

Methods for

Non-destructive testing of pipes and tubes —

**Part 2A: Automatic eddy current testing
of wrought steel tubes**

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- Association of Hydraulic Equipment Manufacturers
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- Confederation of British Industry
- Energy Industries Council
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Foreword

This Part of BS 3889 has been prepared under the direction of the Iron and Steel Standards Committee. It revises and supersedes BS 3889-2A:1965 which is withdrawn.

The purpose of BS 3889 is to establish a number of test methods to cover the various requirements of manufacturers and purchasers. It should not, however, be inferred that for this purpose one method of test is superior to another. Non-destructive testing methods, being complementary to each other, should always be considered in relation to inspection and testing as a whole.

BS 3889-1 describes methods for automatic ultrasonic testing for the detection of imperfections in wrought steel tubes. BS 3889-2B describes methods for eddy current testing of non-ferrous tubes.

This revision of BS 3889-2A takes account of advances made in the understanding and application of automatic eddy current methods of non-destructive testing over the past decade. The automatic testing methods to which this standard is applicable are now widely accepted and utilized by industry. The need for adequate training of personnel engaged in non-destructive testing has been recognized by industry. No specific formal qualifications have been laid down in this standard. However, it is emphasized that the operation of all equipment should be supervised by competent, trained personnel.

Application of automatic eddy current test methods enables tubes to be classified into categories of acceptance appropriate to the application for which the finished tube is required. It is, therefore, necessary to relate the signal indications received from imperfections with those from reference standards that have been established as indicating the required level of acceptance. Details of these reference standards are normally included in the British Standards for tube products.

Guidance on limitations associated with the test methods is also included in Appendix C for information.

This British Standard is being progressively replaced by BS EN 10246, *Non-destructive testing of steel tubes*, Parts of which deal with eddy current testing. When the relevant Parts of BS EN 10246 have been published, BS 3889-2A will be withdrawn.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 8, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 Scope

This Part of BS 3889 describes three methods which are summarized in 3.2 for the automatic eddy current testing of wrought steel tubes.

These methods are intended for the detection of imperfections for acceptance purposes (acceptance levels 1 and 2) or as an alternative to a hydraulic leak tightness test (acceptance level 2) as may be required by the appropriate British Standards for the tube products.

Calibration procedures for the three methods are described in detail and Appendix A and Appendix B give the dimensions of the reference standards for acceptance level 1 and acceptance level 2 that are used where none are given in the appropriate British Standard for the product. In this case it is emphasized that when the test methods described in this Part of BS 3889 are used as an alternative to a hydraulic leak tightness test, the reference standards for acceptance level 2 apply, where these reference standards have been established for the detection of imperfections which may result in the passage of fluids through the tube wall.

NOTE 1 For the purposes of this standard no difference in meaning is intended between “pipe” and “tube”; idiomatic use prefers sometimes the one and sometimes the other.

NOTE 2 The titles of the publications referred to in this standard are listed on the inside back cover.

2 Definitions

For the purposes of this Part of BS 3889 the definitions given in BS 3683-5 apply, together with the following.

2.1

concentric test coil

a test coil that surrounds the tube under test or, conversely, is itself surrounded by the tube

2.2

pancake or segmental test coil

a test coil applied to the surface of the tube under test that may or may not conform to the geometry of the tube

2.3

trigger/alarm level

the level at which the electronic equipment is required to differentiate between acceptable and suspect tubes

2.4

trigger/alarm condition

the condition where the electronic equipment has indicated that a particular tube is suspect

2.5

rate filter

electronic circuitry usually contained within the electronic equipment, whereby frequency selection of the signals from the eddy current test coil can be achieved to produce optimum signal conditions from tube imperfections and minimize the effect of extraneous signals

2.6

electronic calibration

a method of checking equipment sensitivity whereby an electrical signal is induced into the electronic equipment to produce an equivalent response to that which is obtained from the specified reference standard(s)

2.7

test piece

a conveniently sized sample of steel of similar electromagnetic properties as the tube to be tested and in which the reference standards are located

2.8

reference standard

an artificially produced imperfection of predetermined dimensions, usually a notch or a hole, used for the sole purpose of establishing the test sensitivity of the eddy current equipment

2.9

suspect area

that part of the tube length producing a trigger alarm condition

3 Principle and summary of test methods

3.1 Principle

In each of the methods described, the test coil assembly or the tubes to be tested are translated, or translated and rotated, relative to each other. Signals induced in the test coil assembly, from tube imperfections, are fed to electronic equipment where they are evaluated and classified.

A test piece containing a reference standard(s) is used to calibrate the equipment to establish the test sensitivity (trigger/alarm level) and to execute routine calibration checks and recalibration during tube testing.

Tubes are classified into acceptable or suspect categories dependent on whether or not they produce a trigger/alarm condition. The results of the test are assessed and actions to be taken on tubes designated as suspect are given.