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Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
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1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/ Figure/Table/Note	Type of comment	Comment (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	



DRAFT International Standard

ISO/DIS 32543-2

Non-destructive testing — Characteristics of focal spots in industrial X-ray systems —

Part 2: Edge method with hole type gauges

Essais non destructifs — Caractéristiques des foyers émissifs des tubes radiogènes industriels —

Partie 2: Méthode radiographique par sténopé

ICS: 19.100

ISO/TC 135/SC 5

Secretariat: **DIN**

Voting begins on:
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This document is circulated as received from the committee secretariat.

ISO/CEN PARALLEL PROCESSING

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Contents

Page

Introduction	iv
1 Scope	1
2 Normative references	1
3 Terms and definitions	2
4 Principle and detectors	4
4.1 Principle	4
4.2 Detectors	4
4.2.1 General	4
4.2.2 Imaging plates for computed radiography	4
4.2.3 Digital Detector Arrays (DDA)	4
4.2.4 Exposure conditions and Image processing	5
5 Test equipment	5
5.1 General	5
5.2 Essential characteristics of test gauge or Image Quality Indicator (IQI)	5
5.2.1 Nano- and microfocus tubes (spot size < 100 µm)	5
5.2.2 Mini- and macrofocus tubes (spot size ≥ 100 µm)	7
5.2.3 Alignment and position of the gauge in the beam	8
6 Loading factors	10
7 Measurement procedure and determination of the focal spot size	10
7.1 Measurement procedure	10
7.2 Evaluation using a line profile	11
7.3 Automated evaluation using a validated software	13
8 Classification and result of focal spot size evaluation	14
9 Documentation	14
Annex A (normative) Values for the classification of X-ray tube focal spot sizes	16
Bibliography	18

Introduction

To cover the large range of effective focal spot sizes, four different methods are described in EN 12543 series.

In this document, the edge method is intended as user method for measurement of effective focal spot sizes of nano, micro, mini and macro (standard) focus tubes. The edge method uses hole type gauges and is intended for field and lab applications when the users need to observe the effective focal spot on a regular basis and other methods are non-practical.

EN ISO 32543-1, the pin hole method, permits the measurement of spot shape and sizes $\geq 100\ \mu\text{m}$ and EN ISO 32543-3 covers the range of spot sizes for micro focus tubes from $5\ \mu\text{m}$ to $300\ \mu\text{m}$.

Two further methods are in preparation as future part in ISO 32543 series, concerning:

- the line pair gauges for measuring the effective focal spot size of micro- and nanofocus X-ray tubes with focal spot sizes of $0,2\ \mu\text{m}$ to $100\ \mu\text{m}$. This method is intended for the use by manufacturers and users and a measuring range between $0,2\ \mu\text{m}$ to $100\ \mu\text{m}$;
- the reconstruction of the spot shape from hole gauge measurements. The results are equivalent to the pin hole method down to $0,2\ \mu\text{m}$, if no phase contrast is observed.

In the overlapping ranges the different methods give similar values based on the edge response measurement, which allow using the dedicated method also in a limited way outside the above specified ranges.

Non-destructive testing — Characteristics of focal spots in industrial X-ray systems —

Part 2: Edge method with hole type gauges

1 Scope

This document specifies a method for the measurement of effective focal spot dimensions above 0,2 μm of X-ray systems by means of the edge method applied to digital images taken from hole type or disk type gauges if no phase contrast is observed. The imaging quality and the resolution of X-ray images depend highly on the characteristics of the effective focal spot, in particular the size and the two-dimensional intensity distribution as seen from the detector plane.

This document provides instructions for determining the effective size (dimensions) of standard, mini and micro focal spots of industrial X-ray tubes for users in applications where the pin hole method of ISO 32543-1 is not practicable. This determination is based on the measurement of a profile of an image of a hole or disk type gauge.

The method as described in this document can be used for long term monitoring of focal spot sizes without a pin hole camera.

The accuracy of this method is lower than the one of ISO 32543-1, ISO/DIS 32543-3 and the future standards in preparation, for measurements of the effective focal spot size, using ASTM hole plate IQIs (as described in ASTM E 1025, E 1742), due to its manufacturer tolerance of $\pm 10\%$ of the hole diameter. It can be used by manufacturers if special hole gauges, manufactured with lower tolerance, as described in [5.2.1](#) are applied (see [Figure 1](#)).

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

ISO 12181 (all parts), *Geometrical product specifications (GPS) — Roundness*

ISO 16371-1, *Non-destructive testing — Industrial computed radiography with storage phosphor imaging plates — Part 1: Classification of systems*

ISO 19232-5, *Non-destructive testing — Image quality of radiographs — Part 5: Determination of the image unsharpness and basic spatial resolution value using duplex wire-type image quality indicators*

ISO 32543-1, *Non-destructive testing — Characteristics of focal spots in industrial X-ray systems — Part 1: Pinhole camera radiographic method*

ISO/DIS 32543-3, *Non-destructive testing - Characteristics of focal spots in industrial X-ray systems for use in non-destructive testing - Part 3: Measurement of the effective focal spot size of mini and micro focus X-ray tubes*

ASTM E 2903, *Standard Test Method for Measurement of the Effective Focal Spot Size of Mini and Micro Focus X-ray Tubes*

ASTM E 1165, *Standard Test Method for Measurement of Focal Spots of Industrial X-Ray Tubes by Pinhole Imaging*

ASTM E 2002, *Standard Practice for Determining Total Image Unsharpness and Basic Spatial Resolution in Radiography and Radioscopy*

ASTM E 1742, *Standard Practice for Radiographic Examination*

ASTM E 1025, *Standard Practice for Design, Manufacture, and Material Grouping Classification of Hole-Type Image Quality Indicators (IQI) used for Radiology*

ASTM E 1000, *Standard Guide for Radioscopy*

3 Terms and definitions

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

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp/>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1

Thermal focal spot

X-ray producing area of the target as viewed from a position perpendicular to the target surface

Note 1 to entry: Also named as actual focal spot in ASTM E 1165.

3.2

Effective focal spot

X-ray producing area of the target as viewed by a detection device from the defined image plane

Note 1 to entry: Also named optical focal spot in other publications.

3.3

Effective size of focal spot

s
focal spot size measured in accordance with this document ($s = s_{\text{ERF50}}$)

3.4

Roundness

RON_t

value of the largest positive local roundness deviation added to the absolute value of the largest negative local roundness deviation from a reference circle according to ISO 12181 series.

3.5

Effective size of focal spot measured from an ERV_{50}

s_{ERV50}

focal spot size derived from measured edge response function at edge response value 50 % (ERV_{50}) (see 7.2) as applied in ASTM E 2903 and ASTM E 1165, Annex A, according to Formula (7).

Note 1 to entry: ASTM E 1165, Annex A uses an extension value of 1,4 instead of 1,47 as used in the standard practice of ASTM E1165 before Annex A.

3.6

Nominal focal spot size

SS

Value determined from Table A.1 based on the measured focal spot $s = s_{\text{ERV50}}$

3.7

Focal spot size class

FS

Classification value for X-ray tubes, which have a focal spot size in the defined range as defined ANNEX A, Table A.1