex ZA
(normative)

## Normative references to international publications with their corresponding European publications

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

| Publication | Year | Title | EN/HD | Year |
|---|---|---|---|---|
| IEC 60050-151 | 1978 | International Electrotechnical Vocabulary (IEV) Chapter 151: Electrical and magnetic devices | - | - |
| IEC 60050-212 | 1990 | Chapter 212: Insulating solids, liquids and gases | - | - |
| IEC 60050-601 | 1985 | Chapter 601: Generation, transmission and distribution of electricity - General | - | - |
| IEC 60050-651 | 1999 | Part 651: Live working | - | - |
| IEC 60060-1 + corr. March | 1989 1990 | High-voltage test techniques Part 1: General definitions and test requirements | HD 588.1 S1 | 1991 |
| IEC 60060-2 | 1994 | Part 2: Measuring systems | EN 60060-2 + A11 | 1994 1998 |
| IEC 60212 | 1971 | Standard conditions for use prior to and during the testing of solid electrical insulating materials | HD 437 S1 | 1984 |
| 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 | - | - |

| Publication | Year | Title | EN/HD | Year |
|---|---|---|---|---|
| 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 | EN ISO 3104 | 1996 |
| ISO 9001 | 1994 | Quality systems - Model for quality assurance in design/ development, production, installation and servicing | EN ISO 9001 | 1994 |
| ISO 9002 | 1994 | Quality systems - Model for quality assurance in production, installation and servicing | EN ISO 9002 | 1994 |
| ISO 9003 | 1994 | Quality systems - Model for quality assurance in final inspection and test | EN ISO 9003 | 1994 |

# NORME INTERNATIONALE

# INTERNATIONAL STANDARD

**CEI**
**IEC**
**61479**

Première édition
First edition
2001-03

## Travaux sous tension – Protecteurs de conducteurs flexibles en matériau isolant



## Live working – Flexible conductor covers (line hoses) of insulating material





International Electrotechnical Commission 3, rue de Varembé Geneva, Switzerland
Telefax: +41 22 919 0300 e-mail: inmail@iec.ch IEC web site http://www.iec.ch

Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

CODE PRIX
PRICE CODE W

*Pour prix, voir catalogue en vigueur*
*For price, see current catalogue*

# CONTENTS

FOREWORD ..... 7

1 Scope ..... 9
1.1 Classes ..... 9
1.2 Categories ..... 9
1.3 Styles ..... 9
2 Normative references ..... 9
3 Definitions ..... 11
4 Composition ..... 15
5 Classification ..... 15
6 Physical requirements ..... 17
6.1 Shape ..... 17
6.2 Dimensions ..... 17
6.3 Thickness ..... 17
6.4 Workmanship and finish ..... 17
6.5 Marking ..... 19
6.6 Packaging ..... 19
7 Tests on conductor covers ..... 19
7.1 General ..... 19
7.2 Visual inspection and measurements ..... 21
7.2.1 Shape ..... 21
7.2.2 Dimensions ..... 21
7.2.3 Workmanship and finish ..... 21
7.2.4 Marking ..... 21
7.2.5 Packaging ..... 21
7.3 Mechanical tests ..... 23
7.3.1 General ..... 23
7.3.2 Mechanical puncture resistance ..... 23
7.3.3 Tension set ..... 23
7.3.4 Tensile strength and elongation at break ..... 25
7.3.5 Tear resistance test ..... 25
7.3.6 Mechanical positioning test ..... 27
7.4 Dielectric tests ..... 27
7.4.1 General ..... 27
7.4.2 Electrodes ..... 29
7.4.3 Test equipment ..... 31
7.4.4 Failure indicator ..... 31
7.4.5 AC voltage dielectric test ..... 33
7.4.6 DC voltage test ..... 33
7.4.7 Dielectric test on assembly ..... 35
7.5 Ageing tests ..... 35
7.6 Thermal – Melting resistance ..... 37

8 Tests on conductor covers with special properties ..... 37
8.1 General ..... 37
8.2 Category A – Acid resistance ..... 37
8.3 Category H – Oil resistance ..... 39
8.4 Category C – Extremely low temperature ..... 39
8.5 Category W – Extremely high temperature ..... 39
8.6 Category Z – Ozone resistance ..... 39
8.6.1 Method A ..... 39
8.6.2 Method B ..... 39
8.7 Category P – Humid condition ..... 41
9 Quality assurance plan and sampling procedure ..... 41
9.1 General ..... 41
9.2 Records ..... 41

Annex A (normative) Symbol for marking – Double triangle ..... 57
Annex B (normative) Classification of tests ..... 59
Annex C (normative) Oil for tests on category H conductor covers – Oil resistance ..... 61
Annex D (normative) Sampling plans and procedures ..... 63
Annex E (informative) Electrical limits for the use of conductor covers (line hoses) of insulating material ..... 67
Annex F (informative) Acceptance tests ..... 71
Annex G (informative) Recommendations for in-service care ..... 73

Bibliography ..... 75

Figure 1 – Typical styles of conductor covers ..... 43
Figure 2 – Electrodes for proof-test A1 ..... 45
Figure 2a – Outer electrode design for proof-test A1 ..... 45
Figure 3 – Electrodes for proof-test A2 ..... 45
Figure 3a – Outer electrode design for proof-test A2 ..... 45
Figure 4 – Outer electrode design and test arrangement for withstand test B ..... 47
Figure 5 – Mechanical puncture (see 7.3.2) ..... 49
Figure 6 – Dumb-bell test piece (see 7.3.3) ..... 51
Figure 7 – Tear resistance test (see 7.3.5) ..... 53
Figure 8 – Melting resistance – Plastic covers only (see 7.6) ..... 55
Figure A.1 – Symbols and symbol location ..... 57

Table 1 – Designation of special properties ..... 15
Table 2 – Recommended dimensions and tolerances ..... 17
Table 3 – AC voltage requirements ..... 31
Table 4 – DC voltage requirements ..... 33
Table B.1 – General test procedure ..... 59
Table C.1 – Characteristics of the oil ..... 61
Table D.1 – Classification of defects ..... 63
Table D.2 – Sampling plan for minor defects ..... 65
Table D.3 – Sampling plan for major defects ..... 65
Table E.1 – Electrical limits ..... 69

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.

6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.



International Standard IEC 61479 has been prepared by IEC technical committee 78: Live working.

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

| FDIS | Report on voting |
|---|---|
| 78/350/FDIS | 78/363/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 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 this publication 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 normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of IEC and ISO maintain registers of currently valid International Standards.

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 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]