



# SLOVENSKI STANDARD

## SIST EN 12543-2:2009

01-april-2009

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Non-destructive testing - Characteristics of focal spots in industrial X-ray systems for use in non-destructive testing - Part 2: Pinhole camera radiographic method

**iTeh STANDARD PREVIEW**

Zerstörungsfreie Prüfung - Charakterisierung von Brennflecken in Industrie-Röntgenanlagen für die zerstörungsfreie Prüfung - Teil 2: Radiographisches Lochkamera-Verfahren

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Essais non destructifs - Caractéristiques des foyers émissifs des tubes radiogènes industriels utilisés dans les essais non destructifs - Partie 2: Méthode radiographique par sténopé

**Ta slovenski standard je istoveten z: EN 12543-2:2008**

### ICS:

19.100      Neporušitveno preskušanje      Non-destructive testing

**SIST EN 12543-2:2009**

**en,fr**

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EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

**EN 12543-2**

July 2008

ICS 19.100

Supersedes EN 12543-2:1999

English Version

**Non-destructive testing - Characteristics of focal spots in  
industrial X-ray systems for use in non-destructive testing - Part  
2: Pinhole camera radiographic method**

Essais non destructifs - Caractéristiques des foyers  
émissoifs des tubes radiogènes industriels utilisés dans les  
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par sténopé

Zerstörungsfreie Prüfung - Charakterisierung von  
Brennflecken in Industrie-Röntgenanlagen für die  
zerstörungsfreie Prüfung - Teil 2: Radiographisches  
Lochkamera-Verfahren

This European Standard was approved by CEN on 7 June 2008.

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 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 Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
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## Foreword

This document (EN 12543-2:2008) has been prepared by Technical Committee CEN/TC 138 "Non-destructive testing", 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 January 2009, and conflicting national standards shall be withdrawn at the latest by January 2009.

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 12543-2:1999.

EN 12543-2 is part of a series of European Standards under the general title *Non-destructive testing – Characteristics of focal spots in industrial X-ray systems for use in non-destructive testing*; the other Parts are the following:

EN 12543-1: *Part 1: Scanning method*;

EN 12543-3: *Part 3: Slit camera radiographic method*;

EN 12543-4: *Part 4: Edge method*;

EN 12543-5: *Part 5: Measurement of the effective focal spot size of mini and micro focus X-ray tubes*.

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, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

## Introduction

In order to cover the different requirements for focal spot size measurement, five different methods are described in EN 12543-1 to EN 12543-5.

The scanning method (EN 12543-1) is dedicated to those applications where quantitative values for the intensity distribution and spot size are needed, i.e. calibration and image processing purposes.

The radiographic methods (EN 12543-2 and EN 12543-3) describe the traditional techniques and are dedicated for certification purposes and for field applications. A digital detector not only provides focal spot length and width, but also the user with quantitative values for intensity distribution. The digital method may be used as a reference method as in EN 12543-1

Where no pinhole or slit cameras are available in the field, the edge method (EN 12543-4) may be applied. It represents a very simple method for field application.

For micro focus systems, see EN 12453-5.

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## 1 Scope

This European Standard specifies a method for the measurement of focal spot dimensions above 0,2 mm of X-ray systems up to and including 500 kV tube voltage by means of the pinhole camera radiographic method. The voltage applied for this measurement is restricted to 200 kV for visual film evaluation.

The image quality and the resolution of X-ray images depend highly on the characteristics of the focal spot, in particular the size and the two dimensional intensity distribution.

For the characterisation of commercial X-ray tube types (i.e. for advertising or trade) the specific values of Table A.1 are used.

## 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.

EN 462-5, *Non-destructive testing — Image quality of radiographs — Part 5: Image quality indicators (duplex wire type), determination of image unsharpness value*

EN 584-1, *Non-destructive testing — Industrial radiographic film — Part 1: Classification of film systems for industrial radiography*

EN 12543-1:1999, *Non-destructive testing — Characteristics of focal spots in industrial X-ray systems for use in non-destructive testing — Part 1: Scanning method*

## 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

### 3.1

#### **focal spot**

X-ray emitting area on the anode of the X-ray tube as seen from the measuring device

[EN 12543-1:1999]

## 4 Test equipment

### 4.1 Essential characteristics of the pinhole

The pinhole camera shall consist of a diaphragm with a pinhole having the following dimensions according to Table 1 dependent from the actual focal spot size:

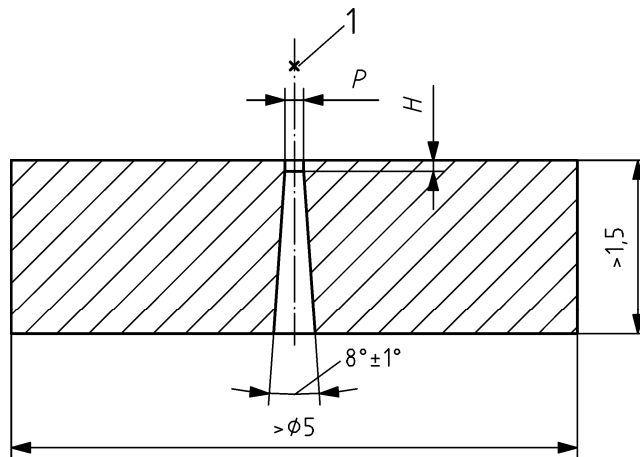
**Table 1 — Dimensions of the pinhole**

Focal spot size mm	Diameter $P$ $\mu\text{m}$	Height $H$ $\mu\text{m}$
0,2 to 1,0	$30 \pm 5$	$75 \pm 10$
> 1,0	$100 \pm 5$	$500 \pm 10$

## EN 12543-2:2008 (E)

The dimensions  $P$  and  $H$  are given in Figure 1.

Dimensions in millimetres



## Key

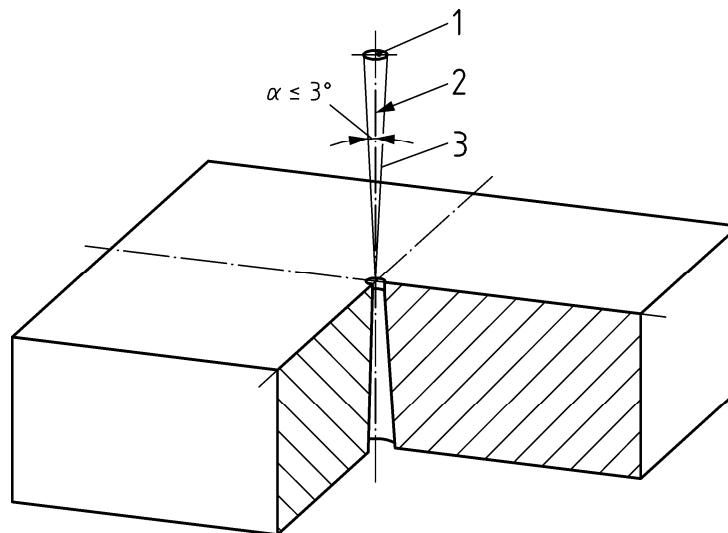
- 1 focal spot

Figure 1 — Essential dimensions of a pinhole diaphragm

The pinhole diaphragm shall be made of tungsten or of a similar absorbant material.

#### 4.2 Alignment and position of the pinhole camera

The angle between the beam direction and the pinhole axis (see Figure 2) shall be smaller than  $3^\circ$ . When deviating from Figure 2, the direction of the beam shall be indicated.



## Key

- 1 focal spot  
2 beam direction  
3 maximum deviation of the axis of the pinhole

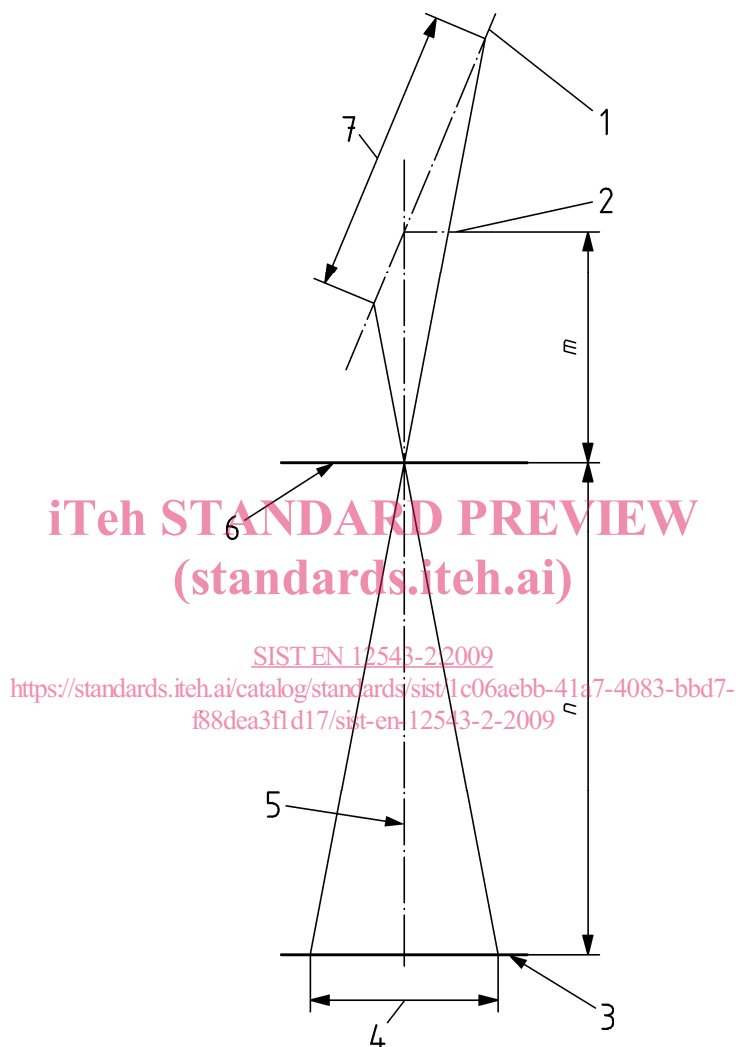
Figure 2 — Alignment of the pinhole camera



The incident face of the pinhole diaphragm shall be placed at a distance  $m$  from the focal spot so that the variation of the magnification over the extension of the actual focal spot does not exceed  $\pm 5\%$  in the beam direction. In no case shall this distance be less than 100 mm.

#### 4.3 Position of the radiographic image detector

The radiographic image detector shall be placed normal to the beam direction at a distance  $n$  from the incident face of the pinhole diaphragm determined from the applicable magnification according to Figure 3 and Table 2.



#### Key

- 1 plane of anode
- 2 reference plane
- 3 radiographic image detector
- 4 magnified length of the effective focal spot
- 5 beam direction
- 6 incident face of the diaphragm
- 7 physical length of the actual focal spot

Figure 3 — Beam direction dimensions and planes