STANDARDS ASSOCIATION OF AUSTRALIA

Australian Standard

METHODS OF TEST FOR METALLIC AND RELATED COATINGS

PART 1—LOCAL THICKNESS TESTS

AS 2331.1.4—1982
MAGNETIC INDUCTION AND EDDY CURRENT METHODS

PREFACE

This edition of this standard was prepared by the Association's Committee on Metal Finishing to supersede AS 2331.1.4—1980.

Whereas the 1980 edition was limited to non-conductive coatings on non-magnetic substrates, this edition includes additional methods for the measurement of non-magnetic and organic coatings on magnetic substrates, and metallic and non-metallic coatings on substrates of differing conductivity.

1 SCOPE. This standard sets out three methods for the non-destructive measurement of the local thickness of metallic and non-metallic coatings under the following conditions:

(a) Non-magnetic and organic coatings on magnetic substrates—magnetic induction (low frequency) method.

(b) Non-conductive coatings on non-magnetic substrates—eddy current (high frequency) method.

(c) Metallic and non-metallic coatings on substrates which differ appreciably in conductivity—eddy current (high frequency) method.

2 APPLICATION. The methods may be applied to the appropriate types of coatings and substrates referred to in Clause 1, where the coating thickness is not less than 2 μm, and the surface contour permits calibration of the appropriate instruments (see also Appendix A).

The magnetic induction (low frequency) method is suitable for the measurement of gold, silver, tin, cadmium, zinc, copper, chromium, lead and organic coatings such as paints and plastics on magnetic substrates.

The eddy current (high frequency) method is frequency applied to the measurement of anodic coatings and organic coatings on aluminium. Additionally, with suitable instruments using appropriate frequencies, it is possible to measure the thickness of various metallic coatings on either magnetic or non-magnetic substrates; e.g.tin-lead on copper, silver on nickel/silver, copper on steel, zinc on steel, cadmium on steel, tin on steel, copper on a non-metallic base, and silver on a non-metallic base.

These methods, under the best conditions of use, are accurate to ±0.7/μm, or ±10 percent, whichever is the greater (see also Appendix B, Paragraph B6).

NOTE: The methods are not suitable for the measurement of chemical conversion coatings.

3 PRINCIPLE. An electromagnetic field is generated in the probe system of both magnetic induction and eddy current instruments.

Magnetic induction instruments generate a low frequency alternating current (typically 50 Hz to 60 Hz) in a probe which produces measurable magnetic induction when the probe is placed on a test piece with a magnetic basis metal. The degree of induction is dependent upon the permeability of the basis metal and on the thickness of any non-magnetic coating being measured.

Eddy current instruments generate higher frequencies (typically in the 6000 kHz range) in the probe which produces eddy currents in the test piece when the probe is placed on the test surface.

The amplitude and phase of these currents is a function of the differences in the thickness of the coating and between the relative conductivities of the coating and the basis metal.

4 APPARATUS. An instrument which complies with the appropriate principle outlined in Clause 3 and which can be calibrated for a known thickness or thicknesses of coating (see Appendix A) is required.