
Basic environmental testing procedures - Part 2: Tests - Test XA and guidance: Immersion in cleaning solvents

Environmental testing -- Part 2: Tests - Test Xa and guidance: Immersion in cleaning solvents

Umweltprüfungen -- Teil 2: Prüfungen - Prüfung XA und Leitfaden: Tauchen in flüssige Reinigungsmittel

Essais fondamentaux climatiques et de robustesse mécanique -- Partie 2: Essais - Essai XA et guide: Immersion dans les solvants de nettoyage

<https://standards.iteh.ai/catalog/standards/sist/5ae492a7-809c-4787-9397-d0e01568d9ba/sist-en-60068-2-45-2002>

Ta slovenski standard je istoveten z: EN 60068-2-45:1992

ICS:

19.040

Preskušanje v zvezi z
okoljem

Environmental testing

SIST EN 60068-2-45:2002**en**

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN 60068-2-45:2002

<https://standards.iteh.ai/catalog/standards/sist/5ae492a7-809c-4787-9397-d0e01568d9ba/sist-en-60068-2-45-2002>

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 60068-2-45

August 1992

+ A1 July 1993

UDC 621.3:620.193.44

Supersedes HD 323.2.45 S1:1988

Descriptors: Electricity, components, cleaning, de-greasing with solvents, cleaning solvents, procedures, components specifications writing

English version

Basic Safety Publication — Environmental testing
Part 2: Test methods
Test XA and guidance: immersion in cleaning solvents

(includes amendment A1:1993)
(IEC 68-2-45:1980 + corrigendum 1981)

Publication fondamentale de sécurité — Essais d'environnement	Umweltprüfungen Teil 2: Prüfungen
Deuxième partie: Essais	Prüfung XA und
Essai XA et guide: Immersion dans les solvants de nettoyage	Leitfaden: Tauchen in flüssige Reinigungsmittel
(inclut l'amendement A1:1993)	(enthält Änderungen A1:1993)
(CEI 68-2-45:1980)	(IEC 68-2-45:1980)

This European Standard was approved by CENELEC on 1992-06-16. 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, 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

EN 60068-2-45:1992**Foreword**

As a consequence of the IEC-CENELEC Agreement, HD 323.2.45 S1:1988 (IEC 68-2-45:1980) with its corrigendum of September 1981 was submitted to the CENELEC voting procedure for conversion into a European Standard.

The text of the International Standard was approved by CENELEC as EN 60068-2-45 on 1992-06-16.

The following dates were fixed:

- latest date of publication
of an identical national
standard (dop) 1993-09-01
- latest date of withdrawal
of conflicting national
standards (dow) 1993-09-01

Annexes designated “normative” are part of the body of the standard. In this standard, Annex ZA is normative.

Foreword to amendment A1

The text of document 50(CO)257, as prepared by IEC technical committee 50, Environmental testing, was submitted to the IEC-CENELEC parallel vote in January 1992.

The reference document was approved by CENELEC as A1 to EN 60068-2-45 on 6 July 1993.

The following dates were fixed:

- latest date of publication
of an identical national
standard (dop) 1994-07-01
- date of withdrawal of
conflicting national
standards (dow) 1994-07-01

iTeh STANDARD PREVIEW (standards.iteh.ai)

SIST EN 60068-2-45:2002

<https://standards.iteh.ai/catalog/standards/sist/5ae492a7-809c-4787-9397-d0e01568d9ba/sist-en-60068-2-45-2002>

1 Scope

This standard comprises a test procedure whereby specimens to be tested are immersed in a certain solvent at a specified temperature and for a specified time.

If required by the relevant specification, after immersion and drying, specimens shall be rubbed with cotton wool or wrapping tissue paper.

Guidance on the test is given in the appendix.

2 Object

To determine the effects of prescribed cleaning solvents on electronic components and other parts suitable to be mounted on printed boards when subjected to immersion in the cleaning solvents stated below.

NOTE This test is not intended to simulate the effects of handling.

3 Types of test solvents and conditions

3.1 Solvents

Three commonly used solvents are specified for the purpose of this test.

NOTE Successful compliance with this test does not imply resistance to other solvents.

3.1.1 A mixture of 1,1,2-trichlorotrifluoroethane, 70 ± 5 % by weight and 2-propanol (isopropyl alcohol), 30 ± 5 % by weight. Commercially available grades (industrial use) shall be used.

NOTE 1 1,1,2-trichlorotrifluoroethane will be hereinafter referred to as R 113, in accordance with ISO/R 817:1974.

NOTE 2 The above mixture is obtainable as a finished product from suppliers of chemicals.

WARNING: The component 1,1,2-trichlorotrifluoroethane is hazardous to the environment; therefore this solvent shall not be used where the solvent specified in sub-clause 3.1.2 is adequate.

3.1.2 Propan-2-ol (isopropyl alcohol) — industrial use — shall be used whenever possible.

NOTE This solvent is obtainable as a finished product from suppliers of chemicals.

3.1.3 Demineralized or distilled water having a resistivity of not less than $500 \Omega\text{m}$ corresponding to a conductivity of 2 mS/m .

NOTE In technically justified cases other solvents similar in activity to the recommended ones may be used as prescribed in the relevant specifications.

3.2 Test conditions

3.2.1 Solvent temperatures

For the solvent specified in Sub-clause 3.1.1, one of the following temperatures shall be chosen:

¹⁾ 23 ± 5 °C

48.6 °C to 50.5 °C (boiling temperature).

NOTE The temperatures 48.6 °C to 50.5 °C are the boiling points at the composition limits of the R 113/2-propanol (isopropyl alcohol) mixture when carrying out a complete reflux at 101.3 kPa (1 013 mbar).

The normal boiling point is 49.2 °C.

For the solvent specified in Sub-clause 3.1.2, the temperature to be applied is:

55 ± 5 °C

NOTE For other solvents (see note of Sub-clause 3.1.2), the temperature shall be 23 ± 5 °C or the boiling temperature as specified in the relevant specification.

3.2.2 Duration of immersion

5 ± 0.5 min, in every case.

4 Initial measurements

If the test is made to determine the superficial effects on marking, encapsulation, coating, etc., the specimen shall be visually inspected.

If the test is made to determine the effects on the characteristics of the specimen, the relevant specification may also require electrical and/or mechanical measurements.

5 Conditioning

The relevant specification shall prescribe which of the following methods is to be used.

5.1 Method 1 (with rubbing)

The specimens shall be completely immersed in one of the solvents specified in Sub-clause 3.1 at one of the temperatures given in Sub-clause 3.2.1 and for the time given in Sub-clause 3.2.2.

After removal of the specimen from the solvent, the specimen shall be allowed to dry for at least 5 min. Then the marking area shall be rubbed with cotton wool or with wrapping tissue paper to determine the durability of the marking. The detail specification shall indicate the rubbing material to be used.

Ten strokes, five in each of two opposite directions, shall be applied over the marking area with a force of $5 \pm 0.5 \text{ N}$ over an area of about 1 cm^2 and at a rate of about two strokes per second. A recommended test jig is described in Sub-clause A.2.3 of Appendix A. New cotton wool or wrapping tissue paper shall be used for each specimen to be tested.

¹⁾ See note in national foreword.

NOTE Commercially available *cotton wool*, e.g. as supplied for medical purposes, may be used.

Wrapping tissue paper as specified in Sub-clause 6-86 of ISO Standard 4046:1978 may be used. This publication describes the paper as: "thin, soft, relatively tough paper generally intended for packaging delicate articles, its substance being between 12 g/m² and 25 g/m²". Commercially available soft tissue paper handkerchiefs are also suitable.

5.2 Method 2 (without rubbing)

The specimen shall be completely immersed in one of the solvents specified in Sub-clause 3.1 at one of the temperatures given in Sub-clause 3.2.1 and for the time given in Sub-clause 3.2.2.

6 Recovery

If final electrical and/or mechanical measurements are required, the specimen shall remain under standard atmospheric conditions for testing for not less than 1 h and not more than 2 h or for a period as prescribed in the relevant specification, after removal from the solvent.

7 Final measurements

If the test is made to determine the superficial effects on marking, encapsulation, coating, etc., the specimen shall be visually inspected.

If the test is made to determine the effects on the performed characteristics of the specimen the relevant specification may also require electrical and/or mechanical measurements.

8 Information to be given in the relevant specification

When this test is included in the relevant specification, the following details shall be given as far as they are applicable:

- 8.1 Solvent to be used (Sub-clause 3.1).
- 8.2 Solvent temperature (Sub-clause 3.2.1).
- 8.3 Initial measurements, if any (Clause 4).
- 8.4 Conditioning, Method 1 or Method 2 (Clause 5).
- 8.5 Rubbing material [cotton wool or tissue paper (Sub-clause 5.1)].
- 8.6 Recovery time, if different from 1 h to 2 h (Clause 6).
- 8.7 Final measurements (Clause 7).
- 8.8 Acceptance criteria:
 - 8.8.1 — for superficial effects;
 - 8.8.2 — for electrical and/or mechanical parameters.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN 60068-2-45:2002

<https://standards.iteh.ai/catalog/standards/sist/5ae492a7-809c-4787-9397-d0e01568d9ba/sist-en-60068-2-45-2002>

Appendix A Guide to test XA

A.1 General

Many components or parts to be mounted on printed boards will be subjected to solvent cleaning processes. To simulate effects of such cleaning operations and to verify the resistance of components or parts to solvents, test XA shall be applied.

The test contains two methods:

- 1) To determine the superficial effects on marking, encapsulation, coating, etc.
- 2) To determine the effects on the characteristics of the specimen.

The test should not be applied until at least 48 h after marking as some marking inks cure by atmospheric reaction.

A.2 Cleaning

A.2.1 Basic considerations: methods, solvents

Soldered printed circuits, i.e. boards plus components, can be cleaned in different ways.

In many cases total immersion of printed circuits in certain solvents is required. In those cases components on boards have to withstand a short-time immersion in the relevant cleaning solvent.

Generally the cleaning solvent used depends on the soldering flux chosen.

A.2.1.1 Printed circuits fluxed with colophony based fluxes

These circuits may be cleaned effectively by fluorocarbon/alcohol mixtures as widely used and commercially available under different trade names.

To remove fluxes and flux residues, circuits are normally:

- immersed in a cold solvent (at ambient temperature), or
- immersed in a boiling solvent, or
- successively immersed in a cold and a boiling solvent.

A.2.1.2 Printed circuits fluxed with water-soluble fluxes

These circuits are cleaned by warm water spraying or by immersion in warm water.

A.2.2 Choice of test solvents and test conditions

A.2.2.1 Solvents

To remove colophony based fluxes and flux residues, a great number of different organic cleaning solvents are used in practice, some of them being highly aggressive, flammable or toxic.

Tests made in industry indicate that relatively mild solvents based on mixtures of R 113 and alcohols give good cleaning results and do not affect most types of components and parts.

NOTE Components which include rubber sealings (i.e. for example electrolytic capacitors) could be damaged when tested or cleaned in halogenated solvents because these solvents penetrate in the rubber sealings and lifetime failure can occur.

Two solvents, widely used in practice and well-matched to the principal types of fluxes, have been chosen as test solvents, viz.

- a mixture of R 113, 70 ± 5 % by weight, and 2-propanol (isopropyl alcohol), 30 ± 5 % by weight.
- water, demineralized or distilled quality, conductivity ≤ 2 mS/m.

The mixture of R 113 and 2-propanol (isopropyl alcohol) is used frequently because it provides the features of low toxicity, non-flammability, stability and sufficient cleaning power.

NOTE If the solvent is maintained within the specified density or boiling point ranges it is non-flammable. However, if excessive evaporation or boiling is allowed to occur, the alcohol concentration of the remaining solvent may be sufficiently high to become a fire or explosion hazard.

In technically justified cases, other solvents similar in activity to the recommended ones may be used as specified in the relevant specification.

NOTE Other organic cleaning solvents, such as some hydrocarbons (petroleum spirit, benzene, toluene, etc.) or chlorinated solvents (trichloroethane, trichloroethylene, perchloroethylene, dichloromethane, etc.) are not recommended for cleaning operations in view of toxic hazards, flammability hazards, insufficient stability, or excessive aggressiveness damaging to many components and materials.

A.2.2.2 Test conditions

To be realistic and to restrict the number of varieties of production cleaning conditions, the following test conditions have been selected:

Solvent	Solvent temperature	Immersion time	Mechanical treatment
1. Mixture of R 113 and 2-propanol (isopropyl alcohol)	1. 23 ± 5 °C	5 ± 0.5 min	Rubbing, if necessary
	2. Boiling temperature (48.6 °C to 50.5 °C)	5 ± 0.5 min	Rubbing, if necessary
2. Water	55 ± 5 °C	5 ± 0.5 min	Rubbing, if necessary

NOTE In case of dispute, fresh solvent must be used for each test.

Application of ultrasonic energy, in association with immersion in a solvent, is omitted, as this test procedure is not intended to simulate effects of ultrasonic energy. The problems of exposure to ultrasonic cleaning stresses are discussed in IEC Publication 653: General Considerations on Ultrasonic Cleaning.

Test temperatures have been based on usual cleaning procedures.

Contact of the R 113/2-propanol (isopropyl alcohol) with the skin must be avoided as, in common with other organic solvents, it can cause de-fatting of the skin leading to skin complaints.

Generally, cleaning in practice is done by immersion of printed circuits in a solvent for 0.5 min to 2 min. To introduce some over stresses an immersion time of 5 min is chosen.

During immersion of components or parts in solvents: solvent temperatures shall be measured; temperatures shall be within the given limits; the boiling mixture of R 113/2-propanol (isopropyl alcohol) shall remain boiling.

The composition of the mixture of R 113 and 2-propanol (isopropyl alcohol) will change due to evaporation. The 2-propanol (isopropyl alcohol) concentration will increase and the solvent may become flammable. When used at 23 ± 5 °C, the composition should be checked immediately before and after the test by measuring the density with an accurate hydrometer.

Temperature (°C)	Density range (g/cm ³)
15	1.17–1.26
20	1.16–1.25
25	1.15–1.24
30	1.14–1.23

When used at its boiling-point, the composition should be checked continuously throughout the test, by measuring the boiling-point which should be maintained between 48.6 °C and 50.5 °C.

To avoid changes in composition during the test, it will normally be necessary to use a simple condenser to prevent excessive loss of the R 113 component. (Appendix B gives two examples.)

R 113 (%)	2-propanol (isopropyl alcohol) (%)	Boiling point at 101.3 kPa (1 013 mbar) (°C)
75	25	48.6
70	30	49.2
65	35	50.5

A.2.3 Rubbing

In practice, after immersion in a cleaning solvent, boards may be rubbed or brushed on the soldered side to remove insoluble residues or certain contaminants.

For this reason rubbing shall be applied, if required by the relevant specification, to a dry surface because rubbing on a wet surface may lead to non-reproducible effects. Rubbing shall be done only to show that the marking will remain legible during usual printed-circuit handling after cleaning procedures.

A reproducible and operator-independent rubbing method can only be achieved by using a suitable test jig. A recommended jig is a simulated “finger-tip” consisting of a disc of rubber 11.3 mm diameter (≈ 1 cm²), 5 mm thick, with a hardness of 30 Shore A to 40 Shore A, backed by a hard (metal or plastic) disc or rod. The rubber tip is covered with a pad of cotton wool or soft tissue paper, having a thickness of about 1 mm when compressed by the specified force. This assembly is fixed to a device for measuring the applied force — a compression spring balance reading the 10 N (approximately 1 kg) is eminently suitable.

Small components may require a scaled-down version of the test-jig with a tip diameter reduced to 5 mm ($\approx 0.2 \text{ cm}^2$) and an applied force of 1 N.

For reproducibility reasons, cotton wool and wrapping tissue paper are chosen (Sub-clause 5.1) as these materials are best specified, readily available and give fairly reproducible rubbing conditions. If considered necessary, and if the size of specimen permits, a stroke length of the order of 10 mm should be recommended.

A.3 Practical considerations

When cleaning solvents are used, the relevant safety precautions shall be observed.

When a type of component or part is to be tested under different test conditions or methods, separate specimens should be used for each test.

Components having insulation sleeves, for example shrinkable plastic tubing, or those whose casings may otherwise include capillary fissures may retain absorbed solvents over longer periods, thus producing long-term effects.

Components of different types may be tested simultaneously. During immersion components shall not be in contact with each other, or with a printed board, to avoid non-reproducible mechanical or solvent-trapping effects.

For the test, components may be mounted on a printed board, suitably spaced from the board and from each other, or they may be connected to a length of wire.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN 60068-2-45:2002

<https://standards.iteh.ai/catalog/standards/sist/5ae492a7-809c-4787-9397-d0e01568d9ba/sist-en-60068-2-45-2002>