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STANDARDS ASSOCIATION OF AUSTRALIA

Australian Standard
for
**BASIC ENVIRONMENTAL TESTING PROCEDURES FOR
ELECTROTECHNOLOGY**

Part 2—TESTS

TEST Z/AM: COMBINED COLD/LOW AIR PRESSURE TESTS

This test shall be read in conjunction with AS 1099.1, General; AS 1099.2A, Test A: Cold; and AS 1099.2M, Test M: Low Air Pressure.

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FOREWORD

The purpose of this standard test is to provide a composite test procedure for the application of combined cold, with sudden (AS 1099.2Aa) or gradual (AS 1099.2Ab or AS 1099.2Ad) change of temperature; and low air pressure tests for both heat-dissipating and non-heat-dissipating specimens.

The object of the test is to determine the ability of components or equipment or other articles to be stored and used under a simultaneously applied combination of low temperature and low air pressure.

This combined test should normally be used only if the effects of combined environments will *not* be revealed by subjecting the specimen to single environments. The procedures given are limited to the case of specimens which achieve temperature stability during the test procedure.

Where heat-dissipating specimens are concerned this procedure is limited to the testing of one specimen at a time.

The test procedure applies to air pressure down to about 10 mb. At air pressures below 10 mb, phenomena not taken into account in the design of this test procedure become important, e.g. the relationship between altitude, pressure and temperature has not been indicated. Such data should be obtained from other sources.

The guidance given in the introduction to AS 1099.2A, for the application of tests for non-heat-dissipating specimens versus tests for heat-dissipating specimens applies.

NOTE: Non-heat-dissipating specimens are defined as in Clause 3.3 of AS 1099.1. The measurement of hottest spot temperatures should not be made at low pressure.

Heat-dissipating specimens should preferably be tested without forced air circulation as for AS 1099.2A.

Reference may be necessary to the following standards:

AS 1099	Basic Environmental Testing Procedures for Electrotechnology
	1099.1: Part 1—General
	1099.2: Part 2—Tests. Test A: Cold
	1099.2: Part 2—Tests. Test M: Low air pressure
	1099.3: Part 3—Background Information. Section 1: Tests A and B: Cold and dry heat tests
	1099.3: Part 3—Background Information. Section 2: Combined temperature/low air pressure tests

TEST

1 SCOPE AND OBJECT. This standard method sets out a test procedure, the object of which is to provide a standard test to determine the suitability of components, equipments or materials for use and/or storage under a combination of low temperature and low air pressure.

2 GENERAL DESCRIPTION. This test is a combination of Test Ab or Ad: Cold, and Test M: Low air pressure.

The specimen shall be subject to the appropriate severity of cold as indicated in the relevant specification. In the case of operational tests, a check shall then be made to ensure that the specimen is capable of operation. With the temperature maintained at the indicated value, the chamber air pressure shall then be reduced to the appropriate severity as specified in the relevant specification. These conditions shall be maintained for the specified duration. Test profiles illustrating the procedure are shown in Figs 1A and 1B.

3 DESCRIPTION OF TEST APPARATUS.

3.1 Test Chamber. The chamber shall be capable of maintaining the conditions specified for both Test Ab (for non-heat-dissipating specimen) or Test Ad (for heat-dissipating specimen) and for Test M. The requirement for the chamber wall temperature does not apply during periods of temperature or pressure change.

Care shall be taken to avoid air contamination by ancillary equipment and devices and by the air introduced when pressure is restored to the normal.

3.2 Mounting. For the testing of a heat-dissipating specimen, the mounting of the test specimen shall comply with the requirements of Clause 3.3.2 of Test Ad.

4 SEVERITIES.

4.1 General. The severities, as indicated by temperature, air pressure and duration of exposure, shall be specified in the relevant specification.

The temperature and low air pressure values, tolerances and durations shall comply with those given in Tests Ab or Ad and M.

NOTE: It is appreciated that at air pressures below 100 mb, the tolerances given in Test A might be difficult to attain. Wider tolerances may in this case be prescribed by the relevant specification.

The duration of exposure shall be measured from the time when temperature stability of the specimen has been reached under conditions of low air pressure (see Figs 1A and 1B).

4.2 Preferred Combinations of Temperature, Air Pressure and Duration.

Temperature °C	Air pressure		Duration h
	kPa	mb	
— 55	4	40	2
— 55	15	150	2
— 55	25	250	2
— 25	53.3	533	2, 16
— 40	55	550	2, 16
— 40	70	700	2, 16

5 PRECONDITIONING. The relevant specification may call for preconditioning.

6 INITIAL MEASUREMENTS. The specimen shall be visually inspected and electrically and mechanically checked as required by the relevant specification. The results shall be recorded.

7 CONDITIONING.

7.1 General.

7.1.1 Heat-dissipating specimens. Heat-dissipating specimens shall preferably be tested without forced air circulation in the chamber according to Test Ad. When the chamber used for testing is large enough to meet the conditions specified for Test Ad, but cooling of the chamber can only be carried out by forced air circulation, Method I of Test Ad may be applied.

7.1.2 Non-heat-dissipating specimens. Non-heat-dissipating specimens may be tested in a chamber with or without forced air circulation.

7.2 Procedure for Heat-dissipating Specimen without Artificial Cooling of the Specimen and for Non-heat-dissipating Specimen.

7.2.1 Change of temperature.

- The chamber shall be at the temperature of the laboratory. The specimen, at the ambient temperature of the laboratory, shall be introduced into the chamber in the unpacked, switched off, 'ready for use' state, in its normal position or as otherwise specified.
- The temperature within the chamber shall be adjusted to the temperature appropriate to the severity. The specimen shall be allowed to reach temperature stability.

The rate of change of temperature within the chamber shall not exceed 1°C min (see Note), averaged over a period of not more than 5 min.

The test (ambient) temperature shall be measured as in Clause 3.6.2 of AS 1099.1.

NOTE: This maximum rate of change of temperature does not apply to specimens capable of withstanding thermal shock, e.g. specimens normally subjected to Test Aa and capable of withstanding Test Na or Nc. For these specimens chambers suitable for Test Aa may be used.

(c) For operational tests only:

The specimen shall be switched on and checked to ascertain whether it is capable of functioning in accordance with the relevant specification.

The specimen shall then be switched off and allowed to reach temperature stability.

The relevant specification may require another procedure for checking at low temperature and normal air pressure.

7.2.2 Change in pressure.

- The pressure within the chamber shall then be reduced to the value appropriate to the severity. The rate of change of pressure shall not exceed 100 mb/min.