SLOVENSKI STANDARD
SIST EN 584-1:1996

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Neporušitveno preskušanje - Film za industrijsko radiografijo - 1. del: Klasifikacija sistemov filmov za industrijsko radiografijo

Non destructive testing - Industrial radiographic film - Part 1: Classification of film systems for industrial radiography

Zerstörungsfreie Prüfung - Industrielle Filme für die Durchstrahlungsprüfung - Teil 1: Klassifizierung von Filmsystemen für die industrielle Durchstrahlungsprüfung

Essais non destructifs - Film pour radiographie industrielle - Partie 1: Classification des systemes films pour radiographie industrielle

Ta slovenski standard je istoveten z: **EN 584-1:1994**

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37.040.25	Radiografski filmi	Radiographic films

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English version

Non destructive testing - Industrial radiographic film - Part 1: Classification of film systems for industrial radiography

Essais non destructifs - Film pour radiographie industrielle- Partie 1: Classification des systèmes films pour radiographie industrielle

Zerstörungsfreie Prüfung - Industrielle Filme für die Durchstrahlungsprüfung - Teil 1: Klassifizierung von Filmsystemen für die Industrielle Durchstrahlungsprüfung

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CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart,36 B-1050 Brussels

Contents list

Foreword

This European Standard has been prepared by the Technical Committee CEN/TC 138 "Non-destructive testing", the secretariat of which is held by AFNOR.

A second part of this standard is in preparation:

EN 584-2 Non-destructive testing - Industrial radiographic film - Part 2: Control of film processing by means of reference values

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of an identical text or by endorsement, at the latest by March 1995, and conflicting national standards shall be withdrawn at the latest by March 1995.

According to the CEN/CENELEC Internal Regulations, the following countries are bound to implement this European Standard: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom.

1 Scope

The purpose of this standard is to fix the performance of film systems.

This standard is applicable for the classification of film systems in combination with specified lead screens for industrial radiography (non-destructive testing). This standard is intended to assure that the image quality of radiographs - as far as this is influenced by the film system - is in conformity with the requirements of European Standards such as EN 444. This European Standard does not apply to the classification of films used with fluorescent intensifying screens.

Additional methods for evaluating the photographic process are described in prEN 584-2 by which the performance of film systems can be controlled under the conditions given in industry.

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 444 Non-destructive testing - General principles for radiographic examination of metallic materials by X- and gamma rays

prEN 584-2 Non-destructive testing - Industrial radiographic film - Part 2: Control of film processing by means of reference values

3 Definitions

For the purposes of this standard, the following definitions apply:

3.1 film system

Combination of film and film processing which is carried out in accordance with the instructions of the film manufacture and/or the manufacturer of the processing chemicals.

3.2 gradient G

Local slope of the characteristic curve at a certain density D. It is a measure of the contrast obtainable with the film system.

3.3 granularity σ_D

Stochastic density fluctuations in the radiograph which are superimposed on the image of the object.

NOTE: The limiting values given in this standard are related to fixed radiation energies and specified screens.

3.4 CEN speed S

Reciprocal value of the dose K_S measured in Gray which results at a specified diffused optical transmission density D of the processed film:

$$S = \frac{1}{K_S} \qquad (1)$$

3.5 film system class

Classification taking into account of limiting values given in table 1.

3.6 gradient-noise-ratio

Ratio of the gradient G and the granularity σ_D. It relates directly to the signal to noise ratio. All further parameters determining the signal, such as the modulation transfer function or the energy of the radiation, are considered to be constant.

4 Sampling and storage

For product specification it is important that the samples evaluated yield the average results obtained by users. This will require the evaluation of several different batches periodically under conditions specified in this standard. Prior to evaluation, the samples shall be stored according to the manufacturers' recommendations for a length of time to simulate the average age at which the product is normally used. The basic objective in selecting and storing samples as described above is to ensure the film characteristics are representative of those obtained by a consumer at the time of use.

5 Test method

5.1 Preparation

The film samples shall be exposed to X-rays from tungsten target tubes. Inherent filtration of the tube, plus an additional copper filter located as close to the target as possible shall provide filtration equivalent to (8,00 ± 0,05) mm of copper. The potential across the X-ray tube shall be adjusted until the half-value-absorption is obtained with (3,5 ± 0,2) mm of copper. A potential of approximately 220 kV generally meets this requirement.

The film system shall include a front and a back screen of 0,02 to 0,04 mm lead. If single coated films are used, the emulsion coated surface shall face the X-ray tube. Good film screen contact shall be ensured.

5.2 Measurement of gradient G

Gradient G relates to a D versus $\log_{10}$ K curve. Within the scope of this standard G is calculated

from the slope $\frac{dD}{dK}$ of a D versus K curve at density $(D - D_0)$, i. e.

$$G = \frac{dD}{d \log_{10} K} = \frac{K}{\log_{10} e} \cdot \frac{dD}{dK} \qquad (2)$$

where

K is the dose, in Gray, required for density $(D - D_0)$
D_0 is the optical density of an unexposed and processed film including base (fog and base density)

The D versus K curve is approximated by a polynomial of third order. To obtain a reliable curve a series of exposures are made to obtain at least 12 uniformly distributed measuring points between density 1,0 and 5,0 above D_0.

The gradient shall be measured with a maximum uncertainty of ± 5 % at a confidence level of 95 %.

5.3 Measurement of granularity σ_D

The granularity is determined by linear scanning of a film of constant diffuse optical density with a microdensitometer. Both emulsion layers shall be recorded; this means that the depth of focus of the microdensitometer has to include both layers. The specular optical density is converted into diffuse optical density after calibration. The standard deviation σ_D is a measure of the granularity.

The optical density of the film shall be D = 2,00 ± 0,05 above fog and base.

The scanning length on the radiographic film shall be at least 100 mm. The diameter of the aperture of the microdensitometer shall be (100 ± 5) µm.

In order to limit the low frequency noise the data measured with the microdensitometer shall be filtered with a highpass filter with a cutoff spatial frequency of 0,1 line pairs per millimeter.

The granularity shall be determined with a maximum uncertainty of ± 10 % at a confidence level at 95 %. At least six measurements shall be made out on different samples.

5.4 Measurement of CEN speed S

The CEN speed S is evaluated for an diffuse optical density D = 2 above fog and base D_0. The CEN speed shall be determined in accordance with values given in table 2.

6 Range of classification and limiting values

The film system classes are defined by limiting values which are determined in accordance with clause 5.

In order to assign a film system class the film system shall meet all the limiting values of the gradient, the granularity and the gradient-noise-ratio of the system class according to table 1. The classification is only valid for the complete film system. In general, the classification for X-rays as described under 5.1 can be transferred to other radiation energies and metallic screen types as well as films without screens.

On request the manufacturers shall supply a certificate containing full datas specified in clause 5 and the following:

- Dose K_S
- Processing:
  - Manual or automatic
  - Type of chemistry
  - Developer immersion time
  - Developer temperature.

Table 1: Limiting values for gradient, gradient-noise-ratio and granularity

Film system class	Minimum gradient G_{min} at		Minimum gradient-noise-ratio $(G/\sigma_D)_{min}$ D=2 above D_0	Maximum granularity σ_D, max D = 2 above D_0
	D = 2 above D_0	D = 4 above D_0		
C 1	4,5	7,5	300	0,018
C 2	4,3	7,4	270	0,018
C 3	4,1	6,8	180	0,023
C 4	4,1	6,8	150	0,028
C 5	3,8	6,4	120	0,032
C 6	3,5	5,0	100	0,039