

# Environmental testing —

## Part 2: Tests —

### Test Xb: Abrasion of markings and letterings caused by rubbing of fingers and hands

The European Standard EN 60068-2-70:1996 has the status of a  
British Standard

This Part should be read in conjunction with BS EN 60068-1:1995 *General  
and guidance*

ICS 19.040

# Committees responsible for this British Standard

The preparation of this British Standard was entrusted to Technical Committee GEL/50, Environmental testing of electrotechnical products, upon which the following bodies were represented:

- Federation of the Electronics Industry
- GAMBICA (BEAMA Ltd.)
- Ministry of Defence
- Society of Motor Manufacturers and Traders Limited

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# National foreword

This British Standard has been prepared by Technical Committee GEL/50 and is the English language version of EN 60068-2-70:1996 *Environmental testing — Part 2: Tests — Test Xb: Abrasion of markings and letterings caused by rubbing of fingers and hands* published by the European Committee for Electrotechnical Standardization (CENELEC). It is identical with IEC 68-2-70:1995 published by the International Electrotechnical Commission (IEC).

### Cross-reference

Publication referred to	Corresponding British Standard
EN 60068-1:1994	BS EN 60068 <i>Environmental testing</i>
(IEC 68-1:1988 <sup>1)</sup> )	BS EN 60068-1:1995 <sup>2)</sup> <i>General and guidance</i>

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### Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the EN title page, pages 2 to 8, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

<sup>1)</sup> Undated in the text.

<sup>2)</sup> BS EN 60068-1:1995 includes the corrigendum October 1988 and A1:1993 to IEC 68-1.

ICS 19.040

Descriptors: Environmental testing, abrasion of marking, abrasion of letterings, rubbing of fingers and hands, test apparatus, test fabric, test liquid

English version

**Environmental testing**  
**Part 2: Tests**  
**Test Xb: Abrasion of markings and letterings caused by**  
**rubbing of fingers and hands**

(IEC 68-2-70:1995)

Essais d'environnement  
Partie 2: Essais  
Essai Xb: Effacement des marquages et  
inscriptions par friction des doigts et des mains  
(CEI 68-2-70:1995)

Umweltprüfungen  
Teil 2: Prüfungen  
Prüfung Xb: Prüfung der Beständigkeit von  
Kennzeichnungen und Aufschriften gegen  
Abrieb, verursacht durch Wischen mit Fingern  
und Händen  
(IEC 68-2-70:1995)

This European Standard was approved by CENELEC on 1995-11-28. 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.

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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 document 50/359/DIS, future edition 1 of IEC 68-2-70, prepared by TC 50, Environmental testing, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60068-2-70 on 1995-11-28.

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) 1996-09-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 1996-09-01

Annexes designated “normative” are part of the body of the standard. Annexes designated “informative” are given for information only. In this standard, annex ZA is normative and annex A is informative. Annex ZA has been added by CENELEC.

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## Introduction

This standard describes a method of test applicable to markings and lettering on such parts of electrical products (switches, plugs, handles etc.) which in service are subjected to rubbing forces caused by the fingers or other parts of the hand. This standard may be applied to other industrial products.

This test should be required by the relevant specification when the stress during normal use is very high or in such cases where the legibility is important because of safety aspects or other reasons.

## 1 Scope

This International standard provides a standard method to determine the resistance of markings and letterings on flat or curved surfaces against abrasion as may occur for example by manually operating actuators and keyboards. The method is also suitable to test the resistance against fluid contamination as may occur under normal use.

## 2 Normative reference

The following normative document contains provisions which, through reference in this text, constitute provisions of this part of IEC 68. At the time of publication, the edition indicated was valid. All normative documents are subject to revision, and parties to agreements based on this part of IEC 68 are encouraged to investigate the possibility of applying the most recent editions of the normative document indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 68-1:1988, *Environmental testing — Part 1: General and guidance.*  
Amendment 1 (1992)

## 3 General description

The surface under test shall be repeatedly stressed by the rubbing movement of a test piston. The tip of the test piston due to its elasticity is deformed in such a way as to fit the surface under test. The material, hardness and shape of the piston, the movement and the angle of action are chosen in such a way that the pressure and friction executed by a human finger or by the ball of a thumb are simulated.

To obtain reproducible conditions of friction a piece of fabric is placed between the piston and the surface under test (either as a cover of the piston or as a curtain, hanging between piston and surface). Depending on the relevant specification this fabric may either be dry (dry test) or soaked with a specified test liquid if the test is intended to cover the influence of fluid contamination as may occur in normal use (wet test).

## 4 Description of the test apparatus

### 4.1 Test apparatus

An example of a suitable test apparatus is shown in the schematic drawing in annex A.

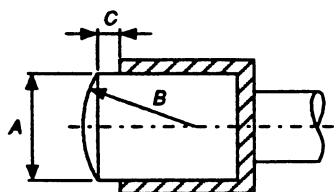
The apparatus moves the rubbing-piston under an angle of  $45^\circ \pm 5^\circ$  via a connecting rod against the surface under test. The force  $F$  (given in the relevant specification) results in an elastic deformation of the test piston combined with a rubbing movement  $s$  across the surface under test. The rubbing movement shall be from 1 mm to 4 mm.

The pressing cycle shall be repeated as many times as prescribed by the relevant specification.

For non-rigid test specimens (for example keyboards) the specification shall specify additional requirements (for example fixing).

Table 1

Size	Dimensions mm		
	A	B	C
1	20	20	2
2	10	20	1



The test piston consists of elastic material which shall be inert against the test liquids and shall have a Shore-A-hardness of  $47 \pm 5$  (for example synthetic rubber).

The size of the test piston shall be selected from Table 1 according to the shape and dimension of the test specimen and the kind of lettering.

The relevant specification shall prescribe the size of the test piston. If necessary other dimensions for the test piston more suited to the test specimen may be chosen. They shall then be prescribed by the relevant specification.

The abrasive dust produced during the test shall not influence the result of the test. Therefore it shall be removed continuously from the area between the test piston and the test specimen.

NOTE The accumulation of abrasive dust can be avoided by mounting the test surface vertically (the dust will fall down) or by blowing it off by means of compressed air free of oil and any pollution at room temperature.

#### 4.2 Test fabric

Between the test specimen and the test piston there shall be an easily replaceable piece of fabric which also can be a cover for the test piston.

The specifications<sup>3)</sup> of the test fabric shall be:

material:	wool
warp:	175 threads/dm $\pm$ 10 threads/dm
weft:	135 threads/dm $\pm$ 8 threads/dm
weight per area:	$\geq 195 \text{ g/m}^2$

For the “dry test” the fabric shall be changed or moved such as to bring an unused part of it into contact with the test specimen after a maximum of 10 000 cycles in order to avoid wear.

For the “wet test” (see 4.3) the soaking of the fabric shall be repeated after every 10 cycles.

Alternatively it may be moved so that a fresh piece of fabric is brought in between the test piston and the test specimen after every 10 cycles. The soaking may be achieved by dipping the fabric into the test liquid or by periodic dripping of the test liquid on to the fabric. At the start of a new test and after a maximum of 10 000 cycles the fabric shall be renewed to avoid stray results due to encrustation and wear.

#### 4.3 Test liquids

When a “wet test” is specified in the relevant specification the test liquid(s) shall be specified.

Such liquids may be:

- artificial sweat;

- lubricating oil;
- hydraulic oil;
- other relevant liquid.

If more than one test liquid is specified different specimens shall be used for each liquid unless otherwise specified by the relevant specification.

### 5 Severity

The severity is given by the force with which the test piston acts on the specimen and by the number of cycles. It shall be chosen from the following values. The chosen values shall be prescribed in the relevant specification.

Force:  $1 \text{ N} \pm 0,2 \text{ N}$ ;  $5 \text{ N} \pm 1 \text{ N}$ ;  $10 \text{ N} \pm 2 \text{ N}$ ;  
 $50 \text{ N} \pm 10 \text{ N}$ ;  $100 \text{ N} \pm 20 \text{ N}$ .

Number of cycles:  $10^1$ ;  $10^2$ ;  $10^3$ ;  $10^4$ ;  $10^5$ ;  $10^6$ ;  $10^7$ .

### 6 Preconditioning

The surface under test shall be in the condition of delivery after normal production. The relevant specification may prescribe preconditioning (for example ageing, dusting, cleaning).

### 7 Initial measurements

The specimen shall be submitted to a visual check and if prescribed by the relevant specification to dimensional and functional checks.

### 8 Testing

Unless otherwise specified in the relevant specification the test shall be a “dry test” carried out at standard atmospheric conditions according to IEC 68-1.

The test specimens are stressed in the test apparatus (see clause 4.1) with the prescribed severity.

The test piston shall be moved with a speed of 60 mm/s towards the test surface. It is pressed against the surface with the force given for the chosen severity. The test conditions shall be chosen so that the “piston pressing on the surface” and “piston lifted” times are approximately equal. The time during which the force is applied shall be not less than 0,2 s. The cycle frequency shall be  $(2 \pm 0,5)$  strokes per second. The relevant specification may prescribe other frequencies.

NOTE With higher frequencies it is possible that the temperature of the test specimen is unacceptably increased.

<sup>3)</sup> According to ISO/CD 12947-1, *Textiles — Determination of abrasion resistance of fabrics — Martindale method — Part 1: Martindale abrasion testing machine*.



## 9 Intermediate measurements

Intermediate measurements may be required by the relevant specification.

## 10 Recovery

Recovery may be required by the relevant specification.

## 11 Final measurements

The specimen shall be submitted to a visual check and if prescribed by the relevant specification to dimensional and functional checks. The relevant specification shall provide the criteria upon which the acceptance or rejection of the specimen is to be based.

## 12 Information to be given in the relevant specification

When this test is included in a relevant specification, the following details shall be given, in so far as they are applicable. The relevant specification shall supply information as required in the clauses listed below, paying particular attention to the items marked with an asterisk \* as this information is always required.

	Clause/Subclause
a) Dimension of the test piston *	4.1
b) Additional requirements for non-rigid test specimens *	4.1
c) If the test is to be wet *	4.2
d) Test liquid(s) if a wet test is specified *	4.3
e) If more than one liquid, the number and distribution of test samples	4.3
f) Severities (force and number of cycles) *	5
g) Preconditioning	6
h) Initial measurements *	7
i) Test conditions if not standard atmospheric	8
j) Cycle frequency if not two strokes per second *	8
k) Intermediate measurements *	9
l) Recovery after test	10
m) Final measurements *	11

## Annex A (informative)

## Schematic drawing of a test apparatus for test Xb

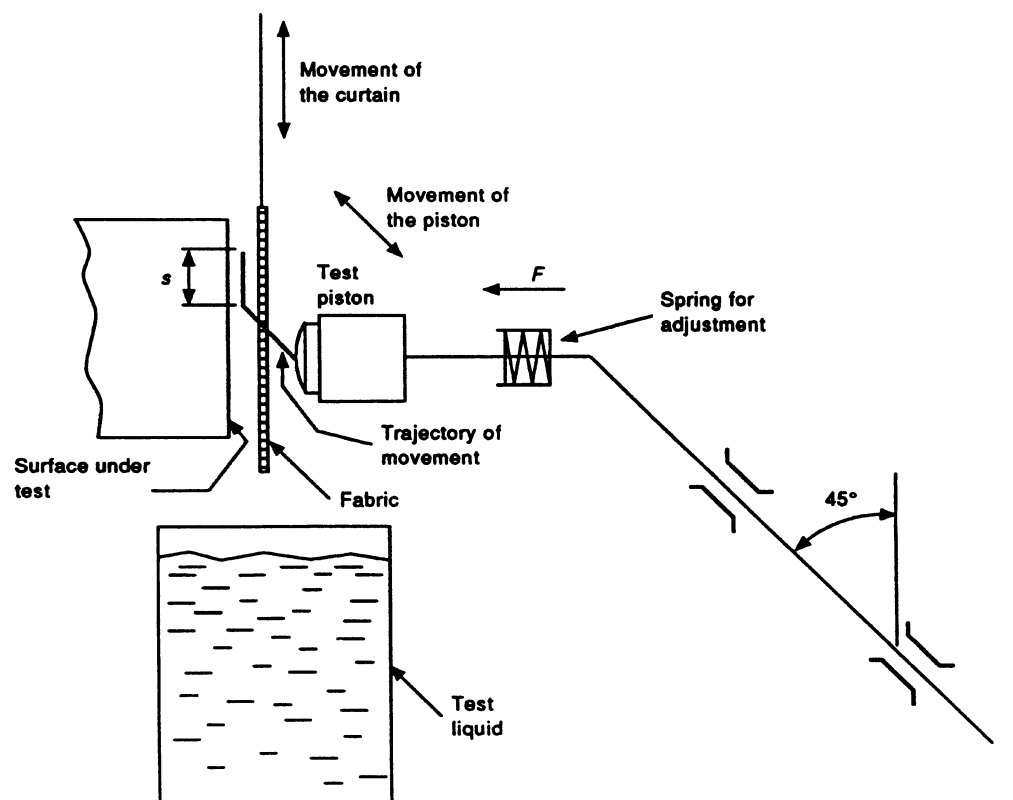


Figure 1.A — Schematic drawing of a test apparatus (clause 4.1)

**Annex ZA (normative)****Normative references to international publications with their corresponding European publications**

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

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

IEC publication	Year	Title	EN/HD	Year
IEC 68-1	1988	Environmental testing Part 1: General and guidance		
+ A1	1992		EN 60068-1 <sup>a</sup>	1994

<sup>a</sup> EN 60068-1 includes corrigendum October 1988 to IEC 68-1.



## List of references

See national foreword.

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