AS 4544—2005

Australian Standard™

Non-destructive testing—Eddy current testing for the detection of surface flaws—Ferromagnetic and non-ferromagnetic metallic products

STANDARDS
Australia

This Australian Standard was prepared by Committee MT-007, Non-destructive Testing of Metals and Materials. It was approved on behalf of the Council of Standards Australia on 24 November 2005.
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The following are represented on Committee MT-007:

Australian Railway Association
Australian Aerospace Non-Destructive Testing Committee
Australian Industry Group
Australian Institute for Non-Destructive Testing
Australian Nuclear Science & Technology Organisation
Australian Pipeline Industry Association
Bureau of Steel Manufacturers of Australia
Engineers Australia
Industrial Research Limited
National Association of Testing Authorities Australia
New Zealand Non-Destructive Testing Association
TestSafe Australia
Victorian WorkCover Authority
Welding Technology Institute of Australia

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PREFACE

This Standard was prepared by the Australian members of the Joint Standards Australia/Standard New Zealand Committee MT-007, Non-destructive Testing of Metals and Materials, to supersede AS 4544.1—1991, *Non-destructive testing—Eddy current testing for the detection of surface flaws,* Part 1: *In non-ferromagnetic metallic products*.

After consultation with shareholders in both countries, Standards Australia and Standards New Zealand decided to develop this Standard as an Australian Standard rather than an Australian/New Zealand Standard.

The objective of this revision is to include ferrous materials in the method for detecting surface flaws in both non-ferrous and ferrous metals and alloys.

The terms 'normative' and 'informative' have been used in this Standard to define the application of the appendix to which they apply. A 'normative' appendix is an integral part of a Standard, whereas an 'informative' appendix is only for information and guidance.

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FOREWORD

Eddy current inspection is based on the principles of electromagnetic induction and is used to identify or differentiate between a wide variety of physical, structural and metallurgical conditions in electrically conductive ferromagnetic and non-ferromagnetic metals and metal parts. Eddy current inspection can be used for the following purposes:

(a) To measure or identify such conditions and properties as electrical conductivity, magnetic permeability, heat treatment condition, hardness and physical dimensions.

(b) To detect seams, laps, cracks, voids and inclusions.

(c) To sort dissimilar metals and detect differences in their composition, microstructure and other properties.

(d) To measure the thickness of a non-conductive coating on a conductive metal or the thickness of a non-magnetic metal coating on a magnetic metal.

Because eddy current inspection employs electromagnetic induction, it does not require direct electrical contact with the part being inspected. The method is based on indirect measurement; thus, it is necessary to establish a correlation between the instrument readings and the structural characteristics and serviceability of the parts being inspected.

The inspection coil is an essential part of every eddy current inspection system. Its shape depends to a considerable extent on the purpose of the inspection and on the shape of the part being inspected.

This Standard gives requirements for the inspection of ferromagnetic and non-ferromagnetic materials for surface defects. The eddy current inspection method is most suitable for inspections where the nature of the defect is known so that the inspection system can be optimized for the detection of this defect. The limitation of the eddy current method is that it is not well suited to broad area scanning where various types of defects are sought.

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1 SCOPE

This Standard specifies requirements for eddy current flaw detection of metals and alloys and includes requirements for the preparation of test procedures, calibration standards and calibration procedures. It covers the inspection of flat and curved surfaces, and bolt holes.

This Standard does not include criteria for acceptance or rejection.

NOTE: Advice and recommendations on information to be supplied by the purchaser at the time of enquiry or order are contained in the purchasing guidelines set out in Appendix A.

2 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

AS

1171 Non-destructive testing—Magnetic particle testing of ferromagnetic products, components and structures

1470 Health and safety at work—Principles and practices

1929 Non-destructive testing—Glossary of terms

2062 Non-destructive testing—Penetrant testing of products and components

3669 Non-destructive testing—Qualification and registration of personnel—Aerospace

3998 Non-destructive testing—Qualification and certification of personnel

3 DEFINITIONS

For the purpose of this Standard, the definitions given in AS 1929 and those below apply.

3.1 Absolute probe

A probe containing a coil that responds to all electromagnetic properties of the test part.

3.2 Array probe

A probe of multiple coils which allows a larger area to be covered in a single pass than is possible with absolute or differential probes.

3.3 Coil

One or more turns of a conductor wound to produce a magnetic field when current passes through the conductor.

3.4 Coil impedance

The total opposition to current flow through a coil and which is represented by the ratio of the coil voltage to the coil current. This impedance is affected by the material within the magnetic field generated by the coil and is sometimes used to measure eddy current response.