SLOVENSKI STANDARD
SIST EN 13068-2:2000

01-oktober-2000

Neporušitveno preskušanje - Radioskopski pregled - 2. del: Preverjanje dolgoročne stabilnosti slikotvornih naprav

Non-destructive testing - Radioscopic testing - Part 2: Check of long term stability of imaging devices

Zerstörungsfreie Prüfung - Radioskopische Prüfung - Teil 2: Prüfung der Langzeitstabilität von bildgebenden Systemen

Essais non destructifs - Contrôle par radioscopie - Partie 2: Contrôle de la stabilité a long terme des systemes d'imagerie

Ta slovenski standard je istoveten z: **EN 13068-2:1999**

ICS:

19.100	Neporušitveno preskušanje	Non-destructive testing

SIST EN 13068-2:2000 **en**

EUROPEAN STANDARD
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EN 13068-2

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ICS 19.100

English version

Non-destructive testing - Radioscopic testing - Part 2: Check of long term stability of imaging devices

Essais non destructifs - Contrôle par radioscopie - Partie 2: Contrôle de la stabilité à long terme des systèmes d'imagerie

Zerstörungsfreie Prüfung - Radioskopische Prüfung - Teil 2: Prüfung der Langzeitstabilität von bildgebenden Systemen

This European Standard was approved by CEN on 29 October 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.

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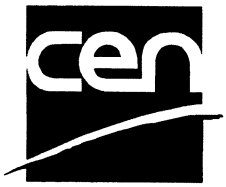

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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

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Contents

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 June 2000, and conflicting national standards shall be withdrawn at the latest by June 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.

EN 13068 comprises a series of European Standards of radioscopic systems which is made up the following:

EN 13068-1:1999, *Non-destructive testing - Radioscopic testing - Part 1: Quantitative measurement of imaging properties.*

EN 13068-2:1999, *Non-destructive testing - Radioscopic testing - Part 2: Check of long term stability of imaging devices.*

prEN 13068-3, *Non-destructive testing - Radioscopic testing - Part 3: General principles of radioscopic testing of metallic materials by X- and gamma rays.*

Introduction

This part of the European Standard gives an outline for the quality control of the imaging devices during operation. Reference is made to part one which deals with the quantitative measurements. A further part 3 and others will be related to special applications, e. g. weld inspection, casting inspection, etc.

Before operation of a new radioscopic system, a quality control procedure should be specified by the producer and the user of the system which ensures the stable and reliable performance of the radioscopic system. This procedure should include the parts of this standard, specify the region of interest (ROI) on the display unit, placement of test IQIs and other relevant parameters for good reproducibility of the tests.

Additionally, the frequency of tests and acceptance levels for system degradation should be specified according to the requirements of NDT specifications and usage of the system.

1 Scope

This part of the standard gives guidance on the on site check of equipment for radioscopy where the image is presented on a display unit including image processing. The radiation sources used can be X-rays or gamma rays.

This standard establishes rules for testing a radioscopic system to assure a constant level of inspection quality. The tests should be easily performable by the operators of the system. They are based on an input signal from defined image quality indicators. The measurement of the systems response should be performed with the same equipment which is in use in this particular installation.

This standard is applicable to installations with an image processing computer as well as to simple display units.

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 13068-1:1999, *Non-destructive testing - Radioscopic examination - Part 1: Quantitative measurement of imaging properties.*

EN 462-1, *Non-destructive testing - Image quality of radiographs - Part 1: Image quality indicators (wire type) - Determination of image quality value.*

EN 462-2, *Non-destructive testing - Image quality of radiographs - Part 2: Image quality indicators (step/hole type) - Determination of image quality value.*

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

3 Comparison with natural defects

Tests with natural defects are not sufficient as the only quality control for the comparison of the actual system performance with the first day appearance.

The performance of the radioscopic system should be tested to its ability to image and recognize the typical and the critical defects of a certain component. In addition to standardized IQIs, samples with smallest or most difficult to detect natural defects can be used for a routine quality control of the overall system performance.

4 Image quality control by image quality indicators (IQIs)

4.1 General

The quality of a radioscopic image is essentially determined by sharpness, contrast and linearity.

These parameters which have been described in EN 13068-1:1999 depend on the set-up of source, imaging system and specimen. For the purpose of quality control they shall be supervised by checking the overall performance of the radioscopic set-up on a routine basis during operation and with the same operational set-up used in usual operation. This can be achieved by means of image quality indicators.

For all specimens the IQI has to be placed at the source side of the specimen if this is possible.

If there are additional parts of this standard on specific inspection subjects (e. g. prEN 13068-3) they shall be supplied during quality control.

4.2 Experimental procedure

4.2.1 General set-up

To achieve reproducible results which allow the control of the long-term stability of a system, it is necessary to define a standardized set-up for the measurements. An example is shown in figure 1. Its details shall be documented for later reproduction. The document shall contain the data of the X-ray source, such as type of tube, voltage and current settings, filtering of X-rays and additional details, which may influence the image quality. Collimators when used shall be described. Test indicators shall be placed at the source side of the component under inspection. They produce a defined radiation relief as an input signal. The performance tests shall be carried out with the same equipment and parameter settings as used under operational conditions.

During measurements the radioscopic system shall be operated in accordance with the instruction manual and manufacturer instructions.

4.2.2 Display unit

Display units used in radioscopy shall be operated with selectors for brightness and contrast, properly adjusted following the instructions of the manufacturer. For systems with a frame buffer a digitized test chart should be loaded for the adjustment of the display unit. Test charts for this purpose can be taken from standard video technique.

The settings shall not be changed until the next test.

4.3 Measurement procedures

4.3.1 Check of unsharpness

The sharpness of the system can be degradated mainly by the lenses, the signal detector and ageing processes of the converter screens. For tests during practical work the total system unsharpness can be registered only.

The total system unsharpness shall be checked with an image quality indicator (IQI) of the duplex wire type according to EN 462-5 as the test object. It shall be placed on the source side of the object. The object shall be plane and represent the typical test specimen in terms of thickness and material.

The unsharpness is position dependent. A region of interest (ROI) on the field of view shall be defined, where the image quality shall fulfill the sharpness criteria given by the particular inspection problem. The unsharpness shall meet these conditions in the whole ROI.

The unsharpness shall be checked by placing the IQI horizontally and vertically in the direction of the detector read out lines.

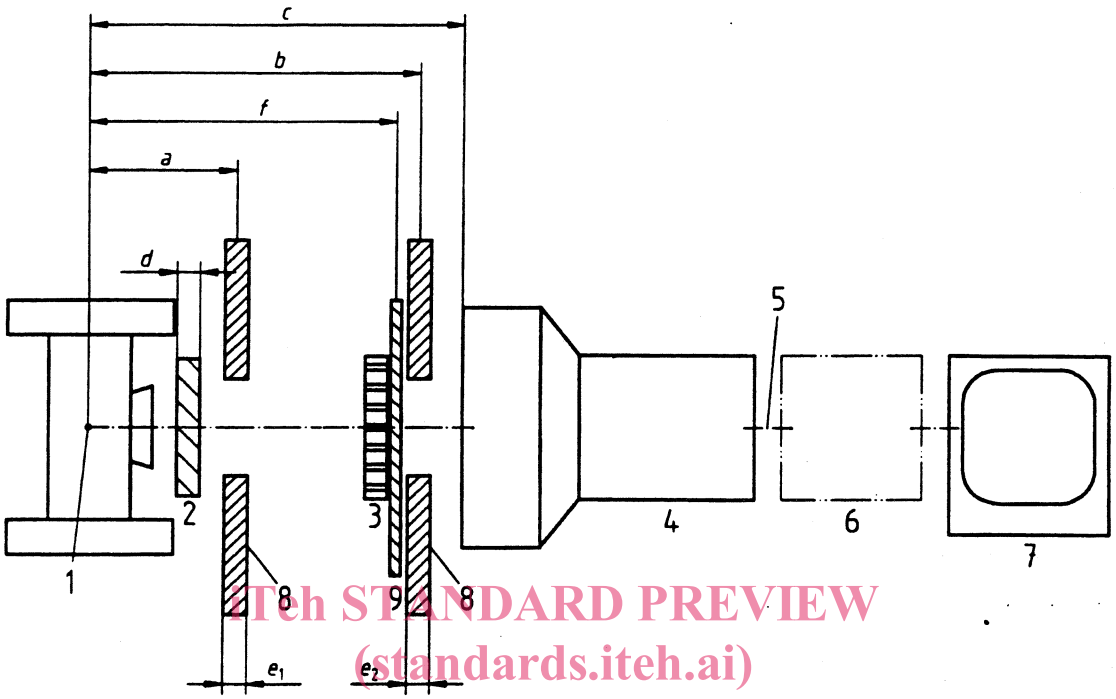
For systems with an image processing computer, the profile across the IQI shall be evaluated. The profiles are similar to figure 2. The number of the duplex wire for which the modulation depth is closest to 20 % and the numerical value of the modulation depth itself shall be evaluated and documented for comparison with later measurements. Also the number of the first unresolved wire pair according to the EN 462-5 shall be written to the document file.

The total unsharpness required depends on the radiation energy to be used with the equipment. The arrangement parameters shall be documented for later reproduction.

4.3.2 Check of contrast sensitivity

For the measurement of contrast sensitivity and wall thickness range a step wedge in accordance with EN 13068-1:1999, made of the same material as the sample under investigation can be used. In addition, to comply with the requirements for standard radiography, the corresponding IQI according to EN 462-1 or EN 462-2 has to be placed accordingly. If integrated to the system, noise reduction by recursive filtering or image integration can be used. The type of algorithm and relevant parameters shall be documented for proper reproduction.

The detectability of the corresponding radiographic IQI can be used as a sufficient image quality indication with respect to the signal noise ratio. This should be measured with an image processing computer if there is one integrated to the inspection system.

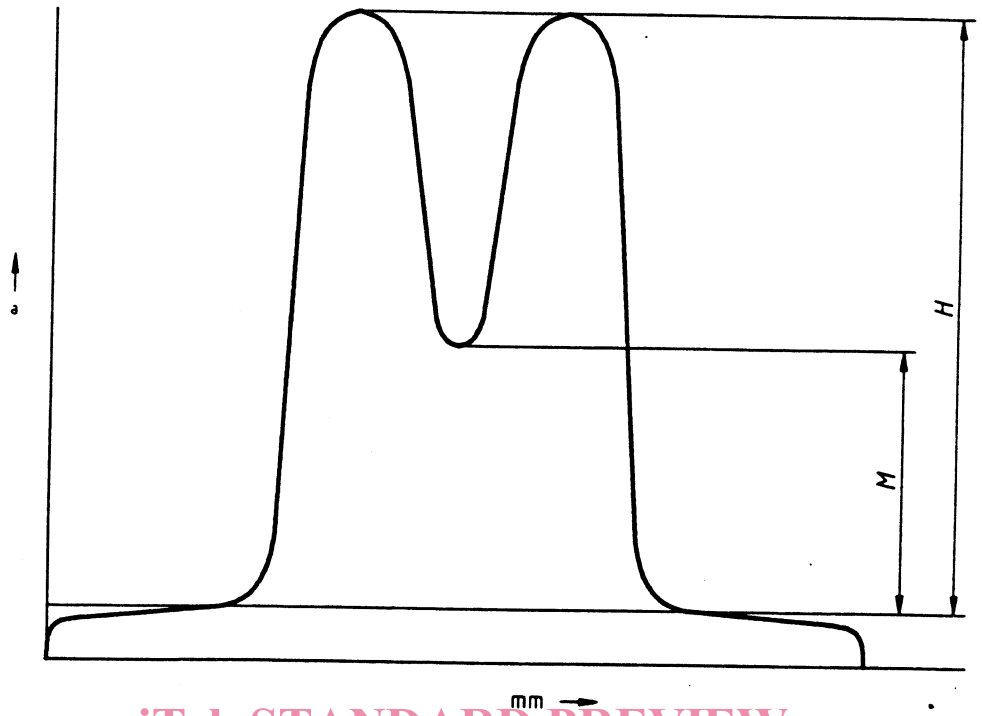


Key

1 radiation source
2 radiation filter
3 image quality indicator
4 conversion device
5 output signal
6 image processing
7 display unit
8 collimator
9 object

a distance source - 1st collimator
b distance source - 2nd collimator
c distance source - conversion device
d thickness of filter
$e_{1,2}$ thickness of 1st resp. 2nd collimator
f distance source - object

Figure 1 – Typical set-up



a Output signal

Modulation depth (%)= $\frac{H - M}{H} \cdot 100$

Figure 2 – Intensity profile across double wire