

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Live working – Electrical insulating blankets

Travaux sous tension – Nappes isolantes électriques

IEC 61112:2009

<https://standards.iteh.ai/catalog/standards/sist/b0674f41-329b-40ae-ac78-7d6a2c870480/iec-61112-2009>



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LIVE WORKING – ELECTRICAL INSULATING BLANKETS

FOREWORD

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International Standard IEC 61112 has been prepared by IEC technical committee 78: Live working.

This second edition cancels and replaces the first edition, published in 1992, and its Amendment 1 (2002). This edition constitutes a technical revision.

It includes the following significant technical changes from the previous edition:

- general review of the requirements and test provisions;
- limitation of the scope in terms of the minimum width of electrical insulating blankets in rolls;
- introduction of a definition of electrical insulating blankets including sheeting in various shapes and in rolls;
- introduction of Class 00;
- withdrawal of category S and introduction of category R;
- clarification of the way electrical insulating blankets in rolls are covered by the test procedures;

- specification of standard and alternative types of electrodes for the proof test;
- modification of the test procedures for low and extremely low temperature by replacing the dielectric proof test by a withstand test in the sanction;
- modification of the test procedures for acid and oil resistance by specifying the use of test pieces and by replacing the dielectric proof test by a withstand test in the sanction;
- specification of liquid 102 for the oil resistance test and harmonisation of the mechanical test sanction with the acid resistance test;
- preparation of the elements of evaluation of defects, and general application of IEC 61318 Ed.3;
- revision of existing annexes;
- deletion of Annexes D and F, not applicable according to IEC 61318 Ed.3;
- introduction of a new normative Annex F on classification of defects.

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

FDIS	Report on voting
78/785/FDIS	78/799/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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- replaced by a revised edition, or
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INTRODUCTION

This International Standard 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 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.

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LIVE WORKING – ELECTRICAL INSULATING BLANKETS

1 Scope

This International Standard is applicable to electrical insulating blankets for the protection of workers from accidental contact with live or earthed electrical conductors, apparatus or circuits and avoidance of short circuits on electrical installations.

Electrical insulating blankets in rolls having a width lower than 50 mm are not covered by this standard.

NOTE 1 For a.c. electrical classification, as well as d.c. use, see 4.2.

NOTE 2 This standard gives a.c. test provisions. There is limited history for use in d.c. applications.

NOTE 3 See Annex A for suggested maximum voltage use.

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*

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

IEC 60068-1, *Environmental testing – Part 1: General and guidance*

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*

IEC 61318, *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 2592, *Determination of flash and fire points – Cleveland open cup method*

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

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

ASTM D 3767:2003 (reapproved 2008): *Standard practice for rubber – Measurement of dimensions*

3 Terms and definitions

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

3.1

disruptive discharge

passage of an arc following dielectric breakdown

NOTE 1 The term “sparkover” (in French “amorçage”) is used when a disruptive discharge occurs in a gaseous or liquid dielectric.

NOTE 2 The term “flashover” (in French “contournement”) is used when a disruptive discharge occurs at least partly along the surface of a solid dielectric surrounded by a gaseous or liquid medium.

NOTE 3 The term “puncture” (in French “perforation”) is used when a disruptive discharge occurs through a solid dielectric producing permanent damage.

[IEV 651-01-18 and definition 2.7.7 of IEC 60743, modified]

3.2

elastomer

macromolecular material which returns rapidly to its initial dimensions and shape after substantial deformation by a weak stress and release of the stress

NOTE 1 The definition applies under room temperature test conditions.

NOTE 2 Elastomer is a generic term that includes rubber, latex and elastomeric compounds that may be natural or synthetic or a mixture or a combination of both. It also includes thermoplastic elastomer (TPE) material.

[ISO 472 modified]

3.3

electrical insulating blanket

flexible sheeting made of elastomer or plastic material, used to cover conductors or metallic parts which are either energized, dead or earthed

NOTE The sheeting is either of various definite shapes or in roll allowing the workers to custom-cut the material to fit the application.

[Definition 5.2.2 of IEC 60743 and IEV 651-04-06, modified]

3.4

nominal voltage (of a system)

suitable approximate value of voltage used to designate or identify a system

[IEV 601-01-21]

3.5

plastic

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

NOTE 1 Elastomeric materials, which also are shaped by flow, are not considered as plastics.

NOTE 2 In some countries, particularly in the United Kingdom, it is a permitted option to use the term “plastics” as the singular form as well as the plural form.

[Definition 2.4.4 of IEC 60743 and ISO 472]

3.6

proof test voltage

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

3.7

withstand test voltage

voltage that a test piece is required to withstand without disruptive discharge or other electric failure when voltage is applied under specified conditions

4 Requirements

4.1 General

Electrical insulating blanket shall be designed and manufactured to 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.

4.2 Classification

The electrical insulating blankets covered by this standard shall be designated as follows:

- by electrical class, as class 00, class 0, class 1, class 2, class 3 and class 4;
- by adding suffix(s) to the class designation, in the case of a blanket with special category(s) as shown in Table 1.

Guidance for the selection of class (a.c. and d.c.) is given in Annex A.

Guidance as to the temperature range at which electrical insulating blankets can be used is given in Annex B.

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Table 1 – Special properties

Category	Resistant to
A	Acid
H	Oil
Z	Ozone
M	Mechanical puncture
R	Acid, Oil and Ozone
C	Extremely low temperature

NOTE Any combination of categories may be used.

4.3 Physical requirements

4.3.1 Composition

Electrical insulating blankets shall be manufactured of elastomer or plastic materials and produced by a seamless process. Where eyelets are provided in electrical insulating blankets they shall be non-conductive. Where other types of fastening systems are provided in electrical insulating blankets (for example hook and loop fastening) they shall also be non-conductive.

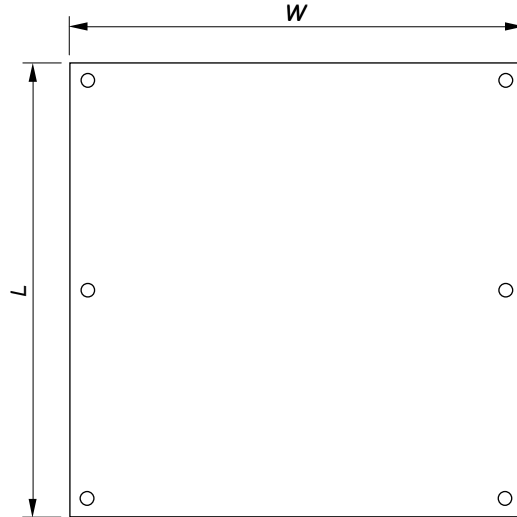
NOTE A standard number, size and type of eyelets is usually proposed by the manufacturers. Eyelets of $\varnothing 8$ mm are the most common. For special needs, agreement could be reached between manufacturer and customer.

4.3.2 Shape and design

There is no requirement for the shape and design of the electrical insulating blankets.

Electrical insulating blankets may be either of various shapes or in rolls to be cut for individual applications.

The electrical insulating blankets of various shapes may be plain or of the slotted design (Figure 1 and Figure 2 provide examples of such design). They may include a grid of synthetic fiber for their reinforcement. In all cases electrical insulating blankets may have a strap(s) (Velcro^{®1)}) around their perimeter.



IEC 456/09

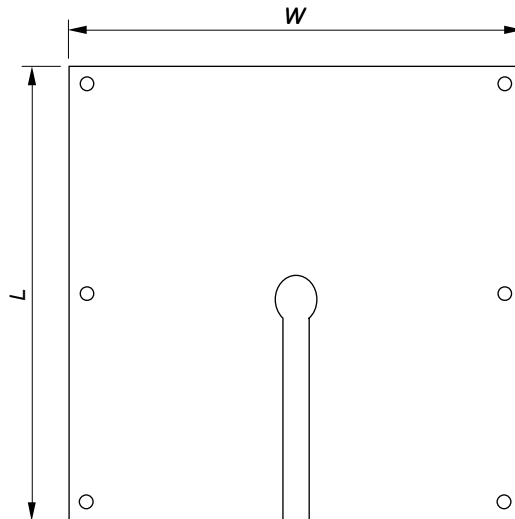
Key

L Length

W Width

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Figure 1 – Example of plain design
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IEC 457/09

Key

L Length

W Width

Figure 2 – Example of slotted design

1) Velcro[®] is the trade name of a product supplied by Velcro Industries B.V. This information is given for the convenience of users of this document and does not constitute an endorsement by IEC of the product named. Equivalent products may be used if they can be shown to lead to the same results.

4.3.3 Dimensions and tolerances

4.3.3.1 Length and width

Manufacturers shall provide blanket length and width. These dimensions for each blanket shall be within a tolerance of $\pm 2\%$ of the stated dimensions.

Common lengths and widths for electrical insulating blankets are indicated in Table 2.

Table 2 – Common lengths and widths for electrical insulating blankets

Blankets of various shapes				Blankets in rolls
Plain design		Slotted design		
Length mm	Width mm	Length mm	Width mm	Width mm
560	560	560	560	60 ^a , 90 ^a 360, 500, 800, 1 000, 1 300, 2 000
660	360			
900	500	900	900	
910	305	-	-	
910	457			
910	690			
910	910	910	910	
1 160	1 160	1 160	1 160	
1 200	800			
2 000	1 300	2 000	1 300	
2 128	910			
2 280	910			

^a To be produced in class 00 and class 0 only.

NOTE Blankets with dimensions of 90 mm or less require special considerations for electrical testing.

4.3.3.2 Thickness

4.3.3.2.1 Maximum thickness

The maximum thickness of an electrical insulating blanket shall be as given in Table 3 in order to obtain appropriate flexibility.

Blankets of categories A, H, M, R and Z may require additional thickness which shall not exceed 0,6 mm.

Table 3 – Maximum thickness for electrical insulating blankets

Class	Elastomer mm	Plastic mm
00	1,5	0,8
0	2,2	1,0
1	3,6	1,5
2	3,8	2,0
3	4,0	^a
4	4,3	^a

^a Unavailable on the market

4.3.3.2.2 Minimum thickness

The minimum thickness shall be determined only by the ability to pass the tests defined in Clauses 5 and 6.

4.3.4 Workmanship and finish

Electrical insulating blankets shall be free from harmful physical irregularities on both surfaces that can be detected by thorough test and/or inspection.

Harmful physical irregularities defined as any feature that disrupts the uniform, smooth surface contour, such as pinholes, cracks, blisters, cuts, conductive embedded foreign matter, creases, pinch marks, voids (entrapped air), prominent ripples and prominent mould marks shall not be acceptable.

Non-harmful physical irregularities defined as surface irregularities present on either surface of the blanket due to imperfections on forms or moulds or other imperfections inherent to the manufacturing process shall be acceptable. These irregularities appear as mould marks that look like cuts even though they are actually a raised ridge of elastomer, indentations, or protuberances.

4.4 Mechanical, climatic and environmental requirements

Electrical insulating blankets shall support the mechanical, climatic and environmental stresses occurring during normal working conditions.

Electrical insulating blankets with one or more special categories shall support any relevant additional stresses.

4.5 Dielectric requirements

Electrical insulating blankets shall be capable of withstanding the corresponding electrical stresses according to their electrical class.

4.6 Marking

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Electrical insulating blankets complying with the requirements of this standard shall be marked on the product with the following items of marking:

- name, trademark or identification of the manufacturer;
- symbol IEC 60417-5216 (2002-10) – Suitable for live working; double triangle (see Annex C);

NOTE 1 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, (IEC 61112);
- month and year of manufacture;
- category if applicable;
- class designation.

For blankets in rolls, these items of marking shall appear at least every metre.

NOTE 2 Manufacturers are recommended to mark blankets in rolls of Class 00 and Class 0 at least every 30 cm to retain marking information in case it is later cut into smaller parts.

NOTE 3 Blankets in rolls of Class 00 and Class 0 may be considered as consumable products, intended for a single use.

Any additional item of marking shall be subject to agreement between the manufacturer and the customer.

The marking shall be clearly visible, durable and shall not impair the quality of the electrical insulating blanket.

When a colour code is used, the colour of the symbol (double triangle) shall correspond to the following code:

- Class 00 - beige;
- Class 0 - red;

- Class 1 - white;
- Class 2 - yellow;
- Class 3 - green;
- Class 4 - orange.

4.7 Packaging

Electrical insulating blankets shall be packaged in containers or packages of sufficient strength to properly protect the electrical insulating blankets from damage during delivery and normal storage and transportation before first use.

NOTE It is the responsibility of the user to provide protective packaging (ex: a specific bag) if cut portions are to be reused.

The outside of the container or package shall be marked with at least the following information:

- number of the relevant IEC standard immediately adjacent to the symbol with year of publication (4 digits), (IEC 61112:2009);
- name, trademark, or identification of the manufacturer.

4.8 Instructions for use

The manufacturer shall provide written instructions for use with each packaging of electrical insulating blankets covered by this standard.

These instructions shall be prepared in accordance with the general provisions of IEC 61477.

The instructions for use shall include, as a minimum, information such as storage, handling, disposal and periodic testing.

The instructions for use shall inform the users about critical hazards the manufacturer is aware of and offer relevant recommendations, but without intruding into the area of work procedures (for example, recommendation in case of overlapping blankets).

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 electrical insulating blankets having completed the production phase.

The allocation of the electrical insulating blankets into various test groups, the quantity required and the order in which the type tests are carried out are given in Annex D.

The test location conditions shall be in accordance with IEC 60068-1:

- ambient temperature: 15 °C to 35 °C;
- relative humidity: 45 % to 75 %;
- atmospheric pressure: 86 kPa to 106 kPa.

For type tests, unless otherwise specified, electrical insulating blankets or test pieces shall be conditioned for a period of $2\text{ h} \pm 0,5\text{ h}$ at a temperature of $23\text{ °C} \pm 2\text{ °C}$ and relative humidity of $50\% \pm 5\%$ according to IEC 60212 standard atmosphere B.