



# SLOVENSKI STANDARD SIST EN ISO 9934-2:2004

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**Neporušitveno preskušanje – Preskušanje z magnetnimi delci – 2. del: Sredstva za preiskave (ISO 9934-2:2002)**

Non-destructive testing - Magnetic particle testing - Part 2: Detection media (ISO 9934-2:2002)

Zerstörungsfreie Prüfung - Magnetpulverprüfung - Teil 2: Prüfmittel (ISO 9934-2:2002)

Essais non destructifs - Magnétoscopie - Partie 2: Produits magnétoscopiques (ISO 9934-2:2002)

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Ta slovenski standard je istoveten z: **EN ISO 9934-2:2002**

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EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

**EN ISO 9934-2**

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**Non-destructive testing - Magnetic particle testing - Part 2:  
Detection media (ISO 9934-2:2002)**

Essais non destructifs - Magnétoscopie - Partie 2: Produits  
magnétoscopiques (ISO 9934-2:2002)

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Prüfmittel (ISO 9934-2:2002)

This European Standard was approved by CEN on 14 July 2002.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Management Centre has the same status as the official versions.

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## Foreword

This document EN ISO 9934-2:2002 has been prepared by Technical Committee CEN/TC 138 "Non-destructive testing", the secretariat of which is held by AFNOR, in collaboration with Technical Committee ISO/TC 135 "Non-destructive testing".

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of an identical text or by endorsement, at the latest by June 2003, and conflicting national standards shall be withdrawn at the latest by June 2003.

Annexes A, B and C are normative

This standard consists of the following parts:

EN ISO 9934-1, *Non-destructive testing - Magnetic particle testing - Part 1: General principle (ISO 9934-1:2001)*.

EN ISO 9934-2, *Non-destructive testing - Magnetic particle testing - Part 2: Detection media (ISO 9934-2:2002)*.

EN ISO 9934-3, *Non-destructive testing - Magnetic particle testing - Part 3: Equipment (ISO 9934-3:2002)*.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

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**EN ISO 9934-2:2002 (E)****1 Scope**

This European Standard specifies the significant properties of magnetic particle testing products (including magnetic ink, powder, carrier liquid, contrast aid paints) and the methods for checking their properties.

**2 Normative references**

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 1330-1, *Non destructive testing - Terminology - Part 1: List of general terms.*

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

EN 10083-1, *Quenched and tempered steels - Part 1: Technical delivery conditions for special steels.*

EN 10204, *Metallic products - Types of inspection documents.*

EN 12157, *Rotodynamic pumps - Coolant pumps units for machine tools - Nominal flow rate, dimensions.*

EN ISO 2160, *Petroleum products - Corrosiveness to copper - Copper strip test (ISO 2160:1998).*

EN ISO 3059, *Non-destructive testing - Penetrant testing and magnetic particle testing - Viewing conditions (ISO 3059:2001).*

EN ISO 3104, *Petroleum products - Transparent and opaque liquids - Determination of kinematic viscosity and calculation of dynamic viscosity (ISO 3104:1994).*

EN ISO 9934-1, *Non-destructive testing - Magnetic particle testing - Part 1: General principle (ISO 9934-1:2001).*

EN ISO 9934-3, *Non-destructive testing - Magnetic particle testing - Part 3: Equipment (ISO 9934-3:2002).*

prEN ISO 12707, *Non-destructive testing - Terminology - Terms used in magnetic particle testing (ISO/DIS 12707:2000).*

ISO 2591-1, *Test sieving - Part 1: Methods using test sieves of woven wire cloth and perforated metal plate.*

ISO 4316, *Surface active agents - Determination of pH of aqueous solutions - Potentiometric method.*

**3 Terms and definitions**

For the purposes of this European Standard, the terms and definitions given in EN 1330-1, EN 1330-2 and prEN ISO 12707 together with the following apply.

**3.1 batch**

quantity of material produced during one manufacturing operation having uniform properties throughout and with a unique identifying number or mark

## 4 Safety precautions

The materials used in magnetic particle inspection and those used in their testing include chemicals that can be harmful, flammable and/or volatile. All necessary precautions should be observed. All relevant regulations, including national and local regulations pertaining to health and safety, anti-pollution requirements etc., shall be observed.

## 5 Classification

### 5.1 General

The magnetic particle materials covered by this specification shall be classified as follows.

### 5.2 Magnetic inks

Magnetic inks shall consist of finely divided coloured or fluorescent magnetic particles in a suitable carrier liquid. They shall form a uniform suspension when agitated.

Magnetic inks may be produced from products supplied as concentrates, including paste and powders, or ready for use.

### 5.3 Powders

Powders for the dry technique shall consist of finely divided coloured and/or fluorescent magnetic particles.

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## 6 Testing and test certificate

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### 6.1 Type testing and batch testing

Type testing and batch testing of magnetic particle materials shall be carried out in accordance with the requirements of EN ISO 9934-1, EN ISO 9934-2, and EN ISO 9934-3.

Type testing is carried out in order to demonstrate suitability of a product for the intended use. Batch testing is carried out in order to demonstrate conformity of the characteristics of a batch to the product type specified.

The supplier shall provide a test certificate showing compliance with this standard having used the methods detailed. This certificate shall include results obtained and tolerances allowed.

If any changes are made to the detection media, then a new type test shall be performed.

### 6.2 In service testing

In service testing is carried out to demonstrate the continued performance of the detection media.

## 7 Requirements and test methods

### 7.1 Performance

#### 7.1.1 Type testing and batch testing

Type testing and batch testing shall be carried out according to annex A using the reference blocks types 1 or 2 as described in annex B.

**EN ISO 9934-2:2002 (E)****7.1.2 In service testing**

In service testing shall be carried out according to annex A using one of the reference blocks types 1 or 2 as described in annex B or a test block which exhibit similar discontinuities to those normally found in components typically processed in the equipment.

**7.1.3 Contrast aid paints**

Type testing and batch testing shall be carried out according to 7.1.1 after having applied the paint in accordance with the manufacturer instructions and using a type test approved, compatible magnetic ink.

**7.2 Colour**

The colour of magnetic particles detection media under working conditions shall be stated by the supplier.

The colour of the batch test sample shall not differ from the colour of the type test sample when visually compared.

**7.3 Particle size****7.3.1 Method**

The method for determination of particle size is dependent on the range of the particle size distribution.

NOTE For magnetic inks the particle-size-distribution can be determined by the Coulter Method or an equivalent method (see Bibliography).

**7.3.2 Definition of the particle size**

The range of particle size shall be as follows: [SIST EN ISO 9934-2:2004](https://standards.iteh.ai/catalog/standards/sist/5ddd670b-bad6-425d-86a6-)  
<https://standards.iteh.ai/catalog/standards/sist/5ddd670b-bad6-425d-86a6->

-lower diameter  $d_l$ : no more than 10 % of the particles shall be smaller than  $d_l$ ;

-average diameter  $d_a$ : 50 % of the particles shall be larger and 50 % smaller than  $d_a$ ;

-upper diameter  $d_u$ : no more than 10 % of the particles shall be larger than  $d_u$ .

**7.3.3 Requirements**

$d_l$ ,  $d_a$  and  $d_u$  shall be reported. For magnetic inks sizes shall lie in the range  $d_l \geq 1,5 \mu\text{m}$  and  $d_u \leq 40 \mu\text{m}$ .

NOTE For powders  $d_l$  is generally  $\geq 40 \mu\text{m}$ .

**7.4 Temperature resistance**

There shall be no degradation of the product after 5 minutes heating at the maximum temperature specified by the supplier. This shall be verified by repeating the performance test as specified in 7.1.1.

**7.5 Fluorescent coefficient and fluorescent stability**

To carry out these tests it is necessary to use dry powder. For magnetic inks the magnetic particle solid content shall be used.

**7.5.1 Type testing****7.5.1.1 Method**

The fluorescent coefficient  $\beta$  in cd/W is defined as follows:



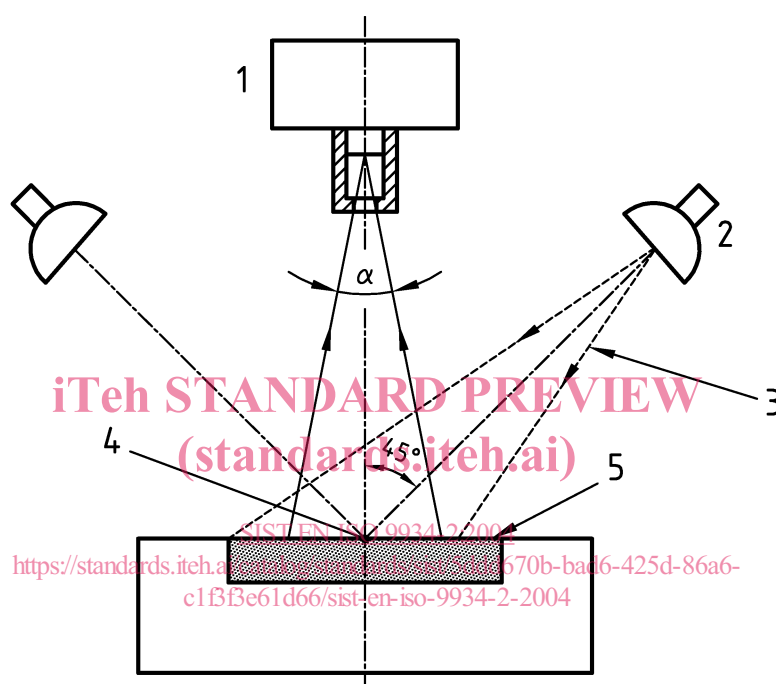
$$\beta = L/E_e$$

where  $L$  = luminance in  $\text{cd/m}^2$  of a plane powder surface;

$E_e$  = level of UV-irradiance in  $\text{W/m}^2$  at the surface of the powder.

The arrangement of the apparatus used is shown in Figure 1.

The powder surface shall be evenly irradiated with UV(A) at an angle of  $45^\circ (\pm 5^\circ)$ . Luminance shall be measured with a suitable meter with an accuracy of  $\pm 10\%$ . It shall measure the luminance from the powder surface and be unaffected by areas outside of the target area. The level of irradiance shall be measured with a meter conforming to EN ISO 3059 with its UV sensor replacing the powder surface.



### Key

- 1 Measurement of luminance
- 2 Lamp
- 3 UV radiation
- 4 Measurement point of the irradiance
- 5 Powder surface

**Figure 1 - Determination of the fluorescent coefficient  $\beta$  for magnetic particles**

NOTE A recommended arrangement is using a luminance meter with a  $200 \text{ cd/m}^2$  range and a viewing angle ( $\alpha$ ) of  $20^\circ$  placed  $80 \text{ mm}$  above the plane powder surface, diameter  $40 \text{ mm}$ . UV (A) lamps are placed so as to give an even irradiance at the powder surface, with  $E_e$  between  $10 \text{ W/m}^2$  and  $15 \text{ W/m}^2$ .

### 7.5.1.2 Requirements

The fluorescent coefficient ( $\beta$ ) shall be greater than  $1,5 \text{ cd/W}$ .

### 7.5.1.3 Fluorescence stability

The sample shall first be tested according to the method described in 7.5.1.1.

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The sample shall then be exposed and re-tested as described in 7.5.1.1 after 30 minutes of exposure to UV-A irradiance of 20 W/m<sup>2</sup> (minimum). The fluorescent coefficient shall not decrease more than 5 %.

**7.5.2 Batch testing**

Batch testing shall be carried out according to 7.5.1.1. The fluorescent coefficient shall be within 10 % of the type test value.

**7.6 Fluorescence of carrier liquid**

The fluorescence of the carrier liquid shall be checked by visually comparing with quinine sulphate solution when irradiated with UV-A of at least 10 W/m<sup>2</sup>.

The concentration of the quinine sulphate solution shall be  $7 \times 10^{-9}$  M (5,5 ppm) in 0,1 N H<sub>2</sub>SO<sub>4</sub>.

The carrier liquid under test shall exhibit no more fluorescence than the quinine sulphate solution.

**7.7 Flash point**

For magnetic inks, other than water based, the flash point (open cup method) of the carrier fluid shall be reported.

**7.8 Corrosion induced by detection media****7.8.1 Corrosion testing on steel**

The corrosive effect on steel shall be tested and reported according to annex C.

**7.8.2 Corrosion testing of copper**

The corrosive effect on copper shall be tested according to EN ISO 2160.

**7.9 Viscosity of the carrier liquid**

The viscosity shall be tested according to EN ISO 3104.

The dynamic viscosity shall not be higher than 5 mPa·s at 20 °C (± 2 °C)

**7.10 Mechanical stability****7.10.1 Long term test (endurance test)**

The manufacturer shall show that the detection media is unaffected by use in a typical magnetic particle testing bench over a period of 120 h.

This may be proven in a magnetic particle testing bench or by using an arrangement to simulate this; a recommended arrangement is as follows:

a 40 l sample of the detection media shall be contained in a corrosion resistant reservoir fitted with a centrifugal pump. The detection media shall be recirculated and the flow interrupted by a valve.

Technical data:

Type of the sump pump      EN 12157 - T 160-270-1

Diameter of the return flow    RI 1" NB pipe

Cycle time

- valve opened 5 s
- valve closed 5 s

The detection media shall be checked with a reference block (see 7.1.1) before use and after 120 h.

Any discernible change in the quality of indications shall be cause for rejection.

## 7.10.2 Short term test

### 7.10.2.1 Equipment

A stirring arrangement similar to Figure 2 shall be used.

- 1) Speed of stirring blade:  $(3\ 000 \begin{smallmatrix} 0 \\ -300 \end{smallmatrix})$  rpm.
- 2) Stirring cup: Capacity 2 l.
- 3) Reference blocks type 1 and type 2 as detailed in annex B.
- 4) UV-A source to give irradiance of 10 W/m<sup>2</sup>, to the requirement of EN ISO 3059.

### 7.10.2.2 Procedure

Stir a 1 l sample for 2 h. Compare the indications on reference block N° 1 and N° 2 produced by the stirred probe and the reference probe.

### 7.10.2.3 Requirements

Any discernible change in the quality of indications shall be cause for rejection.

## 7.11 Foaming

Foaming shall be checked during mechanical stability test to 7.10.1 or 7.10.2. Significant foaming shall be cause for rejection.

## 7.12 pH

The pH of aqueous carrier liquids shall be determined according to ISO 4316. The value shall be reported.

## 7.13 Storage stability

The expiry date shall be given by the producer and shall be marked on each original container.

## 7.14 Solids content

The recommended magnetic particle content in g/l of magnetic inks shall be given by the supplier.

## 7.15 Sulphur and halogen content

For products designated low in sulphur and halogens, the sulphur and halogen content shall be determined by a suitable method which is accurate to  $\pm 10$  ppm at 200 ppm of sulphur/halogens.

- Sulphur content shall be less than 200 ppm ( $\pm 10$ );
- Halogens content shall be less than 200 ppm ( $\pm 10$ ), (halogens shall be taken as chlorine + fluorine).