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# International Standard



# 3066

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## Duplicating machines — Registration

*Duplicateurs — Tolérances de repérage*

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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.

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. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 3066 was prepared by Technical Committee ISO/TC 97, *Information processing systems*.

This second edition cancels and replaces the first edition (ISO 3066-1974), of which it constitutes a technical revision.

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

# Duplicating machines — Registration

## 0 Introduction

The positional consistency of images reproduced by a duplicating machine is a measure of the registration obtainable on that machine. This International Standard gives assistance to manufacturers and users by specifying methods of test for determining such registration and by providing a means of classifying the results obtained from the tests.

Several factors may affect the registration obtainable on a duplicating machine, such as atmospheric conditions, speed of machine operation, type of paper, and paper stretch. It is recognized that in some instances improved registration may be obtained by working a machine under conditions different from those used for the test, for example, at slower speed.

It is not to be expected that the registration obtainable on the different types of duplicating equipment should be directly comparable. As the different types of equipment are used for different purposes, comparisons would be invidious. For this reason, the letters used in this International Standard for classifying the registration are qualified by a letter to identify the type of equipment.

The recommended basis weights of paper are intended solely for the purpose of standardizing the conditions of test and should not be regarded as necessarily indicating the most suitable paper for normal use with the type of machine concerned.

## 1 Scope and field of application

This International Standard specifies methods of test by which the registration obtained on each of the following types of duplicating machine may be determined :

- offset litho;
- stencil;
- spirit (or other fluid).

Tables of limits are given by which the registration obtained on different types of duplicating equipment may be classified.

## 2 Definitions

For the purpose of this International Standard the following definitions apply.

**2.1 offset litho duplicator<sup>1)</sup>** : A machine that uses the off-set duplicating process to produce multiple copies from a master.

**2.2 stencil duplicator<sup>1)</sup>** : A machine having one or more revolving cylinders that employs the stencil duplicating process for the production of multiple copies from a master.

**2.3 spirit (or other fluid) duplicator<sup>1)</sup>** : A machine that uses the spirit (or other fluid) duplicating process to produce multiple copies from a master.

**2.4 registration<sup>1)</sup>** : The consistency of the relative position of images printed on paper by duplicators.

**2.5 machine direction (grain)** : The dimension of a paper or board corresponding to the direction of flow of the stuff on the paper-making machine.

**2.6 standard atmosphere for conditioning and testing** : With reference to temperature and relative humidity,  $20 \pm 2^\circ\text{C}$  and  $65 \pm 5\%$  respectively.

## 3 Offset duplicators

**3.1** Make a suitable metal master-plate of an image from a sheet of squared paper, the horizontal and vertical lines of which are 10 mm (0.394 in) apart and of a thickness not exceeding 0,125 mm (0.005 in). The size of the image shall be slightly smaller than the size of the paper to be used.

NOTE — A measuring microscope or a linen tester with a graticule are suitable instruments for measuring line thickness.

**3.2** Set up the machine for normal working.

A minimum weight of ink shall be carried for the purpose of this test.

**3.3** Take a quantity of wrapped bond paper, of grammage 80 to 90 g/m<sup>2</sup>, cut square, of size A3 or A4, whichever is ap-

1) Definition taken from ISO 5138/2.

appropriate to the machine capacity, which has remained for at least 24 h in the standard atmosphere for conditioning and testing. Examine the paper for smoothness and remove any sheets which are creased or wrinkled. Fan out the paper and square it up to the original state.

**3.4** Ensure that the paper is fed in the machine direction (grain) of the paper, and that the felt (top) side of the paper is printed.

**3.5** Print 50 sheets at two-thirds of the speed range in machines having a continuously variable speed control (i.e. at a setting of 800 for machines having a speed range of 600 to 900) and at the nearest speed to this for machines having a "stepped" speed control. Discard the first two sheets. On one sheet, measure the thickness of the lines which are nearest to each corner of the sheet.

**3.6** Re-run the copies at the same speed so that each sheet is overprinted with a second impression of the image. Discard the first two sheets. Re-measure the thickness of the resultant line or, if separated, the distance between the outer edges of the two lines; in either case, subtract the thickness of the original line used for the test (see 3.5).

**3.7** Examine the 46 remaining sheets and note the greatest registration error occurring both vertically and horizontally. Classify this registration according to table 1 or table 2 as appropriate. Any one sheet that falls into a lower classification than the rest may be discarded and the next greatest error taken to classify the registration.

**Table 1 — Classification of registration for offset duplicators incorporating suction feed and side lay**

Registration tolerance under standard atmospheric conditions	Classification of registration tolerance
Up to and including 0,125 mm (0.005 in)	LA
Over 0,125 mm (0.005 in) up to and including 0,25 mm (0.01 in)	LB
Over 0,25 mm (0.01 in) up to and including 0,5 mm (0.02 in)	LC
Over 0,5 mm (0.02 in)	LD

NOTE — Letter L in the classification column of this table denotes off-set duplicator, i.e. lithographic machine.

**Table 2 — Classification of registration for offset duplicators incorporating feed other than suction and with or without side lay**

Registration tolerance under standard atmospheric conditions	Classification of registration tolerance
Up to and including 0,5 mm (0.02 in)	OA
Over 0,5 mm (0.02 in) up to and including 0,75 mm (0.03 in)	OB
Over 0,75 mm (0.03 in) up to and including 1,00 mm (0.04 in)	OC
Over 1,00 mm (0.04 in)	OD

NOTE — Letter O in the classification column of this table denotes off-set duplicator (i.e. lithographic machine) with feed other than suction and with or without side lay.

**3.8** If more than one sheet falls into a lower classification than the rest, the test may be re-run. If the result of this retest constitutes an improvement on the first result, it is used to classify the registration, employing the method given in 3.7. Otherwise the first result shall stand.

## 4 Stencil duplicators

**4.1** Type or write over a large area of a new stencil in order that the stencil may be evenly inked.

**4.2** Cut a horizontal line, as fine as possible, at line five of the stencil and at one side of the main frame, long enough to reach the side edge of the paper on the printed copy.

Cut a vertical line near the bottom of the A4 paper-size position, coincident with the centre line on the stencil and long enough to reach the bottom edge of the paper.

**4.3** Set up the machine for normal working.

**4.4** Take a quantity of wrapped stencil duplicating paper of grammage 80 to 90 g/m<sup>2</sup>, cut square, of size A4, which has remained for at least 24 h in the standard atmosphere for conditioning and testing. Examine the paper for smoothness and remove any sheets which are creased or wrinkled. Fan out the paper and square it up to the original state.

**4.5** Ensure that the paper is fed in the machine direction (grain) of the paper, and that the felt (top) side of the paper is printed.

**4.6** If the machine is electrically operated, print 50 sheets at two-thirds of the speed range in machines having a continuously variable speed control (i.e. at a setting of 800 for machines having a speed range of 600 to 900) and at the nearest speed to this for machines having a "stepped" speed control. If the machine is hand operated, print 50 sheets at a speed consistent with smooth running of the machine.

**4.7** Remove the printed copies from the machine, square them up to the leading edge and fan them out for inspection. Discard the first two sheets and observe the formation of the lines described in 4.2.

**4.8** To assess the vertical registration, measure the distance between the corresponding edges of the highest and lowest positions of the horizontal line in the batch of 48 copies.

**4.9** To assess the horizontal registration, measure the distance between the corresponding edges of the most laterally dispersed lines in the batch of 48 copies, viewed at the bottom of the copy.

**4.10** Note the greatest error, whether horizontal or vertical, and classify this registration according to table 3. If five sheets

or fewer fall into a lower classification or classifications than the rest, they may be discarded and the next greatest error taken to classify the registration.

**Table 3 — Classification of registration for stencil duplicators**

Registration tolerance under standard atmospheric conditions	Classification of registration tolerance
Up to and including 0,75 mm (0.03 in)	SA
Over 0,75 mm (0.03 in) up to and including 1,5 mm (0.06 in)	SB
Over 1,5 mm (0.06 in) up to and including 3,0 mm (0.12 in)	SC
Over 3,0 mm (0.12 in) up to and including 4,5 mm (0.18 in)	SD
Over 4,5 mm (0.18 in)	SE

NOTE — Letter S in the classification column of this table denotes stencil duplicator.

4.11 If more than five sheets fall into a lower classification or classifications than the rest, the test may be re-run. If the result of this retest constitutes an improvement on the first result, it is used to classify the registration employing the method given in 4.10. Otherwise the first result shall stand.

**5 Spirit (or other fluid) duplicators**

5.1 Make a master from one-sided coated art paper of grammage 80 to 90 g/m<sup>2</sup>, which has remained for at least 24 h in the standard atmosphere for conditioning and testing and which shall be free from creases, wrinkles or other defects. The master shall be ruled with horizontal and vertical lines 5 mm (0.197 in) apart, allowing a margin of 25 mm (0.984 in) at the leading edge, so that the lines reach both side and bottom edges of the printed copy.

5.2 Set up the machine for normal working.

5.3 Take a quantity of wrapped engine-sized writing paper of grammage 70 to 80 g/m<sup>2</sup>, cut square, of size A3 or A4, whichever is appropriate to the machine, which has remained for at least 24 h in the standard atmosphere for conditioning and testing. Examine the paper for smoothness and remove any sheets which are creased or wrinkled. Fan out the paper and square it up to the original state.

5.4 Ensure that the paper is fed in the machine direction (grain) of the paper, and that the felt (top) side of the paper is printed.

5.5 If the machine is electrically operated, print 50 sheets at two-thirds of the speed range in machines having a continuously variable speed control (i.e. at a setting of 800 for machines having a speed range of 600 to 900) and at the nearest speed to this for machines having a “stepped” speed control. If the machine is hand operated, print 50 sheets at a speed consistent with smooth running of the machine.

5.6 Remove the printed copies from the machine, square them up to the leading edge and fan them out for inspection. Discard the first two sheets and observe the formation of the lines described in 5.1.

5.7 To assess the vertical registration, measure the distance between the corresponding edges of the highest and lowest positions of the horizontal lines in the batch of 48 copies.

5.8 To assess the horizontal registration, measure the distance between the corresponding edges of the most laterally dispersed lines in the batch of 48 copies viewed at the bottom of the paper.

5.9 Note the greatest error, whether horizontal or vertical, and classify this registration according to table 4. Any one sheet that falls into a lower classification than the rest may be discarded and the next greatest error taken to classify the registration.

**Table 4 — Classification of registration for spirit (or other fluid) duplicators**

Registration tolerance under standard atmospheric conditions	Classification of registration tolerance
Up to and including 0,75 mm (0.03 in)	HA
Over 0,75 mm (0.03 in) up to and including 1,5 mm (0.06 in)	HB
Over 1,5 mm (0.06 in) up to and including 3,0 mm (0.12 in)	HC
Over 3,0 mm (0.12 in) up to and including 4,5 mm (0.18 in)	HD
Over 4,5 mm (0.18 in)	HE

NOTE — Letter H in the classification column of this table denotes spirit (or other fluid) duplicator, i.e. hectographic machine.

5.10 If more than one sheet falls into a lower classification than the rest, the test may be re-run. If the result of this retest constitutes an improvement on the first result, it is used to classify the registration employing the method given in 5.9. Otherwise the first result shall stand.

5.11 If the paper has become distorted in the course of the test, the test may be re-run on a different, though comparable paper.

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