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Date: 16 January 2020

Origin: European

Latest date for receipt of comments: 19 March 2020

Project No. 2009/01617

Responsible committee: ACE/6 Aerospace avionic electrical and fibre optic technology

Interested committees:

Title: Draft BS EN 4860 Aerospace series - Environmental testing - Test Xb: Abrasion of markings, letterings, surfaces and materials caused by rubbing of fingertips and hands

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Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
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1	2	(3)	4	5	(6)	(7)
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/ Figure/ Table/Note	Type of comment	Comment (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	

**ASD-STAN STANDARD
NORME ASD-STAN
ASD-STAN NORM**

DRAFT

prEN 4860:2019

Edition P2

2019-12-13



PUBLISHED BY THE AEROSPACE AND DEFENCE INDUSTRIES ASSOCIATION OF EUROPE - STANDARDIZATION
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ICS:

Descriptors:

ENGLISH VERSION

Aerospace series — Environmental testing — Test Xb: Abrasion of markings, letterings, surfaces and materials caused by rubbing of fingertips and hands

**Luft- und Raumfahrt —
Umweltprüfung — Abrasiver
Verschleiß von Bedruckungen,
Beschriftungen, Oberflächen und
Materialien verursacht durch die
Reibung der Fingerkuppe oder der
Hand**

**Série aérospatiale — Essais
d'environnement — Essai Xb :
Abrasion de marques, lettres, surfaces
et matériaux par cause de frottement
de doigts et de mains**

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Foreword

This document is currently under preparation for as committee draft by ASD-STAN/D 4/WG 5.

1 Scope

This document provides a series of standard testing methods to determine the resistance of markings, letterings, surfaces and materials on flat or curved surfaces against abrasion as may occur for example by manually operating actuators, buttons, materials and surfaces in aerospace. The method is also suitable to test the resistance against fluids, pastes, particles and other materials and also in combination.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 60068-1, *Environmental testing — Part 1: General and guidance*

3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

4 General description

Marking and lettering on the product surface is a communication feature between the product and human beings. This communication feature often affects its usability and diminishes the value of the product. Therefore, testing of the abrasion resistance to the environmental load on the surface generated by human physical contact is of great importance.

5 Description of the test apparatus, test piston, test fabric and test media

5.1 General description

A suitable test apparatus shall comprise all the parts and generate the motion which are described in the drawing in Annex A.

A dynamic pneumatic drive shall move the test piston via a connecting rod towards the surface under test and then over it. The tip of the test piston due to its viscoelasticity is deformed in such a way as to fit the surface under test. This is to simulate the motion of human fingertip including its hand and arm muscles. This motion shall be repeated cyclically. A viscoelastic test piston shall be used to simulate the characteristics of the human fingertip, ball of a thumb and hand. The material property, hardness, the shape and the surface topography of the test piston shall be 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 for impact and 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). The test fabric shall be chosen according to the real simulation condition. Depending on the relevant specification, this fabric may either be dry (dry test) or wetted with a specified test liquid by means of an automatic feedthrough if the test is intended to cover the influence of fluid contamination as may occur in normal use (wet test).

The test specimen shall be positioned on a solid, rigid frame being able to hold a range of samples with various dimensions and geometries and withstand all forces specified in this document. For non-rigid test specimens, additional sample support shall be used.

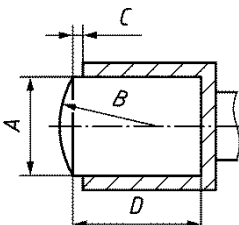
5.2 Motion of the test piston

A single cycle of the test piston shall comprise: movement of the piston towards the test specimen at an angle of $45^\circ \pm 5^\circ$ to the surface of the specimen and at a velocity of $60 \text{ mm/s} \pm 5 \text{ mm/s}$. After the test piston impacts the surface of the specimen, it shall move parallel over the surface of the specimen for a specified distance (referred to as the rubbing path). During this portion of the movement the test piston shall apply a specified force and the longitudinal axis of the test piston shall remain normal to the test specimen. The test piston shall then retract and separate from the surface of the specimen and return to its start position. This motion shall be repeated cyclically as many times as prescribed by the relevant specification and the duration of the cycle set so that the “piston pressing on the surface” and “piston lifted times” are approximately equal. The period of each pressing unidirectional movement cycle is set based upon the force applied by the test piston and the rubbing path. The length of the rubbing movement shall be set to that specified in the relevant specification, which shall be between 4 mm and 40 mm. The applied force shall be set to that specified in the relevant specification and shall be between 1 N and 20 N. The test specimen shall be firmly mounted on an adjustable, solid and rigid frame.

5.3 Test piston

The size and the type 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 test piston shall consist of viscoelastic material which shall be chemically inert against the test liquids and shall be characterized by a Shore-A-hardness of 48 ± 5 , measured on the flat side of the viscoelastic material.

Table 1 — Information about size of the test piston

	Size	Dimensions mm			
		A $\pm 0,1$	B $\pm 0,1$	C $\pm 0,1$	D $\pm 0,15$
	1	10	20	1	32
	2	20	20	3	35
	3	30	20	2	32

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 load-displacement charts shall be documented by the manufacturer and provided upon request.

The test piston shall be replaced regularly to obtain the reproducible test results. The normal lifetime of the test piston is no more than one (1) year or 2 000 000 test cycles, whichever occurs first. It could wear out before reaching the maximum lifetime depending on the usage (e.g. test media, forces) which can drastically change this behaviour. Wear signs include divergent hardness, loss of the contour of the contact surface, damages on the surface, and discoloration and gloss change of the viscoelastic test piston material. If one of the latter occurs, the test piston shall be replaced.

5.4 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.

EN ISO 12947-1:1998 + AC:2006, Table 1 gives an example of specifications of the test fabric.

Abrasion side, machine direction and cross direction of the fabric shall be specified. Additionally, they shall be marked. The movement direction of the test piston shall be parallel to the machine direction of the fabric to maintain reproducibility. To ensure this, a guide for the fabric is recommended. The fabric has to be free from folds, wrinkles and creases. Any post processing to remove those artefacts is not permitted.

In case the test piston is covered by the fabric directly, an additional mark on the fabric is recommended before the use.

Annex D gives a recommendation for technical specification of the fabric. 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 250 cycles in order to avoid wear of the fabric. The fabric feed can be realized automatically or manually.

For the "wet test" (see 5.3), at the start of a new test and after a maximum of 250 cycles, the fabric shall be renewed to avoid stray results due to encrustation and wear. The automatically moistening of the fabric shall be repeated parallel to the fabric feed in order to wet the newly used areas of the fabric. The fabric shall be fully wettened, especially on the area of the fabric facing the specimen. The moistening can be achieved by a periodic dripping of the test media on to the fabric (Annex A).

If mentioned in the relevant specification, other test fabrics can be used. In Annex B, other suitable fabrics are listed.

The abrasive dust produced during the test shall not influence the result of the test. Therefore, it shall be removed periodically 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.

5.5 Test media

When a "wet test" is specified in the relevant specification the test media shall be specified.

Specified test media (e.g. particles, fluids and pastes) shall be added by an automatic feed due to a pump from a closed container. The automatic dripping system will moisten the textile at the abrasion point/area directly.

Specified test media may be:

- a) Artificial sweat;
- b) Oil and grease;
- c) Caffeine-containing liquid;
- d) Sun cream;
- e) Other relevant media.