

Australian Standard™

**Non-destructive testing—
Eddy current testing for the
detection of surface flaws**

**Part 1: In non-ferromagnetic
metallic products**

This Australian Standard was prepared by Committee MT/7, Non-destructive Testing of Metals and Materials. It was approved on behalf of the Council of Standards Australia on 12 February 1999 and published on 5 May 1999.

The following interests are represented on Committee MT/7:

Australasian Railway Association
Australian Aerospace Non-destructive Testing Committee
Australian Industry Group
Australian Institute for Non-destructive Testing
Australian Nuclear Science and Technology Organisation
Australian Pipeline Industry Association
Bureau of Steel Manufacturers of Australia
Electricity Supply Association of Australia
Industrial Research, New Zealand
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PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee MT/7, Non-destructive Testing of Metals and Materials, and is based on a document submitted by the Australian Aerospace Non-destructive Testing Committee (AANDTC).

The aim of the Standard is to specify general requirements for the detection of surface flaws present in components manufactured from non-ferrous metals and alloys. It is applicable to the aerospace industry and other industries where this test method is employed.

This Standard is the first of a series of Standards to be produced on the eddy current testing of metallic products.

A related Australian Standard is AS 2084—1987, *Non-destructive testing—Eddy current testing of metal tubes*.

Currently no international or national Standards have been produced on the subject of eddy current testing for the detection of surface flaws in general components.

This Standard is the result of a consensus among Australian and New Zealand representatives on the Joint Committee to produce it as an Australian Standard.

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 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.

STANDARDS AUSTRALIA

Australian Standard

Non-destructive testing—Eddy current testing for the detection of surface flaws

Part 1: In non-ferromagnetic metallic products

1 SCOPE This Standard specifies requirements for eddy current flaw detection of non-ferromagnetic 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

- 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—General engineering

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

3.3 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.

3.4 Differential probe—an eddy current probe of two or more coils in which an output is generated by the difference in the individual responses of each coil to the test material.

3.5 Eddy currents—currents caused to flow in an electrical conductor by the time or space variation, or both, of an applied magnetic field.

3.6 Edge effect—the effect on the magnetic field caused by the geometric boundaries of the test specimen. The effect is large in magnitude and similar in phase to a large crack. Also called 'end effect'.