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Non-destructive testing — Industrial radiographic films —

Part 2: Control of film processing by means of reference values

Essais non destructifs — Films utilisés en radiographie industrielle — Partie 2: Contrôle du traitement des films au moyen de valeurs de référence

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www. iso. org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www. iso .org/iso/foreword. html.

This document was prepared by Technical Committee ISO/TC 135, *Non-destructive testing*, Subcommittee SC 5, *Radiographic testing*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

This second edition cancels and replaces the first edition (ISO 11699-2:1998), which has been technically revised. The main changes compared to the previous edition are as follows:

— extension of Clause 5 to mixed film systems and support users of mixed systems in quality control and comparison to classified film systems;

— editorial changes.

A list of all parts in the ISO 11699 series can be found on the ISO website.

Introduction

This document specifies a procedure for the control of the film processing systems by users by processing pre-exposed strips.

These strips are pre-exposed by X-rays and are accompanied by a certificate from the film strip manufacturer.

The user processes the pre-exposed strips in his film processing system and records the results. In this document, Clause 4 shows the responsibility of the film strip manufacturer. The user is responsible for Clauses 5 to 8, which show compliance with the chosen film system classification.

Non-destructive testing — Industrial radiographic films —

Part 2: Control of film processing by means of reference values

1 Scope

This document specifies a procedure for the control of film processing systems.

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 11699-1, *Non-destructive testing — Industrial radiographic films — Part 1: Classification of film systems for industrial radiography*

ISO 18901, *Imaging materials — Processed silver-gelatin-type black-and-white films — Specifications for stability*

3 Terms and definitions

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

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

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
film system
combination of film and film processing which is carried out in accordance with the instructions of film manufacturer and/or the manufacturer of the processing chemicals

[SOURCE: ISO 11699-1:2008, 3.1]

3.2
film system class
film system (3.1) classification according to the limiting values given in ISO 11699-1:2008, Table 1

3.3
film strip
piece of film material on which different steps of constant optical density are exposed

3.4
pre-exposed film strip
film strip (3.3) that is pre-exposed by X-rays so as to present at least ten different optical density steps after processing

3.5
net density
diffuse optical density without base and fog density

4 Manufacturing of pre-exposed film strips for control of the processing system

4.1 Size

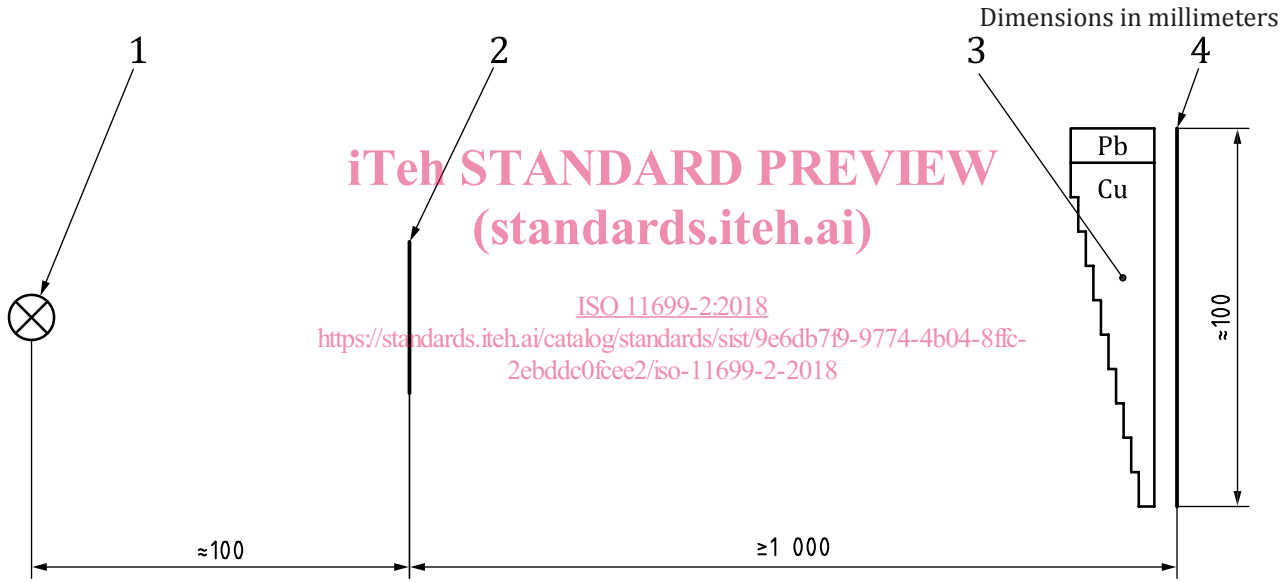
The film strips shall have a minimum exposed area of 15 mm × 100 mm. The pre-exposed film strips contain areas of constant optical densities in increasing optical density steps. These steps are used for optical density measurements and a blank area for base plus fog density and life expectancy test.

4.2 Selection of film strip type

The selected type of film used for the film strips shall have a response to processing which is representative for the set of films which are classified according to ISO 11699-1. Films of film system class C3 or C4 are recommended for exposure of film test strips.

4.3 Examples of production of pre-exposed film strips

The exposure arrangement is shown in Figure 1. The film strip design is described in Figure 2 and Table 1. A different design and material may be used if it provides the same optical density steps.



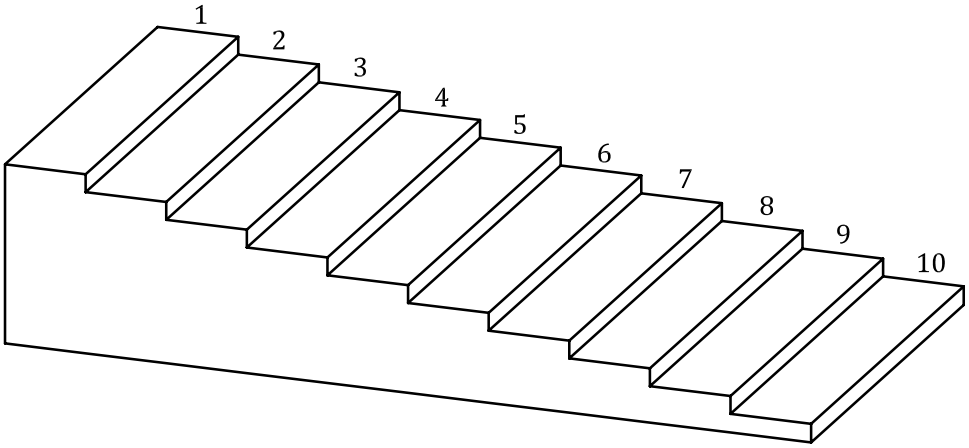
Key

1 source
2 3 mm thick copper pre-filter
3 step wedge
4 film

Figure 1 — Example of an exposure arrangement

The successive optical density steps on the film strip shall be exposed in order to obtain density increments of about 0,3 after processing, for example by a step wedge as described in Table 1 and Figure 2.

Appropriate precautions against scattered radiation shall be taken. The radiation source shall be a constant potential X-ray tube operated at approximately 150 kV. The exposure time shall be chosen to obtain a net density of approximately 2 at one of the first six steps (going from low to high densities) of the film strip after processing the pre-exposed film strip at the processing conditions used for film system classification according to ISO 11699-1.



Key

1 to 10 See Table 1.

Figure 2 — Design of step wedge

Table 1 — Height of steps; material: fine-grained copper

Step No.	Height for 150 kV mm
1	11,7
2	10,8
3	10,0
4	9,3
5	8,7
6	8,2
7	7,7
8	7,3
9	6,9
10	6,5

4.4 Measurement fields and determination of reference values

The steps for determination of reference values shall be as follows (see Figure 3):

Step X: the step with a net density close to $D = 2$.

Step $X + 4$: the step with a higher density which is four steps from X.

To obtain the reference values, at least five pre-exposed film strips shall be processed in a classified film system. The resulting densities shall have a maximum variance of $\Delta D = \pm 0{,}1$.

The reference values are obtained as follows:

— Reference speed index, S_r:

The average value of the net densities of step X is calculated. The speed index reference, S_r, is equal to this average value, rounded to two decimals.