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**Fluid draughting media —**

**Part 2:**

Water-based non-India ink — Requirements  
and test conditions

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Partie 2: Encres aqueuses autres que les encres de Chine — Prescriptions  
et conditions d'essai



Reference number  
ISO 9957-2:1995(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 9957-2 was prepared by Technical Committee ISO/TC 10, *Technical drawings, product definition and related documentation*, Subcommittee 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 — Requirements and test conditions*
- *Part 2: Water-based non-India ink — Requirements and test conditions*

# Fluid draughting media —

## Part 2:

# Water-based non-India ink — Requirements and test conditions

### 1 Scope

This part of ISO 9957 specifies the requirements and test conditions for water-based non-India inks intended for use in draughting instruments<sup>1)</sup> and intended for use on natural tracing paper conforming to ISO 9961, to provide for black line technical drawings.

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

ISO 105-A01:1994, *Textiles — Tests for colour fastness — Part A01: General principles of testing.*

ISO 128:1982, *Technical drawings — General principles of presentation.*

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

ISO 2240:1994, *Photography — Colour reversal camera films — Determination of ISO speed.*

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

ISO 9957-1:1992, *Fluid draughting media — Part 1: Water-based India ink — Requirements and test conditions.*

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 10209-1 and the following definition apply.

**3.1 non-India ink:** Black water-based draughting fluid that contains a colorant such as (but not limited to) one or more of the following: dyes, dispersions of dyes, microfine organic pigments, etc., but does not contain carbon black as its primary colorant.

NOTE 1 A non-India ink does not conform to all the requirements of ISO 9957-1.

1) International Standards dealing with tubular tips for hand-held non-India ink technical pens are in preparation.

## 4 Requirements

Drawings made with non-India ink may not necessarily be reproducible using conventional reproduction techniques (blueprint, exposure and microfilm printing, photographic reproduction, electrostatic processing, etc.) due to the spectral response of the imaging process, and the spectral absorption and reflectance characteristics of the non-India ink line.

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

- line width (see 5.4.2);
- optical density (see 5.4.3);<sup>2)</sup>
- drying time (see 5.4.4);
- adhesion (see 5.4.5);
- erasability/redraughtability (see 5.4.6);
- resistance to water (see 5.4.7) and
- fade resistance (see 5.4.8).

Lines (and characters) drawn with non-India ink are not as fade-resistant as India ink lines and consequently cannot be used to produce archival-quality documents. The use of non-India inks is not recommended to produce or modify original drawings which need to be highly resistant to ageing factors such as oxygen, humidity, light and temperature.

The graphical and mechanical qualities of a non-India ink in its original container shall be preservable for at least two years at the storage conditions recommended by the supplier, starting from the date of manufacture which shall be written on a label attached to the container.

## 5 Test parameters, test conditions and performance

### 5.1 Basic test concept

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

### 5.2 Atmospheric 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 device<sup>3)</sup> 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 to ISO 9961.

It shall be left to stabilize under the standard test atmosphere (see 5.2) 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 non-India ink tubular technical pen<sup>1)</sup>.

The non-India ink shall be supplied to the tubular tip by means of a freshly filled 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 Adhesive tape.

2) The measured optical density does not guarantee the reproducibility.

3) On request, the ISO/TC 10 Secretariat will provide a list of suppliers.

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

**5.3.9 Eraser**, for use with non-India ink.

**5.3.10 Filtered xenon lamp**.

## 5.4 Testing

### 5.4.1 Test lines

Prepare the tubular technical pen (5.3.3) according to the manufacturer's requirements for cleaning, filling and type of non-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 non-India ink 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.

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

The drawing speed shall be:

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

- $2 \text{ cm/s} \pm 0,2 \text{ cm/s}$  for pens intended to produce a line width  $d = 2$  mm.

The conveyor belt shall consist of a polyester film, 0,1 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

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

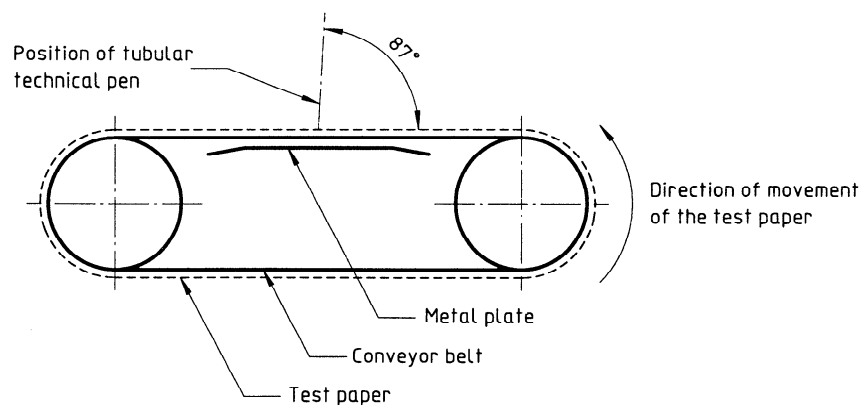
The measuring device shall have a minimum accuracy of 0,01 mm.

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

A further set of 10 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 mm.

For limit deviations on the line width, see table 1.



**Figure 1 — Schematic representation of the test machine**

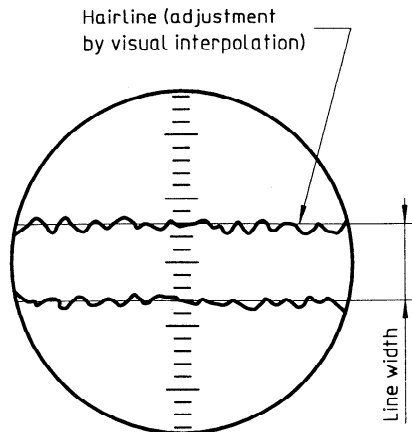


Figure 2 — Evaluation of line width

Table 1 — Limit deviations on line width  
Dimensions in millimetres

Line width <sup>1)</sup> <i>d</i>	Limit deviations
0,132 <sup>2)</sup>	+0,03 -0,01
0,18	+0,03 -0,01
0,25	+0,03 -0,01
0,35	± 0,04
0,5	± 0,05
0,7	± 0,07
1	± 0,1
1,4	± 0,2
2	± 0,2

1) In accordance with ISO 128.  
2) Not yet included in ISO 128.

5.4.3 Optical density

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

a) For transmitted light reproduction:

A test sample of non-India ink lines drawn in accordance with 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, 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 accordance with ISO 2240. An optical reflectance density of 1,0 will provide adequate contrast.

5.4.4 Drying time

Using a tubular technical pen (5.3.3) giving a line width of 0,35 mm, draw a line 150 mm long on tracing paper (5.3.2) at the standard test atmosphere (see 5.2).

For testing the drying time, after 10 s wipe a finger gloved with cotton (or another well-defined material) with light pressure across the central area of the test line. No smearing shall be observed.

5.4.5 Adhesion (tape test and eraser test)

After a drying time of 15 min proceed as follows:

5.4.5.1 Place 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. Pull off the tape as soon as possible at an angle of approximately 90°. No visual loss in optical density of the tested area shall be observed.

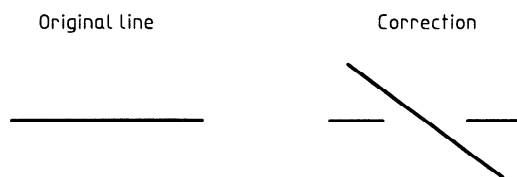
5.4.5.2 Draw a line across another section of the non-India ink test lines using the mechanical pencil (5.3.8). Erase the lead line immediately with a soft lead eraser (5.3.8). No visual loss in optical density of the test lines shall be observed.

5.4.6 Erasability/redraughtability

Non-India inks may be erasable; if so, this should be stated in the test report. To test the erasability/redraughtability, proceed as follows:

Using a tubular technical pen (5.3.3) giving a line width of 0,35 mm, draw manually, with the aid of a straightedge, a non-India ink line at least 50 mm long on test paper conforming to 5.3.2.

After a drying time of 15 min, completely erase a 30 mm long centrally located section of the line with an eraser for use with non-India ink (5.3.9). Clean the erased area to remove any eraser dust and residue. Then draw a new non-India ink line across the erased area, as shown in figure 3.



**Figure 3 — Erasability test**

The erased and redrawn area shall show no recognizable feathering or ghost lines. The width of the redrawn line shall not exceed the nominal width plus the upper deviation given in table 1.

sample to the light of a filtered xenon lamp (5.3.10) for a total exposure of 12 kJ/cm<sup>2</sup>. The degree of fading of the non-India ink lines is judged visually by the difference between exposed and unexposed sections of the test sample, in comparison with the India ink line.

NOTE 2 This simple method is useful in accordance with ISO 105-A01:1994, 13.5: "Where it is not essential to determine the exact colour fastness rating, it may be sufficient to compare the material being investigated with a standard dyeing. This method is used when it is necessary to establish only whether the colour fastness of the specimen to a particular agent is greater than, equal to, or less than that of the reference dyeing."

## 6 Designation

The designation of a non-India ink shall consist of the following elements in the order given:

- "Non-India ink";
- a reference to this part of ISO 9957.

EXAMPLE

Non-India ink ISO 9957-2

## 7 Test report

The test report shall include the following information:

- reference to this part of ISO 9957;
- type and designation of the non-India ink under test and of the India ink used in 5.4.8;
- type and designation of the non-India ink tubular technical pen used;
- type and designation of the test paper (5.3.2) and the cutting direction of the test strip (machine direction or cross-direction);
- 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/redraughtability (see 5.4.6),
  - resistance to water (see 5.4.7),

### 5.4.7 Resistance to water

Using a tubular technical pen (5.3.3) giving a line width of 0,7 mm, draw manually, with the aid of a straightedge, a non-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 and allow the non-India ink line to dry for 15 min. Then put two drops of deionized water on the central area of the test line.

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

Then examine the tested area for ink spreading. Although some slight traces of ink spreading are allowed, no visual reduction in line intensity is permitted.

### 5.4.8 Fade resistance

To a section of the test sample prepared as described in 5.4.1 and containing at least three non-India ink lines, manually add an India ink line to serve as a reference for colour matching. Cover half of the sample with an opaque shield and expose the entire test

- fade resistance (see 5.4.8);
- f) any deviation, by agreement or otherwise, from the procedures specified in this part of ISO 9957;
- g) technical data, name of the test centre, date and signature of the inspector.

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