



**SLOVENSKI STANDARD**  
**oSIST prEN ISO 17638:2015**  
**01-junij-2015**

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**Neporušitvene preiskave zvarnih spojev - Preiskave z magnetnimi delci (ISO/DIS 17638:2015)**

Non-destructive testing of welds - Magnetic particle testing (ISO/DIS 17638:2015)

Zerstörungsfreie Prüfung von Schweißverbindungen - Magnetspulverprüfung (ISO/DIS 17638:2015)

Contrôle non destructif des assemblages soudés - Contrôle par magnétoscopie (ISO/DIS 17638:2015)

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| 25.160.40 | Varjeni spoji in vari | Welded joints |
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# DRAFT INTERNATIONAL STANDARD

## ISO/DIS 17638

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Secretariat: **AFNOR**Voting begins on:  
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## Non-destructive testing of welds — Magnetic particle testing

*Contrôle non destructif des assemblages soudés — Contrôle par magnétoscopie*

ICS: 25.160.40

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### ISO/CEN PARALLEL PROCESSING

This draft has been developed within the International Organization for Standardization (ISO), and processed under the **ISO lead** mode of collaboration as defined in the Vienna Agreement.

This draft is hereby submitted to the ISO member bodies and to the CEN member bodies for a parallel five month enquiry.

Should this draft be accepted, a final draft, established on the basis of comments received, will be submitted to a parallel two-month approval vote in ISO and formal vote in CEN.

To expedite distribution, this document is circulated as received from the committee secretariat. ISO Central Secretariat work of editing and text composition will be undertaken at publication stage.



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## ISO/DIS 17638:2015(E)

## 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](http://www.iso.org/directives)).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

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 WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword - Supplementary information](#)

ISO 17638 was prepared by Technical Committee ISO/TC 44, *Welding and allied processes*, Subcommittee SC 5, *Testing and inspection of welds*.

This second edition cancels and replaces the first edition (ISO 17638:2003), of which have been technically revised.

# Non-destructive testing of welds — Magnetic particle testing

## 1 Scope

This International Standard specifies techniques for detection of surface imperfections in welds in ferromagnetic materials, including the heat affected zones, by means of magnetic particle testing. The techniques are suitable for most welding processes and joint configurations. Variations in the basic techniques that will provide a higher or lower test sensitivity, are described in [Annex A](#).

This International Standard does not specify acceptance levels of the indications. Further information on acceptance levels for indications may be found in EN 23278 or in product or application standards.

## 2 Normative references

The following referenced documents are indispensable for the application 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 9934-1, *Non-destructive testing — Magnetic particle testing — Part 1: General principle*

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 17635, *Non-destructive testing of welds — General rules for metallic materials*

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## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 17635 apply.

## 4 Safety precautions

International, national and local safety and environmental protection regulations shall be observed at all times.

Special consideration shall be given to toxic, inflammable and/or volatile materials, electrical safety and unfiltered UV radiation.

## 5 General

### 5.1 Information required prior to testing

Prior to testing, the following items shall be specified (where applicable):

- a) specific test procedure;
- b) certification requirements for NDT personnel;
- c) extent of coverage;
- d) state of manufacture;

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- e) testing techniques to be used;
- f) overall performance test;
- g) any demagnetization;
- h) acceptance level;
- i) action necessary for unacceptable indications.

**5.2 Additional pre-test information**

Prior to testing, the following additional information can also be required:

- a) type and designation of the parent and weld materials;
- b) welding process;
- c) location and extent of welds to be tested;
- d) joint preparation and dimensions;
- e) location and extent of any repairs;
- f) post-weld treatment (if any);
- g) surface conditions.

Operators may ask for further information that could be helpful in determining the nature of any indications detected.

**5.3 Personnel qualification**

Magnetic particle testing of welds and the evaluation of results for final acceptance shall be performed by qualified and capable personnel. It is recommended that personnel be qualified in accordance with ISO 9712 or an equivalent standard at an appropriate level in the relevant industry sector.

**5.4 Surface conditions and preparation**

Areas to be tested shall be dry unless appropriate products for wet surfaces are used. It may be necessary to improve the surface condition, e.g., by use of abrasive paper or local grinding to permit accurate interpretation of indications.

Any cleaning or surface preparation shall not be detrimental to the material, the surface finish or the magnetic testing media. Detection media shall be used within the temperature range limitations set by the manufacturer.

**5.5 Magnetizing****5.5.1 Magnetizing equipment**

Unless otherwise specified, e.g., in an application standard, the following types of alternating current-magnetizing equipment shall be used:

- a) electromagnetic yokes;
- b) current flow equipment with prods;
- c) adjacent or threading conductors or coil techniques.

The use of direct current-magnetization or permanent magnets shall be specified prior to testing.

The magnetizing equipment shall conform to ISO 9934-3.

Where prods are used, precautions shall be taken to minimize overheating, burning or arcing at the contact tips. Removal of arc burns shall be carried out where necessary. The affected area shall be tested by a suitable method to ensure the integrity of the surface.

### 5.5.2 Verification of magnetization

A tangential magnetic field strength of 2 kA/m to 6 kA/m (r.m.s.) is recommended.

Verification of the magnetic field strength shall be carried out using one of the following methods:

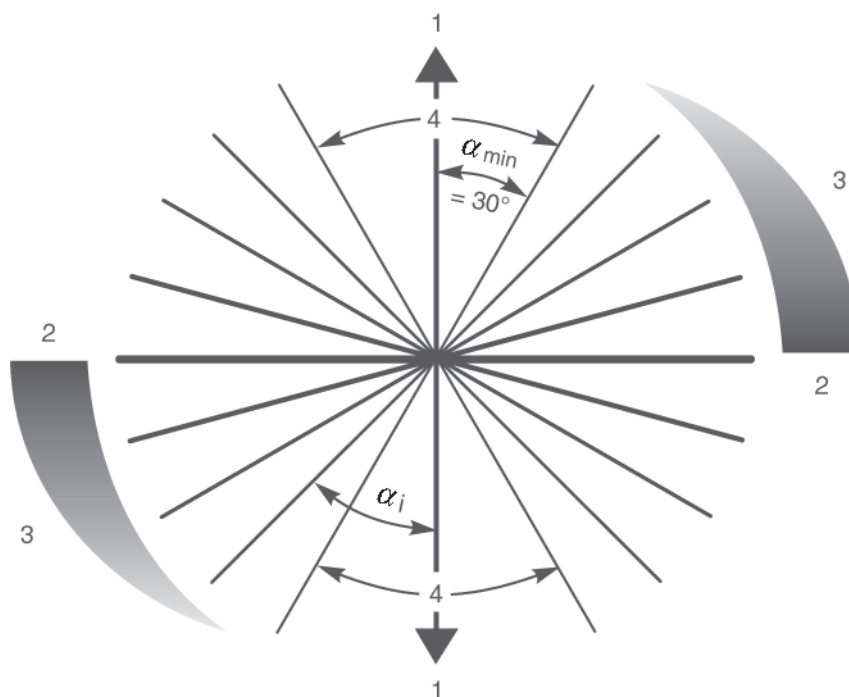
- a) a component containing fine, natural or artificial imperfections in the least favourable locations;
- b) measurement of the tangential field strength as close as possible to the surface using a Hall effect probe. The appropriate tangential field strength can be difficult to measure close to abrupt changes in the shape of a component, or where flux leaves the surface of a component;
- c) calculation of the approximate current value in order to achieve the recommended tangential field strength; the calculation can be based on the current values specified in [Figures 5](#) and [6](#);
- d) other methods based on established principles.

NOTE Flux indicators, placed in contact with the surface being tested, can provide a guide to the magnitude and direction of the tangential field, but should not be used to verify that the field strength is acceptable.

## 5.6 Application techniques

### 5.6.1 Field directions and testing area

The detectability of an imperfection depends on the angle of its major axis with respect to the direction of the magnetic field. This is explained for one direction of magnetization in [Figure 1](#).

**Key**

- |   |                          |                |                                                                                |
|---|--------------------------|----------------|--------------------------------------------------------------------------------|
| 1 | magnetic field direction | $\alpha$       | is the angle between the magnetic field and the direction of the imperfection. |
| 2 | optimum sensitivity      | $\alpha_{min}$ | is the minimum angle for imperfection detection.                               |
| 3 | reducing sensitivity     | $\alpha_i$     | is an example of imperfection orientation.                                     |
| 4 | insufficient sensitivity |                |                                                                                |

**Figure 1 — Directions of detectable imperfections**

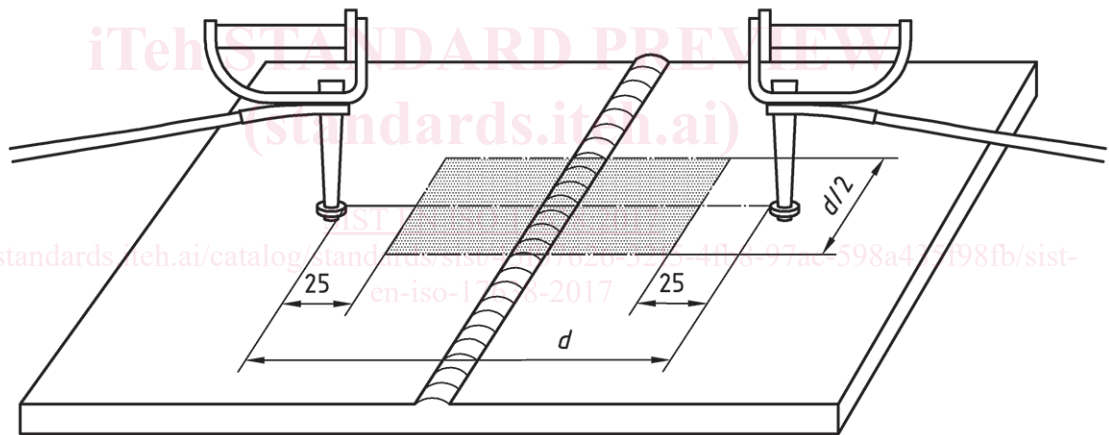
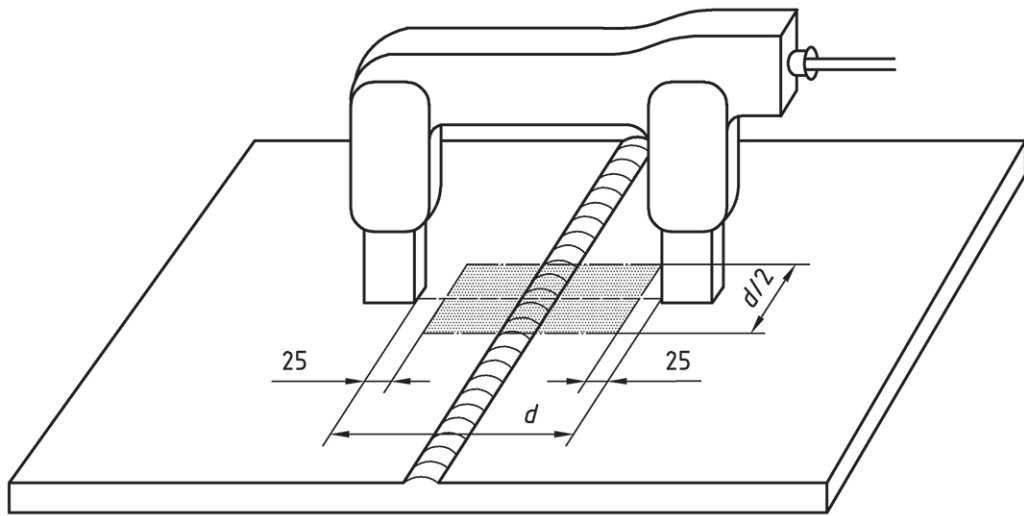
To ensure detection of imperfections in all orientations, the welds shall be magnetized in two directions approximately perpendicular to each other with a maximum deviation of 30°. This can be achieved using one or more magnetization methods.

Testing in only one field direction is not recommended but may be carried out if specified, e.g., in an application standard.

When using yokes or prods, there will be an area of the component in the vicinity of each pole piece or tip that will be impossible to test due to excessive magnetic field strength. This is usually seen as furring of particles.

Care shall be taken to ensure adequate overlap of the testing areas as shown in [Figures 2 and 3](#).

Dimensions in millimetres



$d$  is the yoke/prod separation

**Figure 2 — Examples of effective testing area (shaded) for magnetizing with yokes and prods**