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Fluid draughting media —

Part 1:

Water-based India ink — Requirements and test conditions

Fluides à dessin —

Partie 1: Encres de Chine aqueuses — Prescriptions et conditions d'essai



Reference number
ISO 9957-1:1992(E)

Foreword

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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 9957-1 was prepared by Technical Committee ISO/TC 10, *Technical drawings, product definition and related documentation*, Sub-Committee SC 9, *Media and equipment for drawing and related documentation*.

ISO 9957 consists of the following parts, under the general title *Fluid draughting media*:

- *Part 1: Water-based India ink for tracing paper — Requirements and test conditions*
- *Part 2: Water-based non-India ink for tracing paper — Requirements and test conditions*

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Fluid draughting media —

Part 1:

Water-based India ink — Requirements and test conditions

1 Scope

This part of ISO 9957 specifies the requirements and test conditions for water-based India ink intended for use in drawing instruments conforming to ISO 9175-1 used on natural tracing paper conforming to ISO 9961, to provide black line technical drawings¹⁾.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 9957. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 9957 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 5-4:1983, *Photography — Density measurements — Part 4: Geometric conditions for reflection density*.

ISO 554:1976, *Standard atmospheres for conditioning and/or testing — Specifications*.

ISO 2240:1982, *Photography — Colour reversal camera films — Determination of ISO speed*.

ISO 9175-1:1988, *Tubular tips for hand-held technical pens using India ink on tracing paper — Part 1: Definitions, dimensions, designation and marking*.

ISO 9175-2:1988, *Tubular tips for hand-held technical pens using India ink on tracing paper — Part 2: Performance, test parameters and test conditions*.

ISO 9177-2:1989, *Mechanical pencils — Part 2: Black leads — Classification and dimensions*.

ISO 9961:1992, *Draughting media for technical drawings — Natural tracing paper*.

ISO 10209-1:1992, *Technical product documentation — Vocabulary — Part 1: Terms relating to technical drawings: general and types of drawings*.

3 Definitions

For the purposes of this part of ISO 9957, the definitions given in ISO 9175-1 and the following definition apply.

3.1 India ink; China ink: A water-based drawing fluid that contains dispersed carbon black as its primary colorant.

4 Requirements

Drawings made with India ink shall be reproducible using conventional reproduction techniques (blue-print, microfilming photography, electrostatics, etc.) assuming that reproduction and exposures consistent with the recommendations of the process and the supplier of the materials are used.

This part of ISO 9957 specifies the quality requirements of India ink lines as follows:

— line width (see 5.4.2);

1) Term defined in ISO 10209-1.

- optical density (see 5.4.3);
- drying time (see 5.4.4);
- adhesion (see 5.4.5);
- erasability (see 5.4.6);
- resistance to water (see 5.4.7);
- fade resistance (see 5.4.8).

India ink lines (and characters) are archival, so that original drawings¹⁾ are highly resistant to ageing factors such as oxygen, humidity, light and temperature.

“Archival” means that under agreed storage conditions of original drawings made with India ink conforming to this part of ISO 9957 on natural tracing paper conforming to ISO 9961, the working life of the drawn lines should be at least as long as that of the substrate.

The life expectancy of the India ink in its original container shall be at least two years at storage conditions recommended by the supplier, starting from the day of manufacture.

5 Test parameters, test conditions and performance

5.1 Basic test concept

Test lines of India ink are drawn on natural tracing paper in accordance with 5.4.

5.2 Climatic conditions for testing

The tests shall be carried out under standard test atmosphere 23/50 (see ISO 554).

5.3 Test equipment and accessories

5.3.1 Test machine

The test machine shall be an electromechanical line-drawing device²⁾ permitting the adjustment of :

- angle,
- writing load,
- speed, and
- line pitch.

5.3.2 Test paper

The test paper shall be natural tracing paper conforming with ISO 9961.

It shall be left to stabilize under the standard test atmosphere (see ISO 554) for a minimum of 24 h before the test is performed.

The test strip shall be cut parallel to the longest edge of the test paper.

5.3.3 Test pen

The test lines shall be drawn with a new tubular technical pen conforming with ISO 9175-1.

The India ink shall be supplied to the tubular tip by means of a freshly refilled reservoir or a new ink cartridge.

5.3.4 Densitometer

The densitometer shall measure optically diffuse or doubly diffuse transmission density in accordance with ISO 5-2 and ISO 5-4.

5.3.5 Measuring microscope or profile projector, magnification min. $\times 8$.

5.3.6 Stopwatch

5.3.7 Ordinary adhesive tape

5.3.8 Mechanical pencil, with a black lead ISO 9177-2-P-0,5, of hardness degree HB, and **lead eraser.**

5.3.9 Filtered xenon lamp

5.4 Testing

5.4.1 Test lines

Prepare the tubular technical pen according to the manufacturer's requirements for cleaning, filling and type of India ink.

Fit the tubular technical pen in the test machine (5.3.1) and draw 10 lines of approximately 5 m in total length in accordance with the following requirements.

The load on the tubular technical pen shall be 0,1 N for pens intended to produce a line width $d = 0,13$ mm and 0,2 N for pens intended to produce a line width $d \geq 0,18$ mm.

2) On request ISO/TC 10 Secretariat will provide a list of suppliers.

The drawing angle on the tubular technical pen shall be 87° to the horizontal plane of the oncoming test paper, as shown in figure 1.

The drawing speed shall be

- a) $5 \text{ cm/s} \pm 0,3 \text{ cm/s}$ for pens intended to produce a line width $d = 0,13 \text{ mm}$ to $0,7 \text{ mm}$;
- b) $3 \text{ cm/s} \pm 0,2 \text{ cm/s}$ for pens intended to produce a line width $d = 1 \text{ mm}$ and $1,4 \text{ mm}$;
- c) $2 \text{ cm/s} \pm 0,2 \text{ cm/s}$ for pens intended to produce a line width $d = 2 \text{ mm}$.

The conveyor belt shall consist of a polyester film, $0,1 \text{ mm}$ thick, moving on a solid smooth metal plate.

The step-transverse movement (pitch) of the test machine shall be 3 mm/cycle .

5.4.2 Measurement of line width

The line width shall be determined

- a) microscopically, using a micrometer scale in the ocular, or
- b) by using magnified projection on a profile projector.

The measuring device shall have a minimum accuracy of $0,01 \text{ mm}$.

The line width measurements shall be taken at the 10 intersections of an imaginary line perpendicular to the test lines.

A further set of measurements shall be made at a distance of approximately 150 mm from the first imaginary line. The irregularities at the edges of the test lines are interpolated visually (see figure 2) and the measurement is taken as the distance between these interpolated averages.

The test result is the arithmetic average of the 20 measurements, rounded off to the nearest $0,01 \text{ mm}$.

The maximum permissible deviation in the line width shall be within those given in the table of ISO 9175-2:1988.

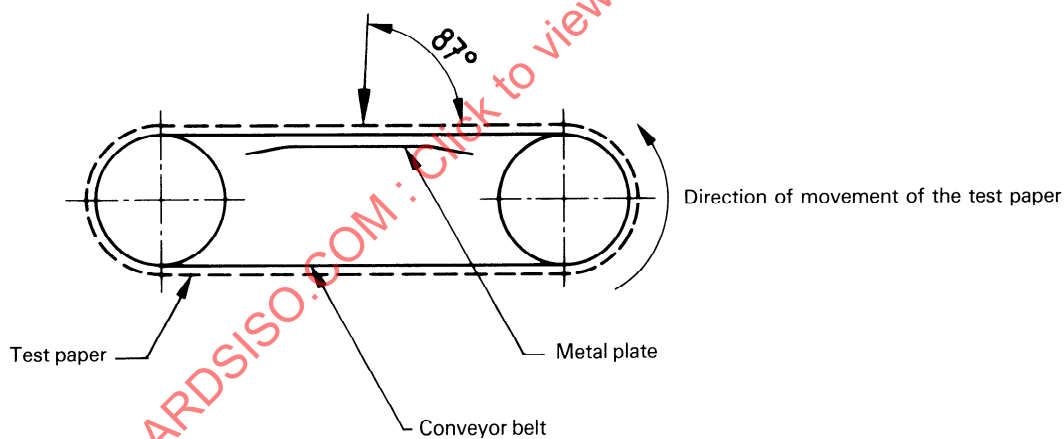


Figure 1 — Schematic representation of the test machine

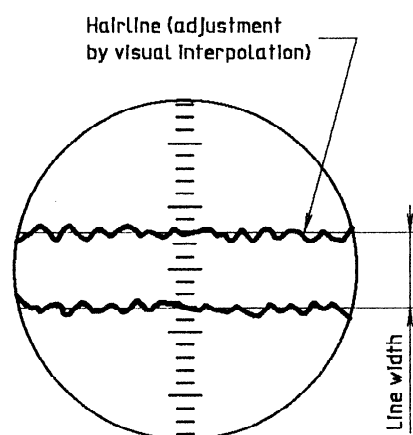


Figure 2 — Evaluation of the line width

5.4.3 Optical density

This test procedure serves to determine the optical density of India ink lines that are at least 1 mm wide.

a) For transmitted light reproduction:

A test sample of India ink lines drawn as per 5.4.1 and having a width of at least 1 mm is used for the measurement. A calibrated transmission densitometer conforming to ISO 5-2 is set to zero and made to read the optical diffuse transmission density of the paper by randomly reading the spaces between the drawn lines. Five readings are also taken of the ink lines, taking care that the illuminating orifice is completely covered and in intimate contact with the ink line.

The optical density of the ink line is obtained by subtracting the average optical density of the paper from the average optical density of the paper plus ink line. An optical density of at least 1,0 will provide adequate contrast for many reproduction processes that use transmitted light.

b) For reflected light reproduction:

The same procedure is followed using a densitometer that measures reflectance optical density in conformity with ISO 2240. An optical reflectance density of 1,0 will provide adequate contrast.

5.4.4 Drying time

With a tubular technical pen conforming to 5.3.3 and giving a line width of 0,35 mm, draw a 150 mm long line on test paper conforming to 5.3.2 at standard test atmosphere (see ISO 554).

After 10 s and with light pressure, wipe a dry finger across the central area of the test line. Absence of smearing indicates that the line has dried.

5.4.5 Adhesion

After a drying time of 5 min, proceed as follows.

Place ordinary adhesive tape (5.3.7) across a section of the test sample as described in 5.4.1 and comprising at least three test lines. Position it across the lines with ordinary finger pressure. As soon as possible pull off the tape at an angle of approximately 90°. No visual loss in optical density of the tested area shall be observed.

Draw a line across another section of the ink test lines with the mechanical pencil (5.3.8). Erase the lead line immediately with a soft lead eraser. No visual loss in optical density of the test lines shall be observed.

5.4.6 Erasability

Using a tubular technical pen complying with 5.3.3, giving a line width of 0,35 mm, draw manually, with the aid of a straight edge, an India ink line at least 50 mm long on test paper conforming to 5.3.2.

After a drying time of 5 min, completely erase a 30 mm long centrally located section of the line with an eraser for use with India ink. Then clean the erased area to remove any eraser dust and residue. Then draw a new India ink line across the erased area as shown in figure 3.

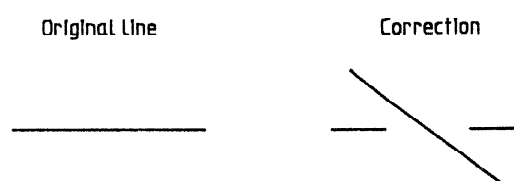


Figure 3

The erased and redrawn area shall show no recognizable feathering or ghost lines. The width of the redrawn line shall not exceed the maximum permissible deviation given in the table in ISO 9175-2:1988.

5.4.7 Resistance to water

Using a tubular technical pen conforming to 5.3.3, giving a line width of 0,7 mm, draw manually, with the aid of a straight edge, an India ink line at least 50 mm long at a drawing speed of approximately 5 cm/s.

Place the test sample on a sheet of glass, allow the ink to dry for 15 min and put two drops of deionized water on the central area of the test ink line.

Allow the water to evaporate under test atmosphere conditions (see 5.2).

Then, examine the tested area for ink spreading.

5.4.8 Fade resistance

Use a section of the test sample as described in 5.4.1 and containing at least three test India ink lines. Cover half of the sample with an opaque shield and expose the entire test sample to the light of a filtered xenon lamp according to 5.3.9 with an energy of 12 kJ/cm².

A visual comparison of exposed and unexposed India ink lines shall not show a recognizable difference in optical density.

6 Test report

The test report shall include the following:

- a) reference to this part of ISO 9957;
- b) type and designation of the India ink under test;
- c) type and designation of the tubular technical pen used;
- d) test results:
 - line width (see 5.4.2),
 - optical density (see 5.4.3),
 - drying time (see 5.4.4),
 - adhesion (see 5.4.5),
 - erasability (see 5.4.6),
 - resistance to water (see 5.4.7),
 - fade resistance (see 5.4.8);
- e) details of any deviation in test parameters or conditions from those specified in this part of ISO 9957;
- f) technical data, name of the test centre, date and signature of the inspector.

Annex A
(informative)

Bibliography

- [1] ISO 128:1982, *Technical drawings — General principles of presentation*.
- [2] ISO 6428:1982, *Technical drawings — Requirements for microcopying*.

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