



SLOVENSKI STANDARD
SIST EN 10228-1:2000

01-april-2000

Neporušitveno preskušanje jeklenih izkovkov - 1. del: Preiskave z magnetnimi prahovi

Non-destructive testing of steel forgings - Part 1: Magnetic particle inspection

Zerstörungsfreie Prüfung von Schmiedestücken aus Stahl - Teil 1: Magnetpulverprüfung

Essais non destructifs des pièces forgées - Partie 1: Contrôle par magnétoscopie

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Ta slovenski standard je istoveten z: EN 10228-1:1999

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ICS:

77.040.20	Neporušitveno preskušanje kovin	Non-destructive testing of metals
77.140.85	Železni in jekleni kovani izdelki	Iron and steel forgings

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en

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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 10228-1

March 1999

ICS 77.040.20; 77.140.85

English version

Non-destructive testing of steel forgings - Part 1 : Magnetic particle inspection

Essais non destructifs des pièces forgées - Partie 1 :
Contrôle par magnétoscopie

Zerstörungsfreie Prüfung von Schmiedestücken aus Stahl -
Teil 1 : Magnetpulverprüfung

This European Standard was approved by CEN on 1 March 1999.

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 Central Secretariat 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 Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPAISCHES KOMITEE FÜR NORMUNG

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Foreword

This European Standard has been prepared by Technical Committee ECISS/TC 28 "Steel forgings", the secretariat of which is held by BSI.

This European Standard replaces EN 10228-1:1999.

The titles of the other Parts of this European Standard are :

Part 2 : Penetrant testing

Part 3 : Ultrasonic testing of ferritic or martensitic steel forgings

Part 4 : Ultrasonic testing of austenitic and austenitic-ferritic stainless steel forgings

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 September 1999, and conflicting national standards shall be withdrawn at the latest by September 1999.

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association. This European Standard is considered to be a supporting standard to those application and product standards which in themselves support an essential safety requirement of a New Approach Directive and which make reference to this European Standard.

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, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This Part of EN 10228 describes the method and acceptance criteria to be used for the magnetic particle inspection of forgings manufactured from ferromagnetic materials. The method described is used for the detection of surface discontinuities. It can also detect discontinuities just below the surface but sensitivity to such discontinuities diminishes rapidly with depth.

2 Normative references

This Part of EN 10228 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 Part of EN 10228 only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 473	Qualification and certification of NDT personnel - General principles
prEN ISO 9934-1	Non destructive testing - Magnetic particle testing - Part 1: General principle (ISO/DIS 9934-1:1996)
prEN ISO 9934-2	Non destructive testing - Magnetic particle testing - Part 2: Characterization of products (ISO/WD 9934-2)
prEN ISO 9934-3	Non destructive testing - Magnetic particle testing - Part 3: Equipment (ISO/DIS 9934-3:1998)

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3 Items for agreement

The following aspects concerning magnetic particle inspection shall be agreed between the purchaser and the supplier at the time of enquiry and order:

- a) the manufacturing stages(s) at which magnetic particle inspection is to be performed (see clause 8);
- b) the surface areas to be examined (see clause 9);
- c) the quality class required, or the quality classes and the surface areas to which they apply (see clauses 9.10 and 15);
- d) whether the inspection shall be performed with non-fluorescent inks or fluorescent inks or powders (see 7.2);
- e) whether a particular current waveform is required (see 11.2);
- f) the applicable recording and acceptance criteria if different from those detailed in table 2.
- g) whether demagnetization is to be carried out after the inspection, together with the maximum level of residual magnetism (see clause 17);
- h) whether the inspection is to be conducted in the presence of the purchaser or his representative;
- i) whether the written procedure shall be submitted for approval by the purchaser (see clause 5).

4 Written procedure

4.1 General

Magnetic particle inspection shall be performed in accordance with a written procedure. Where specified in the enquiry or order, the written procedure shall be submitted to the purchaser for approval prior to the examination.

4.2 Description

This written procedure shall be one of the following:

- a) a product specification;
- b) a procedure written specifically for the application;
- c) this Part of EN 10228 may be used if it is accompanied by examination details specific to the application.

4.3 Content

The procedure shall contain the following details as a minimum requirement:

- a) description of the forgings to be inspected;
- b) reference documents: **(standards.iteh.ai)**
- c) qualification and certification of inspection personnel;
- d) stage of manufacture at which the inspection is carried out;
- e) surface areas specified in terms of the applicable quality classes;
- f) magnetizing techniques;
- g) description of inspection equipment;
- h) calibration and checking of equipment;
- i) waveform and flux density and/or tangential field strength required for each technique used;
- j) detection media, and contrast paint if used;
- k) surface condition;
- l) viewing conditions;
- m) method of marking or recording indications;
- n) whether demagnetization is required: if so the method to be used and required maximum level of residual magnetism;
- o) acceptance criteria;
- p) examination report.

5 Personnel qualification

Personnel shall be qualified and certificated in accordance with EN 473.

6 Testing system

6.1 Magnetizing equipment

If the contact current flow (prods) magnetization method is used on a finished machined surface, then the prod contact points shall be checked after magnetization for damage, using an alternative magnetization technique, penetrant testing or visual examination.

All equipment shall be calibrated and checked in accordance with prEN ISO 9934-3.

One or more of the following types of magnetizing equipment shall be used:

- a) alternating current electromagnetic yokes (see annex A);
- b) current flow equipment with prods (see annex A);
- c) permanent magnets;
- d) magnetic flow equipment with flexible cable or coil;
- e) central conductor;
- f) magnetic induction
- g) equipment enabling multiple magnetizing techniques, either coincidentally or in sequence

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6.2 Detection media

Detection media shall conform to the requirements detailed in prEN ISO 9934-2.

6.3 Function checks

A function check shall be carried out prior to the inspection to ensure the proper functioning of the inspection system. The check shall be performed as detailed in prEN ISO 9934-1

NOTE: the temperature of the forging should be checked to ensure that it is within the detection media manufacturer's specified temperature limits.

7 Stage of manufacture

Where practicable, final acceptance inspection shall be performed on the forging in its delivery condition (see clause 4).

8 Surface condition

8.1 General

Surfaces to be examined shall be clean and free from scale, oil, grease, machining marks, heavy paint and any other foreign matter that could adversely affect inspection sensitivity or the interpretation of indications.

Cleaning and preparation of the surfaces shall not be detrimental to the material, the surface finish or the detection media.

8.2 Surface condition related to quality class

The finish of surfaces to be examined shall conform to the requirements detailed in table 1 for the applicable quality class.

Table 1 — Surface condition

Surface finish	Quality classes ¹⁾			
	1	2	3	4
$6,3 \mu\text{m} < R_a \leq 12,5 \mu\text{m}$	X	X	-	-
$R_a \leq 6,3 \mu\text{m}$	X	X	X ²⁾	X ³⁾
¹⁾ X signifies the quality class that can be achieved for the specified surface finish. ²⁾ Quality class not applicable to the examination of surfaces with a machining allowance greater than 3 mm per face. ³⁾ Quality class not applicable to the examination of surfaces with a machining allowance greater than 1 mm per face. R_a = arithmetical mean deviation of the profile.				

8.3 As-forged surface condition

It is difficult to carry out a comprehensive examination on a forged surface. The surface to be inspected shall be prepared by shot-blasting, sand-blasting or surface grinding so that defects can be clearly distinguished from indications resulting from surface irregularities.

For general applications quality classes 1 and 2 shall be applicable. For closed die forgings quality class 3 shall be the minimum requirement.

9 Coverage

Where practical inspection shall be performed such that 100 % coverage of the surface under examination is achieved.

Viewing of the area under examination shall be completed before proceeding to the next area or the next stage of magnetization.