INTERNATIONAL STANDARD

**ISO 10196**

Second edition
2003-03-01

# Document imaging applications — Recommendations for the creation of original documents

*Applications en imagerie documentaire — Recommandations pour la création des documents originaux*



Reference number
ISO 10196:2003(E)

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Published in Switzerland

 

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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 10196 was prepared by Technical Committee ISO/TC 171, *Document imaging applications*, Subcommittee SC 2, *Application issues*.

This second edition cancels and replaces the first edition (ISO 10196:1990), which has been technically revised.

# Introduction

The expanding use of modern means for managing, conserving, safeguarding and exchanging documents requires the creation of original documents of high quality. At the time of its creation, it is not always known whether a document will be microfilmed or scanned. The requirements of this International Standard should be taken into account in the preparation of any document, to ensure that the document is of a quality that will reproduce well in case it has to be microfilmed or scanned.

These recommendations should be part of the current practice of companies, in particular concerning the creation and duplication of documents.

The quality of the original document has a direct effect upon the quality of a microimage or of a scanned image. Recording operations carried out therefore greatly depend on certain characteristics of the original document, which are essential for the production of quality reproduction.

The progress made in the field of micrographics leads to the use of increasingly greater reduction ratios, which correspondingly makes the creation of originals more important.

Likewise for scanning, the existence of high-performance equipment also leads to creating quality originals. In addition, the increasing frequent use of optical character or image-recognition techniques (OCR or ICR), demands that the text be legible in order to be efficacious.

# Document imaging applications — Recommendations for the creation of original documents

## 1 Scope

This International Standard provides guidance on the creation of printed documents so that they may be easily reproduced as microforms or scanned images.

Although studies were based more specifically on the Latin alphabet, the general principles may be used as guidelines for the production of documents using other alphabets or ideograms.

This International Standard does not apply to technical drawings for which requirements are given in ISO 5457 and ISO 6428. It also does not apply to special micrographics or scanning-related applications (scanning of bank cheques or bar codes).

## 2 Normative references

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

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

ISO 5-4:1995, *Photography — Density measurements — Part 4: Geometric conditions for reflection density*

ISO 216:—[1)], *Writing paper and certain classes of printed matter — Trimmed sizes — A and B series*

ISO 2470:1999, *Paper, board and pulps — Measurement of diffuse blue reflectance factor (ISO brightness)*

ISO 6196-1:1993, *Micrographics — Vocabulary — Part 1: General terms*

ISO 6196-2:1993, *Micrographics — Vocabulary — Part 2: Image positions and methods of recording*

ISO 6196-3:1997, *Micrographics — Vocabulary — Part 3: Film processing*

ISO 6196-4:1998, *Micrographics — Vocabulary — Part 4: Materials and packaging*

ISO 6196-5:1987, *Micrographics — Vocabulary — Part 5: Quality of images, legibility, inspection*

ISO 6196-6:1992, *Micrographics — Vocabulary — Part 6: Equipment*

ISO 12651:1999, *Electronic imaging — Vocabulary*

1) To be published. (Revision of ISO 216:1975)

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 6196 and ISO 12651 and the following apply.

**3.1**
**basic detail**
*d*
smallest element, whether black or white, necessary for the recognition of an individual character (see Figure 1)

EXAMPLE width of the stroke (in particular of the upstroke), space within a symbol, separation between symbols.

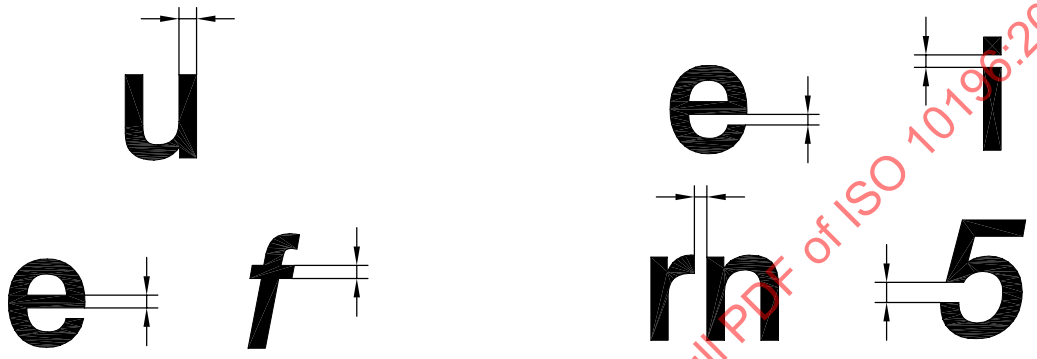


**Figure 1 — Example of a basic detail**

**3.2**
**document**
combination of a medium and the information recorded on or in it

NOTE In this International Standard, "document" means visually readable, typewritten or handwritten texts, and illustrations.

**3.3**
**character font**
set of characters of the same style, weight and size, in sufficient quantity to enable typographic composition

NOTE A font is characterized by its type-face family and size e.g. Univers 55, size 2,13 mm.

**3.4**
**optical class**
*C*
number, representative of the geometrical design of a type of character, used for calculating its legibility and reproducibility limits

**3.5**
**object-image ratio**
*r*
relationship between the dimensions of the object and the corresponding dimensions of the image

EXAMPLES source document/microimage; source document/image on the screen; screen image/image reproduced on paper

**3.6**
**off-format document**
**oversized document**
documents of which the length or width, or both, are greater than the format which can be scanned by the scanner or microfilmed by the camera

# 4 Physical characteristics of the paper

## 4.1 Sizes

The documents should be printed on paper having trimmed sizes in accordance with ISO 216.

As many micrographics or scanning systems are equipped with autofeed, it is preferable to use the most common formats, A4 or A3.

## 4.2 Quality of paper

Paper with a grammage greater than 60 g/m$^2$ should be used. Papers with heavy base weights, (over 150 g/m$^2$) can be unsuitable for equipment with document-autofeed systems or for rotary cameras.

The opacity of paper should be sufficient to minimize show-through. A method for evaluating opacity is described in Annex A.

The paper shall be suitable for use with the type of material or machinery to be used in document preparation.

Avoid the use of paper incorporating fluorescent agents.

## 4.3 Colour of paper

A white base paper with uniform optical density should preferably be used, having a reflectance factor of at least 75 %, measured in accordance with ISO 2470. If the document needs coloured areas (e.g. forms with areas to be filled), the colour shall only be weak. Preferably, marking of special areas should be made in some other way than coloured areas (e.g. frames).

In the case of scanning, the use of coloured paper is possible if the colour of the paper is perceived by the scanner as white.

## 4.4 Translucent paper

The use of translucent paper is not recommended. When a translucent paper is used, its visual diffuse reflection density should be less than 0,25 measured in accordance with ISO 5-3 and ISO 5-4.

# 5 Printing characteristics

## 5.1 Colour of print

Dense black ink should be used for print.

In the case of scanning and microfilming, it is possible to use coloured inks. The latter should preferably be detected as a black colour. In order to determine those colours which can be accepted by the scanner, it is recommended to use the test target defined in ISO 12653. Coloured paper/coloured ink combinations should be carefully studied.

## 5.2 Choice of a character font

### 5.2.1 General

Annex B gives guidance as regards the choice of a character font. The requirements in 5.2.2 and 5.2.3 should be taken into account.

### 5.2.2 Typeface

Characters should be easily recognizable. Character fonts with ornate, condensed or narrow characters, or letters and numerals that are similar in appearance should be avoided (see Figure 2). “Standard” type fonts (Arial, Swiss) are a good example of acceptable character fonts.


**Figure 2 — Examples of letter E**

### 5.2.3 Character size

Character sets, of which the minimum height of the lower case “e” is 1,4 mm for scanning and 1,8 mm for micrographics, should be used. The use of smaller characters can cause problems.

The ratio of heights between upper- and lower-case characters should be 3 to 2.

The width to height ratio of the lower case “e” should be between 0,9 and 1,1.

The line width of character should be at least 0,18 mm, preferably 0,25 mm or more.

The line width to height ratio of the lower case “e” should be less than 0,20.

Figure 3 shows how to measure the characters.

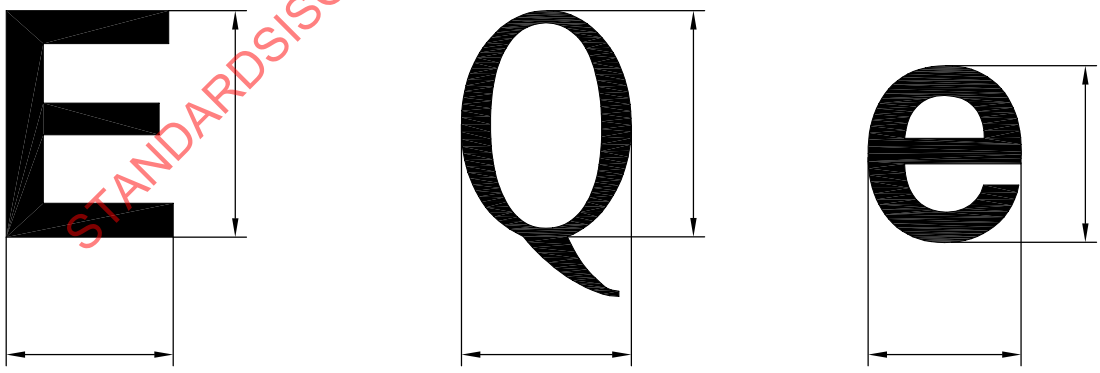

**Figure 3 — Examples of character measurement**

## 5.3 Line space

The space between two base lines of characters should be at least equal to 1,5 times the height of the upper-case letter, measured as shown by Figure 4.

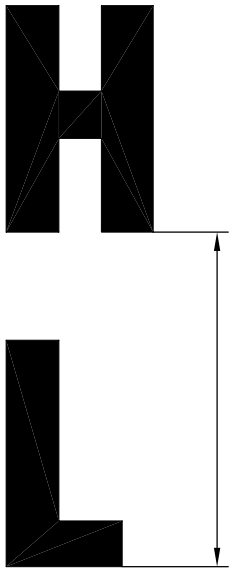

**Figure 4 — Measurement of line spacing**

## 5.4 Contrast

The contrast of all information, including frames, markings, handwritten text, etc., should be as great as possible.

## 5.5 Print quality

In order to obtain high-quality printing, high-gloss inks and techniques that impair the flatness of the medium should be avoided. The choice of ink should minimize penetration, smudging and spreading. The adhesion of the ink to the medium shall be good.

In particular, in the case of scanning, followed by an optical-character recognition, some difficulties can appear if dot matrix printers are used, or again, in the case of used inking ribbons or insufficient developing ink in laser printers.

## 5.6 Reversed print

The writing of text in light-coloured characters on dark-coloured or black backgrounds is not recommended, particularly in the case of optical character recognition, as scanners are often optimized in order to detect black dots on a white background and not the contrary.

## 5.7 Background tint

The use of a background tint should be avoided.

# 6 Presentation of the texts

## 6.1 Text arrangement

The content of the document should be in portrait orientation.

## 6.2 Margins

Adequate margins should be allowed, normally 25 mm on the binding edge and 10 mm on the other edges.

# 7 Information specific to scanning

## 7.1 Bar code

Bar codes do not come within the scope of this International Standard. However, it can be useful to recognize them in the case of automatic document indexing.

## 7.2 Continuous-tone photographs

Continuous-tone photographs pose a large number of problems at the time of scanning, in particular with the appearance of the moiré effect. The most widely used scanners transform each element of the image either into a white dot or into a black dot. This representation leads to images that are often unusable. It is advisable to either avoid documents that contain photographs, or to use scanners that are equipped with grey-scale analysis facilities.

## 7.3 Raster

It is recommended not to use rasters which are too fine (> 65). Beyond this, the scanner reconstitutes, more often than not, the very structure of the raster and not the image.

## 7.4 Colour image

It is advisable to test the capabilities of the scanner with the test target. For this purpose, use the target provided in ISO 12653.

## 7.5 Drawings, graphics, open areas

It is advised not to add a large number of drawings of the logo area, large borders, or hatching. When scanned, these cause unnecessary storage-memory consumption.

## 7.6 Zones to be filled in manually

The zones of the documents that are to be filled in manually (i.e. zone for a signature or for manual data input) should preferably be white and should not contain any grey tints, watermarks, etc.

# Annex A
(informative)

# Method for evaluating the opacity of paper

The original document should be produced on paper that is opaque enough to ensure reproduction of good quality.

In practice, the problem is to determine whether a given paper can be used for printing on both sides.

A simple method of checking is to place two sheets of the paper to be used over a sheet of paper with a dense black image on it, e.g. dry transfer letter, printed area. If the dense black image is not visible through two sheets, the paper is acceptable.

# Annex B
(informative)

# Optical class of characters

## B.1 Introduction

When creating an original document suitable for microfilming or scanning, the choice of the type of characters to be used is of particular importance. In most cases, this choice is based on aesthetic considerations but it is essential that the type or size of the characters chosen will produce legible micro-images.

The optical class of characters is a concept created in order to enable the creator of the document to make a careful choice.

## B.2 Method

Each character font has one value of optical class, $C$, calculated using the following equation:

$$C = \frac{h}{d}$$

where

$C$ is the optical class;

$h$ is the height of the upper-case character of the font[2];

$d$ is the basic detail.

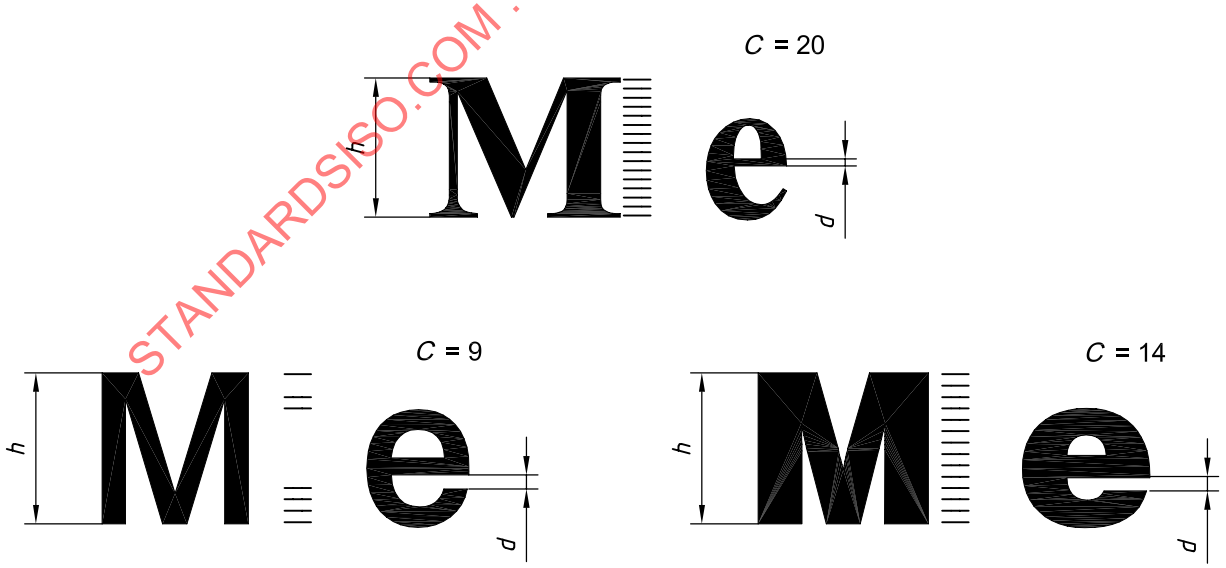


**Figure B.1 — Examples of optical classes**

2) The height of the upper-case of a font is the vertical distance between the baseline and the top of the letters (without stems or details). See Figure 3.

## B.3 Application to micrographics

The optical class allows the comparison of the size of the basic detail of the document, $d$, to the resolution limit (inverse of resolving power) of the system, in relation to the object-image ratio, $r$.

The result obtained permits:

— either to determine the minimum size, $H_{min}$, of the character set to be used with a given reduction ratio, using the following equation:

$$h_{min} = d\,r\,C$$

where

$h_{min}$ is the minimum height of the character set;

$d$ is the basic detail of the document;

$r$ is the object/image ratio;

$C$ is the optical class;

— or to determine the maximum scale ($R_{max}$) to be used with a given character set, using the following equation:

$$R_{max} = \frac{h}{Cd}$$

where

$R_{max}$ is the maximum scale;

$h$ is the size of the character set;

$d$ is the basic detail of the document;

$C$ is the optical class.

# Annex C
(informative)

# Quality index

The concept of a quality index can help in the choice of a character font for a new document or the reduction ratio, for microfilming or scanning an existing document.

The quality index is based on using images of the ISO No. 2 test chart as related to the resolving power of the camera/film/processing systems and the smallest significant character size in the text to be microfilmed[3].

The ISO No. 2 test chart is a series of patterns from 1 lp/mm[4] to 18 lp/mm. By measuring the character height, these patterns can be related to the expected legibility of the image of a character. The resolution required to copy text depends on the size of type, the reduction ratio, and the quality of reproduction required. For most practical purposes, the quality index, QI, can be defined as

$$QI = PR \times h_e$$

where

PR is the pattern resolved;

$h_e$ is the height of lower case "e".

where the pattern referred to is the highest pattern number from the ISO test chart No. 2 resolved on the microimage, and the height of the lower-case "e" is the height of the lower-case "e" of the original document or of the hard-copy obtained from the microimage.

For excellent copy, in which the details of type are clearly defined, QI should be 8 or more. If QI is assigned a value of 5, the copy should be readable without difficulty although serifs and fine details of type are not clear. If QI is 3, the copy will be barely legible, the letters e, c, and o being partly closed.

A QI of 3,6 is recommended to give marginal image quality. At least one pattern smaller should be resolved in the first generation microform for each subsequent generation copy that is to be made.



3) Identical results can be obtained using the ISO No. 1 test chart with the following formula:

$$R = \frac{400}{\text{character ISO test chart No. 1 read}} = \text{pattern ISO test chart No. 2 read.}$$

4) lp/mm is line pair per millimetre.