INTERNATIONAL STANDARD

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Second edition
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Non-destructive testing — Image quality of radiographs —

Part 3: Image quality classes

Essais non destructifs — Qualité d'image des radiogrammes —

Partie 3: Classes de qualité d'image

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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ISO 19232-3 was prepared by the European Committee for Standardization (CEN) in collaboration with ISO Technical Committee TC 135, *Non-destructive testing*, Subcommittee SC 5, *Radiation methods*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 19232-3:2004), which has been technically revised. Changes include:

— deletion of “ferrous metals” in the scope;

— update of references and definitions;

— replacement of film by detector, which includes film and digital detectors;

— use of new reduced IQI values for inspection with the gamma sources ^{192}Ir and ^{75}Se, by agreement of contracting parties and deletion of footnotes in the Tables 1 to 12;

— correction of misprints in Tables 5, 6, and 8.

ISO 19232 consists of the following parts, under the general title *Non-destructive testing — Image quality of radiographs*:

— *Part 1: Determination of the image quality values using wire-type image quality indicators*

— *Part 2: Determination of the image quality value using step/hole-type image quality indicators*

— *Part 3: Image quality classes*

— *Part 4: Experimental evaluation of image quality values and image quality tables*

— *Part 5: Determination of the image unsharpness value using duplex wire-type image quality indicators*

Non-destructive testing — Image quality of radiographs —

Part 3:
Image quality classes

1 Scope

This part of ISO 19232 specifies the minimum image quality values to ensure a uniform radiographic quality. It applies to the two types of image quality indicator as detailed in ISO 19232-1 for wire-type IQI and ISO 19232-2 for step/hole-type IQI and for the two techniques described in ISO 5579. Values are specified for the two classes of radiographic technique specified in ISO 5579.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 5579, *Non-destructive testing — Radiographic examination of metallic materials by X- and gamma rays — Basic rules*

ISO 5580, *Non-destructive testing — Industrial radiographic illuminators — Minimum requirements*

ISO 17636 (all parts), *Non-destructive testing of welds — Radiographic testing*

ISO 19232-1, *Non-destructive testing — Image quality of radiographs — Part 1: Determination of the image quality of radiographs using wire-type indicators*

ISO 19232-2, *Non-destructive testing — Image quality of radiographs — Part 2: Determination of the image quality value using step/hole-type image quality indicators*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 5579 and the following apply.

3.1
image quality indicator
IQI
device comprising a series of elements of graded dimensions which enable a measure of the image quality to be obtained

Note 1 to entry: The elements of IQI are commonly wires or steps with holes.

3.2
image quality value
measure of the image quality required or achieved and is equal to the thinnest element which can be detected on the radiograph

Note 1 to entry: See Tables 1 to 12 for the related values.

3.3
image quality table
table of minimum required image quality values versus the penetrated thickness ranges

4 Image quality classes

4.1 Single-wall radiography

The image quality classes given in Tables 1 to 4 can be obtained if the requirements of ISO 5579 are met:

a) Image quality class A for the class A radiographic basic technique (see ISO 5579);

b) Image quality class B for the class B radiographic improved technique (see ISO 5579).

Image quality values given in Tables 1 to 4 apply in cases where the IQI is placed on the source side. If it is not possible to place the IQI on the source side, it may be placed on the detector side. Tables 1 to 4 cannot be applied in this case.

NOTE The use of exceptional arrangements (for example, use of an iridium 192 source for thin plate sections) can result in obtaining different image quality values from those specified (see Clause 7).

4.2 Double-wall radiography

The image quality classes given in Tables 5 to 12 can be obtained if the requirements of ISO 5579 are met:

a) Image quality class A for the class A radiographic technique (see ISO 5579);

b) Image quality class B for the class B radiographic technique (see ISO 5579).

NOTE The use of exceptional arrangements can result in obtaining different image quality values from those specified (see Clause 7).

When using double-wall radiographic technique, the penetrated thickness, w, can be the sum of both wall thicknesses, t.

Tables 5 to 8 indicate the image quality values corresponding to the image quality classes A and B for a double-wall test with interpretation of the two walls, the IQI being placed on the source side of the object (IQI on the source side).

Tables 9 to 12 indicate the image quality values corresponding to the image quality classes A and B for a double-wall test with interpretation of the single-image, the IQI being placed on the film side of the object (IQI on the detector side).

Tables 9 to 12 may also be used to indicate the image quality corresponding to the double-wall/double-image technique when the IQI is placed on the detector side. This may be the case of elliptical radiographs according to ISO 17636.

5 Arrangement

When the radiograph is taken, the IQI shall be placed on the side of the section under test facing the source of radiation and remote from the detector.

If this is not possible, the IQI may be placed adjacent to the side of the section under test nearest the detector. To indicate that this arrangement has been used, the image of a letter F shall be visible on the radiograph near the IQI marking.

The IQI shall be placed on the object in an area where the thickness is as uniform as possible.

Special arrangements may be determined by application standards.

6 Determination of image quality value

In determining the image quality value, the conditions for viewing radiographs specified in ISO 5580 shall be observed.

For wire-type IQIs, the number of the thinnest wire which is still clearly visible on the radiograph shall be taken as the image quality value achieved. The image of a wire is accepted to be visible if a continuous length of at least 10 mm is clearly visible.

For step/hole-type IQIs, the number of the smallest hole which is clearly visible on the radiograph shall be taken as the image quality value. When the step contains two holes, both shall be visible.

In general, the image quality value shall be determined for every radiograph. If steps have been taken to guarantee that radiographs of similar test objects and regions are produced with identical exposure and processing conditions and no differences in the image quality value are likely, the image quality need not be verified for every radiograph, the extent of image quality verification being subject to agreement between the contracting parties.

7 Image quality values for gamma radiography

If ^{192}Ir or ^{75}Se sources are used, IQI values worse than the ones listed in Tables 1 to 12 may be accepted by agreement of contracting parties as follows:

Double-wall, double-image techniques (Tables 5 to 8), both class A and B ($w = 2t$):

— 10 mm < w ≤ 25 mm 1 wire or step-hole value less for ^{192}Ir;

— 5 mm < w ≤ 12 mm 1 wire or step-hole value less for ^{75}Se.

Single-wall, single-image and double-wall, single-image techniques (Tables 1, 2, 9, and 10), class A:

— 10 mm < w ≤ 24 mm 2 wire or step-hole values less for ^{192}Ir;

— 24 mm < w ≤ 30 mm 1 wire or step-hole value less for ^{192}Ir;

— 5 mm < w ≤ 24 mm 1 wire or step-hole value less for ^{75}Se.

Single-wall, single-image and double-wall, single-image techniques (Tables 3, 4, 11, and 12), class B:

— 10 mm < w ≤ 40 mm 1 wire or step-hole value less for ^{192}Ir;

— 5 mm < w ≤ 20 mm 1 wire or step-hole value less for ^{75}Se.

8 Single-wall technique; IQI on source side

Table 1 — Wire IQI

Image quality class A	
Nominal thickness, t mm	IQI value
$t \leq 1,2$	W 18
$1,2 < t \leq 2$	W 17
$2 < t \leq 3,5$	W 16
$3,5 < t \leq 5$	W 15
$5 < t \leq 7$	W 14
$7 < t \leq 10$	W 13
$10 < t \leq 15$	W 12
$15 < t \leq 25$	W 11
$25 < t \leq 32$	W 10
$32 < t \leq 40$	W 9
$40 < t \leq 55$	W 8
$55 < t \leq 85$	W 7
$85 < t \leq 150$	W 6
$150 < t \leq 250$	W 5
$t > 250$	W 4

Table 2 — Step and hole IQI

Image quality class A	
Normal thickness, t mm	IQI value
$t \leq 2$	H 3
$2 < t \leq 3,5$	H 4
$3,5 < t \leq 6$	H 5
$6 < t \leq 10$	H 6
$10 < t \leq 15$	H 7
$15 < t \leq 24$	H 8
$24 < t \leq 30$	H 9
$30 < t \leq 40$	H 10
$40 < t \leq 60$	H 11
$60 < t \leq 100$	H 12
$100 < t \leq 150$	H 13
$150 < t \leq 200$	H 14
$200 < t \leq 250$	H 15
$250 < t \leq 320$	H 16
$320 < t \leq 400$	H 17
$t > 400$	H 18

9 Single-wall technique; IQI on source side

Table 3 — Wire IQI

Image quality class B	
Nominal thickness, t mm	IQI value
$t \leq 1,5$	W 19
$1,5 < t \leq 2,5$	W 18
$2,5 < t \leq 4$	W 17
$4 < t \leq 6$	W 16
$6 < t \leq 8$	W 15
$8 < t \leq 12$	W 14
$12 < t \leq 20$	W 13
$20 < t \leq 30$	W 12
$30 < t \leq 35$	W 11
$35 < t \leq 45$	W 10
$45 < t \leq 65$	W 9
$65 < t \leq 120$	W 8
$120 < t \leq 200$	W 7
$200 < t \leq 350$	W 6
$t > 350$	W 5

Table 4 — Step and hole IQI

Image quality class B	
Nominal thickness, t mm	IQI value
$t \leq 2,5$	H 2
$2,5 < t \leq 4$	H 3
$4 < t \leq 8$	H 4
$8 < t \leq 12$	H 5
$12 < t \leq 20$	H 6
$20 < t \leq 30$	H 7
$30 < t \leq 40$	H 8
$40 < t \leq 60$	H 9
$60 < t \leq 80$	H 10
$80 < t \leq 100$	H 11
$100 < t \leq 150$	H 12
$150 < t \leq 200$	H 13
$200 < t \leq 250$	H 14

10 Double-wall technique; Double-image; IQI on source side

Table 5 — Wire IQI

Image quality class A	
Penetrated thickness, w mm	IQI value
$w \leq 1{,}2$	W 18
$1{,}2 < w \leq 2$	W 17
$2 < w \leq 3{,}5$	W 16
$3{,}5 < w \leq 5$	W 15
$5 < w \leq 7$	W 14
$7 < w \leq 12$	W 13
$12 < w \leq 18$	W 12
$18 < w \leq 30$	W 11
$30 < w \leq 40$	W 10
$40 < w \leq 50$	W 9
$50 < w \leq 60$	W 8
$60 < w \leq 85$	W 7
$85 < w \leq 120$	W 6
$120 < w \leq 220$	W 5
$220 < w \leq 380$	W 4
$w > 380$	W 3

Table 6 — Step and hole IQI

Image quality class A	
Penetrated thickness, w mm	IQI value
$w \leq 1$	H 3
$1 < w \leq 2$	H 4
$2 < w \leq 3{,}5$	H 5
$3{,}5 < w \leq 5{,}5$	H 6
$5{,}5 < w \leq 10$	H 7
$10 < w \leq 19$	H 8
$19 < w \leq 35$	H 9

11 Double-wall technique; Double-image; IQI on source side

Table 7 — Wire IQI

Image quality class B	
Penetrated thickness, w mm	IQI value
$w \leq 1,5$	W 19
$1,5 < w \leq 2,5$	W 18
$2,5 < w \leq 4$	W 17
$4 < w \leq 6$	W 16
$6 < w \leq 8$	W 15
$8 < w \leq 15$	W 14
$15 < w \leq 25$	W 13
$25 < w \leq 38$	W 12
$38 < w \leq 45$	W 11
$45 < w \leq 55$	W 10
$55 < w \leq 70$	W 9
$70 < w \leq 100$	W 8
$100 < w \leq 170$	W 7
$170 < w \leq 250$	W 6
$w > 250$	W 5

Table 8 — Step and hole IQI

Image quality class B	
Penetrated thickness, w mm	IQI value
$w \leq 1$	H 2
$1 < w \leq 2,5$	H 3
$2,5 < w \leq 4$	H 4
$4 < w \leq 6$	H 5
$6 < w \leq 11$	H 6
$11 < w \leq 20$	H 7
$20 < w \leq 35$	H 8

12 Double-wall technique; Single or double-image; IQI on film side

Table 9 — Wire IQI

Image quality class A	
Penetrated thickness, *w* mm	IQI value
$w \leq 1{,}2$	W 18
$1{,}2 < w \leq 2$	W 17
$2 < w \leq 3{,}5$	W 16
$3{,}5 < w \leq 5$	W 15
$5 < w \leq 10$	W 14
$10 < w \leq 15$	W 13
$15 < w \leq 22$	W 12
$22 < w \leq 38$	W 11
$38 < w \leq 48$	W 10
$48 < w \leq 60$	W 9
$60 < w \leq 85$	W 8
$85 < w \leq 125$	W 7
$125 < w \leq 225$	W 6
$225 < w \leq 375$	W 5
$w > 375$	W 4

Table 10 — Step and hole IQI

Image quality class A	
Penetrated thickness, *w* mm	IQI value
$w \leq 2$	H 3
$2 < w \leq 5$	H 4
$5 < w \leq 9$	H 5
$9 < w \leq 14$	H 6
$14 < w \leq 22$	H 7
$22 < w \leq 36$	H 8
$36 < w \leq 50$	H 9
$50 < w \leq 80$	H 10

13 Double-wall technique; Single or double-image; IQI on film side

Table 11 — Wire IQI

Image quality class B	
Penetrated thickness, w mm	IQI value
$w \leq 1,5$	W 19
$1,5 < w \leq 2,5$	W 18
$2,5 < w \leq 4$	W 17
$4 < w \leq 6$	W 16
$6 < w \leq 12$	W 15
$12 < w \leq 18$	W 14
$18 < w \leq 30$	W 13
$30 < w \leq 45$	W 12
$45 < w \leq 55$	W 11
$55 < w \leq 70$	W 10
$70 < w \leq 100$	W 9
$100 < w \leq 180$	W 8
$180 < w \leq 300$	W 7
$w > 300$	W 6

Table 12 — Step and hole IQI

Image quality class B	
Penetrated thickness, w mm	IQI value
$w \leq 2,5$	H 2
$2,5 < w \leq 5,5$	H 3
$5,5 < w \leq 9,5$	H 4
$9,5 < w \leq 15$	H 5
$15 < w \leq 24$	H 6
$24 < w \leq 40$	H 7
$40 < w \leq 60$	H 8
$60 < w \leq 80$	H 9

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