
**Non-destructive testing — Image
quality of radiographs —**

Part 1:

**Determination of the image quality
value using wire-type image quality
indicators**

Essais non destructifs — Qualité d'image des radiogrammes —

*Partie 1: Détermination de l'indice de qualité d'image à l'aide
d'indicateurs à fils*





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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 19232-1 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 19232-1:2004), of which it constitutes a minor revision with the following changes:

- update of references and definitions;
- statement that EN wire IQIs of EN 462-1:1994^[1] and its designation are identical with ISO wire IQIs and its designation, as defined in this part of ISO 19232;
- replacement of film by detector, which includes film and digital detectors;
- addition of a new Annex for conversion of ASTM wire IQI identities to ISO wire IQI numbers.

It also incorporates the Technical Corrigendum, ISO 19232-1:2004/Cor. 1:2007.

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 value 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 1:

Determination of the image quality value using wire-type image quality indicators

1 Scope

This part of ISO 19232 specifies a device and a method for the determination of the image quality of radiographs using wire-type image quality indicators.

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

ISO/IEC 17050-1, *Conformity assessment — Supplier's declaration of conformity — Part 1: General requirements*

ISO 19232-4, *Non-destructive testing — Image quality of radiographs — Part 4: Experimental evaluation of image quality values and image quality tables*

3 Terms and definitions

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

3.1

image quality

characteristic of a radiographic image which determines the degree of detail it shows

3.2

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.

3.3

image quality value

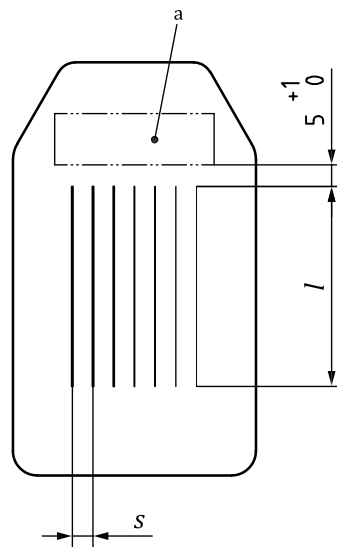
measure of the image quality required or achieved and is equal to the thinnest element which can be detected on the radiograph

Note 1 to entry: For wire-type IQIs, the element numbers are given in [Table 1](#).

4 Specification for wire-type image quality indicators

4.1 Dimensions, designation

[Figure 1](#) represents a wire-type image quality indicator.



Key

- l* lengths of the wires
- s* wire centreline spacing
- a* Space for identification marking.

Figure 1 — Image quality indicator (wire-type)

The IQI system is based on a series of 19 wires of different diameters which are specified in [Table 1](#) together with the relevant tolerances and the wire numbers. This series of wires has been subdivided into four overlapping ranges of seven consecutive wire numbers, viz. W 1 to W 7, W 6 to W 12, W 10 to W 16, and W 13 to W 19. The seven wires in an IQI are arranged parallel to each other. The length of the wires, *l*, is 10 mm, 25 mm or 50 mm.

The written designation of an image quality indicator shall be labelled with the letters IQI, the number of this part of ISO 19232, the wire number of the thickest wire as specified in [Table 1](#) (e.g. W 10), the symbol denoting the wire material (e.g. FE), and the length (e.g. 25):

EXAMPLE 1 IQI ISO 19232-1 - W 10 FE-25

IQIs with the designation EN 462-1^[1] are considered to be identical to IQIs with the designation ISO 19232-1.

NOTE [Annex A](#) gives a table for conversion of ASTM E747-04^[2] wire identities to the wire IQI values of this part of ISO 19232.

The full designation may be abbreviated to the wire number of the thickest wire of the IQI (e.g. W 10) and the wire material (e.g. FE) where reference to this part of ISO 19232 is clear.

EXAMPLE 2 W 10 FE

4.2 Material

All the wires of an IQI shall consist of the same material and shall be embedded in a protective covering of a material which shall not affect the image quality value. See [Table 2](#) for usual wire materials.

4.3 Marking of IQI

The marking applied on the IQI (see [Figure 1](#)) shall give the following information:

- a) number of the thickest wire (1, 6, 10, or 13); this is located at the side of the thickest wire;

- b) letters identifying the wire material used, e.g. FE;
- c) ISO letters.

EXAMPLE 10 FE ISO

IQIs with the letters EN are considered to be identical to IQIs with the letters ISO.

The radiographic image of the identification shall not cause glare when the radiograph is viewed. It is recommended that the absorption of the marking is not more than twice the absorption of the thickest wire.

4.4 Declaration of conformity

Each IQI shall be delivered with a declaration of conformity according to ISO/IEC 17050-1 which confirms that the IQI complies with this part of ISO 19232. For identification, the IQI shall be numbered and marked by the producer.

Table 1 — Wire numbers, diameters, and limit deviations

Dimensions in millimetres

Image quality indicator including				Wire			Wire centre-line spacing <i>s</i>
W 1	W 6	W 10	W 13	element (wire) number	nominal wire diameter	diameter tolerances	
×				W 1	3,20	± 0,03	9,6 ⁺¹ ₀
×				W 2	2,50		7,5 ⁺¹ ₀
×				W 3	2,00		6 ⁺¹ ₀
×				W 4	1,60	± 0,02	5 ⁺¹ ₀
×				W 5	1,25		
×	×			W 6	1,00		
×	×			W 7	0,80		
	×			W 8	0,63		
	×			W 9	0,50	± 0,01	
	×	×		W 10	0,40		
	×	×		W 11	0,32		
	×	×		W 12	0,25		
		×	×	W 13	0,20		
		×	×	W 14	0,16	± 0,005	
		×	×	W 15	0,125		
		×	×	W 16	0,100		
			×	W 17	0,080		
			×	W 18	0,063		
			×	W 19	0,050		

5 Use of image quality indicators

5.1 Selection

The criteria for selecting the IQI to be used shall be the material under test and the image quality value expected or required.

The wire material shall have a coefficient of absorption as close as possible to that of the material under test. Where IQIs as listed in [Table 2](#) are used for materials other than those listed in this table, refer to ISO 19232-4. In such cases, the wire material shall have the next lowest coefficient of absorption to that of the object under test. If this is not feasible because the differences in absorption are too great, IQIs made of the same type of material as the object under test shall be used.

Table 2 — Types of IQI and wire materials used for selected groups of materials

Image quality indicator	Wire number	Wire material	Suitable for testing of the following materials
W 1 CU W 6 CU W 10 CU W 13 CU	W 1 to W 7 W 6 to W 12 W 10 to W 16 W 13 to W 19	Copper	Copper, zinc, tin, and their alloys
W 1 FE W 6 FE W 10 FE W 13 FE	W 1 to W 7 W 6 to W 12 W 10 to W 16 W 13 to W 19	Steel (low alloyed)	Ferrous materials
W 1 TI W 6 TI W 10 TI W 13 TI	W 1 to W 7 W 6 to W 12 W 10 to W 16 W 13 to W 19	Titanium	Titanium and its alloys
W 1 AL W 6 AL W 10 AL W 13 AL	W 1 to W 7 W 6 to W 12 W 10 to W 16 W 13 to W 19	Aluminium	Aluminium and its alloys

5.2 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. The number of the thinnest wire which is clearly visible on the radiograph shall be

taken as the image quality value. The image of a wire is accepted if a continuous length of at least 10 mm is clearly visible.

In general, the image quality value shall be determined for every radiograph for which a verification of image quality is required.

If steps have been taken to guarantee that radiographs of similar test objects and regions are produced with identical exposure and processing techniques 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.

Annex A (informative)

Guidance for conversion of the ASTM E747-04[2] standard wire identities

Wire IQIs as described in ASTM E747-04[2] have equivalent wire diameters as given in [Table 1](#), but different designations. [Table A.1](#) provides guidance for conversion of the ASTM E747-04[2] standard wire identities to the wire numbers of this part of ISO 19232. The acceptance of radiographs with ASTM E747-04[2] IQIs may require the agreement of the contracting parties.

A requirement of [4.4](#) is that the producer number and mark the ASTM E747-04[2] wire IQIs used for identification.

Table A.1 — Conversion of ISO wire number to ASTM E747-04[2] standard wire identities

ISO wire number	Alternate ASTM E747-04[2] identity	ASTM wire set identity	ISO wire number	Alternate ASTM E747-04[2] identity	ASTM wire set identity
—			—	21	Set D
—			—	20	
—			—	19	
—			—	18	
W 1			W 1	17	
W 2	16	Set C	W 2	16	Set B
W 3	15		W 3		
W 4	14		W 4		
W 5	13		W 5		
W 6	12		W 6		
W 7	11		W 7	11	
W 8			W 8	10	
W 9		W 9	9		
W 10		W 10	8		
W 11		W 11	7		
W 12	6	Set A	W 12	6	
W 13	5		W 13		
W 14	4		W 14		
W 15	3		W 15		
W 16	2		W 16		
W 17	1		W 17		
W 18			W 18		—
W 19		W 19		—	

Bibliography

- [1] EN 462-1:1994, *Non-destructive testing — Image quality of radiographs — Part 1: Image quality indicators (wire type) - Determination of image quality value*
- [2] ASTM E747-04, *Standard practice for design, manufacture and material grouping classification of wire image quality indicators (IQI) used for radiology*

