

Australian Standard™

Environmental testing

**Part 2.10: Tests—Test J and guidance:
Mould growth**



This Australian Standard was prepared by Committee EL-026, Protective Enclosures and Environmental Testing for Electrical/Electronic Equipment. It was approved on behalf of the Council of Standards Australia on 14 February 2003 and published on 20 March 2003.

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Australian Chamber of Commerce and Industry
Australian Electrical and Electronic Manufacturers Association
Electrical Compliance Testing Authorities
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Electricity Supply Association of Australia
Testing Interests (Australia)

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Part 2.10: Tests—Test J and guidance: Mould growth

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PREFACE

This Standard was prepared by the Standards Australia Committee EL-026, Protective Enclosures and Environmental Testing for Electrical/Electronic Equipment. It supersedes AS 1099.2.10—1989, *Basic environmental testing procedures for electrotechnology—Tests—Test J—Mould growth*.

The objective of this Standard is to provide the electrotechnology industry with a complete set of environmental test procedures published as a series under AS 60068 *Environmental testing*. This Standard is Part 2.10 of that series.

This Standard is identical with, and has been reproduced, from IEC 60068-2-10:1988, *Environmental testing – Part 2: Tests – Test J and guidance: Mould growth*.

As this Standard is reproduced from an International Standard, the following applies:

- (a) Its number does not appear on each page of text and its identity is shown only on the cover and title page.
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In this Standard, the following print types are used:

- requirements proper: in arial type;
- *test specifications: in italic type;*
- explanatory matter: in smaller arial type.

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STANDARDS AUSTRALIA

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1 General

1.1 This test covers the inoculation of assembled specimens with a selection of mould spores followed by a period of incubation under conditions which promote spore germination and the growth of mould.

Two variations of the test are given. Variant 1 specifies direct inoculation of the specimen with the mould spores whereas variant 2 specifies the preconditioning of the test specimen with nutrients which support mould growth.

1.2 When assembled, specimens must operate where they will be exposed to airborne mould spores, and where climatic conditions will be conducive to the growth of moulds; this test procedure may be used to assess the extent to which mould will grow and/or the operational deterioration which may be expected from this source.

1.3 It is advisable to use established mycological testing procedures to assess the vulnerability to damage by mould contamination of the constructional materials used, and to use only materials which are immune from serious attack.

1.4 Assembled specimens which do not have to operate under conditions of exposure to mould spores may have to be stored or transported where a temporary exposure is experienced, and in these cases also the test procedure will be found useful.

1.5 Surface contamination in the form of dusts, splashes, condensed volatile nutrients or grease may be deposited upon assembled specimens. This can be brought about by storage and use or transport with the assembled specimens exposed to the atmosphere or handled without protective covering. This surface contamination can cause an increased colonization by fungi and may lead to greater growth and damage. An assessment of the effect of such contamination can be given by the application of test variant 2.

1.6 Where assembled specimens will be protected from such exposure, even though operating in a region where mould spores are abundant, ability to withstand the severe procedure of this test is not necessary.

1.7 Due to the difficulty of maintaining the necessary conditions in a very large chamber, a large composite equipment will normally be tested as a number of sub-units. This will in any case minimize the cost of the test since several sub-units may be so similar in construction that only one of them need be tested.

2 Health hazards to operators

2.1 This test procedure requires the use of viable mould spores and the provision of ambient conditions which promote mould growth.

2.2 Therefore before any attempt is made to handle mould cultures, or to carry out steps of the test subsequently described, it is important that the annexes of this standard be studied.

Reference: Annex A – Danger to personnel.

Annex B – Inoculation methods.

Annex C – Recommended safety precautions.

Annex D – Decontamination procedures.

3 Scope

To investigate unforeseen causes of deterioration in assembled specimens, whether or not constructed from mould-resistant materials by the application of test variant 1 and/or test variant 2 using the required severity given in the relevant specification.

- a) Test variant 1: by assessing the extent of mould growth after 28 days' incubation and any physical damage caused thereby, and if required by the relevant specification, by checking the effect on functioning of the specimen after incubation extended to a total of 84 days.
- b) Test variant 2: by assessing the extent of mould growth after 28 days' incubation following quasi-contamination with nutrients and any physical damage caused thereby, and by checking the effect on the functioning of the specimen.

The relevant specification shall state the required test variant and severity.

4 Reagents and materials

4.1 Cultures or spores – Supply and condition

4.1.1 The following cultures shall be used for performing the test. The nature of the attack to be expected from each culture is indicated for guidance, but all spores are used together, whatever the nature of the specimen.

The research centre supplying these cultures or spores for test purposes shall certify that they are as specified.

4.1.2 Cultures from a recognized mycological research centre shall be supplied in suitable containers with the date of seeding thereon.

4.1.3 Cultures and freeze-dried spores shall be handled and stored in accordance with the recommendations of the supplier. These recommendations shall require the date of seeding to be marked on the containers of cultures prepared by the user from freeze-dried spores.

No.	Name	Strain	Typical culture (for guidance only)	Nature
1	<i>Aspergillus niger</i>	V. Tieghem	ATCC, 6275	Grows profusely on many materials and is resistant to copper salts
2	<i>Aspergillus terreus</i>	Thom.	PQMD, 82j	Attacks plastic materials
3	<i>Aureobasidium pullulans</i>	(De Barry) Arnaud	ATCC, 9348	Attacks paints and lacquers
4	<i>Poecilomyces variotii</i>	Bainier	IAM, 5001	Attacks plastics and leather
5	<i>Penicillium funiculosum</i>	Thom.	IAM, 7013	Attacks many materials especially textiles
6	<i>Penicillium ochrochloron</i>	Biourge	ATCC, 9112	Resistant to copper salts and attacks plastics and textiles
7	<i>Scopulariopsis brevicaulis</i>	(Sacc.) Bain Var. <i>Glabra</i> Thom.	IAM, 5146	Attacks rubber
8	<i>Trichoderma viride</i>	Pers. Ex. Fr.	IAM, 5061	Attacks cellulose textiles and plastics

4.1.4 The cultures shall be used for preparing the test suspension when they have been exposed to room temperature for a period of not less than 14 days and not more than 28 days from the date of seeding marked on the container.

4.1.5 If the cultures are not for immediate use, they shall be stored in a refrigerator at a temperature between 5 °C and 10 °C, for a continuous period of not more than six weeks commencing not earlier than 14 days and not later than 28 days from the date of seeding given on the container.

4.1.6 The closures shall not be removed until the mould suspension is about to be made, and only one suspension shall be made from the opened container. A fresh container shall be used for each batch of suspensions made.

NOTE – See annex C for recommended safe method of carrying out the subsequent test procedures.

4.2 Preparation of mould suspensions

4.2.1 The suspension shall first be prepared in distilled water, to which has been added 0,05% of a wetting agent. An agent based on N-methyl taurine or on dioctyl sodium sulphosuccinate has been found to be suitable. The wetting agent shall not contain substances which support or inhibit mould growth.

4.2.2 Ten millilitres of the water containing the wetting agent is added gently to each culture. A platinum or nichrome wire is sterilized by heating to red heat in a flame and allowed to cool. This wire is then used to scrape gently the surface of the culture to liberate spores. The liquid is slightly agitated to disperse the spores without detaching mycelial fragments, and the suspension is then gently decanted into a flask in which all separate suspensions are collected.

4.2.3 The flask is then shaken vigorously to mix the eight spore extracts thoroughly and break up any clumps of spores. The suspension shall be left to stand for at least 30 min and then filtered to remove mycelial fragments, lumps of agar and clumps of spores: good quality, fast flow, cellulose filter papers have been found suitable.

4.2.4 Centrifuge the filtered spore suspension and discard the supernatant liquid. Resuspend the residue in 50 ml of distilled water and centrifuge again. Wash the spores in this manner three times. Dilute the final washed residue in accordance with the following requirements.

4.2.4.1 Test variant 1: Dilute the final residue in 100 ml of distilled water.

4.2.4.2 Test variant 2: When the specimens are to be preconditioned as in clause 8 prior to inoculation by spraying, the final residue shall be diluted in 100 ml of distilled water.

When specimens are to be inoculated by painting or dipping, the suspension may be prepared by using the nutritive solution given in 4.3.2 in place of distilled water.

If a nutritive solution spore suspension is used for inoculation, the preconditioning procedure given in clause 8 is omitted.

4.2.5 The suspension may be diluted with distilled water or nutritive solution, as relevant, to a maximum volume of 500 ml. It shall be used on the day of preparation.

4.3 Control strips

4.3.1 The control strips called for in the test shall consist of strips of pure white filter paper or unproofed cotton textile.

4.3.2 The nutritive solution called for in preparing the control strips shall consist of a solution of the following reagents in distilled water and shall be used on the day of preparation. The quantities are amounts per litre of water.

– Potassium dihydrogen orthophosphate (KH_2PO_4).....	0,7 g
– Potassium monohydrogen orthophosphate (K_2HPO_4).....	0,3 g
– Magnesium sulphate ($\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$).....	0,5 g
– Sodium nitrate (NaNO_3).....	2,0 g
– Potassium chloride (KCl).....	0,5 g
– Ferrous sulphate ($\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$).....	0,01 g
– Sucrose (saccharose).....	30,00 g

4.3.3 The strips shall be placed in a small dish and covered with the nutritive solution. The strips shall be removed from this solution and allowed to drain free of drips immediately before use.

4.3.4 The strips shall be freshly prepared on the day on which they will be used for the test.

5 Description of test apparatus

5.1 For small specimens

5.1.1 Containers of glass or plastics, with close-fitting lids, provided with means for mounting specimens, shall be used.

The container shall be of such size and shape as to expose a sufficient surface area of free water in the base at all times, in order to maintain a value of relative humidity within it greater than 90 %.

The means of mounting shall be such as to ensure that specimens are not allowed to touch or be splashed by the water.

5.1.2 The chamber used for incubating the small specimens in their containers shall maintain a uniform temperature throughout the working space within the range 28 °C to 30 °C.

Any periodic cycling of temperature due to action of the thermostat shall not exceed 1 °C/h.