INTERNATIONAL STANDARD

**ISO 8514-2**

Second edition
2000-05-01

# Micrographics — Alphanumeric computer output microforms — Quality control

## Part 2: **Method**

*Micrographie — Microformes COM alphanumériques — Contrôle de la qualité —*

*Partie 2: Méthode*

Reference number
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## Foreword

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

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 part of ISO 8514 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 8514-2 was prepared by Technical Committee ISO/TC 171, *Document imaging applications*, Subcommittee SC 1, *Quality*.

This second edition cancels and replaces the first edition (ISO 8514-2:1992) which has been technically revised.

ISO 8514 consists of the following parts, under the general title *Micrographics — Alphanumeric computer output microforms — Quality control*:

— *Part 1: Characteristics of the test slide and test data*

— *Part 2: Method*

Annex A of this part of ISO 8514 is for information only.

# Introduction

The use of alphanumeric computer output microforms (alphanumeric COM) for the storage of information requires valid, reliable methods by which the quality of the images can be measured. This is necessary to achieve consistent usable output. Of primary importance in the production of microforms containing alphanumeric information is the legibility of the information presented to the user. This is true whether the microform used is the original (first generation) or a duplicate.

ISO 8514 specifies a method for measuring the quality of computer output microforms (COM) and specifies a test form slide and test data to be used for applying this method. It applies to microforms containing variable data produced using a cathode-ray tube, light-emitting diodes or a laser, and fixed data such as that contained on a form slide, with effective reduction ratios of 1:24 through 1:48, in accordance with ISO 9923. This International Standard applies only to COM recorders that use a physical form slide.

This International Standard describes various systems and equipment to establish test guidelines whereby the user can establish and maintain a given level of performance using the minimum of sophisticated equipment.

The method requires a test form slide and test data generated from the COM image generator.

Part 1 of this International Standard specifies the characteristics of the test slide and of the test data used for applying this method.

# Micrographics — Alphanumeric computer output microforms — Quality control —

## Part 2: Method

## 1 Scope

This part of ISO 8514 describes a method for measuring the output quality of alphanumeric COM recorders that use a physical form slide. It also provides a means for establishing the optimum intensity (exposure) settings of the image generator.

## 2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 8514. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 8514 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 5-2:1991*, Photography — Density measurements — Part 2: Geometric conditions for transmission density.*

ISO 5-3:1995, *Photography — Density measurements — Part 3: Spectral conditions.*

ISO 446:1991*, Micrographics — ISO character and ISO test chart No. 1 — Description and use.*

ISO 3334:1989, *Micrographics — ISO resolution test chart No. 2 — Description and use.*

ISO 6196-7:1992, *Micrographics — Vocabulary — Part 7: Computer micrographics.*

ISO 8514-1:2000, *Micrographics — Alphanumeric computer output microforms — Quality control — Part 1: Characteristics of test slide and test data.*

ISO 9923:1994, *Micrographics — Transparent A6 microfiche — Image arrangements.*

## 3 Terms and definitions

For the purposes of this part of ISO 8514, the terms and definitions given in ISO 6196-7 and the following apply.

**3.1**
**test slide**
form slide designed for use in measuring the quality of output from a COM system.

# 4 Outline of the method

The method described is used initially to set up the COM system to yield satisfactory images and later as a means to maintain consistent performance on a day-to-day basis. If several COM recorders are in use, it also provides the means to ensure that equivalent performance is being obtained from each COM recorder.

The method first uses the test slide specified in ISO 8514-1 to determine if optimum focus of the image of the test slide is being achieved. This is carried out using the ISO No. 1 or No. 2 test chart.

The E-H patterns and density balancing areas (see Figure 1) are then used to establish the proper exposure. The data from the character generator is used to adjust and determine the registration accuracy of the data with the test slide. This is accomplished using the alignment grid. The “E” and “H” characters are used to set up the exposure from the image generator. In general, this exposure level is established by the user in relation to his own needs.

The typical set of COM characters and the characters of similar appearance (see Figure 1) are used to establish that the data from the image generator are legible.

# 5 Test procedure

## 5.1 General

The following procedure consists of obtaining first the best image of the test slide (see 5.2) and then of establishing the best image from the image generator (see 5.3).

## 5.2 Optimizing the test slide image

### 5.2.1 COM reduction ratio

The reduction ratio shall be in accordance with ISO 9923.

The actual reduction ratio of the COM recorder shall be checked by taking the ratio of a dimension of any element of the artwork and the actual dimension on the same element on the microimage.

To do this accurately the use of a travelling microscope[1)] may be required, although such devices may not be readily available. An alternative method is to use a fixed microscope, with a measuring graticule, of sufficient magnification to measure the size of the image of the test slide. It is also essential that the proper reduction has been used during preparation of the test slide. In most COM systems utilizing physical form slides, and using a particular lens, the reduction ratio is fixed, hence this test is useful only in determining if the specifications of this part of ISO 8514 have been met.

### 5.2.2 Optical focus of the test slide

Since, in most cases, the form slide imaging system is prefocused by the manufacturer, this test is used to confirm that the minimum resolution specified in 5.2.4 is being achieved. If not, the necessary adjustment shall be made before any other operation is initiated.

For this purpose the microimage shall be checked. The value obtained is dependent not only on the COM recorder lens focus but also on the exposure conditions, film type and processing.

The maximum resolving power shall be determined through several tests carried out at various exposure settings ranging from underexposure, through normal exposure to overexposure. To measure the resolution, use either the ISO test chart No. 1 or the ISO resolution test chart No. 2 in accordance with ISO 446 and ISO 3334 respectively.

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1) A travelling microscope is one designed to measure distances. Typically it has a graduated moveable stage upon which the microform is affixed, and an eyepiece with cross-hairs.

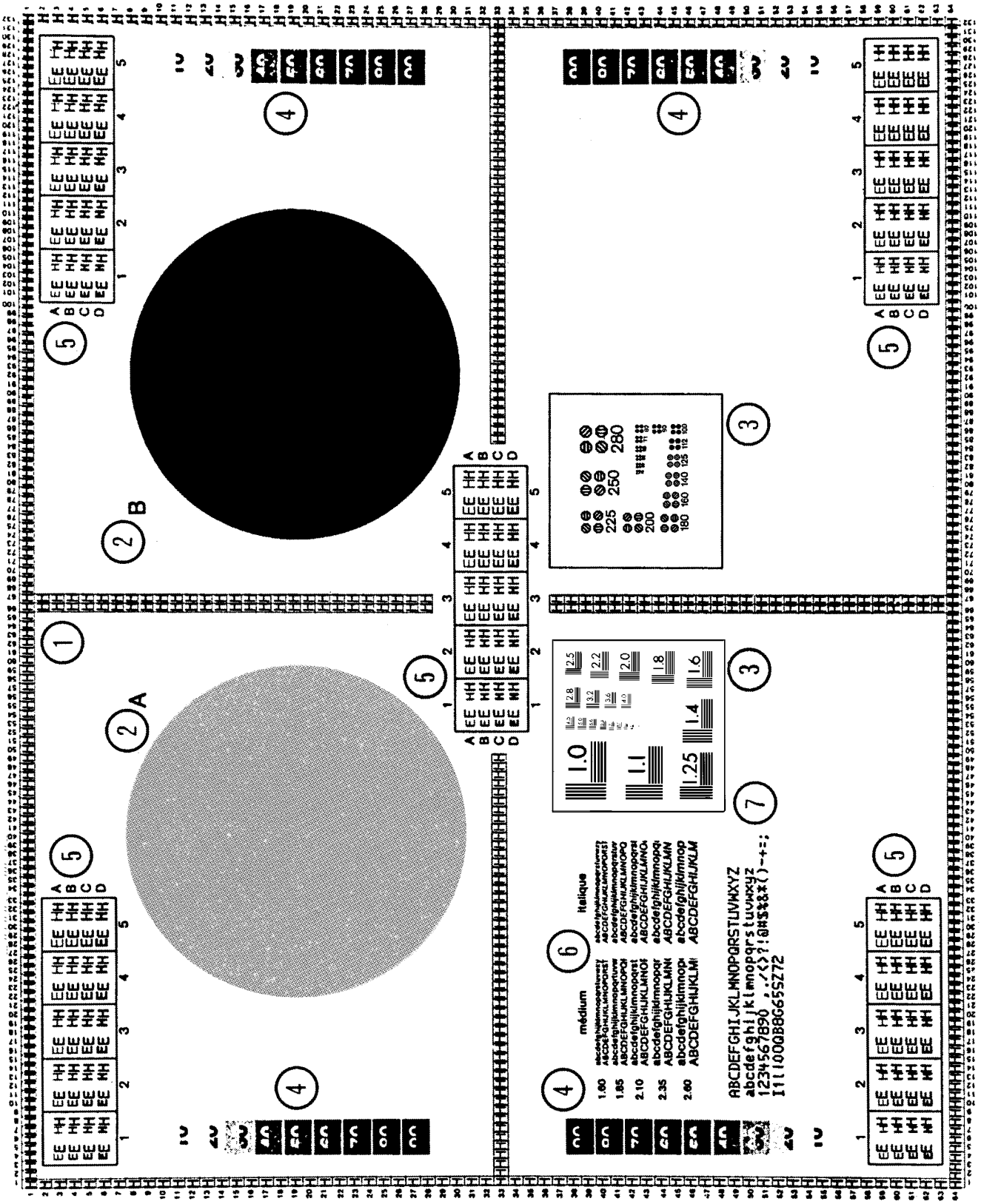


**Figure 1 — Sample layout of image frame combining test slide and the generated test data**

For information regarding resolving power on duplicates, see Annex A.

NOTE Maximum resolution is rarely achieved when practical exposure conditions are used.

### 5.2.3 Test slide exposure — Test “A”

Fill a microfiche or a suitable length of roll microfilm with images of the test slide using a series of gradually increasing form-flash intensities (line by line or column by column). Choose the exposure level for the test slide that gives an image in which the thinnest E-H pair (A1) (see area) appears underexposed and the heaviest E-H pair (D5) appears overexposed. If more than one pair appears underexposed or overexposed, choose the image in which the amount of under- and overexposure is equal. Note the exposure setting that gives these results.

Once the proper exposure level is chosen, if a densitometer which complies to ISO 5-2 and 5-3 is available, measure the visual diffuse transmission density of the appropriate density area. A densitometer with a maximum aperture of 1 mm should be used due to the high reduction ratio often used for computer output microfilm. For positive-appearing COM images measure the maximum density on the density measuring area B and for negative-appearing COM images measure the minimum density on the density measuring area B and measure the density of the density measuring area A. Also record the related coordinates (column and row) of the E and H patterns corresponding to the optimum exposure. These can be used for future checking of the system to ensure that proper exposure and processing is maintained.

If a densitometer is not available, the density balancing areas may be used as a visual comparison reference.

To read the density balancing scale, consider areas as "read" only for those having enough visual contrast to distinguish both the white and the black numbers from the background of the areas in which they are located.

### 5.2.4 COM resolving power

#### 5.2.4.1 Requirements

The resolving power requirements for COM recording depend on the type of characters (font and size) being recorded and on the reduction ratio used. If the data contains lower case or complex characters, then the resolving power requirements are higher than if all upper case characters are used.

#### 5.2.4.2 Determination

The test charts located in area are used to determine the resolving power of the system. Measurement of the resolution of the image of the test slide is used to determine the ability of the COM system to record fine detail. Since the resolving power measurement is made using a high-quality, high-contrast form slide and not the image generator, this test is not a measure of the character resolution. Resolving power shall be determined in accordance with ISO 446 or ISO 3334.

NOTE Measuring resolving power will help to determine whether the lens and film components of the system are capable of recording fine detail. The value obtained is critically dependent upon the focus of the lens. Thus, if the resolving power is below expectation a focus range test should be run at the exposure as determined in 5.2.3.

The character size being used can be determined by examining area on the image of the test slide. Compare the size of the test data EH characters with those from the test slide. Refer to Table 1 in ISO 8514-1 to determine the ‘equivalent’ size of the generated test characters.

Determine the quality obtained by using the following formula:

$$Q = P \times H$$

where

$Q$ is the quality value;

$P$ is the highest pattern number from test chart area resolved;

$H$ is the height determined from COM character legibility test areas.

If only upper case characters are used, the height of the upper case E should be used in the above formula.

If lower case or complex characters are used, then 80 % of the height of the upper case E should be used in the above formula.

A quality value of 8 or greater, excellent copies should be obtained. A value of 5 or greater should be able to be read without difficulty. A value of 3 or less will only be read with difficulty. A minimum value of 3,6 is recommended.

NOTE Resolving power is critically dependent upon the focus of the lens. Thus if resolving power is below expectation a focus range test should be run at the optimum exposure as determined in 5.2.3.

#### 5.2.5 Legibility control of the test slide image

Check the quality of the characters located in area. In routine work all characters in the area shall be legible. The characters located in area are a sample of standard characters recommended for use in making standard form slides.

NOTE This test is used to check that a typical form slide will produce a microimage of acceptable quality.

### 5.3 Optimizing the image of the image generator

#### 5.3.1 General

Set the test slide exposure to the value determined to be optimum in test “A” for all the following tests.

#### 5.3.2 Setting of the image generator luminance — Test “B”

Generate data (see ISO 8514-1, Figure 3) using the image generator. Prior to recording on film, align the dynamic data to the test slide grid. Fill a microfiche or a suitable length of roll microfilm with images from the test slide and image generator using gradually increasing generator intensity.

#### 5.3.3 Legibility and exposure determination

Select the best image of the EH pairs. Use a microscope or a full size blowback microform reader to compare this image with an EH pair from the test slide having the same height and line width. Do this for each area on the test slide image. Note the number and letter position of each comparable EH set. Also examine the resolution targets on the image of the form slide to determine if the pattern resolved is equal to or smaller than the pattern determined to be required using the method described in 5.2.4.

#### 5.3.4 Alignment

The grid area shall be used to check the alignment accuracy of the image generator, the stability of deflection frame to frame and any possible character distortion or aberration.

#### 5.3.5 COM character set

The typical set of COM characters shall be generated in area. Examine each character to ensure legibility, particularly any sequence of similar characters.

— I, 1;

— 0, O, Q;

— B, 8

— G, 6, 5, S;

— Z, 7, 2.

## 6 Density of first generation microform

### 6.1 General

Produce images of the test slide on film and make density measurements on these images as follows.

### 6.2 Density test areas

There are two areas used for the measurement of density. The clear area of the test slide (B) is used to measure the maximum density when conventional processing is used or to measure the minimum density when reversal processing or direct positive film is used. The halftone (A) is used principally with reversal processing to monitor the consistency of exposure and processing.

In addition, the microform background can be used to measure the minimum density (base plus fog) on conventionally processed film and the maximum density for reversal processed film.

### 6.3 Density values

Table 1 gives recommended visual diffuse transmission density values measured with a densitometer complying to ISO 5-2 and ISO 5-3. In some instances a preferred density is given along with a required density. The preferred density is recommended for optimum legibility.

**Table 1 — Summary of acceptable density limits**

| Film type | Process | Density measurement method | Minimum background density | Maximum clear area density | Minimum density difference |
|---|---|---|---|---|---|
| Silver gelatin | Conventional | Printing or visual diffuse | 0,75 | 0,15 or 0,10 plus base [a] | 0,60 |
| Silver gelatin | Full reversal or direct positive | Printing or visual diffuse | 1,50 (1,80 preferred) | 0,20 plus base [a] | 1,30 |
| Thermally processed silver | Heat | Printing ISO type 1 | 1,00 | 0,40 plus base [a] | 0,60 (0,80 preferred) |
| [a] Density of the uncoated base | | | | | |

# 7 Applications

The following checks shall be performed:

— installation and maintenance testing;

— routine checking.

## 7.1 Installation and maintenance testing — Test “C”

— Perform all the tests described in 5.2, particularly, tests “A” and “B” using fresh solutions for the processing.

— Choose the optimum settings, and record them.

— Use these settings to generate a complete microfiche or a suitable length of roll microfilm with composite images as shown in Figure 1.

— Record the densities obtained from the density test areas, the identifying co-ordinates of the EH sets which produce the best results from both test slide and COM generated data in area, the number of the smallest ISO No. 1 character or ISO No. 2 test pattern read in area, and the effective reduction ratio used.

This microform shall be considered as a reference.

When a COM recorder is installed, the equipment shall be checked in accordance with the above method. The test settings as well as the results obtained shall be recorded. The results can be used subsequently as references for performing routine testing of the equipment.

## 7.2 Routine checking

The output from the COM recorder shall be monitored on a regular basis using the method described in this International Standard. The frequency of testing should be determined by the volume of fiche produced within a specific time frame and the ability of the COM system to generate consistent results.

These tests should be used as part of a routine maintenance procedure to ensure adequate quality levels are maintained by the system. These tests are not intended to be included on production microfiche/microfilm. Test results should be documented and stored as part of a quality maintenance system. If a quality problem has been detected, test B in 5.3.2 may be used to assist in trouble-shooting and correcting the problem.

— Generate a complete microfiche (or its microfilm equivalent) with composite images, as shown in Figure 1, with the same exposure and processing conditions as recorded during test “C”.

— Compare results with those recorded for the reference microform obtained by test “C”.

— Make any necessary adjustments and retest.

# Annex A
(informative)

# Duplicates

The tests defined in this International Standard use the first generation or camera film. Since the user generally receives a duplicate or distribution copy, a reference copy of the first generation film should be made, using the duplicator to be used for production.

A series of copies should be made at gradually increasing exposures.

The duplicates should be examined, and the exposure should be chosen that yields the optimum duplicate.

The exposure setting should be recorded and the reference copy should be retained.

The method used to determine the resolution requirements for the first generation is defined in 5.2.4. In practice, the resolution patterns resolved on duplicates should be no more than one pattern larger than on the previous generation.

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