BRITISH STANDARD

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Liquid tight sheathing systems for cable management

The European Standard EN 50369:2005 has the status of a British Standard

ICS 29.120.10

National foreword

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The UK participation in its preparation was entrusted to Technical Committee PEL/213, Cable management, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep UK interests informed;

— monitor related international and European developments and promulgate them in the UK.

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EUROPEAN STANDARD **EN 50369**

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English version

Liquid tight sheathing systems for cable management

Systèmes de gaines souples de protection contre les liquides pour la gestion du câblage

Flüssigkeitsdichte Elektroinstallations-schlauchsysteme

This European Standard was approved by CENELEC on 2005-04-12. 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.

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CENELEC

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

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Foreword

This European Standard was prepared by the Technical Committee CENELEC TC 213, Cable management. The text of the draft was submitted to the formal vote and was approved by CENELEC as EN 50369 on 2005-04-12.

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)	2006-04-01
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2008-04-01

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Contents

1 Scope

This European Standard specifies the requirements against ingress of water and tests for flexible non-flame propagating liquid tight sheathing systems for the protection and management of insulated conductors and/or cables in electrical installations or in communication systems up to 1 000 V a.c. and/or 1 500 V d.c. This standard applies to metallic, non-metallic and composite liquid tight sheathing systems including threaded fittings which terminate the system This European Standard does not apply to conduit systems for electrical installations which come within the scope of EN 50086 series as well as EN 61386 series. Liquid tight sheathing systems do not provide mechanical protection to insulated conductors and/or cables. They are not for use within the construction of buildings as a component of a fixed wiring system.

NOTE Earthing conductors may or may not be insulated.

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.

EN 60423	1994	Conduits for electrical purposes – Outside diameters of conduits for electrical installations and threads for conduits and fittings (IEC 60423:1993, mod.)
EN 60529	1991	Degrees of protection provided by enclosures (IP Code) (IEC 60529:1989)
EN 60695-2-11	2001	Fire hazard testing – Part 2-11: Glowing/hot-wire based test methods – Glow-wire flammability test method for end-products (IEC 60695-2-11:2000)
EN 60695-11-2	2003	Fire hazard testing – Part 11-2: Test flames - 1 kW nominal pre-mixed flame - Apparatus, confirmatory test arrangement and guidance (IEC 60695-11-2:2003)

3 Definitions

For the purposes of this document, the following terms and definitions apply.

3.1
liquid tight sheathing system
closed wiring system consisting of liquid tight sheathing and terminating fittings for the protection against ingress of liquid and management of insulated conductors and/or cables in electrical or communication installations, allowing them to be drawn in and/or replaced, but not to be inserted laterally

3.2
liquid tight sheathing
component of a closed wiring system which protects insulated conductors and/or cables against water

3.3
terminating fitting
terminating device designed to terminate a liquid tight sheathing system

3.4
metallic sheathing and/or terminating fitting
sheathing or terminating fitting which consists of metal only

3.5
non-metallic sheathing and/or terminating fitting
sheathing or terminating fitting which consists uniquely of non-metallic material and which has no metallic components whatsoever

3.6
composite sheathing and/or terminating fitting
sheathing or terminating fitting comprising both metallic and non-metallic materials

3.7
non-flame propagating sheathing and/or terminating fitting
sheathing or terminating fitting which is liable to catch fire as a result of an applied flame, but in which the flame does not propagate and which extinguishes itself within a limited time after the flame is removed

3.8
external influence
factors which may affect the sheathing system

NOTE Examples of such factors are a presence of water, oil or building materials, low and high temperatures and corrosive or polluting substances.

4 General requirements

4.1 Liquid tight sheathing systems shall be so designed and constructed that in normal use their performance is reliable and they provide protection to the user to the user or surroundings.

When assembled in accordance with manufacturer's instructions, the liquid tight sheathing system, shall provide protection against ingress of liquids and electrical protection of the insulated conductors and cables contained therein.

4.2 Liquid tight sheathing and terminating fittings shall withstand the stresses likely to occur during transport, storage, recommended installation practice and application.

4.3 *Compliance is checked by carrying out all the tests specified.*

5 General conditions for tests

5.1 Tests in accordance with this standard are type tests.

5.2 Unless otherwise specified, the tests shall be carried out at an ambient temperature of (20 ± 5) °C.

5.3 Unless otherwise specified, each test shall be made on three new samples.

NOTE Certain tests, for instance the checking of dimensions, do not affect a change in the property of the samples, therefore these samples are considered as new samples and can be used for further tests.

5.4 Samples of liquid tight sheathing and fittings shall be conditioned for at least 240 h, at a temperature of (23 ± 2) °C and a relative humidity between 40 % and 60 %. All tests shall be carried out immediately after general conditioning.

5.5 Unless otherwise specified, the samples for each test shall be in a clean and new condition, with all parts in place and mounted as in normal use. After checking dimensions in accordance with Clause 8, and unless otherwise specified in the relevant test, the fittings shall be assembled with adequate lengths of liquid tight sheathing of the type for which they are intended. Due regard shall be taken of the manufacturer's instructions, especially where force is required in the assembly of the joint.

NOTE Where similarities are claimed, the selection of representative fittings for test purposes can be agreed between the manufacturer, or responsible vendor, and the testing station

5.6 Unless otherwise specified, three samples are subjected to the tests and the requirements are satisfied if the tests are met.

If only one of the samples does not satisfy a test, due to an assembly or a manufacturing defect, that test and any preceding one which may have influenced the result of the test shall be repeated and also the tests which follow shall be carried out in the required sequence on another full set of samples, all of which shall comply with the requirements.

NOTE If the additional set of samples is not submitted at the same time, a failure of one sample will entail a rejection. The applicant when submitting the first set of samples, may also submit the additional set of samples which may used, should one sample fail. The testing station will then, without further request, test the additional set of samples and will not be accepted only if a further failure occurs.

5.7 When toxic or hazardous processes are used, due regard shall be taken of the safety of the persons within the test area.

5.8 Liquid tight sheathing systems which are used as an integral part of other equipment shall also be tested in accordance with the relevant standard for that equipment.

6 Classification

6.1 According to mechanical properties

6.1.1 Resistance to impact

1 Very light
2 Light
3 Medium

6.1.2 Tensile strength

1 Very light
2 Light
3 Medium

6.2 According to temperature

6.2.1 According to low temperature

Table 1 – Lower temperature range

Classification (1st numeral)	Transport, application and installation temperature not less than
1X	+5 °C
2X	-5 °C
3X	-15 °C
4X	-25 °C

6.2.2 According to high temperature

Table 2 – Upper temperature range

Classification (2nd numeral)	Application and installation temperature not more than
X1	60 °C
X2	90 °C
X3	105 °C
X4	120 °C
X5	150 °C
X6	250 °C

6.3 According to electrical characteristics

6.3.1 With electrical continuity characteristics

6.3.2 With electrical insulating characteristics

6.3.3 None declared

6.4 According to resistance to external influences

6.4.1 Protection against ingress of solid objects: Protection in accordance with EN 60529 to a minimum of IP5X

6.4.2 Protection against ingress of water: Protection in accordance with EN 60529 to a minimum of IPX5

6.4.3 Resistance against corrosion

6.4.3.1 Without protection

6.4.3.2 With protection as detailed in Table 6

7 Marking and documentation

7.1 The liquid tight sheathing and terminating fitting shall be marked on the product with a trademark or a name identifying the manufacturer or responsible vendor.

7.2 The liquid tight sheathing shall in addition be marked in such a way that it can be identified in the manufacturer's, or responsible vendor's, literature.

7.3 The marking shall be durable and clearly legible.

Compliance is checked by inspection and by rubbing the marking by hand for 15 s with a piece of cloth soaked with water and again for 15 s with a piece of cloth soaked with petroleum spirit.

NOTE 1 Petroleum spirit is defined as the aliphatic solvent hexane with a content of aromatics of maximum 0,1 % volume, a kauri-butanol value of 29, initial boiling point 65 °C, a dry point 69 °C and density approximately 0,68 kg/l.

NOTE 2 Marking may be applied, for example, by moulding, pressing, engraving, printing, adhesive labels, or water slide transfers.

NOTE 3 Marking made by moulding, pressing or engraving is not subjected to this test.

After the test, the marking shall be legible.

7.4 The manufacturer or responsible vendor shall declare and document in his literature the suitability of the liquid tight sheathing system with specific liquids at specific temperatures, the minimum inside diameter of the system, the minimum bending radius and the classification according to Clause 6.

7.5 The manufacturer or responsible vendor shall be responsible for providing guidelines to assist the safe transport, installation and application of the liquid tight sheathing system.

7.6 The manufacturer or responsible vendor shall declare in his literature that liquid tight sheathing systems are not suitable for use within the construction of buildings as a component of a fixed wiring system.

8 Dimensions

8.1 Threads shall comply with EN 60423.

Compliance is checked by means of the gauges specified in EN 60423.

8.2 The manufacturer shall declare the minimum internal diameter of the liquid tight sheathing system.

Compliance is checked by measurement by means of a cylindrical gauge as shown in Figure 1. The gauge must pass through the liquid tight sheathing system without effort.

9 Construction

9.1 Within the liquid tight sheathing system there shall be no sharp edges, burrs or surface projections which are likely to damage insulated conductors or cables or inflict injury on the installer or user.

Compliance is checked by inspection, if necessary after cutting the samples apart.

10 Mechanical properties

10.1 Mechanical strength

10.1.1 Liquid tight sheathing systems shall have adequate mechanical strength.

10.1.2 Liquid tight sheathing, according to their classification, when exposed to impact or extreme temperature of a specified value in accordance with impact and temperature classification declared for the product, either during, or after, installation according to the manufacturer's instructions, shall not crack and shall not be deformed to such an extent that introduction of the insulated conductors or cables becomes difficult, or that the installed insulated conductors or cables are likely to be damaged, while being drawn in.

10.1.3 *Compliance for 10.1.1 and 10.1.2 is checked by the tests specified in 10.2 to 10.4.*

10.2 Impact test

10.2.1 Twelve samples of liquid tight sheathing, each (200 ± 5) mm in length or fittings are subjected to an impact test by means of the apparatus shown in Figure 2.

Before the test on terminating fittings, the samples are assembled with the appropriate liquid tight sheathing required as for normal use.

NOTE Fittings are not required when testing liquid tight sheathing.

Parts which are not accessible when mounted in normal use, and small fittings whose maximum dimension is less than 20 mm are not subjected to this test.

10.2.2 The test apparatus, together with the samples shall be placed in a refrigerator the temperature within which shall be maintained at the declared temperature as given in Table 1 with a tolerance of ± 2 °C.

When the samples have attained the temperature specified, or after 2 h, whichever is the longer period, each sample shall be placed in position on the steel base as shown in Figure 2. The hammer shall be allowed to fall, once on each sample. The mass of the hammer and the fall height shall be as given in Table 3.

The test shall be made on the weakest part of the fitting except that it shall not be applied to within 5 mm of any entry. Samples of liquid tight sheathing are tested at the centre of their length.

Table 3 – Impact test values

Classification	Liquid tight sheathing and fittings	Mass of hammer Tolerance (+ 1, - 0) %	Fall height Tolerance (± 1) %
1	Very light	0,5 kg	100 mm
2	Light	1,0 kg	100 mm
3	Medium	2,0 kg	100 mm

10.2.3 After the test the samples shall show no sign of disintegration, nor shall there be any crack visible to normal or corrected vision without magnification.

After the impact test the samples of liquid tight sheathing shall continue to provide the IP code declared by the manufacturer performing the tests according to 14.1.

10.3 Flexing test

10.3.1 An assembly of liquid tight sheathing with a terminating fitting, assembled in accordance with the manufacturer's instructions, is subjected to the following flexing test by means of the apparatus shown in Figure 3.

10.3.2 The test shall be made on six samples of liquid tight sheathing of an appropriate length. Three of the samples shall be tested at the declared transport, application and installation temperature in accordance with Table 1 with a tolerance of ± 2 °C. The other three samples shall be tested at the declared permanent application and installation temperature as given in Table 2 with the tolerance ± 2 °C.

10.3.3 The sample A is fixed to the oscillating member by means of the terminating fitting B, so that when the liquid tight sheathing is at the middle of it's travel, the axis of the liquid tight sheathing is vertical and passes through the axis of the oscillation.

The oscillating member is moved backwards and forwards through a total angle of (180 ± 5)° divided equally about the vertical axis.

Dimension Y is the minimum bend radius, declared by the manufacturer.

10.3.4 The assembly is subjected to 5 000 flexings at a rate of 40 ± 5 flexings per minute. A single flexing constitutes, starting from the vertical position, one continuous cycle of movement of essentially sinusoidal form.

After the test, the sample shall show no sign of disintegration, nor shall there be any cracks visible to normal or corrected vision without magnification.

10.4 Tensile test

10.4.1 Liquid tight sheathing systems shall be tested to the manufacturer's declared tensile force according to Table 4.

A sample of liquid tight sheathing and two terminating fittings are assembled in accordance with the manufacturer's instructions so that the overall length is approximately 300 mm. The assembly is subjected to a uniformly increasing tensile force reaching the value given in Table 4 at (23 ± 2) °C within (30 ± 3) s. This force is applied for 2 min ± 10 s.

10.4.2 Where elongation occurs the manufacturer shall be responsible for providing guidelines to assist the safe installation of the liquid tight sheathing system.

10.4.3 After the test, the terminating fittings shall remain properly assembled to the liquid tight sheathing and there shall be no damage visible to normal or corrected vision without magnification.

Table 4 – Tensile force

Classification	Liquid tight sheathing and fittings	Tensile force Tolerance (+ 2, - 0) %
1	Very light	100 N
2	Light	250 N
3	Medium	500 N

11 Electrical properties

11.1 Electrical requirements

11.1.1 Liquid tight sheathing systems declaring electrical continuity characteristics shall be checked by the test in 11.2 immediately after the test in 14.2.

NOTE Liquid tight sheathing systems, in some circumstances may be used in total or in part as a protective conductor in an electrical installation. In that event, the system will be tested after final installation to confirm its suitability for that purpose, in accordance with the installation rules.

11.1.2 Liquid tight sheathing systems of metal or composite materials shall be so constructed that accessible metal parts can be bonded to earth.

Compliance is checked by inspection

11.1.3 Accessible conductive parts of the metal or composite Liquid tight sheathing system, which may become live in the event of a fault, shall be effectively earthed.

Compliance is checked by the test in 11.2

11.1.4 Liquid tight sheathing systems of non-metallic or composite materials, where declared, shall have an adequate electrical insulating strength and insulating resistance

Compliance is checked by the test in 11.3.

11.2 Bonding test

A sample of liquid tight sheathing and terminating fitting shall be assembled in accordance with the manufacturer's instructions and mounted as shown in Figure 7. A current of 25 A, having a frequency of 50 Hz to 60 Hz, derived from an a.c. source having a no-load voltage drop not exceeding 12 V, shall be passed through the assembly for (60^{+5}_{0}) s. Then the voltage drop shall be measured between the points shown in Figure 7 and the resistance calculated from the current and this voltage drop.

The resistance shall not exceed 0,05 **Ω.**

Where special devices are required for the coupling of liquid tight sheathing and terminating fittings, they shall be sufficient to remove the protective coating from the sheathing, or the protective finish shall be removed in accordance with the manufacturer's instructions.

11.3 Electrical insulating strength and resistance

11.3.1 Liquid tight sheathing

11.3.1.1 Samples of liquid tight sheathing are immersed over a length of 1 m ± 10 mm in accordance with Figure 4, in a salt water solution at (23 ± 2) °C , with a length of 100 mm kept above the level of the solution. Samples are bent into a " U " shape and then immersed, see Figure 4.

The salt water solution is made by completely dissolving 1 g/l of sodium chloride.

The salt water solution is poured into the open end of the liquid tight sheathing to match the external level An electrode is placed inside the liquid tight sheathing and another placed into the tank.

11.3.1.2 After 24 h ± 15 min, a voltage is applied across the two electrodes, gradually being increased from 1 000 V to 2 000 V of substantially sine wave form and having a frequency of 50 Hz to 60 Hz. Having reached 2 000 V the voltage is maintained for a period of 15 min (+ 5, - 0) s.

The high-voltage transformer used for the test is so designed that, when the output terminals are short-circuited after the output voltage has been adjusted to the appropriate test voltage, the output current is of at least 200 mA. The overcurrent relay shall not trip when the output current is less than 100 mA. Care is taken that the r.m.s. value, of the test voltage applied is measured within ± 3 %.

The samples shall be considered to have adequate electrical insulating strength if a 100 mA trip device, incorporated into the circuit does not trip during the 15 min test.

11.3.1.3 Immediately after the test in 11.3.1.2, the same samples shall be subjected to an electrical insulation resistance test. A direct voltage of 500 V shall be applied across the two electrodes.

11.3.1.4 After (60 ± 2) s from the application of the voltage, the insulation resistance between the electrodes shall be obtained. Liquid tight sheathing shall be considered to have adequate electrical insulation resistance if the measured resistance is greater than 100 MΩ.

11.3.2 Non metallic terminating fittings

11.3.2.1 Samples of terminating fittings shall be immersed for 24 h ± 15 min, in water at (23 ± 2) °C and then thoroughly dried at room temperature.

11.3.2.2 Terminating fitting samples shall be assembled in accordance with the manufacturer's instructions with a short length of liquid tight sheathing. All other open ends are sealed with an appropriate insulating material. The inside of the fitting is filled with lead shot of a diameter between 0,5 mm and 1,0 mm, and an electrode is inserted into the lead shot via the liquid tight sheathing.

An outer electrode of aluminium foil, is wrapped around the outside of the terminating fitting and compressed so that it follows the outer contour of the fitting as closely as possible.

11.3.2.3 Terminating fitting samples shall be tested in accordance with 11.3.1.2 within 1 h of removal from the water.

11.3.2.4 Immediately after the test in 11.2.2.3, the same samples are subjected to an electrical insulation resistance test. A d.c. voltage of 500 V is applied across the two electrodes.

11.3.2.5 After (60 ± 2) s, from the application of the voltage the insulation resistance between the electrodes is obtained. Terminating fittings are considered to have adequate electrical insulation resistance if the resistance is greater than 5 MΩ.

12 Thermal properties

Not applicable.

13 Fire hazard

13.1 Reaction to fire

13.1.1 Initiation of fire

Not applicable.

13.1.2 Contribution to fire

Under consideration.

13.1.3 Spread of fire

Liquid tight sheathing systems shall have adequate resistance to flame propagation.

13.1.3.1 Compliance of non-metallic and composite liquid tight sheathing fittings is checked by using the glow wire test in EN 60695-2-11.

The glow wire shall be applied once to each sample in the most unfavourable position for its intended use (with the surface tested in the vertical position) at a temperature of 750 °C.

The sample is deemed to have passed this test if there is no visible flame or sustained glowing, or if flames or glowing extinguish within 30 s from the removal of the glow wire.

13.1.3.2 Compliance of non-metallic and composite liquid tight sheathing shall be checked by applying a 1 kW flame, specified in EN 60695-11-2.

13.1.3.2.1 A sample of length (675 ± 10) mm is mounted vertically in a rectangular metal enclosure with one open face, as shown in Figure 5, in an area substantially free from draughts.

The general arrangement is shown in Figure 6.

Mounting is by means of two metal clamps approximately 25 mm wide spaced (550 ± 10) mm apart and approximately equidistant from the ends of the sample.

A steel rod of (2,0 ± 0,1) mm for sizes up to 12 mm, (6,0 ± 0,1) mm for sizes 16 mm to 25 mm and (16,0 ± 0,1) mm for liquid tight sheathing with diameters 32 mm and above, is passed through the sample. It is rigidly and independently mounted and clamped at upper end to maintain the sample in a straight and vertical position. The means of mounting is such as not to obstruct drops from falling onto the tissue paper.

A suitable piece of white pinewood board, approximately 10 mm thick, covered with a single layer of white tissue paper, is positioned on the lower surface of the enclosure.

The assembly of sample, rod and clamping apparatus is mounted vertically in the centre of the enclosure, the upper extremity of the lower clamp being (500 ± 10) mm above the internal lower surface of the enclosure.

13.1.3.2.2 The burner is supported so that its axis is in an angle of (45 ± 2)° to the vertical.

The flame is applied to the sample so that the distance from the top of the burner tube to the sample measured along the axis of the flame is (100 ± 10) mm, and the axis of the flame intersects with the surface of the sample at a point (100 ± 5) mm from the upper extremity of the lower clamp, and so that the axis of the flame intersects with the axis of the sample.

13.1.3.2.3 The test is carried out on three samples.

The flame is applied to the samples for the period specified in Table 5 and is then removed. During the application of the flame, it shall not be moved except to remove it at the conclusion of the period of the test.

Table 5 – Times of exposure of the sample to the flame

Material thickness		Flame application time Tolerance (+ 1, - 0) s
Over	Up to	
-	0,5 mm	15 s
0,5 mm	1,0 mm	20 s
1,0 mm	1,5 mm	25 s
1,5 mm	2,0 mm	35 s
2,0 mm	2,5 mm	45 s
2,5 mm	3,0 mm	55 s
3,0 mm	3,5 mm	65 s
3,5 mm	4,0 mm	75 s
4,0 mm	4,5 mm	85 s
4,5 mm	5,0 mm	130 s
5,0 mm	5,5 mm	200 s
5,5 mm	6,0 mm	300 s
6,0 mm	6,5 mm	500 s

After the conclusion of the test, and after any burning of the sample has ceased, the surface of the sample is wiped clean by rubbing with a piece of cloth soaked with water.

13.1.3.2.4 All three samples shall pass the test.

If the sample is not ignited by the test flame it shall be deemed to have passed the test.

If the sample burns, or is consumed without burning, the sample shall be deemed to have passed the test if after any burning has ceased, and after the sample has been wiped in accordance with 13.1.3.2.3, there is no evidence of burning or charring within 50 mm of the lower extremity of the upper clamp and also within 50 mm of the upper extremity of the lower clamp.

If the sample burns, it shall be deemed to have failed the test if combustion is still in progress 30 s after removal of the flame.

If the tissue paper ignites, the sample shall be deemed to have failed the test. For the part of the sample below the burner, the presence of molten material on the internal or external surfaces shall not entail failure if the sample itself is not burned or charred.

13.2 Additional reaction to fire characteristics

Under consideration.

13.3 Resistance to fire

Not applicable.

NOTE Required only for fire resistant liquid tight sheathing for survival circuits.

14 External influences

14.1 Degree of protection provided by enclosures

Liquid tight sheathing systems when assembled in accordance with the manufacturer's instructions, shall have adequate resistance to external influences according to the classification declared by the manufacturer with a minimum requirement of IP55.

The IP test shall be carried out on samples which have passed the impact test.

Compliance is checked by the tests specified in 14.1.1 and 14.1.2.

14.1.1 Degree of protection - Ingress of foreign solid objects

14.1.1.1 An assembly is made of a fitting with a short length of liquid tight sheathing assembled in each entry. Where necessary, the open ends of the assembly are plugged, or are not part of the test.

14.1.1.2 The assembly shall be tested in accordance with the appropriate test of EN 60529.

14.1.1.3 The assembly tested for numeral 6 shall be deemed to have passed the test if there is no ingress of dust visible to normal or corrected vision without magnification.

14.1.2 Degree of protection - Ingress of water

14.1.2.1 An assembly is made of a fitting with a short length of liquid tight sheathing assembled in each entry. Where necessary, the open end of the liquid tight sheathing is plugged, or is not part of the test.

14.1.2.2 The assembly shall be tested in accordance with the appropriate test of EN 60529.

14.1.2.3 The assembly tested for numeral 6 and above shall be deemed to have passed the test if there is not sufficient ingress of water to form a drop visible to normal or corrected vision without magnification

14.2 Resistance against corrosion

14.2.1 Metallic and composite liquid tight sheathing systems

Metallic and composite liquid tight sheathing systems, excluding screw threads, shall have adequate resistance against corrosion both inside and outside, in accordance with the classifìcation shown in Table 6.

Table 6 – Resistance to corrosion classification

Classification	Protection afforded	Example
1	Low protection, inside and outside	Priming paint
2	Medium protection, inside and outside	Stove enamel/electro zinc plate/air drying paint
3	Medium/High composite protection Inside: class 2 and outside: class 4	Stove enamel Sherardizing
4	High protection, inside and outside	Hot dip zinc coating Sherardizing Stainless steel

Compliance for painted and zinc coated steel and steel composite liquid tight sheathing and liquid tight sheathing fittings is checked by the test in 14.2.2.

For non-ferrous metallic and composite liquid tight sheathing systems, the manufacturer shall provide information about its protection against corrosion.

14.2.2 Test for resistance to corrosion for painted and zinc coated steel and steel composite liquid tight sheathing systems

14.2.2.1 Low protection liquid tight sheathing and liquid tight sheathing fittings shall be inspected for completeness of covering by the protective coating, both inside and outside.

14.2.2.2 Medium protection liquid tight sheathing and liquid tight sheathing fittings shall be cleaned with a piece of wadding soaked in white spirit with a kauri-butanol of 35 + 5.

They shall then be totally immersed in a solution of 0,75 % potassium ferricyanide [$K_3Fe(CN)_6$] and 0,25 % ammonium persulphate [$(NH_4)_2S_2O_8$] in water and a quantity of about 0,1 % of a suitable wetting agent, for instance a sodium salt of an alkylnaphthaline sulphonic acid, shall be added.

The solution and the samples shall be maintained at a temperature of (23 ± 2) °C.

Each sample shall be tested separately, a fresh solution being used each time.

After immersion for 5 min + 5/0 s, the samples shall be removed from the solution and left to dry at ambient temperature in air. After completion of the test as described above, the samples shall show no more than two blue coloured spots on cach square centimetre of the surface, and no blue spot shall have a dimension larger than 1,5 mm. Traces of rust on sharp edges, screw threads and machined surfaces, also any yellowish film removable by rubbing, shall be ignored.

14.2.2.3 High protection liquid tight sheathing and liquid tight sheathing fittings shall be degreased by immersion in trichloroethane or a similar degreasing agent for 10 min + 5/0 s, and wiped dry with a piece of soft cloth. They shall then be immersed in a 2 % solution of sulphuric acid in water for 15 s, thoroughly cleaned in running water and again wiped dry with a piece of clean soft cloth. Each sample shall then be totally immersed in a solution of copper sulphate ($CuSO_4 \cdot 5H_2O$) in distilled water, having a specifìc gravity of 1,186 kg/l at (23 ± 2) °C.

The solution and the samples shall be maintained at a temperature of (23 ± 2) °C, without stirring.

NOTE The solution is made by dissolving 360 g of crystalline copper sulphate in one litre of distilled water and neutralising with copper carbonate or copper hydroxide (about 1 g/l). The specific gravity is then checked and adjusted as necessary.

The container shall be such that it will not react with the solution and it shall be of such a size as to provide clearance of at least 25 mm between the walls thereof and the sample.

Each sample shall be immersed four times in successíon in the same solution, each time for (60 + 5/0) s. A fresh solution shall be used for each sample. After each immersion, the sample shall immediately be cleaned in running water with a brush to remove any black deposit. The sample shall then be wiped dry with a piece of clean soft cloth, and, except after the fourth immersion, returned to the solution. Care should be taken to clean out all holes and pockets.

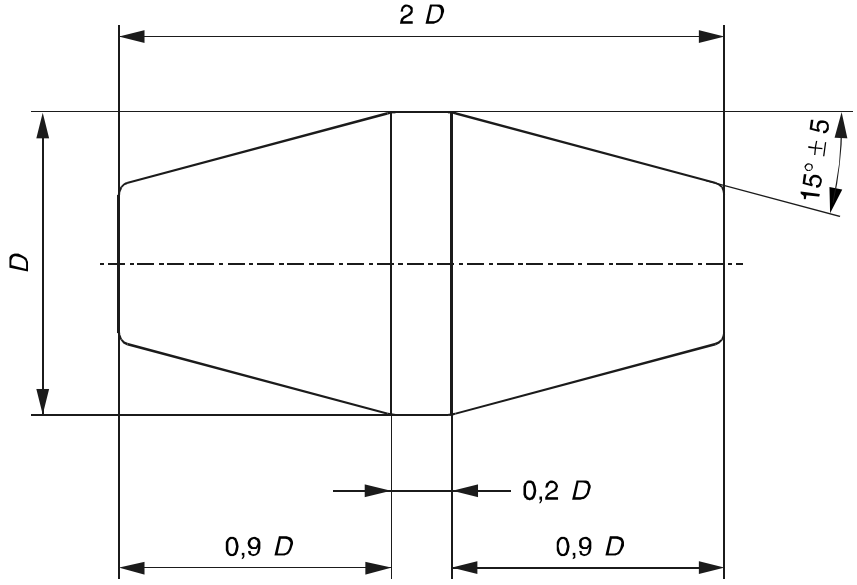
After the test, the sample shall show no precipitation of copper which cannot be scrubbed off in running water, if necessary after immersion for 15 s in a 10 % solution of hydrochloric acid in water.

Traces of copper precipitation on screw threads, sharp edges and machined surfaces may be ignored.

15 Electromagnetic compatibility

Products covered by this standard are, in normal use, passive in respect of electromagnetic influences (emission and immunity).

NOTE When products covered by this standard are installed as part of a wiring installation, the installation may emit or may be influenced by electromagnetic signals. The degree of influence will depend on the nature of the installation within its operating environment and the apparatus connected by the wiring.

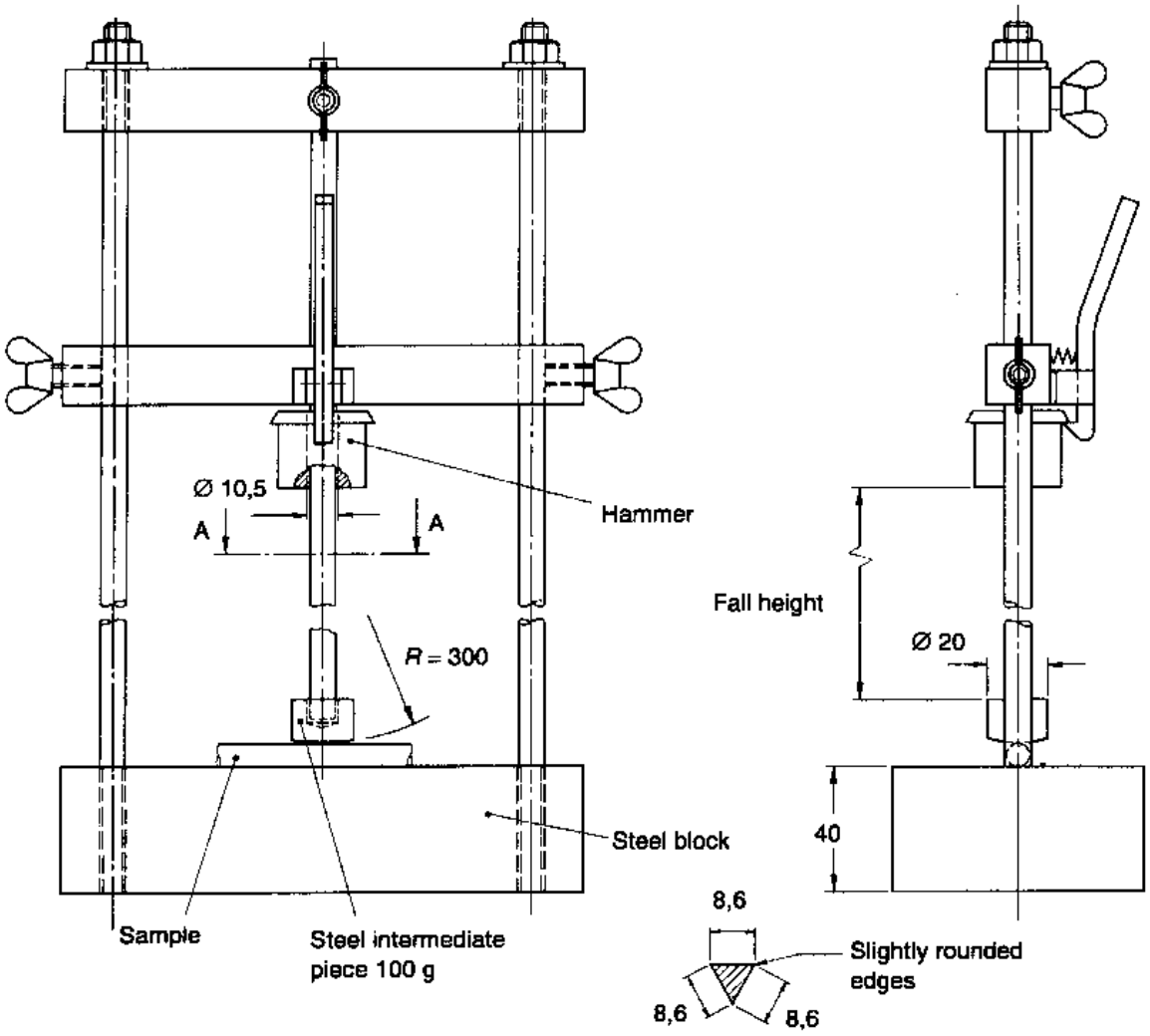


IEC 475/02

D	80 % of the manufacturer's declared minimum inside diameter of the liquid tight sheathing system
Material	Steel, hardened and polished, edges slightly rounded
Manufacturing tolerance	$^{+0,05}_{0}$ mm
Tolerance and axial dimension	± 0,2 mm
Admissible wear	0,01 mm

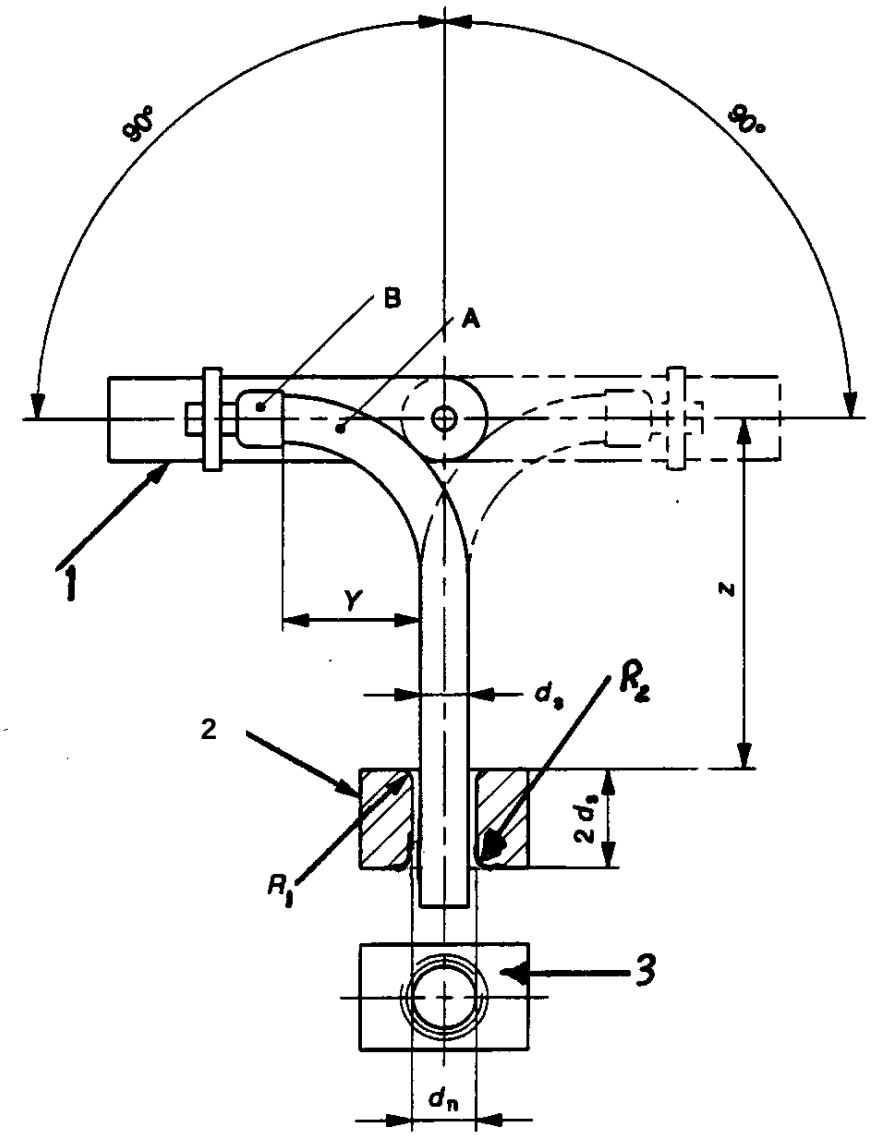
NOTE This drawing is not intended to govern design except as regards the dimensions shown.

Figure 1 – Gauge for checking the minimum inside diameter of the liquid tight sheathing system



Dimensions in millimeters

Figure 2 – Impact test apparatus

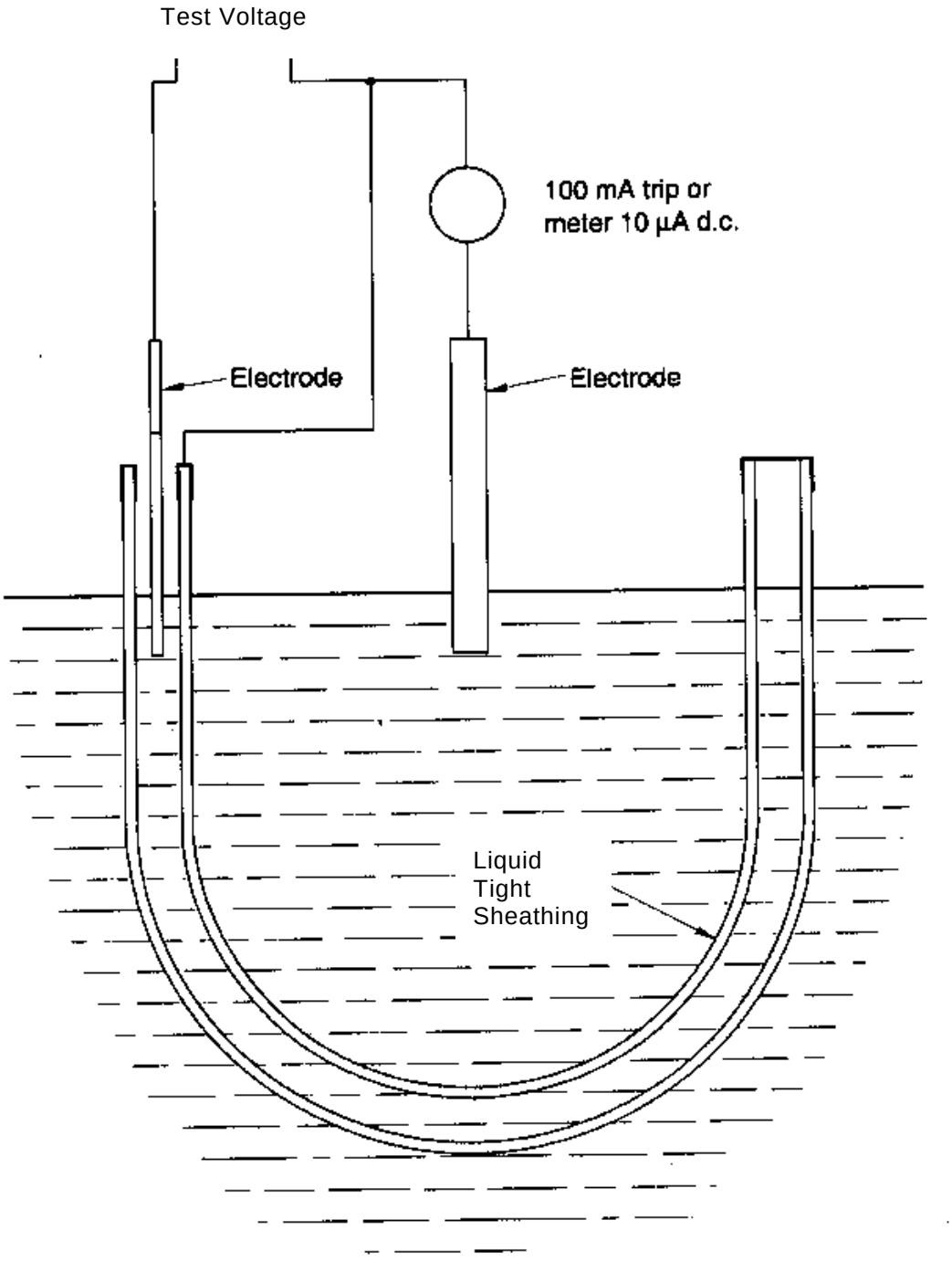


Key

A liquid tight sheathing
B terminating fitting
d_s outside diameter of A
d_n inside diameter of support block: 1,1 x d_s
R_1 radius of support block: 0,5 x d_s
R_2 radius of support block : 0,25 x d_s
Y minimum bend radius, declared by the manufacturer
Z 1,5 x Y
3 plan view of guide support block
2 guide support block
1 oscillating member

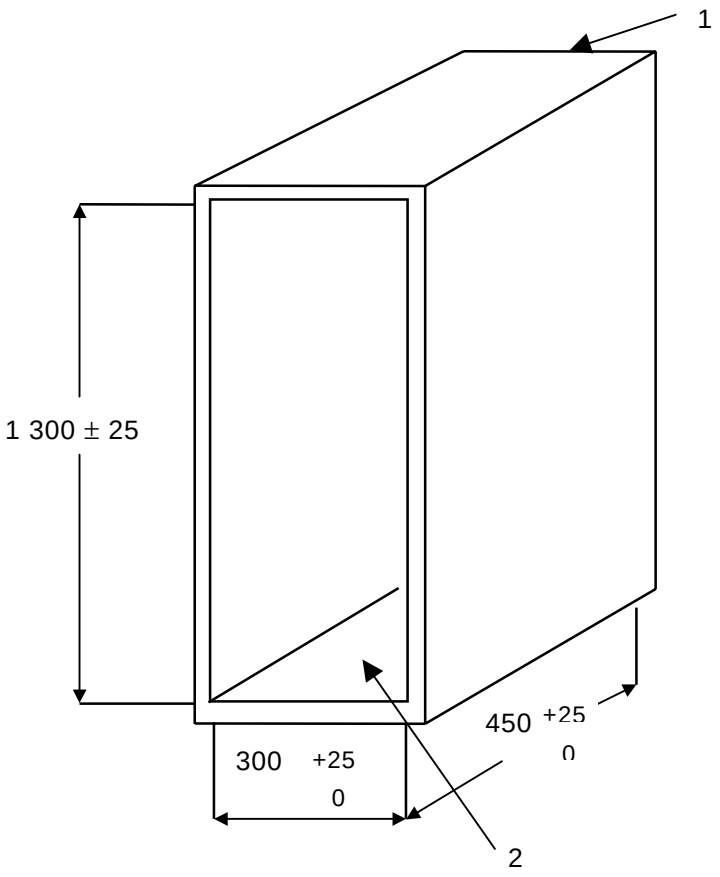
NOTE This drawing is not intended to govern design except as regards the dimensions shown.

Figure 3 – Arrangement for flexing test



Remove sharp edges and burrs

Figure 4 – Arrangement for insulation resistance and electric strength test



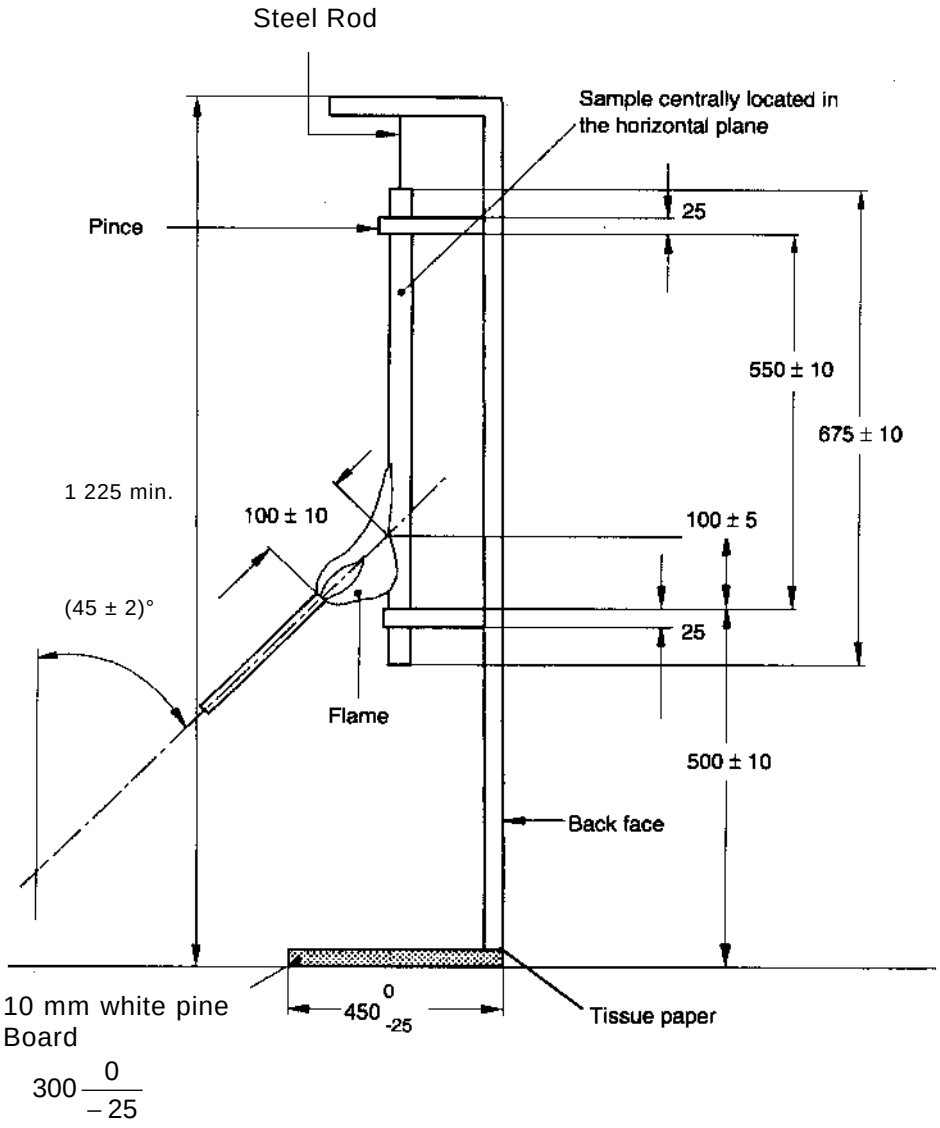
Dimensions in millimetres
Material metal
All measurements given inside

Key

1 closed back surface
2 lower surface

NOTE This drawing is not intended to govern design except as regards the dimensions shown.

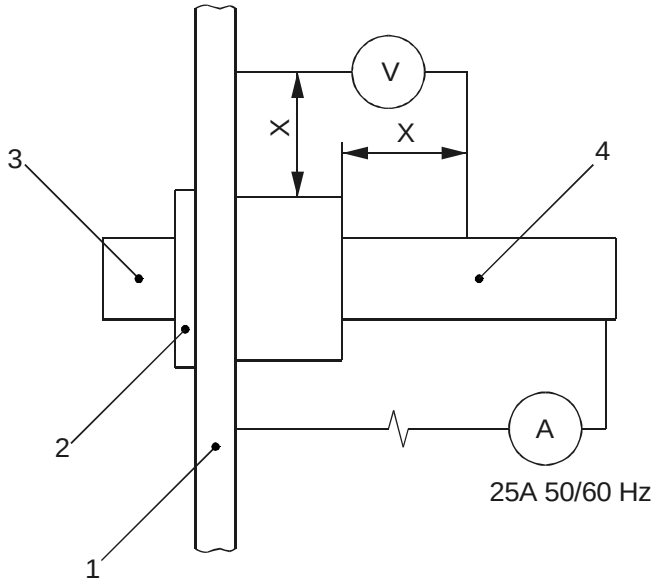
Figure 5 – Enclosure for burning test



Dimensions in millimetres

NOTE This drawing is not intended to govern design except as regards the dimensions shown.

Figure 6 – Arrangement for burning test



Key

X 12 mm ± 2 mm

1 3 mm steel plate

2 optional locknut

3 terminating fitting

4 liquid tight sheathing

NOTE This drawing is not intended to govern design except as regards the dimensions shown.

Figure 7 – Assembly of liquid tight sheathing and fitting for bonding test

Annex A
(informative)

A-deviations

A-deviation: National deviation due to regulations, the alteration of which is for the time being outside the competence of the CENELEC member.

This European Standard falls under Directive 73/23/EEC.

NOTE (from CEN/CENELEC IR Part 2:2002 , 2.17) Where standards fall under EC Directives, it is the view of the Commission of the European Communities (OJ No C 59, 1982-03-09) that the effect of the decision of the Court of Justice in case 815/79 Cremonini/Vrankovich (European Court Reports 1980, p. 3583) is that compliance with A-deviations is no longer mandatory and that the free movement of products complying with such a standard should not be restricted except under the safeguard procedure provided for in the relevant Directive.

A-deviations in an EFTA-country are valid instead of the relevant provisions of the European Standard in that country until they have been removed.

Clause	Deviation
General	**Spain** (Clause 1 of the ITC-BT-21 of Real Decreto 842/2002 dated August the 2nd 2002; and Clause 6.2.1 of the Annex IV of Real Decreto 401/2003 dated May the 14th of 2003.) This product is not allowed.

_____

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