
INTERNATIONAL STANDARD



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Microcopying — ISO Test chart No. 2 — Description and use in photographic documentary reproduction

Microcopie — Mire ISO n° 2 — Description et utilisation dans la reproduction photographique des documents

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FOREWORD

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO Member Bodies). The work of developing International Standards is carried out through ISO Technical Committees. Every Member Body interested in a subject for which a Technical Committee has been set up 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.

Draft International Standards adopted by the Technical Committees are circulated to the Member Bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 3334 was drawn up by Technical Committee ISO/TC 46, *Documentation*, and was circulated to the Member Bodies in March 1974.

STANDARD PREVIEW
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It has been approved by the Member Bodies of the following countries:

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Australia	Iran	Spain
Belgium	Israel	Switzerland
Canada	Italy	Thailand
Egypt, Arab Rep. of	Netherlands	Turkey
Finland	Poland	United Kingdom
France	Portugal	U.S.A.
Germany	Romania	U.S.S.R.
Hungary	South Africa, Rep. of	Yugoslavia

The Member Body of the following country expressed disapproval of the document on technical grounds:

Czechoslovakia

Microcopying — ISO Test chart No. 2 — Description and use in photographic documentary reproduction

0 INTRODUCTION

Microcopying systems vary in their ability to record fine detail such as small alphanumeric characters or closely spaced pencil lines on a drawing.

The method specified in this International Standard involves the measurement of the minimum size of detail which is visually recognizable on the microfilm and therefore can be applied to define and control this aspect of image quality.

Since microrecording systems may be operated close to limits of legibility, resolution testing provides a safeguard against the loss of information, although other factors also contribute to the overall quality of the film image.

This International Standard is based on a widely used method employing the U.S.A. National Bureau of Standards Microcopy Resolution Test Chart. This method has found wide acceptance by users of microcopying techniques and the arrangement of test patterns is identical with the NBS 1963-A Chart. It is intended for use with International Standards concerned with microcopying.

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies a method of determining the resolving power of a given camera, film and development combination used in a microcopying system or the resolution achieved in microcopies therefrom. It provides, for this purpose, a test pattern and a test chart (ISO test chart No. 2). The test chart should be used as part of a test target in the manner prescribed by each relevant International Standard covering various applications of microcopying.

This International Standard does not specify a method of determining the resolving power of microfilm readers or print-producing equipment.

This International Standard also specifies the manner in which the resolving power is to be quoted or defined.

2 REFERENCES

- ISO 3, *Preferred numbers — Series of preferred numbers*.
ISO . . ., *Diffuse reflection density*.¹⁾

3 DESCRIPTION OF THE TEST CHART

3.1 Test pattern

The test pattern shall consist of a numbered group of two sets of five parallel lines at right angles as shown in figure 1. The reflection density of the lines shall be not less than 1,60, and the reflection density of the spaces not more than 0,02 when measured relative to the white of the paper on which the chart is printed. The reflection density of the white printing paper shall be not more than 0,08 when measured relative to a near perfect white reflector, such as barium sulphate, as specified in ISO . . .

3.2 Arrangement of test patterns

3.2.1 The test chart shall consist of an arrangement of test patterns of increasing spatial frequency as detailed in the table. A convenient arrangement is shown in figure 2. The test patterns are designated by a number indicating the spatial frequency in line pairs per millimetre; for example, the 2,0 pattern has lines 0,25 mm in width, with one line and one space constituting one line pair of 0,5 mm width. That pattern has a spatial frequency of 2 line pairs per millimetre.

The test chart shall be made on a white photographic paper with a glossy surface.

3.2.2 The sequence of steps, starting at 1,0, is in accordance with the R 20 series of preferred numbers given in ISO 3, with a first rounding. This gives an average increment of 12,2 % per step. The sequence thus obtained is shown in the table. Measurement for the tolerance shown shall be made after the test chart has been maintained at a temperature of $23 \pm 2^\circ\text{C}$ and a relative humidity of $50 \pm 2\%$ for a period of at least 1 h.

1) In preparation by ISO/TC 42, *Photography*.

3.2.3 The designatory number of each pattern shall be situated within the top right quarter of the rectangle formed by each pattern. The size of the number shall be as shown in figure 1. The type-face used shall be "futura" medium or a similar type suitable for photographic reproduction.

3.2.4 The test chart shall bear the legend "ISO Test Chart No. 2", below the test patterns, and shall show the source of issue.

4 TEST APPARATUS

Images of the test charts shall be appraised only with the use of a microscope having a good quality achromatic objective. The overall magnification of the microscope shall be between 1/3 and 1 times the number of line pairs per millimetre of the expected smallest resolved pattern observed on the microfilm. For example, to view 150 line pairs per millimetre, the magnification shall be between 50 X and 150 X.

5 TEST PROCEDURE

5.1 A test target, composed of test charts together with any other desired test objects such as reflectance targets, reduction ratio numbers and a reduction ratio test strip shall be constructed and photographed onto the microfilm in accordance with the relevant International Standard.

5.2 All test patterns of the test chart shall be examined under the microscope, and for each the designatory number of the smallest resolved pattern noted. A pattern is identified when the two groups of lines constituting this pattern can be distinguished in both directions. For example, in figure 3 the smallest pattern in which the lines can be distinguished in both directions is the pattern designated 5.6.

5.3 In some circumstances, most commonly when a camera is slightly out of focus, some patterns are not resolved when smaller patterns appear to be resolved. This effect is known as spurious resolution. In such a case, the true resolution is determined from the next larger pattern to the first one unresolved.

5.4 If the lines in one direction appear resolved while those at right angles do not, it is possible that the eyesight of the examiner may be astigmatic. To check for this possibility, the pattern is viewed at 90° to the original direction. If the same set of lines remains unresolved, the fault lies in the film sample or in the camera and not in the examiner.

5.5 The designatory number of the smallest resolved pattern multiplied by the reduction ratio at which the target was photographed gives the resolving power of the camera, film and development combination in line pairs per millimetre.

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TABLE – Dimensions and tolerances of test patterns

Test pattern spatial frequencies	1,0 1,1 1,25 1,4 1,6 1,8 2,0 2,2 2,5 2,8 3,2 3,6 4,0 4,5 5,0 5,6 6,3 7,1 8,0 9,0 10 11 12,5 14 16 18
Tolerance on spatial frequency	The length of four full cycles shall be within $\pm 3\%$ of the nominal length of four cycles
Tolerance on $\frac{\text{line length}}{\text{line width}}$	$\pm 5\%$
Tolerance on $\frac{\text{line width}}{\text{space width}}$	1 to 10 line pairs/mm incl. : $\pm 5\%$ 11 to 18 line pairs/mm incl. : $\pm 10\%$

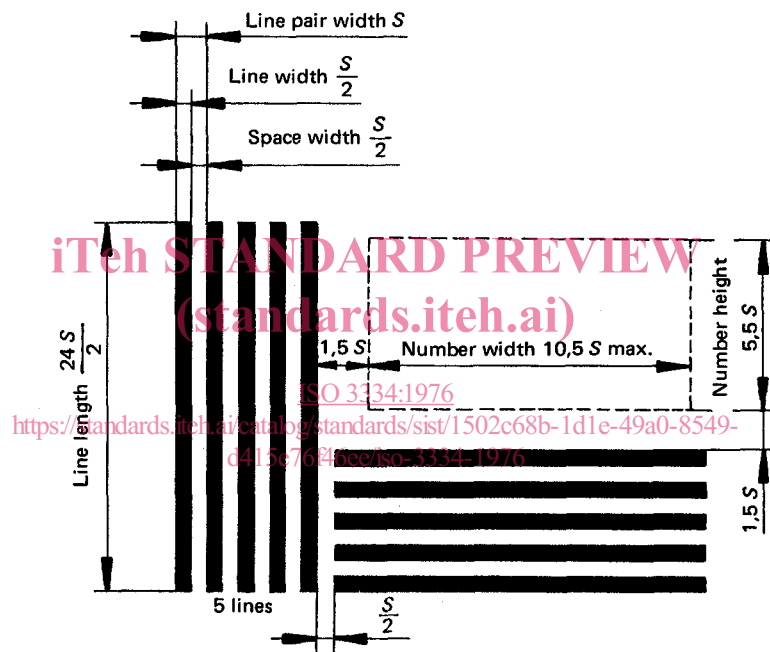


FIGURE 1 – Resolution test pattern

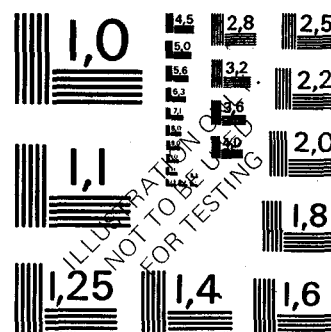


FIGURE 2 – Arrangement of test patterns in ISO test chart No. 2 (actual size)



FIGURE 3 — Reproduction of a photomicrograph of test patterns on a typical microfilm
In the illustration the pattern designated 5.6 is considered the smallest pattern resolved