

# Rigid protective covers for live working on a.c. installations

The European Standard EN 61229:1995, with the incorporation of amendment A1:1998 and A2:2002, has the status of a British Standard

ICS 13.340.20; 29.020

# Committees responsible for this British Standard

The preparation of this British Standard was entrusted to Technical Committee PEL/78, Tools for live working, upon which the following bodies were represented:

- Chief and Assistant Chief Fire Officers' Association
- Department of Trade and Industry
- Electricity Association
- Federation of British Hand Tool Manufacturers
- GAMBICA (BEAMA Ltd.)
- Health and Safety Executive
- Industrial Safety (Protective Safety Association)
- National Association of Glove Manufacturers

This British Standard, having been prepared under the direction of the Electrotechnical Sector Board, was published under the authority of the Standards Board and comes into effect on 15 July 1996

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The following BSI references relate to the work on this standard:  
Committee reference PEL/78  
Draft for comment 93/28752 DC

ISBN 0 580 25643 X

## Amendments issued since publication

| Amd. No. | Date             | Comments              |
|----------|------------------|-----------------------|
| 13490    | 29 March 2002    | See national foreword |
| 14107    | 20 February 2003 | See national foreword |
|          |                  |                       |
|          |                  |                       |

# Contents

|                                                                                              | Page               |
|----------------------------------------------------------------------------------------------|--------------------|
| Committees responsible                                                                       | Inside front cover |
| National foreword                                                                            | ii                 |
| Foreword                                                                                     | 2                  |
| Text of EN 61229                                                                             | 5                  |
| National annex NA (informative) Original IEC text<br>amended by CENELEC common modifications | 38                 |

## National foreword

This British Standard has been prepared by Technical Committee PEL/78 and is the English language version of EN 61229:1995 *Rigid protective covers for live working on a.c. installations*, including amendments A1:1998 and A2:2002, published by the European Committee for Electrotechnical Standardization (CENELEC). It was derived by CENELEC from IEC 1229:1993, including amendments 1:1998, 2:2002 and corrigendum 1:2000, published by the International Electrotechnical Commission (IEC) and prepared by IEC Technical Committee No. 78, Tools for live working.

The CENELEC common modifications have been implemented at the appropriate places in the text. The start and finish of each common modification is indicated in the text by tags [C] [C]. Where a common modification has been introduced by amendment, the tags carry the number of the amendment. For example, the common modifications introduced by CENELEC amendment A11 are indicated by [C11] [C11].

The start and finish of text introduced or altered by amendment is indicated in the text by tags [A1] [A1]. Tags indicating changes to IEC text carry the number of the IEC amendment. For example, text altered by IEC amendment 1 is indicated by [A1] [A1].

Parts of the original IEC text that have been modified by CENELEC have been quoted in National annex NA.

Corrigendum 1:2000 replaces all references to IEC 410 with IEC 61318 or ISO 2859-1, as appropriate.

For ease of reproduction the French text has been retained in some of the annexes.

### Additional information

The graphic signs, symbols and letters used in this standard may be found in the following British Standards:

|                                           |                                                                                         |
|-------------------------------------------|-----------------------------------------------------------------------------------------|
| BS 3939                                   | <i>Graphic symbols for electrical power, telecommunications and electronic diagrams</i> |
| Part 1:1986<br>(related to IEC 617-1)     | <i>General information, general index</i>                                               |
| Part 2:1985<br>(identical with IEC 617-2) | <i>Symbol elements, qualifying symbols and other symbols having general application</i> |

### Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the *BSI Catalogue* under the section entitled "International Standards Correspondence Index", or by using the "Search" facility of the *BSI Electronic Catalogue* or of British Standards Online.

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### Summary of pages

This document comprises a front cover, an inside front cover, pages i to ii, the EN title page, pages 2 to 41 and a back cover.

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Descriptors: Hot-line works, safety device, rigid protective cover, performance evaluation, tests

English version

## Rigid protective covers for live working on a.c. installations

(includes amendments A1:1998 + A2:2002)  
(IEC 1229:1993 + A1:1998 + A2:2002, modified)

Protecteurs rigides pour travaux sous tension sur  
des installations à courant alternatif  
(inclut les amendements A1:1998 + A2:2002)  
(CEI 1229:1993 + A1:1998 + A2:2002, modifiée)

Starre Schutzabdeckungen zum Arbeiten unter  
Spannung in Wechselspannungsanlagen  
(enthält Änderungen A1:1998 + A2:2002)  
(IEC 1229:1993 + A1:1998 + A2:2002, modifiziert)

This European Standard was approved by CENELEC on 1995-07-04. 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.

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## 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

## Foreword

The text of the International Standard IEC 1229:1993, prepared by IEC TC 78, Tools for live working, together with common modifications prepared by the Technical Committee CENELEC TC 78, was submitted to the formal vote and was approved by CENELEC as EN 61229 on 1995-07-04.

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) 1996-07-01
- latest date by which national standards conflicting with the EN have to be withdrawn (dow) 1996-07-01

For products which have complied with the relevant national standard before 1996-07-01, as shown by the manufacturer or by a certification body, this previous standard may continue to apply for production until 2001-07-01.

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

## Foreword to amendment A1

The text of document 78/236/FDIS, future amendment 1 to IEC 61229:1993, prepared by IEC TC 78, Live working, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as amendment A1 to EN 61229:1995 on 1998-04-01.

The following dates were fixed:

- latest date by which the amendment has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 1999-01-01
- latest date by which the national standards conflicting with the amendment have to be withdrawn (dow) 2001-01-01

## Endorsement notice

The text of amendment 1:1998 to the International Standard IEC 61229:1993 was approved by CENELEC as an amendment to the European Standard without any modification.

As a consequence of endorsing this amendment 1 to IEC 61229:1993, clause 11 of EN 61229:1995 is withdrawn. It is replaced by the modified clause 8.

## Foreword to amendment A2

The text of document 78/439/FDIS, future amendment 2 to IEC 61229:1993, prepared by IEC TC 78, Live working, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as amendment A2 to EN 61229:1995 on 2002-07-01.

The following dates were fixed:

- latest date by which the amendment has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2003-04-01
- latest date by which the national standards conflicting with the amendment have to be withdrawn (dow) 2005-07-01

Annexes designated “normative” are part of the body of the standard.

In this standard, Annex ZA is normative.

Annex ZA has been added by CENELEC.

## Endorsement notice

The text of amendment 2:2002 to the International Standard IEC 61229:1993 was approved by CENELEC as an amendment to the European Standard without any modification.

## Contents

|                                                                                                                | Page |                                                                                                                        | Page |
|----------------------------------------------------------------------------------------------------------------|------|------------------------------------------------------------------------------------------------------------------------|------|
| Foreword                                                                                                       | 2    | Annex J (informative) Example of handling adapter                                                                      | 34   |
| 1 Scope                                                                                                        | 5    | Annex K (informative) Acceptance tests                                                                                 | 35   |
| 2 Normative references                                                                                         | 5    | Annex ZA (normative) Normative references to international publications with their corresponding European publications | 37   |
| 3 Definitions                                                                                                  | 6    | Figure 1 — Outer electrode design and test arrangement for proof test A1                                               | 18   |
| 3.1 Terms defined in accordance with IEC 50(121), IEC 50(151) and IEC 50(601)                                  | 6    | Figure 2 — Outer electrode design and test arrangement for proof test A2                                               | 19   |
| 3.2 Terms defined in accordance with IEC 61318                                                                 | 6    | Figure 3 — Outer electrode design and test arrangement for withstand tests B1 and B2                                   | 20   |
| 3.3 Terms defined in accordance with IEC 743                                                                   | 7    | Figure C.1 — Test circuit                                                                                              | 23   |
| 3.4 Definitions of special terms used in this standard                                                         | 7    | Figure C.2 — Construction drawing for guard electrodes (two required)                                                  | 24   |
| 4 Classification                                                                                               | 8    | Figure C.3 — Construction drawing for electrode accessories and electrode support                                      | 25   |
| 5 Physical requirements                                                                                        | 8    | Figure D.1 — Shock test pendulum                                                                                       | 26   |
| 5.1 Shape and dimensions                                                                                       | 8    | Figure E.1 — Electrode for conductor cover                                                                             | 27   |
| 5.2 Material                                                                                                   | 9    | Figure E.2 — Electrode for tension (dead-end assembly) cover                                                           | 28   |
| 5.3 Workmanship and finish                                                                                     | 9    | Figure E.3 — Electrode for pin type insulator cover                                                                    | 29   |
| 5.4 Marking                                                                                                    | 9    | Figure E.4 — Electrode for suspension cover                                                                            | 29   |
| 6 Tests                                                                                                        | 9    | Figure E.5 — Example of test arrangement                                                                               | 30   |
| 6.1 General                                                                                                    | 9    | Figure J.1 — Handling adapter                                                                                          | 34   |
| 6.2 Visual inspection                                                                                          | 10   | Figure K.1 — Mechanical test of handling adapter and assembly end                                                      | 35   |
| 6.3 Mechanical tests                                                                                           | 10   | Figure K.2 — Mechanical withstand test; vertical load                                                                  | 36   |
| 6.4 Dielectric tests                                                                                           | 11   | Figure K.3 — Mechanical withstand test; side load                                                                      | 36   |
| 6.5 Ozone resistance                                                                                           | 16   | Table 1 — Categories of special properties                                                                             | 8    |
| 7 Tests on covers with special properties                                                                      | 16   | Table 2 — Low temperature conditioning characteristics                                                                 | 10   |
| 8 Sampling procedure                                                                                           | 17   | Table 3 — Conditioning characteristics for positioning                                                                 | 11   |
| 9 Acceptance tests                                                                                             | 17   | Table 4 — Diameter of electrodes                                                                                       | 14   |
| 10 Recommendations for in-service care                                                                         | 17   | Table 6 — Test voltages                                                                                                | 15   |
| 11 Quality assurance plan                                                                                      | 17   | Table B.1 — Classification of tests                                                                                    | 22   |
| Annex A (normative) Marking                                                                                    | 21   | Table G.1 — General limit values                                                                                       | 32   |
| Annex B (normative) List and classification of tests                                                           | 22   |                                                                                                                        |      |
| Annex C (normative) Test circuit and drawing for guard electrodes and supports                                 | 23   |                                                                                                                        |      |
| Annex D (normative) Mechanical shock test                                                                      | 25   |                                                                                                                        |      |
| Annex E (normative) Potential electrodes for covers protecting live parts and mechanical positioning of covers | 27   |                                                                                                                        |      |
| Annex F (normative) Sampling procedure                                                                         | 31   |                                                                                                                        |      |
| Annex G (normative) Electrical limits for the use of rigid protective covers                                   | 31   |                                                                                                                        |      |
| Annex H (informative) Recommendations for in-service care                                                      | 33   |                                                                                                                        |      |



## 1 Scope

International Standard IEC 1229 is applicable to rigid insulating covers for live working on a.c. installations, including those described in IEC 743.

The barriers, having dielectric withstand which depends on the positioning clearance, are excluded from this standard.

### 1.1 Classes

Six classes of covers, differing in electrical characteristics, are provided and designated as class 0, 1, 2, 3, 4 and 5.

### 1.2 Categories

Five categories of covers, differing in special properties related to acid, oil, extreme low temperature, extreme high temperature, and humidity are provided. They are designated A, H, C, W and P, respectively.

### 1.3 Types

The type depends on the piece to be protected.

## 2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and 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. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 50(121):1978, *International Electrotechnical Vocabulary — Chapter 121: Electromagnetism*.

IEC 50(151):1978, *International Electrotechnical Vocabulary — Chapter 151: Electrical and magnetic devices*.

IEC 50(601):1985, *International Electrotechnical Vocabulary — Chapter 601: Generation, transmission and distribution of electricity — General*.

IEC 60-1:1989, *High-voltage test techniques — Part 1: General definitions and test requirements*.

IEC 60-3:1976, *High-voltage test techniques — Part 3: Measuring devices*.

IEC 212:1971, *Standard conditions for use prior to and during the testing of solid electrical insulating materials*.

**A2** IEC 60417 (all parts), *Graphical symbols for use on equipment*. **A2**

IEC 743:1983, *Terminology for tools and equipment to be used in live working*.

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

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*.

**A1** ISO 8402:1994, *Quality management and quality assurance — Vocabulary*.

ISO 9000, *Quality management and quality assurance standards*.

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*. **A1**

**C** ENV 50196:1995, *Live working — Required insulation level and related air distances — Calculation method*. **C**

### 3 Definitions

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

#### 3.1 Terms defined in accordance with IEC 50(121), IEC 50(151) and IEC 50(601)

##### 3.1.1

##### **type test**

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

##### 3.1.2

##### **routine test**

a test to which each individual device is subjected during or after manufacture to ascertain whether it complies with certain criteria [IEV 151-04-16]

##### 3.1.3

##### **sampling test**

a test on a number of devices taken at random from a batch [IEV 151-04-17]

##### 3.1.4

##### **acceptance test**

a contractual test to prove to the customer that the device meets certain conditions of its specification [IEV 151-04-20]

##### 3.1.5

##### **electrical puncture**

a disruptive breakdown through a solid insulant [IEV 121-03-13, modified]

##### 3.1.6

##### **flashover**

an arc by-passing an insulating body [IEV 121-03-14]

##### 3.1.7

##### **nominal voltage of a system**

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

#### 3.2 Terms defined in accordance with IEC 61318

##### 3.2.1

##### **minor defect**

a minor defect is a defect that is not likely to reduce materially the usability of the unit or product for its intended purpose, or is a departure from established standards having little bearing on the effective use or operation of the unit (See 2.6 of IEC 61318)

##### 3.2.2

##### **major defect**

a major defect is a defect, other than critical, that is likely to result in failure, or to reduce materially the usability of the unit of product for its intended purpose (See 2.5 of IEC 61318)

##### 3.2.3

##### **critical defect**

a critical defect is a defect that judgment and experience indicate is likely to result in hazardous or unsafe conditions for individuals using, maintaining or depending upon the product; or a defect that judgment and experience indicate is likely to prevent performance of the function of a major end item (See 2.4 of IEC 61318)

### 3.3 Terms defined in accordance with IEC 743

#### 3.3.1

##### **protective covers**

generally made of insulating material, they are used to cover live or non-energized elements in order to avoid accidental contact they can be rigid or flexible and either shaped or in sheets (See 1.5 of IEC 743)

NOTE In this standard the word “cover” includes the meaning “protective cover”.

#### 3.3.2

##### **conductor cover (rigid type)**

made of insulating rigid material and used to insulate conductive parts (See 4.1.3 of IEC 743)

#### 3.3.3

##### **pin type insulator cover (rigid type)**

insulating cover used to cover pin type insulators (See 4.1.7 of IEC 743)

### 3.4 Definitions of special terms used in this standard

#### 3.4.1

##### **tension set cover (dead-end assembly cover)**

insulating cover used to cover tension insulators

#### 3.4.2

##### **clamp cover**

insulating cover used to cover clamp

#### 3.4.3

##### **suspension set cover**

insulating cover used to cover suspension insulator strings

#### 3.4.4

##### **rigid composite insulator cover type**

protective cover used to cover post-type insulators

#### 3.4.5

##### **pole cover (rigid type)**

protective cover used to cover poles

#### 3.4.6

##### **pole top cover (rigid type)**

protective cover used to cover the top of poles

#### 3.4.7

##### **cross-arm cover (rigid type)**

protective cover used to cover cross-arms

#### 3.4.8

##### **electrical protective zone**

the external surface area of a cover where there is no possibility of flashover or puncture to the covered component when the test voltage specified for the class is applied

#### 3.4.9

##### **cover system**

A set of covers of the same class, which can be linked together to produce a wider electrical protective zone

4 Classification

The rigid covers covered in this standard shall be designated as follows:

- a) by type: conductor cover,  
tension cover (dead-end assembly cover),  
suspension cover,  
clamp cover,  
pin type insulator cover,  
composite insulator cover,  
pole cover,  
pole top cover,  
cross-arm cover.

Other types of rigid cover additional to those listed above can be designed and tested in accordance with this standard.

NOTE If a cover has two or more functions, it should be designated by a double or multiple type name.

- b) by class, depending on the electrical limits of use as specified in Annex G: class 0, class 1, class 2, class 3, class 4 and Class 5.

- c) by special properties, with the addition of a suffix, as shown in Table 1.

Table 1 — Categories of special properties

| Category | Resistant to                          |
|----------|---------------------------------------|
| A        | Acid                                  |
| H        | Oil                                   |
| C        | Extreme low temperature <sup>a</sup>  |
| W        | Extreme high temperature <sup>a</sup> |
| P        | Humidity                              |

<sup>a</sup> Guidance for recommended use is given in Annex H.

5 Physical requirements

5.1 Shape and dimensions

The cover shall be designed to ensure that it shall remain in position under all reasonably foreseeable environmental conditions.

5.1.1 Body

The body of a rigid cover shall be designed to function as a barrier.

No conductive part (e.g. bolts) shall pass through the cover wall in the electrical protective zone.

5.1.2 Positioning devices

Rigid covers shall be fitted with a handling adapter. This is necessary to enable their installation using a standard device.

An example of a handling adapter is given in Annex J.

NOTE The customer should ensure that the rigid insulating covers can be positioned, using the tools at his disposal.

5.1.3 Latching devices

The cover design shall render it impossible for a cover to fall accidentally from the part it protects due to wind, conductor movement, etc. For an example, see Annex K. Rigid covers may be fitted with one or several latches. Latches shall be operable with a standard device (e.g. a retractable hook pole). (See 2.1.2 of IEC 743)

NOTE The customer should ensure that the rigid covers can be secured with the standard tools at his disposal.

#### 5.1.4 Compatibility

Individual covers of the same cover system shall be compatible and linkable together.

NOTE 1 There is no requirement that individual components of a system be compatible with components of another system.

NOTE 2 When the components come from more than one manufacturer, the customer should verify their compatibility.

#### 5.2 Material

The body of the rigid cover shall be made of insulating material complying with the test requirements of 6.4.1. Should the design of the cover incorporate a conductive part, this shall not affect the electrical properties of the body of the cover.

#### 5.3 Workmanship and finish

The body of the cover shall have a smooth surface and shall be free, on both inner and outer surfaces, from all visual irregularities such as pinholes, cracks, blisters, cuts, foreign matter and abrasives. Minor depressions or projections are permitted, provided that all other requirements are met.

#### 5.4 Marking

5.4.1 Each cover which is claimed to comply with the requirements of this standard shall be marked with the following (see Annex A):

- Ⓐ a) symbol IEC-60417-5216 — Suitable for live working; double triangle;
- b) number of the relevant IEC standard immediately adjacent to the symbol;
- c) name, trade mark, or identification of the manufacturer;
- d) class;
- e) category, if applicable;
- f) year (and month, if possible), of manufacture;
- g) space for notation of inspection dates. Ⓐ

5.4.2 The marking shall be durable and shall not impair the quality of the cover; if a removable label is used, performance shall not be affected by its removal. The durability of marking is checked by rubbing the marking for 1 min with a piece of lint-free cloth soaked in soapy water and then rubbing it for a further 1 min with a piece of lint-free cloth soaked in ethyl alcohol. At the end of the test, the marking must remain legible.

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

5.4.4 When a colour code is used, the colour of the symbol (a double triangle) shall be as follows:

- Class 0: red
- Class 1: white
- Class 2: yellow
- Class 3: green
- Class 4: orange
- Class 5: violet

Ⓒ

### 6 Tests Ⓒ

#### 6.1 General

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

The allotment of covers to various tests and the order in which these tests are carried out is given in Annex B, Annex F and Annex K.

The following subclauses define the above-mentioned required tests.

For type tests, four covers are required. For sampling tests, see Annex F.

All the high-voltage electrical tests shall be carried out according to IEC 60 with conditioning procedures according to IEC 212.

## 6.2 Visual inspection

### 6.2.1 Shape and dimensions

Type and routine tests shall be carried out according to 5.1.

### 6.2.2 Workmanship and finish

Type and routine tests shall be carried out according to 5.3.

### 6.2.3 Marking

Marking shall be verified by visual inspection according to 5.4, except for the durability test which shall be performed according to 5.4.2 for type test only.

## 6.3 Mechanical tests

The following tests shall be performed to verify the indicated mechanical characteristics.

### 6.3.1 Mechanical test at low temperature

Type tests and sampling tests shall be carried out on covers prior to the tests specified in 6.3.2 and 6.4.3.

Covers shall be conditioned according to Table 2.

**Table 2 — Low temperature conditioning characteristics**

| Category          | Temperature<br>°C | Humidity<br>% | Period<br>h |
|-------------------|-------------------|---------------|-------------|
| Normal A, H and P | −25               | <20           | 4           |
| C                 | −40               | <20           | 4           |
| W                 | −10               | <20           | 4           |

Mechanical shocks should be applied to the cover in the cold chamber. If this is not possible, mechanical shocks shall be applied to the cover within 2 min after its removal from the cold chamber.

If the test cannot be completed within 2 min, the cover shall be removed for re-conditioning for another 2 h before continuing the test for a further maximum duration of 2 min. This procedure shall be repeated as many times as necessary to complete the mechanical shock tests.

The test for moulded covers shall consist in the application of blows with an impact energy of 20 J each applied to the top and to one side of the cover, every 100 mm along its length (a single blow is applied to each point).

The test for spiral type covers made up of flat sheet wrapping shall consist in the application of blows, with an impact energy of 20 J each, applied only to the top, every 100 mm along its length (a single blow is applied to each point).

Moulded covers shall have four fixed points of support. Spiral covers shall have three fixed points of support (see Annex D).

No damage shall appear. However a dent of 5 mm maximum diameter is permissible. There shall be no evidence of fracture at the point of impact. A cover shall be considered to have failed if it does not meet either of the above requirements.

### 6.3.2 Mechanical test positioning

Type tests and sampling tests shall be carried out.

#### 6.3.2.1 Conductor, clamp, tension, suspension and pin type insulator covers

The positioning test shall consist of a “go-no go” test series.

The manufacturer shall provide instructions to the customer concerning the proper installation method for his product when installed on the test arrangement (see, for example, Figure E.5 of Annex E).

The customer shall specify the insulator and conductor to be used. One or two tests are required according to the type of cover. Each test shall consist of two positioning operations, in succession, simulating in service use.