



SLOVENSKI STANDARD

SIST EN 10228-1:2016

01-september-2016

Nadomešča:
SIST EN 10228-1:2000

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 en acier - Partie 1 : Contrôle par magnétoscopie

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Ta slovenski standard je istoveten z: EN 10228-1:2016

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,fr,de

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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 10228-1

June 2016

ICS 77.040.20; 77.140.85

Supersedes EN 10228-1:1999

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 3 October 2015.

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 CEN-CENELEC 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 CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of 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 United Kingdom.

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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

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European foreword

This document (EN 10228-1:2016) has been prepared by Technical Committee ECISS/TC 111 “Steel castings and forgings”, 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 December 2016 and conflicting national standards shall be withdrawn at the latest by December 2016.

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 10228-1:1999.

Annex B provides the significant technical changes to the previous version EN 10228-1:1999.

EN 10228 consists of the following parts under the general title *Non-destructive testing of steel forgings*:

- *Part 1: Magnetic particle inspection;*
- *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.*

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.

EN 10228-1:2016 (E)**1 Scope**

This European Standard describes techniques and acceptance criteria to be used for the magnetic particle testing 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 the sensitivity to such discontinuities decreases rapidly with depth.

NOTE A steel forging is considered to be ferromagnetic if the magnetic flux density is greater than 1 T for a tangential magnetic field strength of 2,4 kA/m.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

EN ISO 9712, *Non-destructive testing — Qualification and certification of NDT personnel (ISO 9712)*

EN ISO 9934-1, *Non-destructive testing — Magnetic particle testing — Part 1: General principles (ISO 9934-1)*

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

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

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 shall be performed (see Clause 7);
- b) the surface areas to be examined (see Clause 8);
- c) the quality class required, or the quality classes and the surface areas to which they apply (see 8.2 and Clause 14);
- d) whether the testing shall be performed with the specified detection media (see 6.2);
- e) whether a particular current waveform is required (see 10.2);
- f) the applicable recording and acceptance criteria if different from those detailed in Table 2.
- g) whether demagnetization shall be carried out after testing, together with the maximum level of residual magnetism (see Clause 16);
- h) whether testing shall be conducted in the presence of the purchaser or his representative;

- i) whether a written procedure shall be submitted for approval by the purchaser (see Clause 4).

4 Test procedure

4.1 General

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

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 testing details specific to the application.

4.3 Content

The procedure shall contain the following details as minimum requirements:

- a) description of the forgings to be tested;
- b) reference documents;
- c) qualification of testing personnel;
- d) stage of manufacture at which the test is carried out;
- e) surface areas specified in terms of the applicable quality classes;
- f) magnetizing technique(s);
- g) description of the testing 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 required;
- 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;

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p) testing report.

5 Personnel qualification

Personnel shall be qualified in accordance with EN ISO 9712.

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 EN 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 EN ISO 9934-2.

6.3 Function checks

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

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

7 Stage of manufacture

Where practicable, final acceptance testing shall be performed on the forging in its delivery condition (see Clause 3).

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 contaminant that could adversely affect the testing 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 tested shall conform to the requirements detailed in Table 1 for the applicable quality class.

Table 1 — Surface condition

Surface roughness parameter R_a *), in μm	Quality classes ^a			
	1	2	3	4
$6,3 < R_a \leq 12,5$	X	X	-	-
$R_a \leq 6,3$	X	X	X ^b	X ^c
<p>^a X signifies the quality class that can be achieved for the specified surface finish.</p> <p>^b Quality class not applicable to the testing of surfaces with a machining allowance greater than 3 mm per face.</p> <p>^c Quality class not applicable to the testing of surfaces with a machining allowance greater than 1 mm per face.</p> <p>*) R_a = arithmetical mean deviation of the profile.</p>				

8.3 As-forged surface condition

It is difficult to carry out a comprehensive test on a forged surface. The surface to be tested 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.

9 Coverage

Where practicable, the test shall be performed in such a way that 100 % coverage of the surface to be tested is achieved.

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

10 Magnetization

10.1 Direction of magnetization

Magnetization shall be performed in accordance with the requirements detailed in EN ISO 9934-1.