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**Fluid draughting media —**

**Part 3:**

**Water-based coloured draughting inks —  
Requirements and test conditions**

iTeh *Fluides à dessins* STANDARD PREVIEW

*Partie 3: Encres aqueuses colorées à dessin — Prescriptions et conditions  
d'essai*

ISO 9957-3:1997

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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.

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 9957-3 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*
- *Part 3: Water-based coloured draughting inks*

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Annex A forms an integral part of this part of ISO 9957.

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## Fluid draughting media —

### Part 3: Water-based coloured draughting inks — Requirements and test conditions

#### 1 Scope

This part of ISO 9957 specifies the requirements and test conditions for water-based coloured draughting inks intended for use in tubular technical pens. The pen and ink combinations are intended primarily to provide for coloured lines and filled areas on natural tracing paper conforming to ISO 9961 and other draughting media.

#### 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 listed below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 105-B02:1994, *Textiles — Tests for colour fastness — Part 3: Colour fastness to artificial light: Xenon arc fading lamp test.*

<https://standards.iteh.ai/catalog/standards/sist/bc37a84e-f839-4509-9597-dff32bbcf9f/iso-9957-3-1997>

ISO 105-J03:1995, *Textiles — Test for colour fastness — Part J03: Calculation of colour differences.*

ISO 128-20:1996, *Technical drawings — General principles of presentation — Part 20: Basic conventions for lines.*

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

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

ISO 9957-2:1995, *Fluid draughting media — Part 2: Water-based non-India ink — Requirements and test conditions.*

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

CIE Publication No. 15.2:1986, *Colorimetry.*

#### 3 Definitions

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

**3.1 coloured ink**

non-black water-based low viscosity ink designed for writing or draughting, intended for the generation of coloured lines and filled areas

**4 Classification**

Coloured draughting inks shall be classified as one of the following types:

Type A: of relatively permanent character exhibiting adhesion, fade and water proofness and other properties conforming to ISO 9957-1;

Type B: of a less permanent character, exhibiting more fugitive colour characteristics and inferior formed film properties.

**5 Requirements**

Lines and filled areas made with coloured draughting inks may not necessarily be reproducible using conventional reproduction techniques, due to the spectral response of the imaging process, the spectral absorption and the reflectance characteristics of the individual coloured ink line.

The characteristics and requirements specified for lines drawn using the two types of coloured draughting inks are given in table 1 (yes = required, no = not required).

**Table 1 — Characteristics and requirements specified for coloured draughting lines**

Characteristic	Requirements specified	
	Type A	Type B
Line width (see 6.4.2)	yes	yes
Colour (see 6.4.3)	yes	yes
Drying time (see 6.4.4)	yes	yes
Adhesion (see 6.4.5)	yes	no
Erasability/redraughtability (see 6.4.6)	yes	no
Resistance to water (see 6.4.7)	yes	no
Fade resistance (see 6.4.8)	> 4 <sup>1)</sup>	no

1) Grey scale rating, in accordance with ISO 105-B02.

Coloured ink lines and filled areas drawn with type A coloured draughting inks have limited fade resistance and permanence. Visual colour and contrast will not archive as well as India ink (see ISO 9957-1).

Coloured ink lines and filled areas drawn with type B coloured draughting inks

- are more fugitive and not as permanent as type A;
- are not as resistant as type A to ageing factors such as: oxygen, moisture, light and temperature;
- do not meet all the requirements of ISO 9957-1.

The graphical and mechanical characteristics of both types of coloured draughting inks shall be preservable in their original container for at least two years at the storage conditions recommended by the supplier starting from the day of manufacture which shall be written on a label attached to the container.

## 6 Test conditions, equipment and performance

### 6.1 Basic test concept

Test lines of the coloured draughting ink are drawn in accordance with 6.4 using a new tubular technical pen in accordance with ISO 9175-1, on natural tracing paper or any other paper recommended for the ink, and the lines are evaluated for the desired characteristic.

### 6.2 Climatic conditions for testing

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

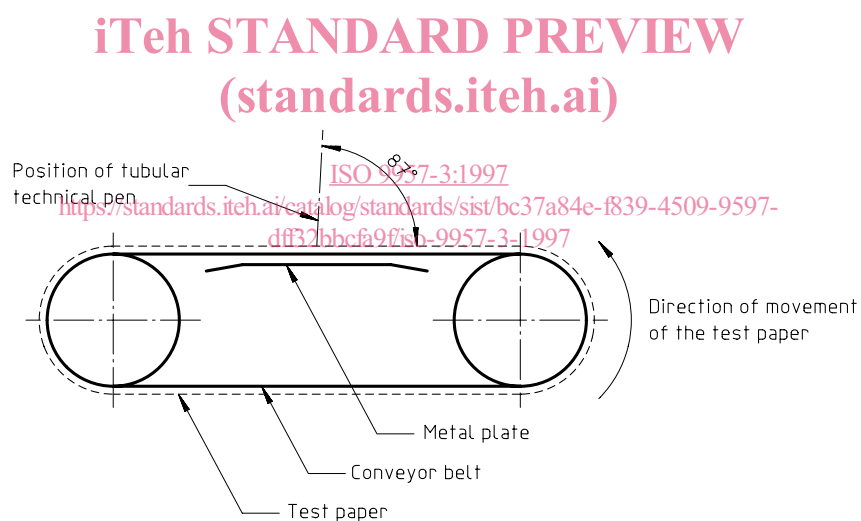
### 6.3 Test equipment and accessories

#### 6.3.1 Test machine

The test machine shall be an electromechanical line-draughting device<sup>1)</sup> permitting the adjustment of:

- writing angle;
- writing load;
- speed;
- line pitch.

See figure 1.



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

#### 6.3.2 Test paper

The test paper shall be natural tracing paper conforming to ISO 9961, or any other paper recommended for the ink. The paper shall be left to stabilize under the standard test atmosphere (see 6.2) 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.

<sup>1)</sup> On request, the ISO/TC 10 Secretariat will provide a list of suppliers.

### 6.3.3 Test pen

The test lines shall be drawn with a tubular technical pen in accordance with ISO 9175-1. The ink shall be supplied to the tubular tip by means of a freshly refilled reservoir or a new coloured-ink cartridge.

### 6.3.4 Reflectance colorimeter

The colorimeter shall measure colour in accordance with CIE Publication No. 15.2.

### 6.3.5 Measuring microscope or profile projector, magnification min. $\times 20$ .

### 6.3.6 Stopwatch.

### 6.3.7 Adhesive tape.

**6.3.8 Mechanical pencil**, with a black lead ISO 9177-2-P-0,5 of hardness degree HB, and **soft eraser** for black lead (max. Shore A hardness 50).

### 6.3.9 Eraser, for use with India ink.

### 6.3.10 Filtered xenon lamp.

## 6.4 Testing

### 6.4.1 Test lines

Prepare the tubular technical pen (6.3.3) according to the manufacturer's specifications for cleaning, filling and type of coloured draughting ink.

Fit the tubular technical pen in the test machine (6.3.1) and draw 10 lines of approximately 5 m in total length in accordance with ISO 9175-2:1988 (5.4).

### 6.4.2 Line width

The line width shall be determined

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

The measuring device shall comply with the limits of permissible error of  $\pm 0,01$  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 in the line width, see table 2.

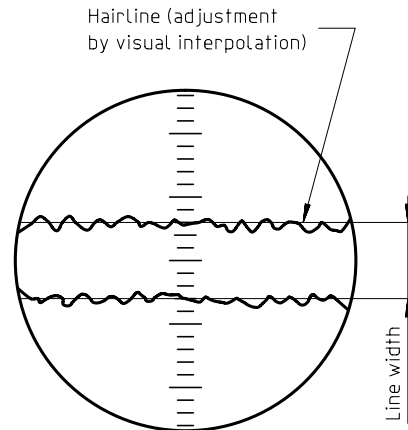


Figure 2 — Evaluation of line width

Table 2 — Limit deviations in line width

Line width <sup>1)</sup> <i>d</i>	Limit deviations
0,13	+ 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) According to ISO 128-20.

### 6.4.3 Colour

**6.4.3.1** The colour areas shall correspond to those shown in figure A.1. The *x* and *y* coordinates of the corner points of the colour areas and luminance factors required shall be as given in table A.1.

Colours specified within an area very close to the boundary line shall be named by the manufacturer, but the designation of the basic colour shall be added to the specimen.

**6.4.3.2** A test sample of coloured ink lines is drawn in accordance with 6.4.1 with a machine pitch of 0,1 mm less than the average line width as obtained in 6.4.2.

The material is considered to be illuminated by daylight as represented by the Standard Illuminant D<sub>65</sub> at an angle of 45° and measured for colour intensity and contrast with a colorimeter in accordance with 6.3.4.

**6.4.4 Drying time**

With a tubular technical pen (6.3.3), giving a line width of 0,35 mm, draw a line 150 mm long on test paper (6.3.2) at standard test atmosphere (6.2).

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.

**6.4.5 Adhesion** (tape test and eraser test)

After a drying time of 15 min, proceed as follows:

**6.4.5.1** Place an adhesive tape (6.3.7) across a section of the test sample as described in 6.4.1, 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.

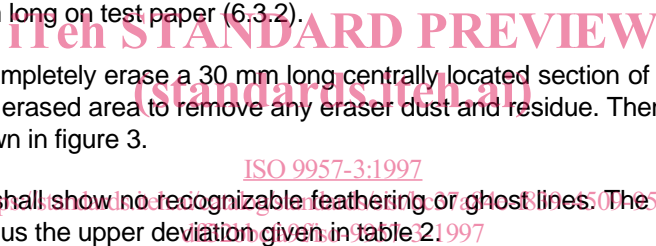
**6.4.5.2** Draw a line across another section of the test lines with a mechanical pencil (6.3.8). Erase the lead line immediately with a soft lead eraser (6.3.8). No visual loss in optical density of the test lines shall be observed.

**6.4.6 Erasability/redraughtability**

Using a tubular technical pen (6.3.3), giving a line width of 0,35 mm, draw manually, with the aid of a straightedge, a coloured ink line at least 50 mm long on test paper (6.3.2).

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 India ink (6.3.9). Clean the erased area to remove any eraser dust and residue. Then draw a new coloured ink line across the erased area as shown in 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 nominal width plus the upper deviation given in table 2.



**Figure 3 — Erasability test**

**6.4.7 Resistance to water**

Using a tubular technical pen (6.3.3), giving a line width of 0,7 mm, draw manually, with the aid of a straight edge, an ink line at least 50 mm long at a draughting speed of 5 cm/s on the test paper (6.3.2).

Place the test sample on a sheet of glass and allow the 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 (6.2).



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

#### 6.4.8 Fade resistance

Use a section of the test sample as described in 6.4.3, measuring at least 3 cm × 6 cm. Cover half the test sample with an opaque shield and expose the test sample to the light of a filtered xenon lamp (6.3.10) for a total exposure of 12 kJ/cm<sup>2</sup>.

The relative degree of fade resistance of the tested ink is evaluated by a visual comparison of the exposed and unexposed coloured ink lines. Fade resistance can be judged by comparing the fade resistance of test inks to the fade resistance of standard samples conforming to the requirements of ISO 105-B02<sup>2)</sup>. By measuring colour coordinates before and after exposure, the degree of fading can be quantified using the CIELAB colour difference equation, see ISO 105-J03.

## 7 Designation

The designation of the coloured ink shall consist of the following elements in the order given:

- a) "Coloured ink";
- b) reference to this part of ISO 9957;
- c) type of ink (A or B), as specified in clause 4.

#### EXAMPLE

Designation of a coloured draughting ink, type A:

**Coloured ink ISO 9957-3 - A**

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## 8 Test report

The test report shall include the following:

- a) reference to this part of ISO 9957;
- b) type and designation of the coloured ink under test;
- c) type and designation of the tubular technical pen used;
- d) type and designation of the test paper (6.3.2) and the cutting direction of the test strip (machine direction or cross direction);
- e) test results:
  - line width (see 6.4.2),
  - colour (see 6.4.3),
  - drying time (see 6.4.4),
  - adhesion (see 6.4.5),

2) Known as "blue wool reference".