INTERNATIONAL STANDARD

ISO 12218

First edition
1997-08-01

Graphic technology — Process control — Offset platemaking

Technologie graphique — Maîtrise des procédés — Confection des plaques offset

Reference number
ISO 12218:1997(E)

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.

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.

International Standard ISO 12218 was prepared by Technical Committee ISO/TC 130, *Graphic technology*.

Annex A forms an integral part of International Standard. Annexes B to F are for information only.

International Organization for Standardization
Case postale 56 • CH-1211 Genève 20 • Switzerland
Internet central@iso.ch
X.400 c=ch; a=400net; p=iso; o=isocs; s=central

Printed in Switzerland

Introduction

During the production of an offset printing plate, a carrier material is coated with a thin radiation-sensitive film. The plate is referred to as pre-sensitized, if it has been produced by a plate manufacturer rather than at the printing site. The radiation-sensitive coating on the offset printing plate may be either positive-acting (for positive polarity films) or negative-acting (for negative polarity films). Some offset printing plates with positive-acting coatings can be used as convertible plates together with negative polarity input material.

During preparation of the offset printing forme, analogue information is transferred from half-tone film to an offset printing plate by means of a contact exposure step with radiation to which the plate coating has been sensitized. Alternatively, offset printing plates may be exposed using optical projection of reflection or transmission copy or by direct writing techniques. While such alternative processes are not covered by this International Standard, many of the principles included may be applied by analogy.

Before the exposure step, the emulsion side of the half-tone film is brought into intimate contact with the sensitized plate coating, usually by means of a vacuum contact frame. The radiation used for the exposure step may contain both diffuse and unidirectional components. The benefit of diffuse radiation is that artefacts like film edges of positive polarity films, scratches and dust particles are not rendered on the plate. However, care is required because diffuse radiation accentuates any artefacts associated with areas where film and plate are out of contact or where the contact is poor.

During the exposure step, the optical spread function of the printing plate and the diffusive component of the radiation cause final detail on a positive-acting printing plate to be reduced in width so that the image elements are somewhat smaller than the original on the film. With negative-acting plates, the same physical phenomena result in fine detail on the plate that is somewhat larger than the original.

After the exposure step but before development, the coating usually shows a colour difference between exposed and unexposed areas.

The development of an offset printing plate normally consists of the removal of the coating in the non-printing areas. These are the exposed areas of a positive-acting plate and the unexposed areas of a negative-acting plate.

The quality of the printing forme produced by the platemaking operation depends in particular on the following process parameters:

— exposure step, especially vacuum conditions (including drawdown);

— chemical composition and temperature of the developer fluid;

— condition of rollers and brushes;

— processing speed (development time);

— finisher condition.

After development, the colour contrast between printing and non-printing areas is usually much greater than before.

Following exposure and processing, baking or post-exposure treatment may be used prior to correction and gumming. The developed offset printing plate is thus transformed into a press-ready offset printing forme. During correction, image elements are deleted (negative correction) or added (positive correction). At the gumming stage, a thin coating of a colloidal solution is applied to the image side of the plate in order to protect the surface and to prevent toning during the printing operation. Baking or post-exposure treatment is a heat treatment which increases the durability of the coating with regard to chemical or mechanical wear.

Determination of the optimum exposure for positive-acting offset printing plates: There are three important considerations.

a) The exposure should be strong enough for artefacts like film edges and dust particles to not normally show on the offset printing forme.

b) The exposure should not be so strong that the transfer of fine highlight half-tone dots is impaired.

c) Since the exposure also determines tone value, which is very important in process control, the exposure should be controlled such that the tone value decrease from the half-tone film to the offset printing forme is constant, irrespective of the offset printing plate type and processing conditions.

For half-tone screens with screen frequencies of 70 cm^{-1} or less, it has been found in practice that it is possible to meet considerations a) and b) with a single exposure step. The exposure used is appreciably stronger than one which would result in the best possible resolution (but where artefacts would also be rendered). Consideration c) can be met in addition by observing a suitably selected microline reading.

For periodic or non-periodic fine screens which contain image elements of less than 25 µm size, conditions a) and b) cannot be met with a single exposure step. Instead, a first exposure step is carried out that yields the best possible resolution or slightly above. During the second exposure step, the subject areas are protected by a so-called burnout mask; an extended exposure removes the artefacts.

For positive-acting printing plates, it has been found that microline targets can be used to define an exposure range which ensures a reproducible tone value decrease from the half-tone film to the offset printing forme. In this range, the tone value decrease from the half-tone film to the printing forme is a linear function of the microline reading; the function depends on the platemaking resolution. For a particular plate, under given exposure and processing conditions, the graph of the positive microline reading over the logarithm of the exposure thus characterizes the tone value dependence on exposure. The slope of the graph is a measure of the rate of tone value change with exposure change. Therefore, a steep slope indicates less exposure latitude than a less steep one.

Microline targets useful for process control of platemaking contain a number of subtargets with graduated linewidths ranging from a few micrometres to several tens of micrometres. As distinct from the targets used for testing the resolving power in photography, microline targets show line-to-space ratios other than 1:1. Usual ratios are 1:9, 3:5 and 1:4. Within the usual exposure range the microline reading depends very slightly on the line-to-space ratio. It is important to realize that the microline reading depends on the density level between the microlines. It must not be appreciably higher than elsewhere on the control strip film. As an alternative to a division into subtargets of constant linewidth, a single target with microlines of continuously variable linewidth may also be used. Since there can be directional effects during the manufacture of printing plates as well as during plate processing, it is a good plan to average over readings taken at right angles or to use targets with circular microlines. It is important to note that microline readings always refer to the width of the microlines on the film, not to the (unknown) width on the printing forme.

Determination of exposure negative-acting offset printing plates: There are three important considerations.

1) The exposure should be strong enough to achieve a sufficient and reliable run length.

2) The exposure should not be so strong that there is excessive tone value increase from the half-tone film to the printing forme or that extreme shadow detail is lost.

3) The tone value increase from the half-tone film to the offset printing forme should be at a specified level.

Since the first criterion is overriding, negative-acting offset printing plate exposures usually follow the recommendation of the plate manufacturer, which is expressed as the reading of a continuous-tone step wedge. Once the optimum exposure has been established, microline targets may be used to additionally monitor the consistency of subsequent exposures. They should not be used as the primary exposure determinant.

Some users employ weaker exposures than the manufacturer recommends, in an effort to obtain a desired tone reproduction in automatic processing systems with plates that have long run-length coatings which require more aggressive processing.

With some plates, the run length may be extended by post-exposure or heat treatment. In these cases, the manufacturer may recommend a lower range of allowable exposures and a post-exposure or baking treatment to extend press life. This may result in a lower tone value increase than otherwise.

Apart from its use for determining the exposure of negative-acting offset printing plates, a continuous-tone step wedge may also be used to assess the development process. A useful quantity in this respect is the platemaking gradation; it characterizes the reaction of the plate coating to the amount of radiation under a given processing condition. A change of the platemaking gradation indicates that the processing conditions or the coating have changed.

This page intentionally left blank

Graphic technology — Process control — Offset platemaking

1 Scope

This International Standard establishes unified terminology, test methods and requirements for the process control of the preparation of the offset printing forme.

This International Standard

- applies to pre-sensitized metal plates;
- applies to contact exposures whether in a contact frame, step-and-repeat machine or other automated processor;
- does not apply to optical projection or direct writing techniques, although the principles may be applied by analogy;
- does not apply to non-periodic half-tone screens, although the tone value specifications may be applied by analogy.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO 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 12647-1:1996, *Graphic technology — Process control for the manufacture of half-tone colour separations, proof and production prints — Part 1: Parameters and measurement methods.*

3 Definitions

For the purposes of this International Standard, the following definitions apply. They are given in alphabetical order.

NOTE — For quantities, the preferred unit is given together with the definition. By definition, the unit of so-called dimensionless quantities is 1.

3.1 baking: Heat treatment to increase the durability of the coating with regard to chemical attack or mechanical wear.

3.2 contact exposure step: Process step where an offset printing plate is exposed in intimate contact with a half-tone film.

NOTE — Usually, a vacuum is used in order to achieve an intimate contact.

3.3 continuous-tone step wedge: Linear array of continuous-tone control patches whose transmittance densities are stepped in increments of 0,15 or 0,30.

3.4 control patch: Area produced for control or measurement purposes. [ISO 12647-1]

3.5 control strip: One-dimensional array of control patches. [ISO 12647-1]

3.6 core density (on a half-tone film)**:** Transmittance density in the centre of an isolated opaque image element such as a half-tone dot or line. Unit: 1. [ISO 12647-1]

3.7 exposure: Product of the irradiance and duration of the photochemically active radiation during the exposure process step. Unit: J/m^2.

NOTE — Instead of the photochemically active (actinic) radiation, any measure for the total energy deposited may be used once the correspondence has been ascertained.

3.8 exposure latitude: Maximum ratio of exposures that produce acceptable results. Unit: 1.

3.9 exposure step: Process step where an offset printing plate is exposed to photochemically active radiation.

3.10 film polarity: Positive if clear and solid areas on the half-tone film correspond to unprinted and solid areas on the print, respectively. Negative if clear and solid areas on the half-tone film correspond to solid and unprinted areas on the print, respectively.

NOTE — Adapted from ISO 12647-1.

3.11 fringe width (of an isolated opaque half-tone dot)**:** Average distance between the density contour lines corresponding to 10 % and 90 % of the minimum core density specified for the printing process under consideration. Unit: µm.

NOTE — Adapted from ISO 12647-1.

3.12 half-tone film: Film for use with a half-tone printing process showing image elements like dots or lines. [ISO 12647-1]

3.13 microline reading: Under given conditions, the minimum width of positive or negative microlines on half-tone film that transfer such that at least 50 % of the length of the microlines is clearly visible on the offset printing forme. The positive microline reading refers to positive microlines (dark lines on light ground) and the negative microline reading refers to negative microlines (clear lines in dark solid) as they appear on the offset printing forme. Unit: µm.

3.14 microline target: Control patch compressing fine positive and negative lines or various but accurately designated widths.

3.15 negative-acting (offset printing) plate: Offset printing plate for use with negative polarity film. [ISO 12647-2]

3.16 offset printing forme: Forme for planographic printing where the printing parts accept and the non-printing parts do not accept printing ink.

NOTE — An offset plate is transformed into an offset printing forme by means of the exposure, development and post-treatment process steps.

3.17 offset (printing) plate: Plane workpiece whose surface has been coated such that an offset printing forme can be produced thereof. [ISO 12647-2]

NOTE — In current usage also known as an offset printing forme.

3.18 out-of-contact phenomenon: Insufficient transfer of image elements from a half-tone film to an offset printing plate as a result of inadequate contact between them.

NOTE — This may be caused by a mechanical object or an air bubble (due to insufficient vacuum drawdown).

3.19 platemaking; preparation of the offset printing forme: Process steps by which an offset printing forme is prepared from an offset printing plate.

3.20 platemaking gradation: Measure of the dependence of the coating thickness on the offset printing forme on exposure. Unit: 1.

3.21 platemaking resolution: Minimum microline reading for both positive and negative microlines that is achievable with a single exposure step. Unit: µm.

NOTES

1 Not to be confused with the term “resolving power” in photography.

2 Sometimes referred to as the optimum resolution.

3.22 positive-acting (offset printing) plate: Offset printing plate for use with positive polarity film. [ISO 12647-2]

3.23 pre-sensitized offset plate: Offset plate whose surface has been coated by the manufacturer with a radiation-sensitive coating.

3.24 reflectance factor (R): Ratio of the measured reflected flux from the specimen to the measured reflected flux from a perfectly reflecting and perfectly diffusing material located in place of the specimen. Unit: 1. [ISO 5-4]

3.25 reflectance factor density[1]; reflection density[2]: The logarithm to the base 10 of the reciprocal of the reflectance factor, R. Unit: 1.

3.26 screen ruling; screen frequency: Number of image elements, such as dots or lines, per unit of length in the direction which produces the highest value. Unit: cm^{-1}. [ISO 12647-1]

3.27 screen width: Reciprocal of screen ruling. Unit: cm. [ISO 12647-1]

3.28 step-and-repeat machine: Apparatus for making automated-contact exposure steps onto an offset plate.

3.29 tone value; dot area (on a print or a printing forme), A: Percentage of the surface which appears to be covered by colorant of a single colour (if light scattering in the print substrate and other optical phenomena are ignored), calculated from the formula:

$$A\,(\%) = 100 * \left[1 - 10^{-(D_t - D_0)}\right] / \left[1 - 10^{-(D_s - D_0)}\right]$$

where

D_0 is the reflectance factor density of the unprinted print substrate, or the non-printing parts of the printing forme;

D_s is the reflectance factor density of the solid;

D_t is the reflectance factor density of the half-tone.

Unit: Percent.

NOTES

1 Adapted from ISO 12647-1.

2 Also known as apparent, equivalent or total dot area.

3 The synonym “dot area” may be applied only to half-tones produced by dot patterns.

1) International Lighting Vocabulary ([4] in annex F).

2) ISO 5-4.

4 This definition may be used to provide an approximation of the tone value on certain printing formes.

5 In general it is assumed that the tone value (termed "ink value" in ISO 12640) of the data is reproduced identically on the film produced by an image setter. Final films should reproduce those tone values.

3.30 tone value; dot area (on a half-tone film of positive polarity), A**:** Percentage calculated from the formula:

$$A\,(\%) = 100 * \left[1 - 10^{-(D_t - D_0)}\right] / \left[1 - 10^{-(D_s - D_0)}\right]$$

where

D_0 is the transmittance density of the clear half-tone film;

D_s is the transmittance density of the solid;

D_t is the transmittance density of the half-tone.

Unit: Percent. [ISO 12647-1]

NOTES

1 Adapted from ISO 12647-1.

2 Also known as the film-printing dot area.

3.31 tone value; dot area (on a half-tone film of negative polarity), A**:** Percentage calculated from the formula:

$$A\,(\%) = 100 - 100 * \left[1 - 10^{-(D_t - D_0)}\right] / \left[1 - 10^{-(D_s - D_0)}\right]$$

where

D_0 is the transmittance density of the clear half-tone film;

D_s is the transmittance density of the solid;

D_t is the transmittance density of the half-tone.

Unit: Percent.

NOTES

1 Adapted from ISO 12647-1.

2 Also known as the film-printing dot area.

3.32 transmittance (optical) density[1]**; transmission density**[2]**:** The logarithm to the base 10 of the reciprocal of the transmittance factor, T. Unit: 1.

3.33 transmittance factor (T**):** Ratio of the luminous flux transmitted through an aperture covered by a specimen to the luminous flux through the aperture without the specimen in place. Unit: 1.

3.34 vacuum frame; contact frame; exposure frame: Manually operated vacuum apparatus where contact exposure steps can be carried out.

1) International Lighting Vocabulary ([4] in annex F).

2) ISO 5-2.

4 Requirements

4.1 Colour separation film quality

Unless otherwise specified, the core density shall be at least 2,5 above the transmittance density of the clear film (film base plus fog). The transmittance density in the centre of a clear half-tone dot shall not be more than 0,1 above the corresponding value of a large clear area. The transmittance density of the clear film shall not be higher than 0,15. Measurements shall be made with a (UV) transmission densitometer whose spectral products conform to ISO type 1 printing density as defined in ISO 5-3.

The fringe width shall be not greater than one-fortieth of the screen width; the half-tone dot shall not be split up into distinct parts. The quality of the colour separation film shall be evaluated according to A.1 of annex A.

NOTES

1 The clear film density requirement is based on the understanding that

— the density range of the clear areas of all films that are to be exposed onto an offset printing plate, for consistent work, should not exceed 0,10;

— 0,05 represents the lowest commonly found value for ISO type 1 printing density. In order to minimize the impact of the use of half-tone films with clear film densities above this range, agreements between the supplier of colour separations and the recipient are required. Contacting or duplicating can also be used to bring half-tone films with dissimilar clear film densities into agreement.

2 As a practical guide, a core density of 2,5 above the clear film density will normally be achieved, if the density of large solid areas is more than 3,5 above the clear film density.

3 If a user wishes to use a blue filter to transmittance density measurements, it is necessary to determine, for the particular film type and processing conditions, the correlation between densities obtained with the blue filter and those obtained with an ISO type 1 printing density instrument.

4.2 Control patches

The platemaking process steps shall be monitored by exposing at least one control strip along with the work on the offset printing plate. The control strip shall contain well-defined half-tone control patches with tone value designations accurate to ± 1 %. The shape of the half-tone dot structure shall be circular. The screen ruling shall be constant, it shall be selected from the range 50 cm^{-1} to 70 cm^{-1}. The core density shall be not less than 3,0 above the transmittance density of the clear film (film base plus fog). The fringe width shall be not greater than 2 µm as determined by the apparatus described in A.2 of annex A.

For positive-acting plates, a microline target is the primary tool for exposure control. It shall be exposed with the work, a continuous-tone step wedge should be exposed at the same time. For negative-acting plates, a continuous-tone step wedge is the primary tool for exposure control. It shall be exposed with the work; a microline target may be exposed at the same time. The line-to-space ratio of the microline targets shall be selected from the range 1:9 to 1:2; it shall be kept constant throughout the target(s). The continuous-tone step wedge should possess a step increment of 0,15 or smaller.

4.3 Selection of the exposure

4.3.1 Positive-acting plates

The platemaking process shall be controlled such that the tone values of the 40 % or 50 % control patches on the ready-to-print but not yet inked offset printing forme are smaller than those of the corresponding control patches on the control strip film by the amounts given in table 1. The tone values on the offset printing forme and the control strip film shall be determined by the methods given in 5.1 and 5.2, respectively. Instead of the reference method given in 5.1, a secondary method may be used if the results can be directly related to those of the reference method.

NOTE — Secondary methods are described in annexes B and C.

Table 1 — Tone value decrease from the half-tone film to the printing forme

Screen ruling1) cm⁻¹	Tone value decrease 40 % control patch %	Tone value decrease 50 % control patch %
50	2,5 to 3,5	3,0 to 4,0
60	3,0 to 4,0	3,5 to 5,0
70	3,5 to 4,5	4,5 to 6,0

1) In this range the tone value change is proportional to screen ruling.

4.3.2 Negative-acting plates

No requirement is given. The exposure shall be selected according to the plate manufacturer's recommendation. Compared to the manufacturer's recommendation for optimum exposure, the exposure actually used shall not be weaker than one 0,15 density step, as shown by a continuous-step wedge. If a manufacturer recommends a range of exposures for plates that can be treated after development by either baking or additional exposure, the actual exposure shall not be weaker than the lower limit of the range specified.

NOTE — With these conditions, the tone value increase from the half-tone film to the offset printing forme is usually within the ranges shown in table 2 for information only. Under the conditions mentioned in the last but one paragraph of the introduction, the tone value increase may be slightly lower.

Table 2 — Tone value increase from the half-tone film to the printing forme
(for information only)

Screen ruling1) cm⁻¹	Tone value increase 40 % control patch %	Tone value increase 50 % control patch %
50	2,5 to 3,5	3,0 to 4,0
60	3,0 to 4,0	3,5 to 5,0
70	3,5 to 4,5	4,5 to 6,0

1) In this range the tone value change is proportional to screen ruling.

4.4 Reproduction limits

Isolated opaque half-tone dots of more than 25 µm in diameter on the control strip film shall transfer onto the offset printing forme in a uniform and consistent manner. Likewise, negative half-tone dots (clear circular holes) with diameters more than 25 µm on the control strip film shall transfer onto the offset printing forme in a uniform and consistent manner.

5 Test methods

5.1 Tone value on an offset printing forme — Reference method

With the aid of a standard test object (with resolution in the micrometre range) calibrate for either area or diameter determination:

— an electron probe microanalyser, or

— a scanning electron microscope, or

— a microscope-videocamera image analyser combination.

Determine the area taken up by a single circular half-tone dot on the offset plate. Calculate the tone value by dividing the average area covered by a single dot by the square of the screen width. Measure and average over as many half-tone dots as needed for a tone value accuracy of ± 0,5 %.

5.2 Tone value of a half-tone control patch on a control strip

Using a transmission densitometer conforming to ISO 5-2, determine the transmittance densities of the film base material, D_0, the solid tone, D_s, and a well-defined half-tone area, D_t. calculate the tone value from the pertinent definition, that is 3.30 for positive polarity and 3.31 for negative polarity half-tone films.

In order to assure sufficient accuracy, the sampling aperture of the instrument should have a diameter not less than 15 times the screen width, it shall be not less than ten times the screen width. This requirement also applies, by analogy, to the area of non-circular sampling apertures.

Annex A
(normative)

Determination of quality parameters of half-tone dots on a half-tone film

A.1 This method shall be applied only to those half-tone films whose clear film ISO Status T (blue) transmittance density is 0,06 or less. Other films shall be tested by the method described in A.2 or any other method whose equivalence to A.2 has been proven. Place a film control strip with a microline target, film emulsion orientation up, on a light table and cover it with the film to be evaluated, film emulsion orientation down. With a hand-held microscope of between 60- and 100-fold magnification, observe the isolated opaque half-tone dots. If the microlines are distinctly visible below the half-tone dots then the core density is too low.

The fringe width shall be estimated by comparing it to the width of the microlines which is stated on the microline target. For the fringe width evaluation, the colour separation film should be illuminated from below by light of oblique angles of incidence, a condition known as dark field illumination.

NOTE — With some experience, the compliance of half-tone dots to a specified maximum fringe width can be predicted with near certainty.

A.2 A scanning microdensitometer shall be used, that is a transmission microscope where a diaphragm has been introduced either into the illumination stage or the image plane with the effect that an aperture is formed in the centre of the object plane. For these tests the aperture shall be less than 3 µm wide. The half-tone film shall be moved automatically in both x and y directions of the object plane. The light intensity transmitted by the film shall be measured with a photodetector whose output signal is processed to yield the transmittance density. For half-tone films whose clear film ISO Status T (blue) transmittance density is higher than 0,06, the sensitivity of the photodetector shall be restricted to the band 280 nm ± 30 nm. The core density shall be evaluated from a density profile measured along a section of the half-tone dot that passes through its centre. The fringe width shall be evaluated as the average distance in micrometres between the contour lines corresponding to the transmittance densities 0,25 and 2,25.

NOTE — A density profile graph and a density contour line map are shown as examples in annex B of ISO 12647-1.

Annex B
(informative)

Secondary test method for positive-acting plates: Tone values on an offset printing forme — Microlines

B.1 Exposure-step test

An exposure-step test is used for determining quantities like platemaking resolution, recommended microline exposure and exposure latitude.

Perform a series of individual exposure steps of graduated magnitude under otherwise constant conditions (this includes development and post-treatment) on a single offset printing plate. The minimum exposure is chosen such that the plate coating is not fully developable, the maximum exposure should be above the range used in practical platemaking. It is recommended to step the exposures in geometric progression, for instance 10, 14, 20, 28, 40, 56, 80 exposure units, etc. or 10, 20, 40, 80 exposure units, etc. Evaluate the ready-to-print but not yet inked offset printing forme.

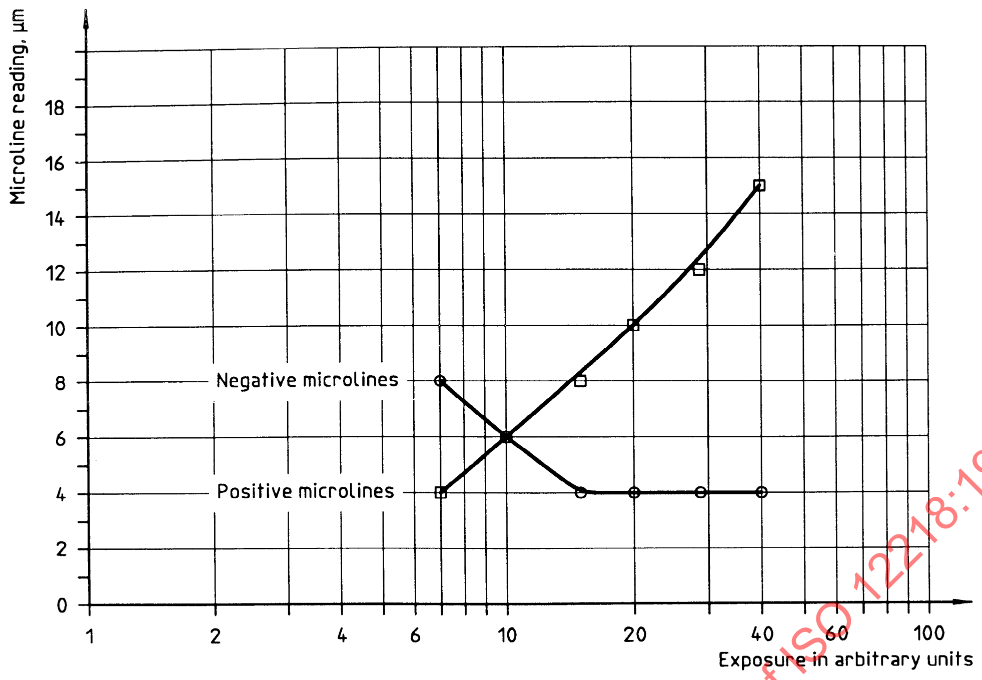
B.2 Determination of the platemaking resolution

Perform a contact exposure-step test according to B.1 with a microline target on a film. Make sure that there is intimate contact between the emulsion side of the half-tone film and the light-sensitive coating on the offset printing plate. There must be no air bubbles, dirt or adhesive particles in between. On the ready-to-print but not yet inked offset printing forme, determine the positive and negative microline readings in a microline target with the aid of a 5- to 30-fold magnifier. The microline reading is the minimum width of positive or negative microlines on half-tone film that transfer such that at least 50 % of the length of the microlines is clearly visible on the offset printing forme. The positive microline reading refers to positive microlines (dark lines on light ground) and the negative microline reading refers to negative microlines (clear lines in dark solid) as they appear on the offset printing forme.

Plot the microline readings over the logarithm to base 10 of the exposure. If it is observed that the microline readings depend on the orientation of the microlines, take the average over orientations which are at right angles to each other. Draw two smooth curves that best represent positive and negative microline readings. Refer to figure B.1 for an example. From the plot, determine the microline reading that corresponds to the crossover of the two curves. This is the platemaking resolution. When quoting a value, state the line-to-space ratio of the microline target.

The accuracy of the determination can be improved by repeating the step test several times and plotting the averages for positive and negative microline readings.

For an approximate determination, it suffices to visually select the plate image where the positive and negative microline readings agree and to note the width of the corresponding microlines on the control strip film.



NOTE — The vertical axis shows a linear scale; the horizontal axis shows a logarithmic scale.

Figure B.1 — Positive-acting plates: Example for the dependence of positive and negative microline readings on exposure

B.3 Microline reading that produces the tone value decreases specified in table 1

Observation of the microline readings given in table B.1 produces the tone value decreases given in table 1.

NOTES

1 The microline reading ranges given in table B.1 are based on extensive measurements of tone values on offset printing formes using the method described in 5.1 with a microscope-videocamera image analyser combination.

2 The platemaking resolution of most positive-acting plates is below 8 µm.

Table B.1 — Positive microline reading ranges

Values in micrometres

Platemaking resolution	up to 8	> 8 to 12
Microline reading range	12 to 15	15 to 20

B.4 Determination of the exposure latitude corresponding to a given microline reading range

Perform an exposure-step test as described in B.2 but plot only the positive microline reading for positive-acting plates and the negative microline reading for negative-acting plates. In a linear-logarithmic diagram, draw a smooth curve that well represents the data points. Determine the average slope m of the curve in the region used for practical platemaking and express it in micrometres per exposure decade.

Determine

$$L = 10^{a/m}$$

where

L is the exposure latitude;

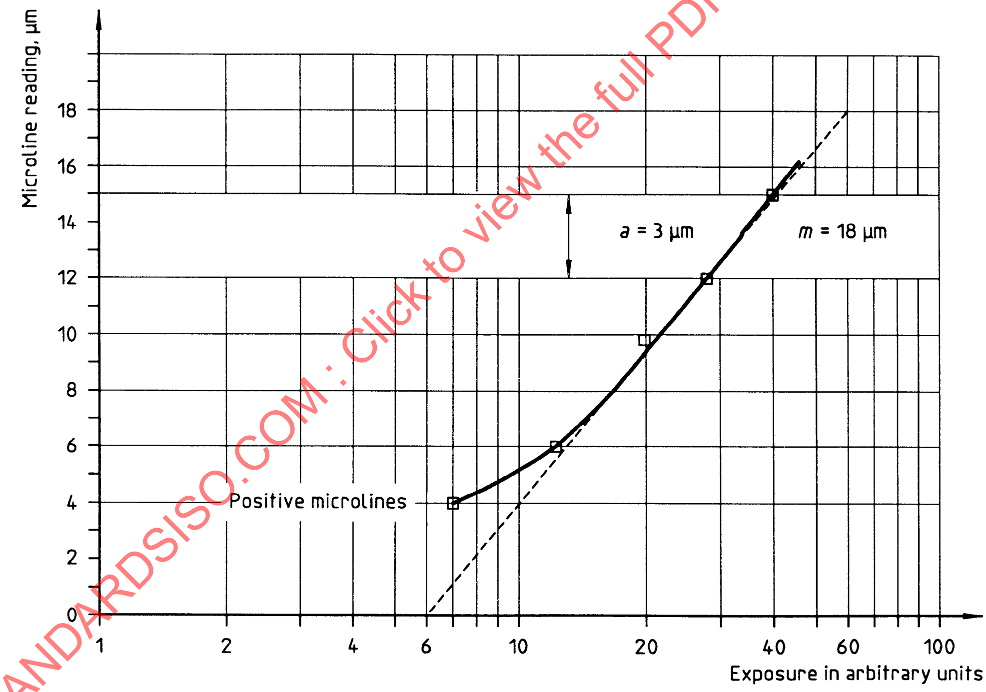
a is the width of the microline reading range, expressed in micrometres;

m is the average slope, expressed in micrometres.

EXAMPLES

See figure B.2. Suppose the recommended range for microline readings is 12 µm to 15 µm as in table B.1, hence $a = 3$ µm. The slope of the curve corresponds to a rise of 18 µm for the decade from 6 to 60 exposure units. Since lg(60/6) equals 1, the slope becomes m =18 µm/1 = 18 µm, this gives L = 1,47. If the microline reading is to stay within the 3 µm margin, the ratio of the maximum to the minimum exposure must not exceed 1,47.

If it is desired to work within the microline reading range, the ratio of the maximum exposure to the minimum exposure must not exceed L. This also applies to variations of the radiation intensity in the plane of the plate or variations of the exposure duration.



a Width of the microline reading range

m Average slope

NOTE — The vertical axis shows a linear scale; the horizontal axis shows a logarithmic scale.

Figure B.2 — Positive-acting plates: Example for the determination of the exposure latitude

Annex C
(informative)

Secondary test method: Tone values on an offset printing forme — Densitometry

This is the least reliable and the least accurate method. It is only useful if the following conditions are met:

— the printing forme provides for a good contrast between the clear and solid parts of the surface;

— there are no density variations in both the clear and solid parts of the surface;

— the densitometer is a three decimal, high precision instrument.

Take a reflection densitometer and measure, on the same offset printing forme, the reflectance factor densities of the uncoated carrier material, a solid control patch and a half-tone control patch. For reliable results, measure immediately after development and drying, and before extensive exposure to daylight. Use the spectral response setting of the densitometer that results in the highest density for the solid area control patch. If the densitometer reading depends on direction, average over at least 10 measurements, where half of the measurements are made with the densitometer parallel to the around-the-cylinder-direction of the plate and half with the densitometer perpendicular to that direction. Measure the reflectance factor densities of the clear uncoated carrier metal, of a well-defined half-tone area and of a nearby solid. Calculate the tone value of the half-tone control patch using the formula in 3.29.

In order to assure sufficient accuracy, the sampling aperture of the instrument should have a diameter not less than 15 times the screen width, it shall be not less than 10 times the screen width. This requirement applies also by analogy to the area of non-circular sampling apertures.

The measured tone values should be related to those of the primary method described in 5.1 and a conversion table should be established. Only tone values that relate to the method described in 5.1 should be reported.

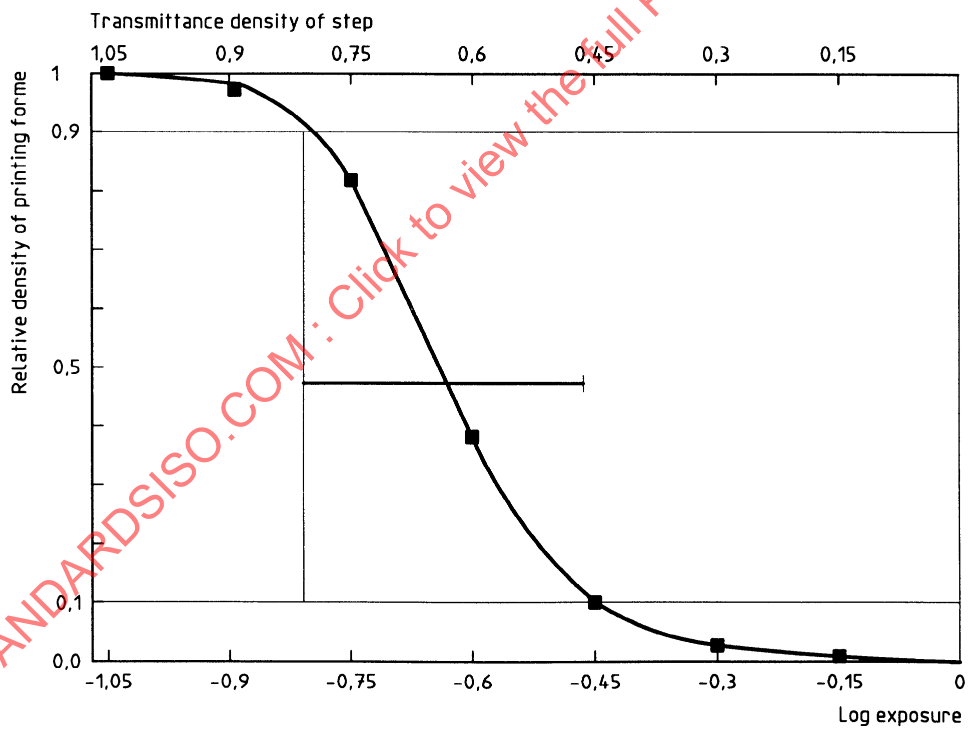
Annex D
(informative)

Test method: Platemaking gradation

Expose a continuous-tone step wedge onto a plate with the emulsion side of the continuous-tone film pointing away from the offset plate coating; that means the base side of the film is in contact with the offset plate. With a reflection densitometer, measure the reflectance factor densities D of the continuous-tone steps on the ready-to-print but not yet inked offset printing forme. Let D_{min} be the minimum reflection density found and D_{max} be the maximum reflection density found. Plot the quantity

$$\frac{D - D_{min}}{D_{max}}$$

over the corresponding transmittance density of the continuous-tone step wedge. Figure D.1 shows an example for a positive-acting plate; the graph for a negative-acting plate would look similar to the mirror image. Draw a smooth curve that represents the data points. Determine the points on the curve with the ordinates 0,1 and 0,9 and note the difference between the corresponding transmittance densities. Divide the difference by 0,15; the result is the platemaking gradation. It gives approximately the number of steps intermediate between the highest free step and the lowest covered step, as read on a continuous-tone wedge a step increment of 0,15.



NOTE — The platemaking gradation may be visually estimated by noting the number of steps in a 0,15 increment step wedge that are separately discernible on the printing forme between the step showing no density, or a scum density, and the step showing the solid.

Figure D.1 — Example of a diagram showing the determination of the platemaking gradation, positive-acting plate