STANDARDS ASSOCIATION OF AUSTRALIA

Australian Standard

METHODS OF TEST FOR METALLIC AND RELATED COATINGS

PART 4 — PHYSICAL TESTS

AS 2331.4.1—1981
QUALITATIVE ADHESION TESTS

FOREWORD

Methods described in this standard for checking the adhesion of electrolytically and chemically deposited coatings are limited to tests of a qualitative nature.

Standards writers seeking guidance on differences between tests are recommended to examine Table 1 for the test(s) most appropriate to their particular requirements.

Methods which give quantitative values for adhesion of a coating to a substrate have not been included because such tests require special apparatus and considerable skill in their performance which renders them somewhat unsuitable for general quality control purposes.

TABLE 1
ADHESION TESTS APPLICABLE TO DIFFERENT TYPES OF COATING

Type of adhesion test	Coating metal									
	Cadmium	Copper	Gold	Hard chromium	Nickel	Nickel + chromium	Silver	Tin	Tin-nickel alloy	Zinc
Burnish	X	X	X		X	X	X	X	X	X
Peel (adhesive method)	X	X	X		X		X	X	X	X
Peel (soldering method)		X			X		X		X	
Bend		X		X	X	X			X	
Thermal shock		X		X	X	X		X	X	
File		X			X	X			X	
Grind and saw				X	X	X			X	
Chisel				X	X	X	X		X	
Scribe and grid	X	X	X		X	X	X	X		X

SECTION 1. SCOPE AND GENERAL

1.1 SCOPE. This standard sets out methods for the qualitative assessment of the adhesion of electro-deposited and chemically deposited coatings.

NOTE: The methods are used for quality control purposes but do not include acceptance/rejection criteria. This falls within the province of the product standard or is the subject of agreement between the purchaser and the supplier.

1.2 APPLICATION. The tests described are suitable for assessing the likelihood of metallic coatings separating from the substrate by blistering or by peeling, or in the case of multilayer coatings, delamination between coatings.

1.3 PRINCIPLE. Coated items are stressed by a process such as bending, burnishing, cutting or by thermal shock. Coatings with poor adhesion to the substrate will blister and peel. Poor adhesion between coatings in multilayer coatings will lead to delamination.

1.4 PREPARATION OF TEST PIECES. There are no specific requirements for the preparation of test pieces except that they shall be of sufficient size to allow the specified test to be carried out. Test pieces may constitute the item under test or a section cut from the item under test. Sections of items shall be taken in such a manner that the area to be tested is not affected.

SECTION 2. TEST METHODS

2.1 BURNISH TEST.

2.1.1 Application. This test is limited to the testing of coatings up to 25 μm thick.

2.1.2 Apparatus. The following apparatus is required:

Burnishing tool — a steel rod 6 mm in diameter, with a smooth hemispherical end.

2.1.3 Test Procedure. The burnish test shall be carried out as follows:

(a) Rub an area of not more than 600 mm^2 with the burnishing tool for a period of about 15 s.

(b) Examine the surface for the appearance of any blisters, peeling or delamination.

NOTES:

1. Poor adhesion is indicated by the appearance of a blister which grows as rubbing is continued.
2. If the mechanical properties of a coating are poor, blisters may crack and the coating will peel away from the basis metal.

2.2 PEEL TESTS.

2.2.1 Adhesive Tape Test.

2.2.1.1 *Application.* This test is particularly suitable for testing the adhesion of coatings on printed circuit board conductors and contacts and coatings on plastics substrates.

2.2.1.2 *Apparatus and testing media.* The following apparatus and testing media are required:

(a) Cellulose acetate adhesive tape complying with AS 1621* with an adhesion value of approximately 8 N/25 mm width.

(b) A roller having a mass of 1 kg.

2.2.1.3 *Test procedure.* The adhesive tape test shall be carried out as follows:

(a) Clean the test piece by any suitable means and ensure that the test area is dry.

(b) Apply the adhesive side of the tape to the test area and draw the roller over the tape to remove all air bubbles and to ensure good contact. Unless otherwise specified in the product standard or purchase order, the test area shall be not less than 30 mm^2.

(c) After an interval of 10 s, remove the tape by applying a steady force at one end. The force shall be perpendicular to the coated surface.

(d) Examine the coating for evidence of detachment from the basis metal.

2.2.2 Solder Test.

2.2.2.1 *Application.* This test is suitable for the testing of coatings less than 125 μm thick which are intended to withstand an assembly soldering process.

NOTE: Heat associated with a soldering process is more apt to reduce the adhesion of thin coatings than thick coatings.

2.2.2.2 *Apparatus and testing media.* The following apparatus and testing media are required:

(a) A test strip of tinplate steel or brass, 75 mm long × 10 mm wide × 0.5 mm thick.

(b) 60/40 rosin-cored solder conforming to AS 1834† Type 2.

NOTE: Another solder may be specified in the product standard or purchase order.

(c) Soldering iron with facilities to control the tip to a temperature of 340 ±10°C.

2.2.2.3 *Test procedure.* The solder test shall be carried out as follows:

(a) Bend 10 mm of one end of the test strip to a position normal to the remainder of the strip.

(b) Solder the short limb flat onto the test piece using the rosin-cored solder and the heated soldering iron.

As soon as soldering has taken place, remove the soldering iron and allow to cool.

(c) Apply a force along the axis of the long limb of the test strip and normal to the surface of the test piece.

(d) Visually examine for separation of the coating from the substrate.

NOTE: Failure within the joint or within the coating itself, unless delamination occurs in multilayer coatings, is not a cause for rejection.

* AS 1621, Pressure Sensitive Adhesive Electrical Tapes

† AS 1834, Tin-lead and Other Tin-based Solder Alloys