SLOVENSKI STANDARD
SIST-TP CEN/TR 16638:2014

01-julij-2014

Neporušitvene preiskave - Pregled s penetranti in magnetnimi delci z uporabo modre svetlobe

Non-destructive testing - Penetrant and magnetic particle testing using blue light

Zerstörungsfreie Prüfung - Eindring- und Magnetpulverprüfung unter Anwendung von blauem Licht

Essais non destructifs - Essais par ressuage et essais par magnétoscopie à la lumière bleue

Ta slovenski standard je istoveten z: **CEN/TR 16638:2014**

ICS:

19.100	Neporušitveno preskušanje	Non-destructive testing

SIST-TP CEN/TR 16638:2014 **en,fr,de**

TECHNICAL REPORT

RAPPORT TECHNIQUE

TECHNISCHER BERICHT

CEN/TR 16638

February 2014

ICS 19.100

English Version

Non-destructive testing - Penetrant and magnetic particle testing using blue light

Essais non destructifs - Essais par ressuage et essais par magnétoscopie à la lumière bleue

Zerstörungsfreie Prüfung - Eindring- und Magnetpulverprüfung unter Anwendung von blauem Licht

This Technical Report was approved by CEN on 9 December 2013. It has been drawn up by the Technical Committee CEN/TC 138.

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.

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

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

Ref. No. CEN/TR 16638:2014 E

Contents

Page

Foreword

This document (CEN/TR 16638:2014) has been prepared by Technical Committee CEN/TC 138 “Non-destructive testing”, the secretariat of which is held by AFNOR.

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.

1 Scope

This Technical Report specifies the requirements for penetrant and magnetic particle testing, the materials and viewing conditions when using fluorescent detection media excited by actinic blue light.

It is not intended that this “sub-method” technique is used as a substitute for the existing colour contrast and fluorescent techniques standardised in the EN ISO 3452 series and EN ISO 9934 series.

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 1330-7:2005, *Non-destructive testing - Terminology - Part 7: Terms used in magnetic particle testing*

CEN/TR 14748, *Non-destructive testing - Methodology for qualification of non-destructive tests*

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

EN ISO 3452-1:2013, *Non-destructive testing - Penetrant testing - Part 1: General principles (ISO 3452-1:2013)*

EN ISO 3452-2:2013, *Non-destructive testing - Penetrant testing - Part 2: Testing of penetrant materials (ISO 3452-2:2013)*

EN ISO 3452-4, *Non-destructive testing - Penetrant testing - Part 4: Equipment (ISO 3452-4)*

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)*

EN ISO 12706:2009, *Non-destructive testing - Penetrant testing - Vocabulary (ISO 12706:2009)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 12706:2009, EN 1330-7:2005 and the following apply.

3.1
actinic blue light
monochromatic blue light in a specific range which excites fluorescent penetrants and fluorescent magnetic particles used for the purpose of non-destructive testing

4 Safety precautions

Actinic blue light has the potential to rapidly cause injury to the retina. Precautions shall therefore be taken to avoid direct vision of sources and reflections.

All relevant international, regional, national and local regulations including health and safety shall be taken into account.

5 General principles

5.1 General

This sub-method of non-destructive testing comprises the use of fluorescent detection media with actinic blue light for the purpose of detecting material imperfections. It is recommended that qualification of this sub-method is carried out in accordance with CEN/TR 14748.

The actinic blue light sub-method may be suitable under specific conditions for example penetrant testing on materials that fluoresce under UV-A irradiation or for detection of defects where some ambient light is present.

Implementation of the actinic blue light sub-method for magnetic particle testing may be particularly suitable where the combination of detection media, viewing conditions and test method have been shown to provide good contrast and defect visibility.

The fluorescent response of detection media for the actinic blue light sub-method shall not be assumed to be the same as for conventional UV techniques.

To ensure adequate contrast and to eliminate actinic blue light reaching the inspectors eyes inspection shall be carried out using suitable yellow or amber filters. For general inspection this is usually in the form of contrast glasses.

WARNING — It has been shown that fluorescent detection media not developed for the actinic blue light sub-method can show different behaviour in terms of sensitivity. Therefore sensitivity levels as determined using UV shall not be used and there will be a need to demonstrate, that the sensitivity for this sub-method is appropriate to the application.

An advice is given in 5.2.3 and 5.2.4 for penetrant testing as well as in 5.3.3 for magnetic particle testing regarding tests to compare the flaw detecting capability with other methods or techniques using components containing natural defects, with known defect standards. Tests shall be qualified by an appropriate method, for example according to CEN/TR 14748.

It shall also be demonstrated that for the application the actinic blue light does not damage the detecting media or the fluorescent stability.

Tests shall be documented.

5.2 Penetrant testing: description of the sub-method

5.2.1 General requirements

Penetrant testing within this sub-method is basically carried out as described in EN ISO 3452-1 but using detection media specifically qualified for the application and actinic blue light for producing indications under the viewing conditions defined herein. It is important to carry out techniques, and implement any referenced standards, only to the extent covered by the qualification previously carried out.

5.2.2 Process sequence

The sequence of operations is generally as illustrated in EN ISO 3452-1:2013, Annex A. However, only penetrants qualified to this Technical Report shall be used.

Testing proceeds through the following stages:

a) preparation and precleaning: see EN ISO 3452-1:2013, 8.2;

b) application of penetrant: see EN ISO 3452-1:2013, 8.4;

c) excess penetrant removal and drying: see EN ISO 3452-1:2013, 8.5 except:

   1) use blue light of a minimum of 3 W/m^2 with no more than 150 lx ambient light at the surface of the part, when the blue source is off; blue fluorescent tubes or domestic architectural LEDs luminaries are convenient;

   2) for the purpose of penetrant removal the blue light shall have a peak emission from 440 nm to 450 nm and a full width at half maximum (FWHM) of not more than 50 nm;

d) application of developer: see EN ISO 3452-1:2013, 8.6;

e) inspection: see EN ISO 3452-1:2013, 8.7 except 8.7.1 and

   1) light sources shall be in accordance with 6.3;

   2) viewing equipment shall be in accordance with 6.4;

   3) viewing conditions shall be in accordance with 8.1;

   4) for recording, if a camera is used, a filter similar to that described in 6.4.1 is needed;

f) postcleaning and protection: see EN ISO 3452-1:2013, 8.8;

g) retesting: see EN ISO 3452-1:2013, 8.9.

5.2.3 Effectiveness

The effectiveness of penetrant testing depends upon many factors including:

a) the types of penetrant materials;

b) the testing equipment;

c) surface preparation, condition and temperature;

d) the material under examination

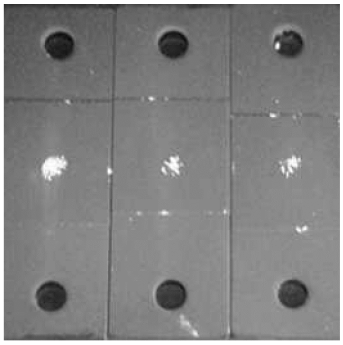
e) expected discontinuities;

f) penetration and development time;

g) viewing conditions.

A substantiation test shall be carried out to demonstrate that the correct parameters are used.

Effectiveness can be best demonstrated using known defect standards containing defects or artificial defects of various sizes (e.g. EN ISO 3452-3, type 2) comparing the results obtained using the conventional UV method with the results of this blue light sub-method (see Figure 1). Other test panels (e.g. EN ISO 3452-3, type 1) may be adequate for use, but may provide less information.



a) UV-A

b) actinic blue light

Figure 1 — UV-A vs. actinic blue light showing acceptable results

5.2.4 Sensitivity

Sensitivity levels shall be specifically defined for this sub-method. Sensitivity levels defined using UV-A light in EN ISO 3452-2 do not apply.

The fluorescence of the detection media will have an effect on sensitivity. The fluorescent coefficient can be measured in cd/W and, if appropriate, compared with the fluorescent coefficient using UV radiation to obtain a fluorescent factor. This is of particular relevance when considering viewing conditions (see Clause 8).

Known defect standards containing defects or artificial defects of various sizes (e.g. EN ISO 3452-3, type 2) can be used to monitor the relative sensitivity of different penetrants and to compare the behaviour of a penetrant when using UV-A and actinic blue light.

The contrast ratio will have an effect on sensitivity and shall be considered.

5.3 Magnetic particle testing

5.3.1 General requirement

Magnetic particle testing within this sub-method is basically carried out as described in EN ISO 9934-1 but using detection media specifically qualified for the application and actinic blue light for producing indications