



**SLOVENSKI STANDARD**  
**SIST EN 12543-2:2000**  
**01-oktober-2000**

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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

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

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

**Ta slovenski standard je istoveten z: EN 12543-2:1999**

**ICS:**

19.100      Neporušitveno preskušanje      Non-destructive testing

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EUROPEAN STANDARD

EN 12543-2

NORME EUROPÉENNE

EUROPÄISCHE NORM

September 1999

ICS 19.100

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

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This European Standard was approved by CEN on 16 August 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  
EUROPÄISCHES KOMITEE FÜR NORMUNG

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**Contents**

	Page
Foreword .....	3
Introduction .....	4
1 Scope .....	4
2 Normative references .....	4
3 Terms and definitions .....	5
4 Test equipment .....	5
5 Measurement and determination of the focal spot size .....	8
Annex A (informative) Preferred values of $d$ for the characterization of X-ray tube types .....	9

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## Foreword

This European Standard 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 March 2000, and conflicting national standards shall be withdrawn at the latest by March 2000.

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.

In the framework of its scope, Technical Committee CEN/TC 138 entrusted CEN/TC 138/WG 1 "Ionizing Radiation" with preparing the following standard:

EN 12543-2, *Non-destructive testing - Characteristics of focal spots in industrial X-ray systems for use in non-destructive testing - Part 2: Pinhole camera radiographic method.*

EN 12543-2 is a part of series of European Standards with the same number; the other Parts are the following:

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

EN 12543-3, *Non-destructive testing - Characteristics of focal spots in industrial X-ray systems for use in non-destructive testing - Part 3: Slit camera radiographic method*

EN 12543-4, *Non-destructive testing - Characteristics of focal spots in industrial X-ray systems for use in non-destructive testing - Part 4: Edge method.*

EN 12543-5, *Non-destructive testing - Characteristics of focal spots in industrial X-ray systems for use in non-destructive testing - Part 5: Measurement of the effective focal spot size of mini and micro focus X-ray tubes.*

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## 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 up to 200 kV.

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.

In order to cover also the micro focus systems, a specific method is presented in EN 12543-5.

## 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.

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 characterization of commercial X-ray tube types (i. e. for advertising or trade) the specific maximum values of annex A should be preferred.

## 2 Normative references

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

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

EN 12543-1, *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 standard, the following definition applies:

Focal spot: the X-ray emitting area on the anode of the X-ray tube as seen from the measuring device [EN 12543-1].

## 4 Test equipment

### 4.1 Essential characteristics of the pinhole

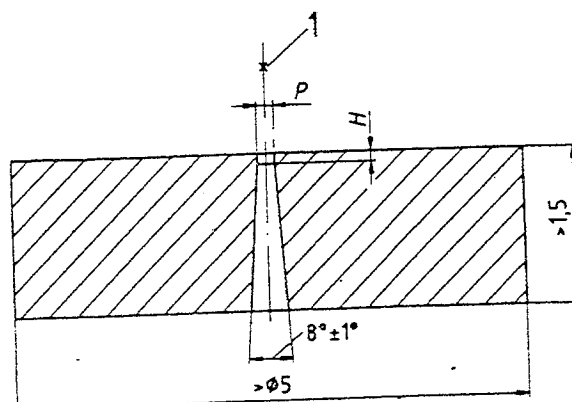
The pinhole camera shall consist of a diaphragm with a pinhole having following dimensions according to table 1 dependent from the actual focal spot size:

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	$100 \pm 5$	$500 \pm 10$

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**

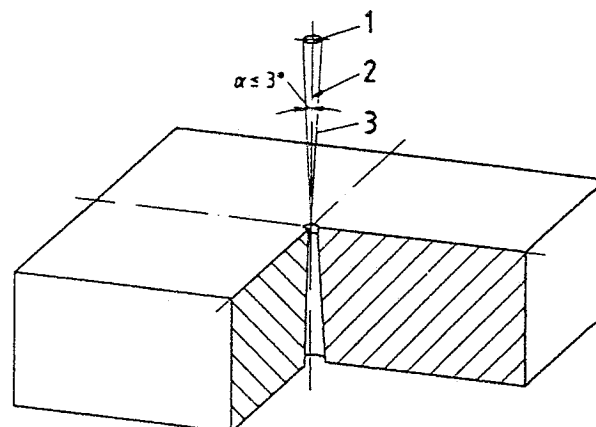
The pinhole diaphragm shall be made of tungsten or of a similar absorbant material.

**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.

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**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.

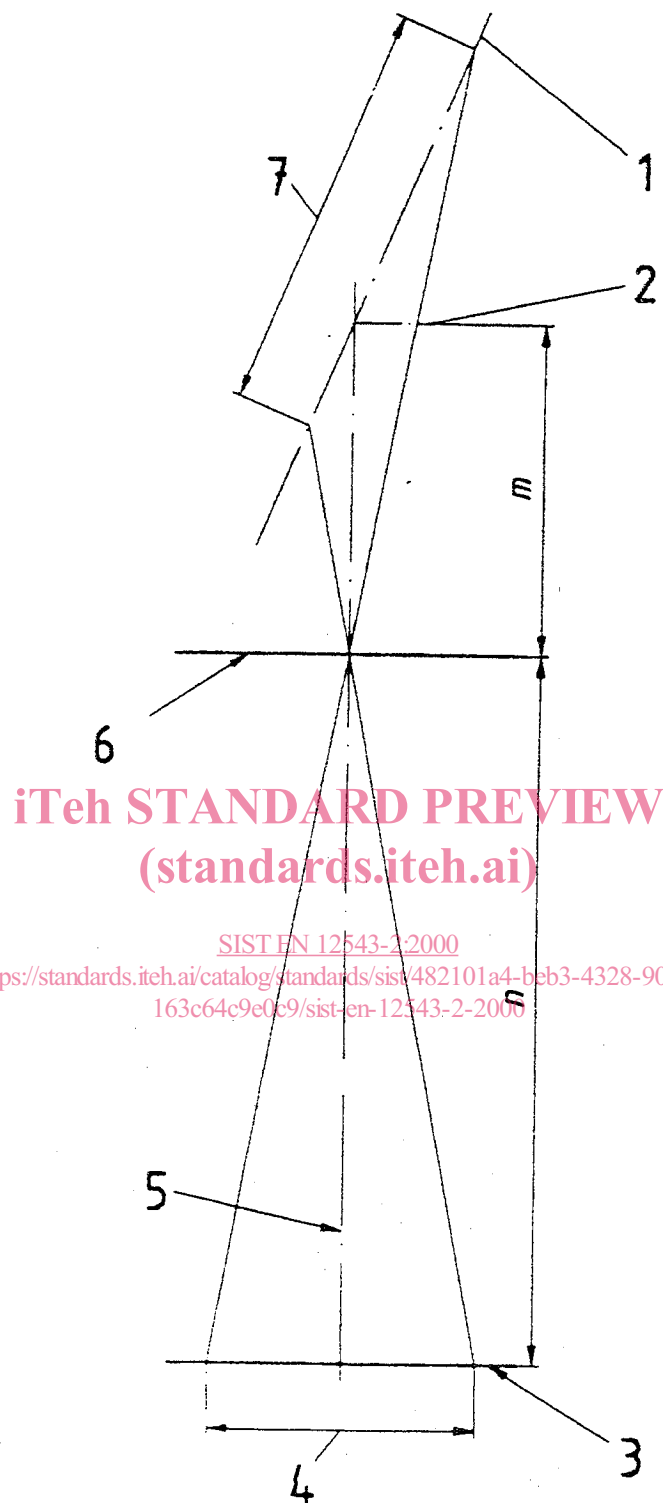
**4.3 Position of the radiographic film**

The radiographic film 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.

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**Key**

- 1 plane of anode
- 2 reference plane
- 3 radiographic film
- 4 length of the focal spot
- 5 beam direction
- 6 incident face of the diaphragm
- 7 length of the actual focal spot

**Figure 3 – Beam direction dimensions and planes**