

BS EN ISO 9934-1:2016



BSI Standards Publication

Non-destructive testing — Magnetic particle testing

Part 1: General principles
(ISO 9934-1:2016)



National foreword

This British Standard is the UK implementation of EN ISO 9934-1:2016. It supersedes BS EN ISO 9934-1:2015 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee WEE/46, Non-destructive testing.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Published by BSI Standards Limited 2016

ISBN 978 0 580 93987 7

ICS 19.100

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This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 December 2016.

Amendments/corrigenda issued since publication

Date	Text affected
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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN ISO 9934-1

December 2016

ICS 19.100

Supersedes EN ISO 9934-1:2015

English Version

Non-destructive testing - Magnetic particle testing - Part 1: General principles (ISO 9934-1:2016)

Essais non destructifs - Magnétoscopie - Partie 1:
Principes généraux du contrôle (ISO 9934-1:2016)

Zerstörungsfreie Prüfung - Magnetpulverprüfung - Teil
1: Allgemeine Grundlagen (ISO 9934-1:2016)

This European Standard was approved by CEN on 21 October 2016.

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European foreword

This document (EN ISO 9934-1:2016) has been prepared by Technical Committee ISO/TC 135 "Non-destructive testing" in collaboration with Technical Committee CEN/TC 138 "Non-destructive testing" the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by June 2017, and conflicting national standards shall be withdrawn at the latest by June 2017.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN ISO 9934-1:2015.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Endorsement notice

The text of ISO 9934-1:2016 has been approved by CEN as EN ISO 9934-1:2016 without any modification.

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

The committee responsible for this document is ISO/TC 135, *Non-destructive testing*, Subcommittee SC 2, *Surface methods*.

This third edition cancels and replaces the second edition (ISO 9934-1:2015), of which it constitutes a minor revision, with the modification for clarity of Clause 13 and other editorial improvements.

A list of all parts in the ISO 9934 series, published under the general title *Non-destructive testing — Magnetic particle testing*, can be found on the ISO website.

Non-destructive testing — Magnetic particle testing —

Part 1: General principles

1 Scope

This document specifies general principles for the magnetic particle testing of ferromagnetic materials. Magnetic particle testing is primarily applicable to the detection of surface-breaking discontinuities, particularly cracks. It can also detect discontinuities just below the surface but its sensitivity diminishes rapidly with depth.

This document specifies the surface preparation of the part to be tested, magnetization techniques, requirements and application of the detection media, and the recording and interpretation of results. Acceptance criteria are not defined. Additional requirements for the magnetic particle testing of particular items are defined in product standards (see the relevant International Standards or European standards).

This document does not apply to the residual magnetization method.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 3059, *Non-destructive testing — Penetrant testing and magnetic particle testing — Viewing conditions*

ISO 9934-2, *Non-destructive testing — Magnetic particle testing — Part 2: Detection media*

ISO 9934-3, *Non-destructive testing — Magnetic particle testing — Part 3: Equipment*

ISO 12707, *Non-destructive testing — Magnetic particle testing — Vocabulary*

EN 1330-1, *Non-destructive testing — Terminology — Part 1: General terms*

EN 1330-2, *Non-destructive testing — Terminology — Part 2: Terms common to non-destructive testing methods*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 12707, EN 1330-1 and EN 1330-2 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

4 Qualification and certification of personnel

It is assumed that magnetic particle testing is performed by qualified and capable personnel. In order to provide this qualification, it is recommended to certify the personnel in accordance with ISO 9712 or equivalent.

5 Safety and environment

International, regional, national and/or local regulations which include health, safety and environment may exist and may need to be taken into account.

Magnetic particle testing often creates high magnetic fields close to the object under test and the magnetizing equipment. Items sensitive to these fields should be excluded from such areas.

6 Testing procedure

When required at the time of enquiry and order, magnetic particle testing shall be performed in accordance with a written procedure.

The procedure can take the form of a brief technique sheet, containing a reference to this and other appropriate standards. The procedure should specify testing parameters in sufficient detail for the test to be repeatable.

All testing shall be performed in accordance with an approved written procedure or the relevant product standard shall be referenced

7 Surface preparation

Areas to be tested shall be free from dirt, scale, loose rust, weld spatter, grease, oil, and any other foreign materials that can affect the test sensitivity.

The surface quality requirements are dependent upon the size and orientation of the discontinuity to be detected. The surface shall be prepared so that relevant indications can be clearly distinguished from false indications.

Non-ferromagnetic coatings up to approximately 50 μm thickness, such as unbroken adherent paint layers, do not normally impair detection sensitivity. Thicker coatings reduce sensitivity. Under these conditions, the sensitivity shall be verified.

There shall be a sufficient visual contrast between the indications and the test surface. For the non-fluorescent technique, it might be necessary to apply a uniform, thin, temporarily adherent layer of approved contrast aid paint.

8 Magnetization

8.1 General requirements

The minimum magnetic flux density (B) regarded as adequate for testing is 1 T. The applied magnetic field (H) required to achieve this in low-alloy and low-carbon steels is determined by the relative permeability of the material. This varies according to the material, the temperatures, and also with the applied magnetic field and for these reasons, it is not possible to provide a definitive requirement for the applied magnetic field. However, typically a tangential field of approximately 2 kA/m will be required.

Where time varying currents (I) are used to produce a magnetic field (which will also be time varying), it is important to control the crest factor (shape) of the waveform and the method of measurement of the current in order to establish a repeatable technique. Both peak and RMS measurements are