Australian Standard®

Methods of test for metallic and related coatings

Method 4.2: Physical tests—Ductility test

1 SCOPE. This Standard sets out a simple bend test method for determining the ductility of electroplated coatings. This method allows the maximum percentage elongation of the coating to be determined.

NOTE: The test is particularly useful in determining the ductility of nickel deposits.

2 PRINCIPLE. A test piece of coated strip is bent through 180 degrees around a mandrel of specified diameter with the coating in tension. The convex surface is then examined for evidence of cracking.

3 DEFINITION. For the purpose of this Standard, the definition below applies:

3.1 Ductility—the ability of an electroplated coating to undergo plastic or elastic deformation under specified test conditions without fracture or cracking.

4 NOTATION. The quantity symbols used in this Standard are listed below.

D = diameter of mandrel
E = percentage elongation
F = force
d = thickness of test piece (thickness of basis metal plus coating thickness).

5 APPARATUS. The required apparatus consists of a supported mandrel to allow bending of the test piece through angles up to 180 degrees (see Figure 1 and Figure 2).

The test apparatus shall be of such construction that test pieces can be adequately controlled during the performance of the test and shall be of adequate design to ensure reproducibility of results.

6 PREPARATION OF TEST PIECES. Test pieces 150 mm long, 10 mm wide and 1 ±0.1 mm thick, shall be made using the following procedure:

(a) Select a sheet of metal of similar composition to that of the items being plated, and of sufficient length and width to allow for subsequent trimming. Polish one face.

NOTE: In the case of zinc diecast metal, use soft 60/40 or 70/30 brass or a metal of similar ductility.

(b) Stop-off or mask the unpolished side of the metal sheet.

(c) Electroplate the polished side using plating solutions and conditions identical with those specified for the plated items.

(d) Cut each test piece from the plated strip by means of a sharp guillotine, ensuring that a minimum of 25 mm has been trimmed off the entire perimeter.

(e) Chamfer or carefully round the long edges of the test piece.

7 TEST PROCEDURE. The procedure shall be as follows:

(a) Clamp one end of the test piece in the test apparatus so that the coated side is in tension during the test. The mandrel diameter shall be as specified in the product Standard.

(b) Apply steady pressure and bend the test piece through 180 degrees.

The force may be applied manually or by blows from a soft mallet or by use of a roller bending device. Where a roller bending device is used, the distance from the point of contact of the roller to the mandrel shall not exceed $2d$ where d is the thickness of the test piece (see Figure 2).

(c) Remove the test piece and examine the external bent portion for cracks, or as required by the product Standard.

NOTE: Small cracks at the edges of test pieces and cracks which require magnification to be visible may be disregarded unless the product Standard indicates otherwise.